High Level Policy Dialogue on Biotechnology for Food Security and Poverty Alleviation: Opportunities and Challenges

7-9 November 2005
Rama Gardens Hotel, Bangkok, Thailand

PROCEEDINGS

FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC (FAO RAP)
ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH INSTITUTIONS (APAARI)
and
GLOBAL FORUM ON AGRICULTURAL RESEARCH (GFAR)
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FOREWORD

The Asia-Pacific countries have accorded high priority to biotechnology as reported during this high level policy dialogue. The level of utilization of biotechnology, however, varies from country to country. Biotechnology ranges from micro-propagation of vegetatively propagated crops, advanced diagnostics, genomics, and genetic engineering to the development and commercialization of GM crops. China, India, Indonesia, Iran, Japan, the Philippines, and Thailand have made very good progress in the application of modern biotechnology for improving agriculture. The other countries are also moving towards the adoption of these new technologies for a common goal of achieving food security and poverty alleviation. While the area under GM crops as projected is likely to grow at a faster rate in the years to come, the capacity of the region in utilizing full potential of biotechnology greatly varies from country to country.

As of now, the use of modern biotechnology is limited to a few crops, a few desirable traits and a few countries and therefore with limited impact in addressing poverty and hunger in the region. Therefore, one very important issue before us is how to ensure that application of modern biotechnology promotes food security and reduces poverty in the region, which has almost two-thirds of the world’s undernourished population. Success in eradicating hunger is central to the achievement of the Millennium Development Goals (MDGs).

Both FAO RAP and APAARI, over more than a decade, have held a number of conferences and expert consultations in the Asia-Pacific region, to address concerns of developing countries in the context of new technological options for increased agricultural production, especially by the small and marginal farmers. The joint FAO-APAARI-GFAR high level policy dialogue conducted on 7-9 November 2005 in Bangkok, Thailand was a step forward to assess the recent developments in biotechnology and address all relevant concerns that would accelerate their useful and safe application. This broad-based dialogue covered both conventional and modern biotechnological options. It addressed issues related to food security, policy and legal framework concerning biotechnology, biosafety and regulatory procedures, intellectual property rights (IPRs) and private sector research, as well as global and regional partnerships.

We thank the 81 participants who contributed in this dialogue, including the Ministers/Secretaries of Agriculture, Heads of NARS and CGIAR Centers, distinguished scientists and leaders of several regional and international organizations, representatives of private sector, NGOs and farmers or organizations for sharing information, knowledge and experience. The dialogue succeeded in bringing together different stakeholder groups, governments, academia, the private sector, and civil society to promote greater understanding and foster mutual learning on some of the most debated issues related to biotechnology. The sharing of knowledge on new developments and findings on modern biotechnology tools raised awareness of the potential benefits and risks associated with biotech products and the implications in terms of needed regulatory framework, institutional capacity building and human resource development, and modes of partnership.

Developing countries in Asia-Pacific can take on appropriate knowledge-and science-based policy decisions with respect to application of both conventional and modern biotechnologies in their food and agriculture sector and to address poverty and hunger, in accordance with the World Food Summit and Millennium Development Goals. As recommended from this dialogue, FAO, APAARI-APCoAB and GFAR shall continue to assist developing countries in the region by taking a proactive role in policy.
dialogues, increasing public understanding, promoting the necessary legal and regulatory framework, capacity building, and mobilizing resources for enhancing regional cooperation to address the needs of the poor people in the region.

He Changhui
Assistant Director General and Regional Executive Secretary
Representative for Asia and the Pacific (FAO RAP)

Raj Paroda
Executive Secretary
APAARI
**ACRONYMS AND ABBREVIATIONS**

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<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>AREO</td>
<td>Agricultural Research and Education Organization (Iran)</td>
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<td>AARINENA</td>
<td>Association of Agricultural Research Institutions in the Near East and North Africa</td>
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<td>ADG</td>
<td>Assistant Director General</td>
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<td>AIT</td>
<td>Asian Institute of Technology</td>
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<td>APAARI</td>
<td>Asia-Pacific Association of Agricultural Research Institutions</td>
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<td>ACoPAB</td>
<td>Asia-Pacific Consortium on Agricultural Biotechnology</td>
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<td>APEC</td>
<td>Asia-Pacific Economic Cooperation</td>
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<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
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<td>AVRDC</td>
<td>Asian Vegetable Research and Development Center (World Vegetable Center)</td>
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<td>BAFPS</td>
<td>Bureau of Agriculture and Fisheries Products Standards (Philippines)</td>
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<td>BecA</td>
<td>Biosciences eastern and central Africa</td>
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<td>BPI</td>
<td>Bureau of Plant Industry (Philippines)</td>
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<td>Bt</td>
<td>Bacillus thuringiensis</td>
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<td>CACAARI</td>
<td>Central Asia and the Caucasus Association of Agricultural Research Institutions</td>
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<td>CARP</td>
<td>Sri Lankan Council for Agricultural Research and Policy</td>
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<td>CBD</td>
<td>Convention on Biological Diversity</td>
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<td>CGIAR</td>
<td>Consultative Group of International Agricultural Research Centers</td>
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<td>CIMMYT</td>
<td>International Maize and Wheat Improvement Center</td>
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<tr>
<td>CIRAD</td>
<td>Centre de Cooperation Internationale en Recherche Agronomique pour le Development</td>
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<td>COEs</td>
<td>Centers of Excellence</td>
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<td>CSOs</td>
<td>Civil Society Organizations</td>
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<td>DA</td>
<td>Department of Agriculture (Philippines)</td>
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<td>DMC</td>
<td>Direct seeding, mulch-based systems and conservation agriculture</td>
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<td>DOA</td>
<td>Department of Agriculture (Thailand)</td>
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<td>ECOSOC</td>
<td>Economic and Social Council</td>
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<td>EO</td>
<td>Executive Order</td>
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<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<td>FAO RAP</td>
<td>Food and Agriculture Organization Regional Office for Asia and the Pacific</td>
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<td>FARA</td>
<td>Forum on Agricultural Research in Africa</td>
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<td>FDI</td>
<td>Foreign Direct Investment</td>
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<td>FH</td>
<td>Future Harvest</td>
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<td>FPA</td>
<td>Fertilizer and Pesticide Authority (Philippines)</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>Genetic Engineering Approval Committee (India)</td>
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<td>GFAR</td>
<td>Global Forum on Agricultural Research</td>
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<td>GM</td>
<td>Genetically modified</td>
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<td>GMOs</td>
<td>Genetically modified organisms</td>
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<td>GPhI</td>
<td>Global Post-Harvest Initiative</td>
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<td>Acronym</td>
<td>Full Name</td>
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<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<tr>
<td>UNESCAP-CAPSA</td>
<td>Center for Alleviation of Poverty through Secondary Crops Development in Asia and the Pacific (Indonesia)</td>
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<td>UPOV</td>
<td>Union for the Protection of Plant Varieties</td>
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<td>WFP</td>
<td>World Food Programme</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WIPO</td>
<td>World Intellectual Property Organization</td>
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<td>WTO</td>
<td>World Trade Organization</td>
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BACKGROUND

The global population is increasing by roughly 80 million annually and almost all this growth is taking place in the developing countries. Asia is home for 60 per cent of the world's population. It is projected that by 2025, Asian population will increase by over 35 per cent reaching 4.7 billion, as against expected world population of 8.0 billion. Most of this population lives in rural areas, where small farmers practice subsistence agriculture, often under harsh conditions. Most of these areas are also rampant with poverty, food insecurity and malnutrition. Today, Asia is home for the maximum poor people in the world.

It is well understood that the rising population growth will require substantial increase in food production, that too on sustainable basis. It is well recognized that to keep pace with increasing demand for food, existing technologies will have to be scaled up, using advanced biotechnological interventions. Biotechnology has emerged as a powerful tool for improving both food and nutritional security. It offers enormous opportunities to increase overall productivity, nutritional status, resistance to pests, drought, and salinity, among others. Furthermore, biotechnology is also expected to reduce health risks and environmental pollution due to reduced use of chemicals for pest management. Hence, there is a strong basis to supplement conventional breeding methods with biotechnological options for increasing production, improving nutritional status and reducing input costs for the resource poor farmers of Asia, resulting in increased income as well as reduced poverty.

In 2004, global area under the GM crop was estimated to be 81.0 million ha, grown by 8.25 million farmers in 17 countries. Compared to 1.7 million ha in 1996, the present acreage represents a 47-fold increase in eight years. However, so far only 34 per cent of such areas is covered in the developing countries (mainly China, India, Argentina, Brazil, and South Africa). So ybean, cotton, canola, papaya, rice, tomato and potato are the major GM crops presently in the global market. However, so far only a few farmers in a few developing countries are reaping these benefits. Neither the private nor the public sector has invested significantly in these technologies for the crops that have great relevance for food and nutritional security such as wheat, rice and food legumes. Also there are technological and policy related barriers that prevent the poor from accessing modern biotechnology. These are: inadequate regulatory procedures, complex intellectual property issues, poorly functioning markets and seed delivery systems, and weak domestic plant breeding capacity.

One fundamental question of ten raised is whether GMOs are really needed to achieve the World Food Summit objective of halving the number of under nourished by 2015. This is because improved seeds and planting materials generated by the International Agricultural Research Centers as international public goods, including hybrids and varieties, have also not reached all smallholder farmers of the Third World. In the meantime, attention has also been drawn to feed the world population that will increase from a current six billion to nine billion people in 2050, requiring a 60 per cent increase in food production. On the contrary, expanding the arable area is becoming unfeasible because of urbanization and industrialization. Also the second generation of transgenic crop plants is resulting in increased biotic and abiotic stresses, poor soil health, water quality and even salinization. Such a situation will require intensified cultivation, higher yields and greater productivity. It is in this context that genetic engineering and bio technology of tremendous oppor tunities for increasing productivity as well as profitability by reducing the costs of inputs. Transgenic crops of new options to improve productivity through improved resistance to pest and disease can be in the plants to both abiotic and biotic stress.
It is also a well recognized fact that the capacity of different developing countries to apply advanced biotechnology greatly differs across the Asia-Pacific region. Some countries are clear about their priorities, have good scientific, policy and legislative capacity to participate in international negotiations and prepare necessary regulatory framework domestically to implement international undertakings, and are well geared towards national risk assessments and safeguards for using biotechnologies. Others are rather much behind and not yet clear about their policies and the pros and cons of using modern biotechnology. Thus, sharing of knowledge and experiences among developing countries in this fast developing field is critical at this stage.

Both FAO RAP and APAARI, over more than a decade have held a number of conferences/expert consultations in the Asia-Pacific region, where issues of the developing countries were discussed in the context of new technological options for increased agricultural production, especially by the small and marginal farmers. The high level policy dialogue conducted on 7-9 November 2005 in Bangkok, Thailand was a step forward to assess the recent developments in biotechnology and address all relevant concerns that would make their application useful as well as environmentally safe. This broad-based policy dialogue covered both conventional and modern biotechnological options and addressed issues related to food security, policy framework concerning biotechnology, testing and regulatory measures, biosafety, and the issues related to IPRs and benefit sharing by both producers and consumers.

Objectives of the policy dialogue

In the context of increasing application of GMOs, the member countries' commitments to the MDGs and the World Food Summit Declaration and the strategic priorities of both FAO, APAARI and GFAR, there is need to support the developing countries in the Asia-Pacific region for moving forward to reap the expected benefits of biotechnology, through informed judgment to adopt appropriate policies, device regulatory procedures that are well tested and understood and to build needed institutional capacity and competent human resource. It is necessary to address the existing concern of "technology divide" in the Asia-Pacific region so that benefits are available to resource poor farmers and nations are able to address the concerns of food security, food safety and quality, and sustainability. Within this overall framework, the policy dialogue was conducted to address the following:

1. Review country experiences regarding application of biotechnology in the context of increasing food supply and environmental safety as well as biosecurity. Highlight socio-economic impacts and empirical evidence (or lack of it) on issues related to, inter alia, relevance and access of the technology to resource poor farmers, cost and benefit sharing, IPR and trade related issues;

2. Understanding the current status and limitations of public sector research in biotechnology and how to orient the same to reap the benefits as international public goods so that the resource poor farmers are able to contribute to poverty alleviation and food security;

3. Identify the biotechnology policy and regulatory issues faced in addressing food security, sustainability and biosafety and ways to tackle them. In particular, identify practical means to implement international instruments and develop standards of governance which would ensure faster adoption of new technological options that are pro-resource poor farmers;

4. Developing information, communication and public awareness to interlink all concerned for sharing the information on available technologies;
5. Identify the gaps and the needs for capacity building in the developing countries of Asia-Pacific region; and

6. Developing modalities for regional cooperation in the field of agricultural biotechnology involving all stakeholders.

**Specific Aim:** Select countries who have adopted GM crops and who have either developed or in the process of developing national policy, institutions and infrastructure were requested to share their experiences with those who are yet to move forward in this direction. A total of 20 papers were presented in five sessions addressing the above objectives (Annex I).

**Participants:** A total of 81 participants (Annex II) attended this meeting. These included Agriculture Ministers/Secretaries, policy makers, research managers, heads of NARS, international organizations/CGIAR Centers, representatives of the private sector, and CSOs (NGOs and farmers).

**OPENING SESSION**

Dr. Raj Paroda, Executive Secretary of APAARI, welcomed the participants on behalf of APAARI, FAO and the GFAR - the co-sponsors of this important meeting. He acknowledged the presence of the Honourable Ministers of Agriculture from different developing countries that have laid considerable emphasis on agricultural biotechnology. He thanked the Heads of NARS and CGIAR Centers as well as a number of distinguished scientists and leaders of several regional and international organizations, including representatives of Private Sector, NGO and farmer organizations. He recognized that this diverse assemblage of resource persons, policy makers, managerial scientists and other stakeholders constitute a think-tank, which will add to the success of this meeting. He mentioned that the need for organizing such a dialogue was conceived during the earlier joint meetings of APAARI and FAO. He thanked He Changhui, Assistant Director General, FAO RAP, P.K. Mudbhar, Sr. Policy Officer, Roozitalab, Chairperson, GFAR and Ola Smith, Executive Secretary, for co-sponsoring this event.

In their opening messages, APAARI Chairperson Dr. Herath Gunasena and Executive Secretary Dr. Raj Paroda pointed out the emerging concerns in the Asia-Pacific region such as rapid population increase (over 35%), thus reaching 4.7 billion by 2025), poverty, food insecurity and malnutrition, expanding urbanization and industrialization, and conservation of natural resources. Pragmatic approaches for sustainable agriculture to improve productivity, meet food security, alleviate poverty and increase income of resource poor farmers would need a blend of both conventional and modern biotechnologies. In Asia-Pacific region, the NARS are heterogeneous in their R&D structures and their capacity to apply advanced technologies. The public needs science-based information concerning food safety, biosecurity and environmental risks associated with release of GM crops. A stronger public-private partnership is crucial to ensure quick access to the new technologies by the farming community. They acknowledged that this dialogue is part of the policy advocacy mandate of the Asia-Pacific Consortium on Agricultural Biotechnology (APCoAB), an initiative of APAARI and FAO.

GFAR Executive Secretary Dr. Ola Smith indicated that the theme of this policy dialogue could have been more appropriately chosen given the times we live in. He emphasized the benefits and opportunities that these biotechnologies offer in terms of producing more and better quality food. He likewise pointed out the following challenges in the development and appropriate application of biotechnologies: provision of the required infrastructure and capacity building, understanding and effectively managing risks, and finding ways to promote partnerships among stakeholders for mutual benefit without crippling conditionalities.
Vice-Minister Mr. Charal Trinvuthipong, Thailand Ministry of Agriculture and Cooperatives, indicated that the Royal Thai Government has taken many initiatives towards the use of biotechnology in agriculture for sustained growth of the sector and has undertaken measures to build national research and regulatory capacity. He congratulated the organizers such as FAO, APAARI and GFAR for taking the initiative to bring all stakeholders together to develop greater understanding and mutual respect for each others’ views.

In his inaugural address, FAO Assistant Director General and Regional Representative for Asia and the Pacific Dr. He Changhui highlighted the need to achieve the Millennium Development Goals of poverty and hunger eradication through technological progress. He emphasized that technology must be pro-poor and its delivery system must be effective. He indicated that there are many biotechnologies that have helped farmers to improve, protect and diversify their production, and assisted processors and marketers to add value and increase trade in food and agricultural products. The most widely discussed and controversial one is genetic engineering giving rise to genetically modified organisms (GMOs). While commercial planting of GM crops rose to 81 million hectares in 2004, with China cultivating 3.7 million hectares, and India and Philippines cultivating more than 100,000 hectares, current GM crop releases are still very narrow in terms of crops and traits and have not addressed the special needs of developing countries. Many important crops such as pulses, vegetables, and fodder and industrial crops, and certain traits such as drought and aluminum tolerance are still almost entirely neglected. He emphasized that the need to establish national legal and regulatory framework in harmony with the international instruments and the necessary infrastructure including human resources to efficiently implement the established system. He encouraged the participants to pay attention to the expected three major outcomes of this meeting which are: (i) identification of the major priorities in biotechnology that FAO and its partners should focus on to enhance its contribution to food security and poverty reduction, (ii) recommended roles for different stakeholders in meeting these priorities, and (iii) mechanisms and modalities of enhanced cooperation and partnership among stakeholders.

A publication entitled “Commercialization of Bt Corn in the Philippines: A Status Report” was released by Philippine Agriculture Secretary Mr. Domingo Pangandaman. This publication has been co-authored by Philippine scientists R.V. Ebora, M.B. Palacpac and C.G. Custodio, Jr. and published by APCoAB, a Consortium on Biotechnology under APAARI umbrella. Copies of publication were distributed to APAARI members and other participants during the dialogue.

Dr. Purushottam Mudbhary, Sr. Policy Officer and Acting Chief, Policy Assistance Branch, FAO RAP, referred to the background document earlier circulated to the participants. He briefed the participants about the objectives and expected outputs of the policy dialogue, as follows:

Objectives:

- Take stock of status and experiences: Global, Regional, National
- Discussion on policy and regulatory issues: Biosafety, Regulatory measures, Bioethics, and IPR
- Enhancing biotechnology as international public goods to expand access
- New partnership initiatives to promote biotechnology
- How to make modern biotechnology work for poverty alleviation and food security

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- Enhancing biotechnology as international public goods to expand access
- New partnership initiatives to promote biotechnology
- How to make modern biotechnology work for poverty alleviation and food security
SESSION I: STATUS OF AGRICULTURAL BIOTECHNOLOGY

Chairperson: Andrew Bennett, Syngenta Foundation
Co-chairperson: Thierry Mennesson, IAC

In this session, five papers were presented regarding the status of biotechnology at the global and regional levels, developments in China and India, and the CGIAR approach to biotechnology and biosafety.

A comprehensive paper on Global Development on Agricultural Biotechnology was presented by Clive James, President, ISAAA. He presented the latest information on the global status of genetically modified (GM) crops, now more often referred to as biotech crops and reviewed the data for 2004 regarding global adoption during the last nine years (1996-2004). Most recent status (2004) was presented by country, crop and trait wise. He stated that during 1990s many were skeptical that biotech crops would deliver improved products and make an impact at the farm level. There was even more skepticism that developing countries in Asia, Latin America, and Africa would adopt biotech crops.

Dr. James highlighted that between 2003 and 2004, global area of biotech crops increased by 20% (13.3 million hectares). In 2004, the estimated total global area of approved biotech crops was 81.0 million hectares, grown by approximately 8.25 million farmers in 17 countries. He also emphasized that almost 90% of the beneficiary farmers were resource-poor farmers from developing countries, whose increased incomes from biotech crops contributed to the alleviation of poverty. In 2004, there were 14 biotech major countries (compared with 10 in 2003), growing 50,000 hectares or more, (9 developing countries and 5 industrial countries). In order of hectares they were: USA, Argentina, Canada, Brazil, China, Paraguay, India, South Africa, Uruguay, Australia, Romania, Mexico, Spain, and the Philippines.

According to him, the developing countries had higher increase in biotech area than industrial trial countries in 2004. The number of developing countries (11) growing biotech crops in 2004, was almost double the number of industrial trial countries (6). Bio tech area in developing countries grew 7.2 million hectares, or 35% in 2004, compared with 6.1 million hectares or 13% in industrial trial countries. The five lead biotech crop developing countries (China, India, Argentina, Brazil and South Africa) with a combined population of 2.6 billion (40% of global) grew 26 million hectares of biotech crops in 2004, which is almost one-third of the total area. He also highlighted the potential economic benefits from deploying biotech crops by the five lead developing countries as follows:
1. China – seven million small farmers benefited from Bt cotton in 2004 and benefits equivalent to US$ 5 billion are projected for 2010 from rice and cotton.

2. India – adopted Bt cotton in 2002; the area under Bt cotton increased five-fold to 500,000 hectares in 2004; more than 15 biotech crops at R&D stage.

3. Argentina – ranks number two biotech country, growing 20% global area in 2004, with benefits amounting to about US$ 2 billion/yr from Bt soybean, maize, and cotton.

4. Brazil – approved herbicide-resistant soybean in 2003 which covered five million hectares in 2004; estimated potential benefits of about US$ 1 billion/yr from Bt soybean, maize, and cotton.

5. South Africa – lead biotech country in Africa; in 2004 biotech maize, white (food), yellow (feed), soybean and cotton were grown.

Dr. James also mentioned that continuing rapid adoption of biotech crops reflects the substantial improvements in productivity, the environment, economics, health and social benefits realized by both large and small farmers, consumers and society in both industrial and developing countries. The major benefits are summarized as follows:

1. Improved productivity and income-increased yields of 5 to 40%, farm income gains of US$ 6.5 billion in 2004 and US$ 2.7 billion in 1996-2004, biotech crop production value of US$ 4.4 billion in 2003;

2. Protect biodiversity – double crop production on same area of land, save the forests/biodiversity considering that 13 million hectares loss/year in developing countries;


4. Yield stability – control of abiotic/biotic stresses, promising progress with drought tolerance which is a major cause of famine; and

5. Social benefits – alleviation of poverty, improved environment and health, a time-saving technology which contributes to more affordable food, feed and fiber.

He concluded his presentation while highlighting the cautious optimism that global area and the number of farmers and countries planting biotech crops will continue to increase in 2005, which is the 10th anniversary of the commercialization of biotech crops. Furthermore, using 2004 baseline data, it is projected that by 2010, the number of countries planting biotech crops will increase from 17 to 30, the number of farmers planting biotech crops will increase from 8 million to 15 million, and the total global area of biotech crops will increase from 81 to 150 million hectares. The challenges for the future though include the following:

1. Improved communication with society to be able to make knowledge-based decisions regarding biotech crops;

2. Increase in number of biotech countries, farmers and areas; and ensure that developing countries have option to use biotech crops in conjunction with conventional technologies to contribute to more sustainable agriculture, global food, feed and fiber security, alleviation of poverty and a safer environment for all.
Another Status paper on Research and Development of Agricultural Biotechnology: Regional Scenario was presented by Anupam Varma in which he gave a brief status of biotechnology research and development in some of the countries of the region. These countries have accorded high priority to biotechnology. However, the level of utilization of biotechnology varies greatly among them, from the level of adoption of biotechnology such as tissue culture-based micro-propagation and biocontrol on the one end to that of commercial introduction of GM crops on the other end. He reported that the application of biotechnology and the use of GM crops in China, India and the Philippines have shown great promise. The other countries are also moving towards the adoption of these new technologies for a common goal of achieving food security and poverty alleviation.

He further mentioned that some countries have also developed GM animals and fish for improved quality and improved production. It reflects a great variation in the capacity of the region in utilizing full potential of biotechnology. In 2004, the area under GM crops was less than five million hectares in Asia. It is likely to grow at a faster rate in the years to come, considering the initiatives taken by some of the countries to develop transgenic crops of their interest. The success of biotechnology application, however, depends on the establishment of a technically sound national framework for biosafety. This is an important priority, as the Cartagena Protocol on Biosafety is an internationally accepted legal instrument dealing with issues like transboundary movement of GMOs and allowing countries to take informed decisions to import GMOs. As of 25 October 2005, 31 countries of Asia and the Pacific have deposited instruments of ratification or accession with the UN Secretary-General so as to become a party to Cartagena Protocol.

Varma also stated that the countries of the region, however, differ considerably in their status of formulating and implementing regulatory mechanisms to ensure biosafety of GMOS. These countries mostly lack unified systems to ensure biosafety, which is co-ordinated by different ministries and departments. An ideal single window system, for the efficient testing and release of GMOs has not been developed in most countries. There is an urgent need to put in place biosafety regulatory mechanisms and develop an efficient system for risk assessment and risk management (RARM). In spite of diversity of countries in the region, the regulatory measures related to biosafety would have considerable common features. Hence, harmonization of biosafety procedures will be useful for ensuring safety and efficient implementation of regulatory mechanisms.

Some countries in the region are better placed than the others in having a strong group of scientists trained and practicing hard core molecular biology and biotechnology. However, most of the countries in the region lack the required expertise essential for developing and utilizing biosafety regulatory related areas like risk assessment and risk management (RARM), monitoring, detection of GMOs, biosafety guidelines and regulations, and therefore, very important.

While concluding he mentioned that the regional collaboration will be needed in the areas of capacity building, training of scientists, legal experts and administrators, workshops, sharing of information (on all aspects of biosafety and documentation of problems, and on RARM), development of database, harmonization of biosafety procedures, RARM (capacity and methodologies), strengthening of quarantine systems, collaborative research (on food, feed, and environmental safety of GMOs, developing standardised methods for GMO detection), and strengthening of regional programs such as Asian BioNet and APCoAB.

A paper entitled Agricultural Biotechnology in China: Status and Perspective was presented by Zhangliang Chen in which he indicated that the Chinese go vernment believe that agrobiotechnology
offers an important new tool for agricultural production and country food security. Thus the Government strongly supports more than 200 agritech R&D laboratories in China. However, the safety debates and trade policy on GMO today in the world are greatly affecting application of the technology in China. The Chinese government, therefore, has been cautious in approving commercialization of transgenic crops.

China was the first country in Asia to introduce GM crops in 1996. Since then, a large number of transgenic crops have been approved for pre-production field trials, and some (cotton, green pepper, petunia and tomato) are grown commercially. The area under GM crops in China is growing at a much faster rate. About 5 million farmers are growing Bt cotton. In 2004, nearly 3.7 million hectares were under GM crops.

Chen stated that in China, many research institutions are developing transgenic plants with traits like improved yield, herbicide-tolerant, stress- and disease-resistance, and quality (nutrient improvement). The National Biosafety Committee also approved the production of GM X-21 rice in November 2004, after extension field testing for 7 years. However, the government has yet to give its final approval. The National Regulation on Safety Management on Agricultural GMO consists of:

1. Final approval by the Committee consisting of several ministries;
2. Production trials for GMO before commercialization;
3. Labeling requirement; and
4. Import regulation.

Chen concluded that adoption and commercialization of transgenic crops is faced with the challenges related to environmental safety, food safety, and public acceptance and trade issues. Harmonization of international regulations of GM crop production is the key issue today, which we should jointly address.

Another case study on Agricultural Biotechnology in India: Status, Opportunities and Challenges was presented by G. Kalloo in which he presented an account of biotechnology activities conducted by the different institutions led by ICAR and by the private sector. These activities are in tissue culture (potato, banana, sugarcane, medicinal and aromatic plants), molecular breeding (improved molecular markers, mapping populations, QTL mapping and marker assisted breeding in various crops such as rice, maize, sorghum, pig eon pea, soybean, potato, tomato, sugarcane, banana, g rape), transgenics (novel genes and promoters, improved regeneration and transformation protocols, biosafety, public awareness), and genomics (structural and functional genomics for important traits in rice, wheat, maize, chickpea, brasi le, tomato, and banana). Biosafety regulation of biotech crops requires review and approval at various levels such as the Institutional Biosafety Committee, the Review Committee on Genetic Manipulation (ICGM) under Department of Biotechnology and the Inter-Ministerial Genetic Engineering Appraisal Committee (GEAC) under MOEF. In March 2002, GEAC approved commercial cultivation of three Bt cotton varieties of MAHYCO's (MECH12, MECH162 and MECH184) for a period of three years. There are now nearly 20 hybrids available. The first commercial planting in 2002 was done in total area of 4,500 hectares covering six states. In 2005, more than 700,000 hectares is planted to Bt cotton. While concluding Dr. Kalloo stated that biotechnology research in India is addressing the challenges of improving productivity, countering the biotic and abiotic stresses, enhancing the nutritional quality, value addition and export orientation, and global competitiveness and system sustainability.
An Assessment of the Perspectives within Future Harvest Centers of the Consultative Group on International Agricultural Research Approach to Biotechnology and Biosafety was presented by R.S. Ziegler. He shared the current status of discussions within Future Harvest (FH) Centers of the CGIAR regarding important biotechnology issues, such as biosafety and regulatory issues, and Intellectual Property issues and the private sector research.

He indicated that the CGIAR Centers firmly believe that biotechnology research has a significant role to play in achieving food security and alleviating poverty in developing countries. It has potential to help improve livelihoods, preserve the environment and reduce environmental impact of agriculture in developing countries. However, biotechnology is not a silver bullet and rather complements many approaches. The FH Centers approach to biotechnology is as follows:

1. Biotechnology per se is neither safe nor unsafe;
2. Only 'products' of biotechnological research can be so attributed; and
3. Products need to be examined and tested case-by-case.

The different tools and uses of biotechnology in FH Centers are: genomics, molecular markers, genetic engineering, tissue culture and micropropagation, in vitro selection, diagnostics and epidemiology, vaccine development, and animal nutrition. The centers see the potential for transgenics to offer important options for meeting food demand and environmental challenges. In several countries where FH crop research centers are located (India, the Philippines, Colombia, Mexico, and Indonesia), commercial production has already been approved. To date the adoption of biotech crops continuously rises across developed and developing countries. As controversies arise, the FH Centers engage in public dialogue on a range of issues (biosafety, food safety, trade issues, intellectual property rights, and ethical and cultural issues). While CGIAR member countries will unlikely reach consensus on every issue, it is crucial that all countries adopt science-based policies.

Zeigler further emphasized that on biosafety and regulatory issues, FH Centers: (1) will comply with all relevant national and international legislation, treaties and guidelines, or regional biosafety, food, environment, and policy regulations; (2) will not conduct research on genetically engineered organisms in any country lacking such regulations; (3) may voluntarily adhere to more stringent standards than the national minimums; (4) will not make GMOs available in a country without that country's prior informed consent; (5) will work with national partners to help develop capacity, strategies and methodologies.

In concluding remarks, Zeigler stated that on IPR issues and the private sector, FH Centers will work to ensure that new opportunities and solutions are available as international public goods, i.e. with as few restrictions as possible. Moreover, the centers will complement private sector research that may otherwise fail to reach the poor.

SESSION II: ISSUES (BIOSAFETY, IPR AND REGULATORY MEASURES)

Chairperson: Robert Zeigler, IRRI
Co-chairperson: Thomas Lumpkin, AVRDC

There were four papers presented in this session, on issues such as biosafety and regulatory issues, Intellectual Property rights, and access to biotechnological innovations from the private sector perspective. Following are the highlights of the four presentations:
Andrea Sonnino addressed in his presentation important issues relating to Biotechnology and Biosafety Capacity Building. He presented the following analysis of current biotechnology applications and the role and activities of FAO in this area:

There is a huge potential of biotechnology in food security if it is (1) properly integrated with other technologies, (2) accompanied by a systematic risk assessment and management (biosafety systems), and (3) used to address food security and other key agriculture challenges of poor countries. However, there are problems associated with GMO cultivation, mainly: (a) the need for heavy regulatory systems, (b) technical complexity such as coexistence, preserved identity, refugia among others), (c) too competitive monocultures, illegal cultivation, (d) deficiencies of extension services, and (e) improper utilization - wrong event, wrong recipient variety.

Sonnino highlighted that in terms of investment, ten top multinationals from industrialized countries have invested a total of US$ 3 billion or 96% of total investments in biotechnology. All commercially released GMOs were developed by US private companies for US markets (except in China). The traits and crops are for temperate climates and mechanized agriculture. Few countries, however, benefit from spillovers. Biotechnology activities in developing countries are mostly at the research level, with several field trials, and limited commercial application.

To ensure access to information, FAO has developed a database (BIODEC) on the status of development, adoption, and application of biotechnology in developing countries (http://www.fao.org/biotech/inventory_admin/dep/default.asp). FAO provides technical assistance to developing countries in the areas of: (a) identification of needs through regional or sub-regional surveys, workshops or technical consultation, (b) national policies, (c) regulatory frameworks, and (d) training and facilities. In capacity building for biosafety, FAO has provided legal assistance to draft national legislation, train regulatory bodies in risk analysis, train scientists and technicians in GMO detection, and communication and public awareness for journalists/media, school teachers, extension officers, policy makers, and community leaders. Regional or sub-regional projects and networks such as REDBIO, Asian BioNet and APCoAB are initiated and supported. Moreover, FAO builds partnerships with other international organizations such as UNEP, WHO, WFP.

Sonnino further emphasized that the following new challenges are recognized: full enforcement of Cartagena Protocol, locally developed GMOs, post-release monitoring, socio-economic considerations, and regional versus national priorities/concerns. In order that developing countries shall benefit fully from new technologies, FAO shall assist member countries in policy formulation, legislation development for biosafety, PGRs and IPRs, and capacity building.

Manju Sharma in her presentation highlighted important issues concerning Regulatory Measures. She gave a brief review of bio technology issues such as biosafety, food safety, consumer issue on labelling, and IPR. She cited the biosafety regulation in India and shared her insights on the matter. The biosafety regulation in India was issued in 1989 by the Ministry of Environment and Forests under the Environment (Protection) Act 1986. The notification has set the rules for manufacture, use, import, export, and storage of hazardous microorganisms/gene technologically engineered organisms. The notification has also set up various levels of committees considering the level of risk inolved. These committees are: Recombinant DNA Advisor y Committee (RDAC), Review Committee on Genetic Manipulation (R CGM), Institutional Biosafety Committee (IBSC), Genetic Engineering Approval Committee (GEAC) and State and District Level Technology Coordination Committees (SBC & DBCC).
Sharma further informed that a Task Force on Applications of Agricultural Biotechnology under the Chairmanship of M.S. Swaminathan submitted a report to the Ministry of Agriculture for streamlining the regulatory procedure and speeding up the clearances. The guiding principle of the report is “National Agricultural Biotechnology Policy should be the economic welfare of farm families, food security of the nation, health security of the consumer, protection of the environment and the security of our national and international trade in farm communities.” The Task Force recommended a National Agricultural Biotechnology Regulatory Authority. Another Task Force on Recombinant Products for Pharma Sector chaired by R.A. Mashelkar has also suggested reorganization of the existing structures in order to have a ‘single window’ clearance mechanism.

She further emphasized that the present regulatory procedures take time, especially when biosafety and agronomic evaluation are not conducted concurrently. Reducing the time gap is the key in the innovation chain starting with research in the laboratory to the greenhouse, to the limited field trials and finally, large-scale field trials in the farmers’ field. If the time can be reduced without compromising the safety protocols, it will also educate the frustration of not only the scientific community, but also the farmers and industry. Proactive research on GM crops, generation of agronomic data, correct interpretation and analysis of the agronomic trends are some of the areas in which research protocols need to be generated by various countries. Alt hough, it is essential to have a ‘single window’ system for clearances, yet decentralization at various levels will also be important. It is time that each country develops a regulatory mechanism which will be able to stand the test of all the scientific queries and investigations, which would be less time consuming, which will also give opportunty to the farmers to learn the new agronomic practices for transgenic crops taking no te of the plant variety protection issues and the intellectual property rights. The ultimate objective is to give farmers full satisfaction about the importance, efficiency and higher productivity, nutritional and economic value of a particular crop. Rigorous training programs for the farmers need to be conducted to introduce precision farming, molecular breeding programs and large-scale cultivation of transgenic crops with desired novel traits introduced through genetic engineering. Broad guidelines can be taken from the countries which have had success. However, the regulatory measures must be in conformity with the national and international boundaries. The labeling of GM crops, especially for edible purposes, also requires an appropriate regulatory system. It has to be a joint responsibility of government, scientists, industry and the farmers to put in place a regulatory system based on sound scientific principles, easy to implement and replicable and last but not the least, should be acceptable to the farming community.

Sharma concluded that each national government, as per its rules and regulations and the laws of the land, has a regulatory policy for bio technological interventions in agriculture and for food and nutritional security. The key to an efficient regulatory mechanism must be the basic principle of science, efficiency and speed with which papers move. Single window approach can be useful provided the consumer, the industry and the scientists understand the guidelines and procedures. Number of steps need to be taken starting from transgenic research in labor atory, agriculture in greenhouses and field trials, large-scale cultivation and seed production and finally, commercialization. The time between various steps must be reduced. An appropriate legal framework is also essential as part of the regulatory procedure for plant variety protection, rights of the farmers and IPR. Biotechnology offers enormous potential with the rapid advances taking place in genomics, cell biology, crop and plant breeding and in developing new molecular approaches and precision farming methods. Human and animal safety and environment al protection are the three major factors to be taken note of for safety and thus, regulatory procedures need to be conducive to the farming community and the living beings.
Victoria Henson-Apollonio made a presentation on Recent Developments in IP Laws and Practice. She gave an account of recent developments in international agreements, regional/bilateral agreements, national laws and contract laws. She provided some examples of activities and offered recommendations for future action.

The following international agreements were highlighted: International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), Convention on Biological Diversity (CBD), Trade Related Aspects of Intellectual Property of the WTO Agreement (TRIPS), UPOV, and WIPO Development Agenda.

- The ITPGRFA which came into force on 29 June 2004 builds on the International Undertaking. It provides for a multilateral system (MLS) for exchange of plant germplasm as listed in Annex 1 of the Treaty. Exchange will be under a Standard Material Transfer Agreement (SMTA) which will be adopted by the Governing Body (member states) in June 2006.

- The CBD ad hoc Working Group on Access and Benefit Sharing held its 3rd Meeting in February 2005. The first meeting of the Ad Hoc Open-ended Working Group on Review of the Implementation was held in Montreal from 5 to 9 September 2005. The Carthagena Protocol on Biosafety negotiated under the CBD, which came into force in September 2003, had met in July 2005.

- The TRIPS concerns the disclosure of country of origin of source of biological material or traditional knowledge, Prior Informed Consent (PIC), and Equitable Benefit Sharing, in patent application.

- UPOV concerns on the release of information associated with protected varieties. UPOV currently in talks with several APAARI countries regarding membership in UPOV.

- At the June 2005 Meeting of the WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC), it was decided to recommend that the WIPO Genera1 Assembly renew its mandate as it stands for a further two years.

Regional and bilateral Free Trade Agreements (FTAs) have proliferated in the region following the setback of the WTO Ministerial Conference in Cancun in September 2003. Thailand is reported to have initiated negotiations in the region following the setbacks of the WTO Ministerial Conference in Cancun in September 2003. Thailand is reported to have initiated negotiations with ten countries and hoping to conclude most of these in 2006.

Henson-Apollonio further stated that special interest to this dialogue is the information that several countries in the Asia-Pacific region have either drafted or passed their national IP laws and other legal instruments, namely: Australia (houses its PVP administration in IP Australia), Bangladesh (draft PVP law), Chinese Taipei (2004 PVP law scheduled for enactment in June 2005), Japan (created a special patent court in 2003), Malaaysia (administration of IP has been put in the Intellectual Property Corporation of Malaysia); and UPOV in discussions regarding PVP bill compliance, Nepal (acceded to the Berne Convention in October 2005), Pakistan (sui generis PVP bill being promulgated), Sri Lanka (draft PVP bill based on UPOV 1991), Thailand (formulated Biotechnology Framework 2004-2011), and Vietnam (Ordinance on Plant Varieties in force, April 2004).

Henson-Apollonio concluded by stating that APAARI member countries should: (1) utilize broad range of experiences available amongst them; (2) join the ITPGRFA; (3) look for experience that they have within each country; and (4) inventory intellectual property assets and publically disclosed least.
controversial ones. She quoted the World Investment Report, 2005, UN CTAD, that “Trade secrets may in fact be even more important than patents for a country to be able to attract FDI in R&D”.

A Corporate Foundation Perspective for Access to Biotechnological Innovations was presented by Andrew Bennett. He explained the mission of Syngenta Foundation for Sustainable Agriculture, i.e. to increase opportunities and choice for poorer rural communities, in semiarid areas through sustainable innovation in agriculture. The context and structure of agriculture are changing and so are priorities. Application of biotechnology and access to them should consider these current realities.

Biotechnology covers a wide range of technologies and processes in which some are considered old such as fermentation and nitrogen fixation; some novel (vaccines, monoclonal antibodies); some public goods (fermentation); some proprietary (transgenic traits and processes); and some controversial (stem cells, transgenic, embryo transfer); some are expensive, while others are cheap. Moreover, some are considered safe because they have been in use for many generations; their risks and benefits are well understood while others are new and because of this the risks and benefits associated with them are not yet fully documented and understood.

According to Bennett, there are many factors which now influence access to new technologies and the development and delivery of products of benefit to farmers. These are: systems for access, availability and delivery of technologies to farmers, investment in research and ownership of technologies, licensing agreements, regulatory requirements, managing risks and uncertainties, responsibility for stewardship, and formation of partnerships.

There is an evolving legal, social and political context within which biotechnologies operate. It is difficult to insure and avoid risks associated with the following: (1) failure to develop and deliver varieties that are reliable, acceptable and affordable, (2) unviable expectations of the potential benefits, (3) failure to obtain the necessary freedoms to operate (IP), (4) delays, for a variety of reasons, increasing costs, (5) human errors such as spraying of experiments with pesticides and failure of stewardship such as accidental release of materials, (6) insufficient institutional capacity and infrastructure to handle the tasks and delivery of products to farmers, (7) absence of clear, robust policy and legal framework for the management and release of transgenic – uncertain over regulatory requirements, (8) loss of confidence and participation through mistakes, non-performance and delay, (9) lack of financial resources to complete the project, (10) sustained opposition and active campaigning against the use of transgenic technologies despite any evidence of harm to health or to the environment, leading to over-regulation, (11) failure to put in place, implement and sustain, effective and robust monitoring systems, leading to a loss of effectiveness of the technology.

Bennett further emphasized that a better understanding of risks is essential. This can be done by identifying the potential risk, the likelihood of its occurrence, the scale of their impact, possible countermeasures, the means of seeing them coming, and the ability to respond quickly; (2) establish strong technical advisors and executive committees that meet regularly; (3) assign clear roles and responsibilities for all the partners; (4) provide staff training; (5) develop reporting and information systems – vigilance and response; (6) develop effective post-release response systems; (7) make decisions – even if they are unpopular – and implement them. Regulation is also necessary but should be effective and enforceable, and responsible of key people and...
institutions are clear. Regulation should balance precaution with proportion and may be modified with experience.

He further pointed out that the partnerships are able to help manage risk — but they cannot remove it. Partnerships must be voluntary and purposeful. The key to successful partnerships are:

1. leadership and preparedness to take risks;
2. clear responsibilities and shared objectives;
3. incentives and rewards;
4. acceptance of different motivations and comparative advantage, but a balance between the partners;
5. access to resources;
6. trust and transparency;
7. time; and
8. progress and luck.

When introducing transgenic crops public and private partnerships could be a fruitful ground for purposeful partnerships aimed at better and quicker delivery of products of biotechnological research for the benefit of farmers. Many of the skills and experience are in the private/business sector or and hence can be harnessed effectively.

SESSION III: MINISTERIAL ROUNDTABLE ON NATIONAL DEVELOPMENTS

Chairperson: Secretary Mr. Domingo Panganiban, Philippines
Co-chairperson: Deputy Minister Dr. Jafar Khalghani, Iran

There were four presentations during this session: Iran, the Philippines, Sri Lanka and Thailand. The aspects highlighted were: the priority accorded to biotechnology by each government, the enabling environment under which biotechnology operates, the scope of R&D, and the success to date with respect to commercializing products of biotechnology, both conventional and modern.

Agricultural Biotechnology in Iran: History, Policy and Achievements

Dr. Jafar Khalghani, Deputy Minister of Agriculture, Iran

Dr. Khalghani in his presentation highlighted that biotechnology in Iran started 80 years ago and is currently one of the three top priorities in science and technology. A Higher Council for Biotechnology composed of the President, seven Ministers, three Deputy Presidents and four experts was established as the high level policy making body. Biotechnology policies include approval of the medium term strategic plan, approval of the GM technology for both research and production, strong national financial support, ratification of the Cartagena Protocol on Biosafety and establishment of the National Biosafety Committee and a Technology Clearing House (CH). There are many government institutions involved in biotechnology, conducting basic and applied research in agriculture, medicine, environment, food biotechnology and bioprocessing, among others. The private sector is quite active. Rana Agro-Industry Corp, a pioneering private company established in 1992 in a joint venture with a British company, is successfully producing tissue cultured date palm and banana plantlets, about 200,000 plantlets per year. The first transgenic crop plant released in Iran is rice, the first transgenic rice released in the world.

According to Dr. Khalghani, some of the challenges of biotechnology are:

1. effective biotechnology policy framework compatible with international agreements, which will provide an effective IPR regime, incentives for local in vestment and innovation, and enforceable science-based regulations;
2. capacity building;
3. harmonization and simplification of biosafety regulations in the region; and
4. partnerships in solving South-North, as well as private-public sector collaboration.

He further informed that Iran offers to share information with NARS/IRCs, provide on-the-job trainings, conduct training courses and workshops in collaboration with NARS/IRCs, exchange of “germplasm”
for “technology”, and conduct joint research and development with NARS/IRCs. It expects APCoAB to: (a) strengthen capacity of developing countries in the region, in particular IPR related issues and assistance in acquisition and application of “technology”; (b) facilitate and provide a ground for constructive dialogue between the private and public sectors to promote R&D and in vest on biotechnology products; (c) facilitate networking for the local development of the GM technology in the region; and (d) assist in harmonization and simplification of the biosafety regulations in the region.

Breaking Grounds for the Seeds of Biotechnology

Agriculture Secretary Mr. Domingo Panganiban, Philippines

H.E. Panganiban mentioned that biotechnology research and development was initiated in the Philippines in 1979. The R&D institutes engaged in biotechnology have adequate core competencies and infrastructure. Work on transgenic crops, papaya, banana, and coconut began in 1997 for disease resistance, long shelf life, quality oil, and expanded to include other crops, fishes, and other traits, majority of which are in the research stage. Only Bt corn produced by Monsanto is commercialized since 2002. The country joined the mega-country group producing GM crops in 2004. In 1990, the country established a National Biosafety Committee which developed guidelines for the planned release of GMOs and potentially harmful exotic species (EO430). DA AO 8 was also passed to regulate the import, field testing and propagation of GM plants and plant products. The Philippine regulatory system is harmonized with OECD, FAO/WHO, Codex, and Caraga Biosafety Protocol. A National Ethics Committee on Biosafety of the Philippines was also established. The responsibilities of the different regulatory agencies implementing DA AO 8 are: Bureau of Plant Industry (BPI) for environmental safety, Bureau of Agriculture and Fisheries Products Standards (BAFPS) for food safety, Bureau of Animal Industry (BAI) for feed safety, and the Fertilizer and Pesticide Authority (FPA) for safety for plants with pesticidal properties. There are three approved transformation events for propagation, 20 approved transformation events for direct use as food, feed, and for processing, seven approved combined traits for direct use as food, feed, and for processing, and one approved combined trait product for propagation.

On IPR, Executive Order 247 and Republic Act 9147 were the country’s response against biopiracy, ensuring also that benefits accrue to the appropriate stakeholders. Likewise, the Plant Variety Protection Law in the Philippines was issued to protect the intellectual properties of technology generators.

He further informed that in 2001, the government articulated its policy on modern biotechnology, which is “to promote the safe and responsible use of modern biotechnology and its products as one of the several means to achieve food security, equal access to health services, a sustainable and safe environment, and industry development.” The Philippine Agriculture and Forestry Biotechnology Agenda were formulated (PAFBA I: 1995-2005) and updated (PAFBA II: 2002-2010). In 2005, the Biotechnology Media and Advocacy Resource Center was created, the Biotechnology Week was proclaimed and the first GAWAD GALING for Biotechnology Journalism was awarded. Likewise, the Agricultural Biotech Center and Biotechnology Intellectual Property Center at the Philippine Rice Research Institute was established.

In conclusion, he emphasized that harmonization of regulations and collaborative programs for technology development and regulatory compliance still remains a challenge.
Biotechnology Status in Sri Lanka

Mr. Tissa Warnasuriya, Secretary, Ministry of Agriculture

According to Mr. Warnasuriya, the Ministry of Agriculture has given highest priority to develop and apply biotechnology to improve agriculture, livestock and fisheries sectors of the country. There are three institutions looking at various aspects of biotechnology: Council for Agricultural Research Policy (CARP), Hect or Kobbe kaduwa Agrarian Research and Training Institute (HAR&TI), and Institute of Post harvest Technology (IPHT). CARP has formed a National Steering Committee on "Plant Breeding" and "Bio technology" with the involvement of both the public and private sector. This committee has formulated national priorities in biotechnology research (2003-2008). It is developing an Investment Plan on biotechnology R&D to privatize the areas of research that have potential for local application.

On the other hand, HAR&TI is engaged in bringing in agrarian reforms through education and training and rural institutional development. HAR&TI has recently reviewed biotechnology applications, the constraints and models of partnership. IPHT is engaged in using R&D outputs in the industries and rural agro-based enterprises in poverty reduction and employment generation.

Mr. Warnasuriya further mentioned that with regard to biotechnology commercialization Sri Lanka is still in an evolving process. Some modest applications include: (a) nitrogen fixing inocula for soybean root nodules; (b) tissue culture of banana, potato, pineapple, cinnamon and cardamom; (c) hybrid seed development for 25-40% yield increase in maize, capsicum, brinjal, tomatoes, chilli and rice; and (d) DNA fingerprinting of under utilized crops (Amla, Woodapple and Anona) and livestock (domestic cattle and fowl). The challenge is to use modern biotechnology tools in combination with conventional methods with which Sri Lankan scientists are currently addressing.

Biotechnology for Food Security and Poverty Alleviation: Thailand's Opportunities and Challenges

Dr. (Ms.) Supranee Impithuksa

Dr. Supranee Impithuksa of Department of Agriculture, presented the status of biotechnology and biosafety of GM crops in Thailand, cited the specific case of viral-resistant transgenic papaya, the challenges and strategies in development and utilization of biotechnology. Thailand is one of the countries that realize the importance of biotechnology as an alternative tool to achieve food security in a sustainable manner. The National Bio technology Policy Framework (2004-2009) spells out the goals for biotechnology development in Thailand, namely: emergence and development of new bio-business; promotion of Thailand as the Kitchen of the World; healthy community and healthcare center of Asia; environment conservation and clean energy; self-sufficiency in econo my; and human resource development.

She mentioned that the development of transgenic plants for quality improvement, tolerance of abiotic stresses and resistance to pests and diseases has been accorded high priority. Biotechnology applications including genome sequencing, gene cloning, marker assisted selection, and the implications of genetic engineering are used in R&D projects aimed for crop variety improvement and increasing productivity. Transgenic plants have been developed in various crop species for a variety of traits. Some of the transgenic lines are being tested at field scale. The viral resistance papaya is the first transgenic plant to be in an advanced stage of evaluation. It was developed through a direct collaboration between the government of Thailand and Cornell University. The transgenic papaya was however, is co-verified by intellectual property rights which is no wbeing managed to ensure the technology will be available to the rural communities.
She highlighted that the biosafety Guidelines on Genetic Engineering and Biotechnology for laboratory work, field work and planned release of GMOs were finalized in 1992 and updated in 2002. A National Biosafety Committee and a total of 25 Institutional Biosafety Committees were established. Although many research and development projects on genetically modified plants have been established, the Thai government still does not allow commercial release of genetically modified plants until proven safe. The Ministry of Agriculture and Cooperatives issued a notification under the Plant Quarantine Act B.E. 2507 (1964) as amended in B.E. 2542 (1999), which specified 89 transgenic plant species from all sources as prohibited materials for importation unless permitted for research purposes. Several GM crops have undergone biosafety testing and assessment in accordance with the Biosafety Guidelines. A specific law on biosafety has recently been in consideration. Several laws that are applicable for the protection of biological products are the Patent Act, Plant Variety Protection Act, Bill on the Law of Trade Secrets, and Thai patents. Thai patent is still struggling with protection for DNA, genes and protein. Thailand needs to continue strengthening its capacity for the development of human resources, research and technology, regulations, and programs on assessment and management of biosafety based on transparent and science-based approaches. While the use of gene technology applications is wider and much appreciated for use in the pharmaceutical area, negative perception against GM crops in Thailand remains. The need for increasing public awareness is critical. The implication of intellectual property rights as experienced from the viral resistant transgenic papaya is of utmost concern, and the capacity for managing IPR must be strengthened.

GENERAL CONCLUSIONS

Biotechnology is accorded high priority by most of the Governments. They are committed to enhance investments in R&D. The enabling environment under which biotechnology operates varies from country to country. Some have formulated biotechnology policy frameworks with goals of food security, poverty alleviation, environmental conservation, market competitiveness, etc. There are NARS which are advancing much faster than the others in commercializing biotechnology such as transgenics. Others are approaching it with caution. In countries with more advanced biotechnology work, regulations need to be streamlined and enforced; risks must be effectively assessed, monitored and communicated. Developing NARS need to develop the necessary competence and infrastructure. National laws and practices related to development and utilization of biotechnology need to be harmonized with international laws/agreements to promote purposeful partnerships. The capacity to formulate the legal instruments and regulatory guidelines should be strengthened. APAARI-APCoAB and FAO should assist developing countries to strengthen their capacity so that they too benefit from the tremendous potentials of biotechnology. They should provide them with more opportunities to share information, knowledge and experience, and network among themselves, with other regional and international institutions as well as with the private sector or that have the skills and the experience. While the process of developing and applying biotechnologies may be long and tedious, food security and poverty alleviation may actually be attainable.

SESSION IV: BIOTECHNOLOGY FOR INTERNATIONAL PUBLIC GOODS

Chairperson: William Dar, ICRISAT
Co-chairperson: Ola Smith, GFAR

In this Session, three papers were presented: two focused on GM food regulations, and one on biotechnology tools other than genetic engineering.
Ingo Potrykus made a presentation on GMO technology and Malnutrition: Public Sector or Responsibility and Failure. The message of his paper was based on six years of experience from the Humanitarian Golden Rice project, whose aim is to transfer the benefits of a scientific breakthrough to the needy in developing countries. The initiative is an example of a public-private partnership in which the public gains access to the technology, while the private (Syngenta) gains commercial rights even though these rights were eventually not claimed. Golden Rice could substantially reduce Vitamin A malnutrition in rice-based societies, but cannot yet do so, because its deployment is severely hindered by "extreme precautionary regulations." Potrykus emphasised that the technology consisted of biofortifying rice with Vitamin A which became possible through genetic engineering. The potential impact of this technology lies in the fact that one Golden Rice seed has the potential to produce in two years food for 100,000 poor people, who will benefit from a food security as well as health aspect. Ex-ante studies in Bangladesh, India, and the Philippines have suggested that adoption by developing countries in Asia would result in economic gains of US$ 1.52 billion annually. Because of GMO regulations the availability of Golden Rice may be delayed by another six years and will not reach the farmers before 2009. According to him, the present regulations require a thorough safety assessment (for GMOs only) which includes a detailed description of the genetic modification (methods used, function and regulation of the gene(s), characterization of the gene in the modified organism, stability of the genetic changes, general safety issues (history of use, nature of new protein, impact from potential transfer into cells of the human digestive tract), toxicological issues (levels of naturally occurring toxins, potential toxicity of new proteins, stability of naturally occurring allergens), and nutritional issues (nutrient analysis, levels of anti-nutrients, ability to support typical growth and well being). These requirements take a minimum of six years for a team of specialists and cost US$ 20 million.

He further highlighted that the extreme precautionary regulation is unjustified and irrational. The benefits of GMO technology will become available for food security and poverty alleviation only if regulations are changed from the present 'extreme precautionary attitude' to science-based 'rational regulations', and these regulations are applied with a 'common sense' and not with ideological attitude.

A paper entitled "International and developed country regulations of genetically modified crops and their effects on developing country ies" was presented by Mark W. Rosegrant. His presentation highlighted the interactions between domestic policies on agricultural biotechnology and international agricultural trade for developing countries, offered policy solutions to satisfy domestic and international economic objectives in developing countries, and cited the current research of IFPRI on the matter. Rosegrant informed that the GMOs to date are cultivated in 17 countries, covering a total of 81 million hectares, and benefitting 8.25 million farmers. About 96% of prduction is in five countries, namely, USA, Canada, Argentina, China, and Brazil. GMOs are mainly four crops (maize, soybean, cotton and canola) and only one transgenic food crop (milk) is commercially available (papa ya in the US). Many developing countries want to remain "GM free" at any price, even rejecting food aid. Many Asian countries have adopted biosafety regulations for the planting of GM crops, but only a few have implemented policies related to the marketing of GM food, waiting for decisions at the international level.

Trade regulations of GM food include any regulation targeting GM food that directly or indirectly affects trade, such as import approval regulations (safety risk assessment), and marketing regulations (labeling, documentation, traceability and segregation). There is great heterogeneity of domestic regulations among countries. Among developed countries, the EU requires strict import approval,
mandatory labeling for GM food and GM derived products and traceability requirements; the US requires voluntary safety approval, and voluntary labeling on substantially equivalent (all current) GM crops; and Japan, Republic of Korea and Australia adopt intermediate approaches. Among developing countries, China and Brazil require mandatory labeling, while South Africa and Argentina adopt voluntary labeling. In many developing countries, regulations are either not enforced, not implemented, or not regulations at all. Many countries are in a “wait and see” position.

There are organizations dealing with international harmonization efforts but only three organizations are directly regulating GM food outputs, namely, UN FAO/WHO Codex Alimentarius, UN Cartagena Protocol on Biosafety (BSP), and World Trade Organization (WTO). Efforts at international harmonization of trade regulations have so far not been successful.

According to him, the effects of international regulations on developing countries are: (1) Fear of export loss to importers with stringent regulations makes certain developing countries reject GM (food) crops; and (2) Adopting stringent labeling requirements to satisfy export markets. Harmonization can facilitate trade through standardization but stringent mandatory labeling likely reduces domestic consumption and production of GM, raises prices of domestic non-GM because of concern over export markets; and voluntary labeling and certification with segregation could provide access to EU/Japan, with price premium for non-GM food. Developing countries could adopt the following economic objectives, to be able to respond accordingly, namely:

1. Maintain or develop export opportunities,
2. Lower consumer price and large food quantities available to consumers,
3. Manage biosafety risks and consumer acceptance, and
4. Sustainable increase of agricultural productivity and farmers’ revenues.

The policies recommended to meet these four economic objectives are: (1) Adopt international scientifically based standards for safety approval (food and imports) regulations, (2) Develop segregation options for GM and export sensitive non-GM crops and domestic niche markets, (3) Adopt adequate information provision without raising costs of food (voluntary labeling, minimum necessary information for traded commodities), and (4) Authorize use and import of beneficial and safe GM crops that are adapted to regional constraints, with high income potential for farmers.

Rosegrant cautioned that the international regulations will continue to affect future expansions of the technology. WTO dispute and BSP information requirements are likely to have a direct impact on the use of transgenic (food) crops in developing countries. Full international harmonization is unlikely especially y on labeling. Trade linkages confer a large economic power to importers, affecting regulations and technology choice in man y developing countries. As a result, we can expect that the global future of GM food crops will depend significantly on large developing countries’ decisions such as GM rice in China. With often unenforceable regulations, increasing evidence of profitability of GM crops, and more DNA tests in countries by NGOs, private seed companies, governmental agencies or international institutions. It is recommended that (1) potential solutions such as segregation be adopted to respond to a dual demand if exports are jeopardized and adequate information policies that are not excessively costly; (2) food trade issues should be explicitly taken into account within the Biosafety Protocol; and (3) more quantitative policy studies need to be conducted. IFPRI’s current research work provides (a) quantitative analysis of effects of international regulations on developing countries such as India, Bangladesh, Indonesia, Philippines, and Kenya; and (b) quantitative evaluation of the global effects of the Biosafety Protocol’s proposed stringent information requirements.
Claire Lanaud presented her paper on “From Genetic Resources to Marker Assisted Selection”. This paper focused on bio technology application other than genetic engineering and demonstrated their usefulness on three specific crops, i.e. sugarcane, cocoa and rice. The techniques used include molecular marker approaches such as marker-assisted selection (MAS), genetic mapping, quantitative trait loci (QTL), gene discovery, and functional genomics. Some of the outcomes were: tracing origin and domestication history, traits characterization, construction of new varieties, and improved quality traits.

She further mentioned that bio technology provides powerful tools to increase our knowledge on crop diversity and on traits’ determinism. Genetic resources (GR) provide the foundation for sustaining agricultural production; bio technology could provide tools to better exploit and valorize GR collections and characterization data, encouraging their maintenance. With advances made on model species, many orphan or complex species could benefit from this information to facilitate their improvement. They will allow controlling the construction of new varieties and improving them for resistance, productivity or other complex traits. The will be more powerful if they are integrated in classical breeding activities, and linked with other agronomical and bioc hemical approaches.

SESSION V: GLOBAL/REGIONAL PARTNERSHIP INITIATIVES

Chairperson: Shinobu Inanaga, JIRCAS
Co-chairperson: Gabrielle Persley, Doyle Foundation

In this Session, four papers were presented: one on global, two on regional, and one on inter-regional partnerships. The salient features, current status and future directions to strengthen such partnerships were discussed.

Ola Smith made a presentation on “Global Partnership Programs”. He stated that the Global Forum on Agricultural Research for Development (GFAR) was founded in October 1996 by a group of stakeholders to promote the development of new knowledge and capacity based on Partnership and Innovation approach that relies on the building of strategic alliances among various stakeholder s. The thematic areas of research being addressed are: (1) genetic resources management and bio technology, (2) natural resources management and agro-ecology, (3) commodity chains and under-utilized species, and (4) policies, management and institutional development. GFAR stakeholders currently have two specific tools to foster partnerships, namely (1) Competitive Funding Mechanism, and (2) the Global Partnership Program (GPP).

A GPP is a collaborative project, program or activity initiated, developed and implemented by recognized GFAR stakeholders, and which remains open to participation by other stakeholders as and when they find a suitable niche. It exploits the comparative advantages of participating stakeholders, does not reinvent the wheel, and is implemented at the most effective level - local, regional or global. GPPs reflect and demonstrate the GFAR guiding principles of partnership, complementarity, additionality, and subsidiarity. Priority GPPs have so far been selected based on the four criteria: (1) relevance of the program to the goals and objectives of food security, poverty alleviation and environmental sustainability; (2) existence of a lead stakeholder institution that will drive the initiative; (3) adoption of an integrated approach that covers not only research activities but also post-harvest and marketing development or policy framework that promotes impact; and (4) potential for the development of a coordinating mechanism that facilitates dialogue among stakeholders and donors for the development of the program. The four bio technology related proposals discussed for GPP have been: a global network on trait discovery in rice, a global initiative for the improvement of livestock productivity through the control of Trypanosomiasis, an initiative for the development of a common...
vision for the role of biotechnology in food and agriculture and the Bio-collecting Society Initiative for protecting indigenous knowledge on genetic resources. So far, none of them has moved to the stage of a GPP.

Smith highlighted that currently, there are two GPPs on natural resource management and agro-ecology and one on the commodity chains. These are: Promoting Local Innovation in Ecologically-oriented Agriculture and Natural Resource Management (PR OLINNOVA www.prolinnova.net), Direct Sowing, Mulch-based Systems and Conservation Agriculture (DMC), and the Under-utilized Species (www.underutilized-species.org), respectively. The Global Post-harvest Initiative (GPhI) is now close to becoming a full-fledged GPP. The glaring absence of a GPP on biotechnology is surprising, because it is the area of inquiry that should foster the type of partnership required to develop and implement a GPP, given its complexity and the high level of expertise required to develop appropriate interventions. The APAARI region was identified in Dresden to take the lead in fostering partnerships around the utilization of biotechnologies for poverty alleviation, food security and conservation of our natural resources. More recently, within the context of developing inter-regional collaboration on a prioritized set of activities, APAARI has offered to champion activities to which biotechnology applications could be applied.

The recent establishment of the Asia-Pacific Consortium on Agricultural Biotechnology (APCoAB) is a step in the right direction for playing this leading role within GFAR. GFAR looks forward to the continuous development of the Consortium, including the development and implementation of concrete activities focused on plant (including trees) and livestock (including fish) improvement which safeguard intellectual property rights and which do not compromise human and environmental safety.

Raj Paroda gave a Brief Update on APCoAB’s Activities, being a new regional initiative. The Asia-Pacific Agricultural Consorium on Agriculture Biotechnology (APCoAB) was established in 2003 under the umbrella of the Asia-Pacific Association of Agricultural Research Institutions (APAARI) – an initiative of Food and Agriculture Organization (FAO) that has been promoting appropriate use of emerging agritech and tools in the region. APCoAB’s mission is “To harness the benefits of agricultural biotechnology for human and animal welfare through the application of latest scientific technologies while safeguarding the environment for the advancement of society in the Asia-Pacific region”. It serves as a neutral platform to harness the benefits of agricultural biotechnology in Asia-Pacific. The strategic areas are on thematic research networks for crop, livestock and fisheries sectors, information and communication technology, agricultural biotechnology, and post-harvest technology. APCoAB is expected to assist member states in research prioritization and partnerships, conduct public awareness and capability building, provide policy advice, and facilitate knowledge dissemination online.

Paroda mentioned that APCoAB has organized workshops on regulatory mechanisms, public-private sector partnerships, and his high level policy dialogue. The salient points raised during the workshop on public-private sector partnerships are: the need of a mutual trust between the public and private partners; the need to change the mindset and bring in corporate culture in public sector institutions; capacity building should be done in the field of scientific policy and legal matters; private sector must invest in basic research and must have a balance between their profits and meeting their social obligations; the need to set up incubation facilities specifically for nurturing start-ups thereby encouraging early stage innovations through appropriate public-private partnerships mechanisms. APCoAB and JIRCAS supported training of scientists in Japan. It has expanded collaboration with h networks such as INCANA to promote hybrid cotton and Bt cotton. It has published a status report on “Bt Cotton in India” co-authored by four Philippine scientists. The draft status report on “Bt Cotton in India” is now almost ready for publication.
APCoAB is supported by APAARI, ACIAR, the Rockefeller Foundation, Monsanto and Mahyco. It is hosted by ICRISAT in India. The Steering Committee is composed of ten members representing public, international and regional institutions, as well as the private sector and NGOs, namely: JIRCAS, ICRISAT, ICAR, GFAR, FAORAP, APAARI, ISAAA, ANGOC, Thailand Department of Agriculture, and Monsanto. The ASEAN, SAARC and SPC have been approached for effective partnership.

According to him, the challenges to APCoAB are: (1) strengthen R&D collaboration among NARS, regional and international organizations and develop private-public sector or public-private sector models; (2) strengthen national and regional capability on biosafety/regulatory aspects, and IPR related issues; (3) improve public awareness through website updating/upgrading, e-newsletter, translation of publication into local languages, publication of status reports/success stories on conventional biotechnologies and GM crops; and (4) expand inter-regional partnerships (APAARI-AARINENA-CACAARI-FARA).

Banpot Napompeth presented an account of Asian BioNet. Asian BioNet is a Project on Capacity building in Biosafety of GM Crops in Asia (GCP/RAS/1 85/JPN), participated in by ten countries, namely Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam. It was formulated to assist countries in the region in safe handling of GM crops and harnessing the benefits derived from modern biotechnology in accordance with relevant global agreements, namely, the Convention on Biological Diversity (CBD) of 1992 and the Cartagena Protocol on Biosafety (CPB) to the CBD of 2003. The general objective was to establish and strengthen technical cooperation among Asian countries to realize the potential benefits of modern biotechnology in a safe and environmentally friendly manner through transparent and science-based principles and approaches. Current activities evolve on promoting the development of national biosafety measures, intensifying an Asian network on biotechnology for harmonizing biosafety measures, and supporting and promoting R&D for safe and sustainable use of GM crops. Specifically, national stakeholders’ workshops, study tours were conducted, and an Asian Biosafety Encyclopedia was published documenting the basic concepts, related instruments, current status and situation in participating countries. National and regional training workshops on various aspects include analyzing, monitoring and communicating risks associated with GM crops, GMO detection, and promotion of collaborative research on benefits of GM crops such as post-release monitoring, environmental impacts and food safety. Regional consultation meetings, Focal points/Technical experts’ group meetings and internet-based information sharing were also held. An official web site www.asianbionet.org was developed.

Napompeth also highlighted the challenge to institutionalize Asian BioNet after the project is completed in December 2005.

Gabrielle Persley presented a paper on Mobilizing Biociences for Africa’s Development and Prospects for Linkages between Africa and Asia. She mentioned that the Biosciences Eastern and Central Africa (BeCA) is a New Partnership for Africa’s Development (NEPAD) network of “centres of excellence”. The BeCA Hub is at the International Livestock Research Institute (ILRI) with new/refurbished labs and greenhouse opened to scientists from region and internationally. The core competencies are identified, and biosafety and containment facilities for GM crops and animal pathogens are in place. In terms of research scope, there are four priority farming systems in Africa, 12 priority crops (maize, sorghum, cassava, sweet potato), five priority livestock (cattle, sheep, goats, chickens, camels), and priority traits such as drought resistance. On capacity building, it initiated the development of new nodes of institutions in national institutions and universities to complement Hub, conduct of PhD theses in hosted projects, provision of short term fellowships, and creation of African Biociences Fund for fellowships and grants at Hub and nodes. Africa and Asia share common
interests on the following: (1) research agenda such as genomics (e.g. rice, sorghum, millet), trait identification (marker identification and genes discovery, e.g. Newcastle disease and Avian flu in chickens); (2) environmental risk assessments specifically environment assessment, risk assessment methodologies and costs, and specific applications data and dossier, e.g. Bt corn and Bt cotton in Asia; (3) human health risks (methodologies of assessing food safety and food safety of GM maize) and human health benefit (improved quality such as reduced mycotoxins in maize, and improved nutrition content such as vitamins and proteins); (4) product delivery (from discovery to delivery pathways for products); and (5) communications (risk/benefit analysis, stakeholders communications, communications with policy makers). According to her, the future challenges are (1) functioning national regulatory systems, (2) regional and international regulatory compatibility, and (3) public policy and the political will.

SESSION VI: BRAINSTORMING ON FUTURE STRATEGY

The participants were divided into two working groups to brainstorm on future strategy. The Group I consisted of countries with advanced stage of biotechnology development, whereas Group II consisted of countries in the initial stage of biotechnology development. Group I (China, India, Japan, Republic of Korea, the Philippines, Iran, and private sector) addressed issues related to partnerships for R&D, IPR, and regulatory mechanisms, whereas Group II (all other countries) discussed issues such as partnership, capacity building and legal framework. Following are the highlights of their discussions and salient recommendations:

Group I: Countries with More Advanced Stage of Biotechnology Development

Chairperson: Andrew Bennett, Syngenta Foundation
Rapporteur: Anupam Varma, IARI

Detailed deliberations in Group I clearly highlight ed that a very good progress has been made in some of the countries of the region, like China, India, Indonesia, Iran, Japan, Republic of Korea, the Philippines, and Thailand in the application of biotechnology for improving agriculture. These technologies range from micro-propagation of vegetatively propagated crops, advanced diagnostics, development of GM crops and commercialization of GM crops. In some countries, the negative perception of GM crops is very strong, due to which some Governments were forced to withdraw the approval of field release and commercialization of GM crops. Examining the present position, the following recommendations emerged:

- Biotechnological developments should address the problems identified in collaboration with the farming community, particularly the resource poor farmers of the region and these should also address gender issues.
- The overall objective of these technologies should be to help in achieving the Millennium Development goals (MDGs) of the United Nations by reducing poverty through improved productivity and income generation and equitable benefit sharing between the farmers, industry and consumers.
- To achieve the MDGs, the priority areas to be addressed in future are: to develop GM crops, as a complementary tool to traditional breeding, that are tolerant to stresses and abiotic and biotic stresses, and have better quality and use through value addition.
- The potential for improving nutritional status of the crops such as ‘Golden rice’ is a good example. Such efforts will play an important role in providing solutions to malnutrition and deficiency diseases that are much prevalent in the region.
- The new technologies need to be robust and provide sustainable agricultural growth, while protecting the available natural resources.
- The available genetic resources must be conserved through effective use and breeding of new crop varieties using marker-assisted selection technique.
- There is a strong need to develop intra-regional, inter-regional and private-public partnerships for sharing information, expertise, infrastructure and materials (under specific material transfer agreements) in order to ensure quick delivery of products. It is recommended that APAARI needs to be strengthened so that it plays a key role in ensuring active partnerships among stakeholders for achieving MDGs in the region.
- The countries in the region must play a proactive role in capacity building.
- For the success of bio-technology programs in the region, well structured dialogues be organized to change the public perception through dissemination of science-based information which is easily understandable and convincing.
- All efforts should be made at the national level to engage the decision makers, politicians, technocrats and society, for promoting bio-technologies so as to meet the present and future needs of our society.
- These important recommendations should be presented in the Regional Conference of the FAO and other Regional Organizations.

Group II: Countries at Initial Stage of Biotechnology Development

Chairperson: William G. Padolina, IRRI
Rapporteur: Betty del Rosario, APAARI

This Group deliberated at length various issues that would help in building much needed capabilities in the field of bio-technology especially in those developing countries that have not yet moved forward to reap the available benefits of this technology. The Group decided to address this concern in the context of the following:

1. Framework: A framework is adopted to allow the promotion of bio-technology products and favorable growth of bio-technology industry in countries which have made some initial investments in agricultural biotechnology research and development. The framework considers the following elements: rapid advances in science, measures to regulate the movement and release including conflict and dispute resolution, communications strategies to create public awareness, technology delivery to farmers and technical information dissemination among R&D workers, and resource mobilization at national and international levels.

The framework recognizes that countries will have to put in place their national policy on bio-technology and create an enabling environment that will allow them access to new information, new knowledge and technology, develop their capacity (S&T, legal and regulatory) for national innovation systems, and regulate the environment for bio-technology application.
Framework for the promotion of biotechnology in Asia-Pacific: Countries at initial stage of biotechnology development

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2. **Recommendations:**

a. **Partnerships**

The development and effective utilization of biotechnologies (or products of biotechnology) would require strong partnership among several stakeholders at the national, regional and international levels. Such partnerships may involve sharing of information and experiences among NARS regarding “best practice” in developing a national policy and legal framework on biotechnology which could serve as inputs to a country’s Coordinated/Integrated National Program on Biotechnology. Available advanced technologies could be shared among NARS, and capacities could be developed through existing networks within the region (intra-regional) and across other regions (inter-regional). The challenge is to find ways of promoting such partnerships so that expected benefits are reaped by the farming community at the national, regional and global levels.

(i) **National level** – There is a need to formulate a National Coordinated/Integrated Program on Biotechnology consistent with the national policy and national development objectives. This activity could be convened by an appropriate government body and should involve different stakeholders: farmers, government ministries (agriculture, health, environment, education, science and technology, trade and industry), universities, NGOs, the private sector and consumer groups. The idea is to communicate and promote public understanding right from the start. The National Biotechnology Program shall have the following components: the scientific (research), regulation, communication and funding requirements. The implementing strategies shall include partnership, capacity building and resource mobilization.

FAO and APAARI-APCoAB should formulate a simple guideline to develop a National Biotechnology Program as desired by the NARS. They should assist countries in advocating for increased R&D investment to at least 1% of GDP as recommended by ECOSOC. The proportion of R&D investment in biotechnology will depend, however, on the country’s absorptive capacity.

(ii) **Intra-regional level** – Each country will have to identify which will be its partner(s) based on its national interest and its development objectives. It could partner with stronger NARS in the region, such as China, India, Japan, and Republic of Korea. It could also partner with those sub-regional efforts, such as the ASEAN and SAARC, which are based on eco-political cooperation, trade areas and networks. The following
regional networks may be considered: APAARI-APCoAB, Asian BioNet and APGREN-Secretariat of Pacific Community.

The facilitative role of APAARI-APCoAB should be fully harnessed. In collaboration with FAO, APAARI-APCoAB should help countries build capacity in bio-technology, put the regulatory measures in place, communicate for public understanding and confidence building, and act as funding broker. Specifically, APAARI-APCoAB should promote technology transfer through exchange of scientists, research materials and technologies. It should inventory research facilities so that these can be accessible for external funding.

(iii) Inter-regional level - There is a need to broaden partnerships so that countries are not only confined within the NARS, and to take advantage of the tools available elsewhere. The partnership should focus on the mechanisms already established by FAO and GFAR with other advanced research institutions in developed countries, including the CGIAR Centers. Linkages with other regions such as Africa (Biosciences in Eastern and Central Africa, BecA, and African Development Bank) and Latin America (REDBIO) should be fully explored.

b. Capacity Building

The country's capability in exploiting agriculture biotechnology for economic development is based on its manpower capabilities and infrastructure complements. In many countries in the Asia-Pacific region, the local technology base is weak. They have limited competence and facilities to do bio technology research, limited capacity to do risk analysis (risk assessment, risk management, and risk communication), limited skills to communicate science-based information to policy makers and the general public, and rather weak technology transfer delivery system. As national capabilities improve and local innovative capacity is demonstrated, the limited competence of lawyers and scientists on intellectual property protection need to be addressed.

(i) Institution Development - Different institutions will play different roles in the whole biotech RDE and commercialization continuum. Their capacities to do bio tech research, regulate the environment for bio tech applications and disseminate information should be upgraded and enhanced. F AO should help countries raise funds to strengthen existing capacity or create new R&D Centers of Excellence (C OEs). Ins titutions of higher learning such as universities should develop learning materials for risk communication and integrate biotechnology to enhance existing curricula. A communication system through quarterly journals, newsletters and other media must be set up; the institutions must communicate both for the technical aspects and public understanding. A feedback mechanism must be provided so that technology developers and scientists will be duly informed.

(ii) Human Resource Development - Scientists should be trained (either short-term or long-term) on new trends/advances in science within the country or abroad. They should be trained in communication skills to simplify the technical concepts without losing science accuracy. APAARI-APCoAB and GFAR should assist countries look for appropriate training institutions in important areas in advanced sciences, regulation and legal aspects, and communication. Networking should be sustained to foster mutual learning through sharing of best practice. Sensitization for leaders, policy makers and decision makers (legislative, e,
executive and judiciar y) should be conduct ed to raise a wareness, enhance t heir int erest, gain and sus tain suppor t to National Bio technology Pr ogram.

c. Legal Framework

The set of r egulations and nor ms to regulat e the environment f or bio technology application shall pr ovide an enabling fr amework wit hin whic h bio technology activities in a par ticular countr y will oper ate. This fr amework should ha ve provisions f or bio technology activities fr om R&D, import ation of bio technology mater ials, t o commer cialization. This set of nor ms include t he following: Int ernational T reaty on Plant Gene tic Res our ces f or Food and A gricultur e (ITPGRFA), Biosaf ety, IPR (PVP, patents, licenses), Bioe thics, A ccess t o genetic res our ces (or Biopr ospecting), other related laws suc h as Seed La ws, Quar antine, A gro-chemicals (pes ticides and f ertilizers), Trade Laws, Consumer Pr ot ection, En vironment La ws, Pr oduct/Pr ocess Cer tification/S tandar ds, and Veterinary Medicine La ws.

Most countr ies lac k the component of t his fr amework, especiall y IPR, and w ould need t echnical assis tance, on-t he-job tr aining (f or in s tance in PVP of fice in ano ther countr y), and int ernship (f or ins tance in EU f or IPR). The y would need nego tiation and im plement ation skills and competence in consensus building on har monization pr otocols at t he national and r egional le vels. FAO, APAARI and GFAR should pr ovide suppor t for these muc h needed assis tance.

Conclusions:

There is a pr omising de velopment of ag ricultur al bio technology in t he Asia-P acific region. Ho wever, countr ies ar e faced wit h the challenge of cr eatin g an enabling en vironment wit hin whic h bio technology activities will oper ate. Some countr ies lac k the component of t he legal framework; others lac k the capacity t o im plement t hem. The higher goals of bio technology R&D ar e good healt h, equity , and secur ity. Bio technology can contr ibute to achieve these goals t hrough utilization of its pr oducts and technologies. Ho wever, consumer and commer cial conf idence mus t be gained bef ore utilization can occur. To create a critical le vel of tr ust, public a wareness and education should be conduct ed on t he safety and benef its of bio tech products, biosaf ety regula tions and IPR pr otection. These activities should be present all t hroughout t he bio technology ext ension, commer cialization, and utilization continuum. The in puts t o these activities ar e t he clients/s takeholder s, t he resour ces, and t he raw materials.

The development and ef fective utilization of bio technologies (or pr oducts of bio technology) would r equire strong par tnership among se veral takeholder s at t he national, r egional and int ernational le vels. Such partnerships ma y involve shar ing of inf ormat ion and e xperiences among N ARS regarding “bes t practice” in de veloping a national policy and leg al framework on bio technology whic h could ser ve as in puts to a countr y’s Coor dinat ed/Int egrated National Pr ogram on Bio technology. Available adv anced technologies could be shar ed among N ARS, and capacities could be de veloped t hrough existin g ne tworks within t he region (intr a-regional) and acr oss o ther r egions (int er-regional). Ther e is a s trong need t o develop intr a-regional, int er-regional and pr ivate-public par tnership f or shar ing inf ormat ion, e xpertise, infrast ructure and mater ials under specif ic mater ial transfer agreements, and deliv er y of pr oducts. It is r ecommended t hat APAARI be st rengthened so t hat it pla ys a key role in ar ranging activ e partnerships f or achieving the common goals. The ch allenge is t o find ways of pr omo tin g suc h partnerships so t hat expect ed benef its ar e reaped b y the farming community at t he national, r egional and global le vels. FAO, APAARI-APCoAB and GFAR can assis t developing countr ies in t he region b y taking pr oactive ro le in policy adv ocacy, increas ing public under standing, putting up t he necessar y legal and r egulat ory framework, harmonization of r egulat ory procedur es, capacity building, and
mobilizing resources for the promotion of bio technology to address the needs of the poor people in the region. The above recommendations should be presented to the policy makers during the Regional Conference of the FAO and other fora to draw attention of donors so that investments in R&D in general could be increased to a desired level of 1% of GDP.

PLENARY SESSION: SUMMARY RECOMMENDATIONS AND CONCLUSION

Chairperson: He Changchui, FAO RAP
Co-chairperson: H.P.M. Gunasena, CARP

The Plenary Session Chairperson Dr. He Changcui drew attention of the participants to the three expected outcomes of the dialogue as follows: (i) identification of the major priorities in bio technology that FAO and its partners should focus on to enhance its contribution to food security and poverty reduction, (ii) recommended roles for different stakeholders in meeting these priorities, and (iii) mechanisms and modalities of enhanced cooperation and partnership among stakeholders.

Based on the reports of the different session Chairpersons and the discussions which ensued, the following major recommendations were endorsed:

1. Considering important role of bio technology in meeting the Millennium Development Goals (MDGs), both conventional and GM bio-technological approaches need to be promoted in the developing countries of the Asia-Pacific region so as to ensure effective conservation of valuable genetic resources, increased productivity of crops and income of the resource poor farmers, while ensuring environment safety as well as agricultural sustainability.

2. Exciting developments in some countries such as China, India, Philippines, and others are clear indicators of potential benefits of bio technology in agriculture. Other developing countries also need to move forward by adopting appropriate policies, regulatory framework and needed capacity building.

3. Agenda for research in biotechnology and National Framework should be developed keeping in view the priorities that are defined through active involvement of all stakeholders, especially the NGOs and farmers (especially the women farmers).

4. There is need to examine existing regulatory/legal framework of different countries, especially in the context of biosafety, and to ensure proper harmonization at the regional level in order to build much needed public confidence.

5. All aspects of biosafety must be given top priority, including capacity building and development of competent human resource.

6. For reaping the benefits of bio technology at a faster pace, strengthening of Public-Private Partnership (PPP) becomes critical for which appropriate facilitation mechanisms and encouragement through high level policy interventions is critical. Existing models of partnership be examined for identifying "bright spots" for confidence building.

7. Both policy dialogues and public awareness campaigns are needed for greater support and better understanding at all levels. For future success, all existing apprehensions and fears will have to be dispelled through scientific evidences and understanding. All interested governments and stakeholders must play a proactive role to build much needed public confidence. In this context, role of media is important in disseminating proper knowledge...
citing examples of “Success Stories” and “best practices”. Hence, media need to be well informed.

8. For accelerating scientific progress in the field of agricultural biotechnology, it is essential that government funding for R&D is increased substantially. Role of donor community in ensuring this objective need not be overemphasized.

9. Need for building regional cooperation through active involvement of regional/sub-regional Fora such as APAARI, ASEAN, and SAARC was highlighted to be crucial for promoting agricultural biotechnology. All participants, while appreciating the establishment of APCoAB under AP AARI umbrella, and Asia BioNet by FAO, reaffirmed the need to strengthen such Consortia in the Asia-Pacific region.

10. Also it was strongly recommended that organizations such as FAO, GFAR, APAARI should hence forth play a proactive role with regard to facilitation functions such as: advice in regulatory mechanisms and their harmonization; biosafety issues; proper knowledge dissemination and public awareness; catalyzing policy makers for more support for R&D; enabling environment for building strong public-private partnerships; and the capacity building especially in those developing countries that are to move forward in order to harness the benefits of biotechnology.

11. It was agreed to share these recommendations of High Level Policy Dialogue with all concerned policy makers and stakeholders in the region. These recommendations should also be put up before the various Agricultural Ministers and Government officials during the next FAO Regional Conference as well as other political bodies such as ASEAN, SAARC and APEC.

In addition to above, specific priorities, roles of stakeholders and mechanisms of partnership were defined for appropriate action by the concerned key stakeholders. These are provided in the table attached.

In his concluding remarks, Dr. Raj Paroda, Executive Secretary of APAARI, thanked the Ministers, all APAARI member states (regular, associate, reciprocal), the FAO ADG Dr. He Changhui and his colleagues, the APAARI Secretariat, and all who distinguished persons from the public, private sector, international institutions, and NGOs for a highly satisfactory policy dialogue. He also thanked GFAR and FAO for supporting this activity. The recommendations and proceedings will be circulated to all.

Prof. H.P.M. Gunasena, Chairman of APAARI, expressed that he was very pleased and impressed about the meeting progress. The meeting made a very clear message that bio technology could be a powerful tool to address MDGs. The essence of the NGOs and the private sector are quite encouraging. He noted the tremendous progress by countries to move biotechnology forward through their identified COEs. He acknowledged FAO’s interest, support and capacity to help and equated the FAO ADG to initiate some activities recommended by this dialogue. He thanked the Ministers for the political will demonstrated to support biotechnology. He expressed hope that FAO will continue to support APCoAB which it initiated to assist the developing countries foster new technologies or for the developing world.

FAO ADG Dr. He Changhui affirmed that the Ministers’ commitment inspired the views of the participants to this dialogue. He was impressed by the intellectual inputs during the discussion and was quite pleased that the present action and discussion generated the three major outcomes he pointed out during his inaugural address, namely, (1) the major priorities in bio technology that FAO and its
partners should focus on the enhancement of contributions to food security and poverty reduction, (2) recommended roles for different stakeholders, and (3) mechanisms and modalities of enhanced cooperation and partnerships among stakeholders. He acknowledged that the technical dimensions, policies, and legal framework are the major factors that either facilitate or hinder biotechnology development and utilization. Identification of the gaps and priority interventions to address them are critical in formulating knowledge-and science-based policy decisions, educating the public, capacity building, information sharing, and advice on policy and regulatory framework. He recognized that countries can make their own decisions and reiterated that APAARI, GFAR, and FAO shall play a proactive role in policy dialogues, exchange of information and country experiences, and continue to provide relevant policy and technical advice either directly or through regional organizations such as ASEAN and SAARC, doing more follow-through, and drawing attention of donors to promote initiatives in Asia to achieve MDGs. FAO will do so recognizing its honest broker and facilitative role. Finally, the ADG thanked all participants and FAO’s partners in organizing this highest level policy dialogue: Prof. Gunasena, Dr. Paroda, Dr. Ola Smith, the APAARI Secretariat, and everyone for the collaboration in organizing this meeting.

Table 1. Expected Role of Concerned Stakeholders

<table>
<thead>
<tr>
<th>Issues to be addressed</th>
<th>National Governments</th>
<th>Private sector, advanced research institutions, academies, NGOs</th>
<th>APAARI-APCoAB</th>
<th>GFAR</th>
<th>FAO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National policy on biotechnology</strong></td>
<td>Formulate clear, science-based, effective biotechnology policy framework involving all stakeholders, that is compatible with international agreements, and which provide for an effective IPR regime, incentives for local investment and innovation, and enforceable science-based regulations</td>
<td>Provide science- and knowledge-based information</td>
<td>Assist members in policy formulation; provide science- and knowledge-based information; provide information on countries’ “best practices” in policy formulation and enforcement</td>
<td>Policy advocacy, awareness raising, facilitation role</td>
<td>Promote policy analysis and dialogue; catalyze policy makers for science-and knowledge-based policy decisions; provide advisory role directly or through regional organizations such as ASEAN, APEC, SAARC, APAARI etc.</td>
</tr>
<tr>
<td><strong>National Biotechnology Agenda</strong></td>
<td>Develop and update medium and long term National Biotechnology Agenda</td>
<td>Generate, synthesize, share knowledge-and science-based information; address orphan crops and gender issues, important traits such as nutrition, tolerance/resistance to abiotic and biotic stresses, sustainable</td>
<td>Provide simple guidelines in developing and updating national biotechnology agenda</td>
<td>Information and knowledge sharing</td>
<td>Assist in formulating guidelines in developing and updating National Biotechnology Agenda; Draw attention of donors to promote initiatives to achieve MDGs</td>
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agricultural growth and environmental protection; complement modern biotechnology with conventional methods such as classical breeding, and link with other agronomic and biochemical approaches; provide access to new genetic materials, new genes and training opportunities.

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<tr>
<td><strong>Legal and Regulatory Framework</strong></td>
<td>Establish legal and rational regulatory framework addressing both the production and marketing/ commercialization of GM products; define and clarify roles of the different regulatory agencies (environmental safety, food safety, feed safety, biopiracy, etc.)</td>
<td>Create at the institutional level biosafety committee, adopt, implement protocols/ guidelines; capacity building and awareness raising</td>
<td>Capacity building for both the technical, legal/ regulatory aspects for researchers and legal experts, policy makers, media, and professional associations/ bodies</td>
<td>Information and knowledge sharing; capacity building; policy level dialogue</td>
<td>Technical assistance and direct support in drafting national legislation and framework; training; information and knowledge sharing; catalyzing policy makers on legal and regulatory aspects</td>
</tr>
<tr>
<td><strong>Streamline regulatory procedures; harmonize regulations with regional standards, and international laws and agreements; take into account food trade issues within the biosafety protocol; ensure efficient system for</strong></td>
<td>Information and knowledge sharing</td>
<td>Capacity building; information and knowledge sharing</td>
<td>Capacity building; information and knowledge sharing</td>
<td>Facilitate harmonization at the national, regional and international levels</td>
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Table 1  (continued)

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<td>risk management (assessment, monitoring and communication)</td>
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<td><strong>Capacity Building</strong></td>
<td>Needs assessment for both institutional and human resources; establishment or strengthening of Centers of Excellence for R&amp;D, legal and regulatory bodies, and educational institutions, the media, and community-based producer organizations</td>
<td>Capacity building fellowships, internships; participatory research and monitoring; academe should also develop learning materials for risk communication and integrate biotechnology to enhance appropriate existing curriculum; policy briefs for policy makers</td>
<td>Assist in fund raising; inventory of existing infrastructure and core competence; provide access to training opportunities; exchange of scientists, information and knowledge sharing; Networking</td>
<td>Assist in fund raising, provide access to training opportunities; information and knowledge sharing; Networking</td>
<td>Technical assistance; assist in fund raising; information and knowledge sharing; training for developing countries</td>
</tr>
<tr>
<td><strong>Partnership</strong></td>
<td>South-South collaboration among 10 Asian countries in the area of capacity building</td>
<td>Information, knowledge and expert sharing</td>
<td>Assist further in identifying appropriate mode of institutionalizing APCoAB, Asian BioNet and other networks</td>
<td>Assist in fund raising for institutionalizing Regional or Global Partnership Programs (GPPs) on biotechnology</td>
<td>Facilitate further institutionalization and strengthening of regional fora/networks such as APCoAB, and Asian BioNet</td>
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<td></td>
<td>Inter-regional partnership between Asia and Africa through the Biosciences eastern and central Africa (BecA) Hub.</td>
<td>Share research agenda, information, knowledge, materials, expertise, facilities</td>
<td>Take lead in fostering inter-regional partnership; assist in fund raising; strengthen collaborative R&amp;D; document and synthesize lessons learned; foster mutual learning and nurture partnership</td>
<td>Facilitate partnership, assist in fund raising, foster mutual learning, and nurture partnership; build GPP on biotechnology</td>
<td>Mobilize resources to implement and nurture the partnership networks both for R&amp;D and public awareness</td>
</tr>
<tr>
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<tr>
<td>Public-private partnership-better negotiations for mutual benefit; fast and effective delivery of technology</td>
<td>Inventory intellectual property assets, publicly disclose least controversial ones; create new opportunities to make new technologies available to the rural poor with as few restrictions as possible</td>
<td>Foster partnership; document, and synthesize lessons; foster mutual learning; nurture partnerships</td>
<td>Foster partnership; assist in fund raising; information and knowledge sharing; support to GPP on agricultural biotechnology</td>
<td>Mobilize resources, policy advice, information and knowledge sharing; generating awareness for effective Public-Private Partnerships (PPP)</td>
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High Level Policy Dialogue on Biotechnology for Food Security and Poverty Alleviation: Opportunities and Challenges

Jointly Organized by APAARI, FAO and GFAR

7-9 November 2005
Rama Gardens, Bangkok, Thailand

Agenda

7 November 2005 (Monday)

8:00-9:00 Registration

Opening Session

9:00-9:10 Welcome Remarks
Dr. Raj Paroda, Executive Secretary, APAARI

9:10-9:20 Opening Remarks
Prof. H.P.M. Gunasena, Chairman, APAARI

9:20-9:30 General Remarks
Dr. Ola Smith, Executive Secretary, GFAR

9:30-9:40 Opening Statement by H.E. Charal Trinvuthipong
Vice Minister, Ministry of Agriculture, Thailand

9:40-9:55 Inaugural Address
Dr. He Changchui, FAO Assistant Director-General & Regional Representative for Asia and the Pacific

9:55-10:00 Group Photograph
10:00-10:20  **Coffee Break**

*Business Session: Briefing on the Policy Dialogue and Adoption of Agenda*

10:20-10:30  **Policy Dialogue Objectives and Expectations**
Dr. Purushottam Mudbhary  
Senior Policy Officer & Acting Chief, Policy Assistance Branch, FAO RAP

10:30-10:40  **Adoption of Agenda and Election of Rapporteur**

*Session I: Status on Agricultural Biotechnology*

Chairperson: Dr. Andrew Bennett, Syngenta Foundation  
Co-chairperson: Dr. Thierry Mennesson, IAC

10:40-11:10  **Global Developments on Agricultural Biotechnology**  
Dr. Clive James, Chair, ISAAA

11:10-11:40  **Regional Scenario**  
Prof. Anupam Varma  
National Professor, Indian Agricultural Research Institute  
New Delhi

11:40-12:00  **Developments in China**  
Dr. Chen Zhangliang  
President China Agricultural University

12:00-12:20  **Developments in India**  
Dr. G. Kalloo  
Deputy Director General  
ICAR, India

12:20-12:40  **CGIAR Approach to Biotechnology and Biosafety**  
Dr. Robert Zeigler  
Director General, IRRI

12:40-13:00  **Discussion**

13:00-14:00  **Lunch**

*Session II: Issues (Biosafety, IPR, Regulatory Measures)*

Chairperson: Dr. Robert Zeigler, IRRI  
Co-chairperson: Dr. Thomas Lumpkin, AVRDC

14:00-14:20  **Biotechnology and Biosafety Capacity Building**  
Dr. Andrea Sonnino, FAO

14:20-14:40  **Regulatory Measures**  
Dr. Manju Sharma  
Former Secretary, DBT, India

14:40-15:00  **IPR Related Developments**  
Dr. Victoria Henson-Apollonio  
Project Manager, the CGIAR CAS-IP, IPGRI
15:00-15:20 A Corporate Foundation Perspective for Access to Biotechnological Innovations  
Dr. Andrew Bennett  
President  
Syngenta Foundation

15:20-15:40  Coffee Break

**Session III: Ministerial Round Table on National Developments**

**Chairperson:** Secretary Domingo Panganiban, Philippines  
**Co-chairperson:** Dr. Jafar Khalghani, Deputy Minister, Iran

15:40-16:30  Presentation by Agriculture Ministers/Secretary of Agriculture:

- Iran  
  Dr. Jafar Khalghani, Deputy Minister
- Philippines  
  Mr. Domingo Panganiban  
  Secretary of Agriculture
- Sri Lanka:  
  Mr. Tissa Warnasuriya,  
  Secretary of Agriculture
- Thailand  
  Dr. Supranee Impithuksa  
  Deputy Director General, DOA

16:30-17:00  General Discussion and Conclusions

19:00  Reception Dinner hosted by ADG-FAO

8 November 2005 (Tuesday)

**Session IV: Biotechnology for International Public Goods**

**Chairperson:** Dr. William Dar, ICRISAT  
**Co-chairperson:** Dr. Ola Smith, GFAR

9:00-9:30  Developments on Golden Rice  
Prof. Ingo Potrykus  
Swiss Federal Institute of Technology

9:30-10:00  Genetically Modified Food Regulations and International Trade for Developing Countries  
Dr. Mark W. Rosegrant, IFPRI

10:00-10:30  From Genetic Resources to Marker-Assisted Selection  
Dr. Claire Lanaud, CIRAD

10:30-11:00  Coffee Break

**Session V: Global/Regional Partnership Initiatives**

**Chairperson:** Dr. Shinobu Inanaga, JIRCAS  
**Co-chairperson:** Dr. Gabrielle Persley, Doyle Foundation
11:00-11:20  Global Partnership Program Initiative  
Dr. Ola Smith  
Executive Secretary  
GFAR

11:20-11:40  APCoAB – A Regional Consortium  
Dr. R.S. Paroda  
Executive Secretary  
APAARI

11:40-12:00  Asian BioNet  
Dr. Banpot Napompeth

12:00-12:20  Mobilizing Biosciences for Africa's  
Development and Prospects for Linkages  
between Africa and Asia  
Dr. Gabrielle Persley  
Chair, Doyle Foundation

12:20-13:00  Discussion

13:00-14:00  Lunch

Session VI: Brainstorming on Future Strategy

14:00-17:00  Interactive Sessions on Way Forward through Group Discussions

Group I:  Countries with More Advanced Stage of Biotechnology Development  
(China, India, Japan, Republic of Korea, Philippines, Thailand, and Iran)  
Suggested issues to be covered to accelerate delivery of biotechnology:  
Partnerships for R&D, IPR, and Regulatory  
Chair:  Dr. Andrew Bennett  
Rapporteur:  Prof. Anupam Varma

Group II:  Countries at Initial Stage of Biotechnology Development  
(Other Countries)  
Suggested issues to be covered:  Assessment of and Partnerships for R&D,  
Capacity Building and Legal Framework  
Chair:  Dr. William G. Padolina  
Rapporteur:  Dr. Betty del Rosario

19:30  Reception Dinner hosted by APAARI
9 November 2005 (Wednesday)

8:30-10:30 Joint Panel Discussion  
Moderator: Dr. Raj Paroda

10:30-11:00 Coffee Break

**Plenary Session**

Chairperson: Dr. He Changchui
Co-chairperson: Prof. H.P.M. Gunasena

11:00-12:00 Recommendations of Each Session and Conclusions

Session Chair/Co-Chair report:

Session I: Dr. Thierry Mennesson
Session II: Dr. Thomas Lumpkin
Session III: Dr. Betty del Rosario
Session IV: Dr. Raj Paroda
Session V: Dr. Shinobu Inanaga
Session VI: Prof. Anupam Varma (Group I)
Dr. William G. Padolina (Group II)

12:00-13:00 Lunch and Adjournment
Annex II

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