CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

BIOTECHNOLOGY, BIOSAFETY AND THE CGIAR

Promoting Best Practice in Science and Policy

FEBRUARY 2009

IRRI
INTERNATIONAL RICE RESEARCH INSTITUTE

Bioversity International

SCIENCE COUNCIL
CGIAR

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Science Council Commentary

The 2004 Science Council (SC) Study on Biosafety[1] made twelve recommendations which, with additional comments, were endorsed by SC and the Executive Council. While most of the recommendations have been implemented by the Centers to varying degrees, there was a need to review their status and to identify areas where further work might be necessary.

This would also fulfill the twelfth recommendation in the 2003 SC Biosafety Study: "… in order to ensure that the results of the CGIAR investments in gene technology are able to be used with safety and confidence, the Biosafety Panel report and its recommendations be discussed at a workshop involving members of the CGIAR Science Council, the Biosafety Panel, representatives of the CGIAR Centers, their R&D partners and other stakeholders, including national regulators, policy makers, civil society, farmers and consumers."

To this end, the Workshop entitled *Biotechnology, Biosafety and the CGIAR: Promoting best practice in Science and Policy* was held at International Rice Research Institute (IRRI) headquarters in Los Baños, the Philippines, on 22-24 April 2008. The workshop was co-organized with IRRI and Bioversity International, with a total of 41 participants, including representatives from nine CGIAR Centers, National Agricultural Research Systems (NARS), Civil Society Organizations and relevant international agencies.

The Workshop reviewed biotechnology-related work in the CGIAR and partner NARS and focused discussion on three major issues:

i) How can CGIAR Centers best work with NARS to ensure a smooth and timely delivery of research products to target farmers?

ii) Does the CGIAR need a Biotechnology Research Support Network? What will it do, and how can it best function?; and,

iii) Policy issues: How should CGIAR be represented in international fora?

Currently no Center has reached the release stage for a genetically modified (GM) crop; the most advanced project is that of IRRI and its partners with Golden Rice, with staged release planned for 2011/2012. However, progress in this area is providing lessons for all involved as it goes hand-in-hand with the establishment of biosafety regulations and their operation in partner developing countries. The workshop's main outcomes can be summarized into three points:

1. There is a clear need for special procedures, particularly involving key NARS at the earliest stage, to ensure efficient flow from research to use.

[1] Report of the Biosafety Panel to the CGIAR Science Council on biosafety policy and practices of the CGIAR Centers (February 2004), available at: http://www.sciencecouncil.cgiar.org/activities/spps/index.html.

2. A network to improve the delivery of CGIAR biotech products is imperative. The Network should involve NARS and other partners. Its functions should include identification of best practices, development of business plans, and other aspects of product development and delivery.
3. System-wide representation at international policy fora should be coordinated (possibly through the CGIAR Biotechnology Research Support Network), particularly in providing technical contributions and highlighting research options/scenarios.

The SC fully agrees with the workshop outcomes and stands ready to provide guidance as the Centers and NARS partners develop details of network operation and will assist the concerned Centers to seek donor assistance for the initiation of the network.

In particular, the need for a more effective research-to-product chain for public sector agricultural research has often been called for, and the SC sees that the CGIAR Center scientists can close the current gap by consulting with NARS and other product delivery partners at the outset of their research. The SC confirms that the Biotechnology Research Support Network would be vital in promoting more consultation, cooperation, and information-exchange among the CGIAR Centers and between the Centers and their national counterparts in managing the various biosafety issues surrounding biotechnology research.

The network should seek to assist in the practical issues of designing and conducting research projects including GM technologies, and should aim to make use of existing international and national standards. Careful considerations should be made to identify areas of possible collaboration and synergy in the areas of project preparation/management and policy discussion, while respecting the integrity of each research project. The SC concurs with the concerns raised by some workshop participants regarding the sustainability of such a network; this will require clear agreement on the mandate, scope, and responsibilities together with viable logistical and financial arrangements. More discussion will be needed among the stakeholders of the network, but the SC urges that the new network should link with and use the advice of existing bodies as appropriate to the tasks in hand. Strong political support from the Center management would also be vital to the sustainability. The incorporation of the network will be an important instrument for biosafety in the CGIAR, helping structure collaborative research, and most importantly, getting superior new varieties rapidly into the hands of those who need them.

Acronyms

AARINENA	Association of Agricultural Research Institutions in the Near East and North Africa
AATF	African Agricultural Technology Forum
ABSP II	Agricultural biotechnology support project II
AGERI	Agricultural Genetic Engineering Research Institute
ARC	Agricultural Research Council
ARI	Advanced Research Institute
ASEAN	Association of Southeast Asian Nations
AVRDC	The World Vegetable Center
BecA	Biosciences East and Central Africa
Bt	Bacillus thuringiensis
CAS-IP	Central Advisory Service on Intellectual Property
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIMBAA	Collaboration on Insect Management for Brassicas in Asia and Africa
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
CMV	Cauliflower Mosaic Virus
CPB	Cartagena Protocol on Biosafety
DNA	Deoxyribonucleic acid
EU	European Union
FAO	Food and Agriculture Organization of the UN
FFF	Federation of Free Farmers
FMV	Feathery mottle virus
GATT	General Agreement on Tariffs and Trade
GEF	Global Environment Facility
GM	genetically modified (or genetic modification)

GMO	Genetically Modified Organism
GRPC	Genetic Resource Policy Committee
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRISAT	International Center for Research in Semi-Arid Tropics
IFAP	International Federation of Agricultural Producers
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute
INIFAP	National Institute of Forestry, Agricultural and Animal Research
INTA	National Institute of Agricultural Research
IP	Intellectual Property
IPM	Integrated Pest Management
IPR	Intellectual Property Rights
IRMA	Insect-resistant Maize for Africa
IRRI	International Rice Research Institute
ISAAA	International Service for the Acquisition of Agri-biotech Applications
ITPGRFA	International Treaty on Plant Genetic Resource for Food and Agriculture
KARI	Kenyan Agricultural Research Institute
LMO	Living Modified Organism
NARS	National Agricultural Research System
NGO	Non-governmental Organization
OPV	Open-pollinated variety
PBS	Program for Biosafety Systems
PROCISUR	Cooperative Program for the Technological Development of the Agro-food and Agro-industry in the Southern Cone
PRRI	Public Research and Regulation Initiative
PRSV	Papaya ringspot ***virus***
R&D	Research and Development
rDNA	recombinant DNA
RR	Roundup Ready

SC	Science Council
SGRP	System-wide Genetic Resource Programme
SINGER	Systemwide Information Network for Genetic Resources
SPS	(Agreement on the Application of) Sanitary and Phytosanitary Measures
TBT	(Agreement on) Technical Barriers to Trade
TSV	Tobacco streak virus
TWN	Third World Network
UNEP-DGEF	United Nations Environment Programme – Division of GEF
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WANA	West Asia and North Africa
WARDA	Africa Rice Center
WTO	World Trade Organization

BIOTECHNOLOGY, BIOSAFETY AND THE CGIAR:
PROMOTING BEST PRACTICE IN SCIENCE AND POLICY

22-24 April 2008, Los Baños, The Philippines

WORKSHOP REPORT

Agenda Item 1. Opening and Introduction

Robert Zeigler, Director General of International Rice Research Institute (IRRI), opened the workshop and welcomed the participants. He noted the significance and timeliness of hosting the workshop in the Philippines, where the regulatory environment is amenable to new agricultural technologies and the recent rise in rice prices has triggered an urgent need to seek various approaches to increase productivity. He acknowledged that, while Genetically Modified Organisms (GMOs) will not single-handedly solve the problem, it could provide a part of the solution. There is a sense that the public perception towards GMOs could consequently become more positive and would allow a renewed discussion on the future of GMOs and how they could contribute to food security. He hoped that this workshop would provide an opportunity to consider the roles and responsibilities that CGIAR might have in undertaking transgenic research.

Mike Gale, CGIAR Science Council (SC), introduced the objectives of this workshop, which is organized jointly by SC, IRRI, and Bioversity International. The workshop was premised on the mandate of the SC, to "ensure that the CGIAR System is better than the sum of its Centers" by engendering cooperation and collective action, and especially, responded to the recommendations of the SC-commissioned report on biosafety in 2004. He stressed the workshop's focus was on the process rather than the science of biosafety research. The main goals of the workshop were: to identify ideal relationships between Centers and its partners so that the research products would reach the farmers in a timely fashion and whether a new network was required to facilitate that; to identify special needs for fisheries, livestock and trees; and to examine ways in which the CGIAR might be able to speak with one voice in the policy arena, possibly establishing a network to perform some of the required tasks.

Gabrielle Persley, International Livestock Research Institute (ILRI), and Scientific Secretary for the 2004 SC report, gave an overview of the main messages in the report. The most important observation was the need for a better product pipeline. She expressed her concern that none of the 14 transgenic products in the pipeline that had been reported by the Centers in 2004 were commercialized to date, and stressed the need to investigate whether the obstacle was a technical or a policy problem. Citing the recent ISAAA report[2], she said that we are yet to see GM products beyond the four major commercially released crops, dealing with local traits, or developed by NARS. In order for that to happen through the CGIAR, there is a need for Centers to approach the regulatory

[2] James, C (2007) Global Status of Commercialized Biotech/GM Crops. International Service for the Acquisition of Agri-biotech Applications (ISAAA).

environment not only on a scientific basis but also with a focus on risk-benefit analysis, ecological factors, and regional considerations. The Centers must consult NARS on the biosafety aspects from early in the research project rather than treat it as a regulatory issue at the end. A "portfolio approach" with NARS could build synergies and address common issues, share experiences and research results. She hoped that this workshop would lead to an enabling environment that would allow products to be commercialized in the near future.

Gerard Barry, IRRI, reviewed the recommendations of the 2004 SC report and gave an update on the first 11 recommendations by highlighting what has been put in place or is in progress. He noted that Recommendation 12 provided the mandate for this workshop, and gave a description of what is needed under the recommendation's sub-categories: enhance CGIAR Center biosafety policies; enhance capacity-building in national biosafety policies and practices; strengthen center Capacity in biosafety practice and research through pro-active approaches to biosafety; develop integrated approach to practice of biosafety in the centers; establish a CGIAR System biosafety network; increase biosafety-related research by Centers; publish and communicate results of biosafety research; prepare for forestry and fisheries biosafety issues (and livestock); undertake more risk-benefit analysis; develop plans for preparing risk assessment dossiers for product approval; and better address bioethical issues.

PART I

Getting novel products to market

Agenda Item 2. Current work on biotechnology[3]

2.1 CGIAR Centers working with NARS

Simon Gichuki, Kenya Agricultural Research Institute (KARI), gave an overview of the joint KARI-CIMMYT Insect Resistant Maize for Africa (IRMA) project. In addition to improving productivity by developing varieties resistant to a major biotic stress, IRMA endeavors to demonstrate good practice for biosafety and to serve as a pilot project for public-private partnership that employs state-of-the-art technology while remaining transparent and open through ongoing dialogues with stakeholders (Box 1). Two major imperatives in this context are to use publicly-produced gene constructs whenever possible to avail the product to farmers at a reasonable cost, and to produce plants free of antibiotic marker genes. He explained that experiments using only publicly available technology resulted in insufficient pest-resistance, which compelled the acquisition of private sector technology. One of the lessons learned through IRMA was that research involving GM technology was a long and expensive process that could not be carried out by any single public institution. Encouraging local participation through stakeholder meetings, involvement of NARS scientists, creating multi-disciplinary research teams, sharp focus on the final product by developing a business plan, and careful

[3] Under this agenda item, the presenters were requested to give a brief overview of their relevant projects, with an emphasis on the key biosafety and stewardship issues that have helped or hindered the project. They were also requested to mention any bottlenecks, biosafety or otherwise, in getting products into the farmers' hands.

communication with the media were all considered important for the success of the project. IRMA also made direct and indirect contributions to biotechnology and biosafety in Kenya, including to the national biosafety regulatory framework by acting as a real-life case study.

Box 1. IRMA Project Themes (source: S.Gichuki)

- Development of Bt maize event, Bt source line, and human health safety assessment
- Development of conventional, Bt products, and compositional analysis
- Environmental impact assessment
- Insect resistance management and contingency plans
- Biosafety and regulatory issues
- IPR/Licensing
- Seed production
- Market assessment and analysis
- Economic impact assessment
- Communication, promotion, and capacity building

Gerard Barry gave an update on the Golden Rice project (integrating β-carotene, a precursor of pro-vitamin A, in the edible parts of rice). The Golden Rice now contains meaningful levels of β-carotene, and the project is in the breeding phase, moving the trait into Asian varieties. He described the various studies currently being conducted, including storage/cooking stability and bioavailability in humans. The project was also building experience of the various considerations related to ensuring deployment for impact, such as: the interaction with national regulatory systems; development and submission of data for regulatory review; field testing; and interaction with nutrition experts and public health advocates. More biosafety data is expected to accumulate as the project is beginning outdoor field trials from 2008 in a number of countries.

Kiran Sharma, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), presented the strategy of the HarvestPlus Challenge Program, which aims to develop up to 16 staple crops rich in micronutrients such as provitamin A, iron, and zinc, using both traditional and modern technologies (Table 1) as well as the progress of its research activities. He elaborated on the country programs, which are aimed to develop institutional structures in selected countries for the purpose of promoting and coordinating research and dissemination of biofortified crops. These are currently being undertaken in China, India and Brazil. The countries are expected to provide regional leadership and share research findings with others. Over time they are expected to run the project themselves and eventually achieve financial sustainability. The country programs are designed to go through three phases, with strategic issues considered at each phase to ensure individualized consideration as well as maximum impact and commitment at the national level. *Gerard Barry* continued with the Harvest Plus strategy, emphasizing its approach that if conventional breeding can achieve the nutritional enhancement goals, transgenics will not be used. He reported on the status of current transgenic projects, highlighting the types of crops, target traits, breeding strategy, additional agronomical opportunities, and the product development timelines.

Table 1 Crops under consideration in HarvestPlus Challenge Program (source: K.Sharma)

Phase I Crops	Phase II Crops
▪ Rice	▪ Potato
▪ Wheat	▪ Barley
▪ Maize	▪ Cowpeas
▪ Cassava	▪ Groundnuts
▪ Sweet Potato	▪ Lentils
▪ Beans	▪ Millet
	▪ Plantain
	▪ Sorghum
	▪ Pigeon peas
	▪ Yams

Discussion

The session converged on four points. On the general issue of the follow-up of the 2004 SC report, it was clarified that the SC and the CGIAR Centers had the responsibility to implement the recommendations even though there is no formal mechanism for enforcement. There are signs of progress among the Centers, particularly in their better understanding and recognition of the issues related to environmental and food safety concerns. This workshop was therefore considered to be an optimal way to illustrate the current state of play, and to explore the basis of a potential network.

For the IRMA project, cost implications of accessing proprietary technology from the private sector as well as on the regulatory approval process, was of central concern. It was explained that IRMA was currently negotiating a royalty-free agreement for the use of private-sector technology, but it was predicted that there will still be cost implications. It was difficult to predict whether the final product would have a higher price tag than the conventional hybrid varieties. More important was the issue of costs required for meeting the regulatory requirement, and whether/how the public sector could meet them. Transgenic plants were expensive also due to the transaction costs and to the human time invested in the regulatory procedure itself. Over-regulation, experienced in some instances, quickly increases the regulatory costs in meeting requirements.

It was mentioned that CIMMYT had a much lower visibility as a partner institute for IRMA, compared to its private sector counterpart. This brought an important issue on how the information on CGIAR research outputs could be disseminated better to the public in order to increase their visibility. For example, more technical reports (that are already available internally) could have been made public. With regards to transgenic work, however, it was difficult to balance between getting visibility in public and being sensitive to the media reaction. A proactive approach is necessary to respond quickly to public questions about transgenic work, which requires an adequate capacity at the Center- or project-level.

Participants were happy to hear the progress made in the Golden Rice project, which had completed a human study and was moving steadily towards commercial release, currently planned for 2012. There were some questions on the extent and timeline of the product deployment (also an issue raised with reference to the IRMA project), as well as on measuring impact on the nutritional enhancement once it has been deployed. It was

confirmed that the initial stage will be a deliberate, targeted deployment using existing networks and partners in order to assess the impact, after which a wider market release will be considered.

2.2 Existing national initiatives

Alicia Ilaga, Department of Agriculture, The Philippines, gave an overview of the policy development and implementation required for the commercial release of *Bt* maize in the Philippines. She described the rules, regulations, and the administrative procedures that govern the various uses of the products of modern biotechnology, emphasizing that the Philippines is the first ASEAN country to regulate modern biotechnology. She stressed that under limited resources, various measures were also put into place in order to ensure that expenditure is effectively made in targeted areas to maintain the sustainability of the regulatory system. She demonstrated how the *Bt* maize went through each of the regulatory steps of the integrated system: pre-market safety assessment; technical evaluation; and post-commercialization oversight and assessment.

Esteban Hopp, National Institute of Agricultural Research (INTA), Argentina, illustrated how Argentina deals with modern biotechnology. In Argentina, where the economy was based on agricultural exports, introduction of transgenics (particularly herbicide-tolerant soybeans, maize and cotton as well as Bt maize and cotton, Fig. 1) was successful for a number of reasons: its compatibility with no-tilling agricultural practice; adaptability to conventional agricultural practices; the development of a technological innovation system through farmer organizations; the ability of the seed industry to deliver new varieties to the farmers quickly; the establishment of a governmental biosafety framework required for the appropriate management of agricultural biotechnology and farmer acceptability. Direct economic impacts were not limited to large agriculture but also involved the smallholder, and there were also indirect positive impacts in the form of job increases, strengthened agroindustry, environmental effects, etc. Argentina is also involved in non-crop research areas such as animal vaccines and transgenic livestock.

On the issue of regional cooperation, Argentina is involved in initiatives such as the PROCISUR platform on soybean rust biotechnology and FAO-REDBIO (a horizontal network of biotechnology laboratories in the region). He noted that regional efforts in innovation based on genetic modification are faced with some limitations; international pressures, such as the uncertainty of EU consumer reactions, contribute to the uncertainty in assessing future GM markets.

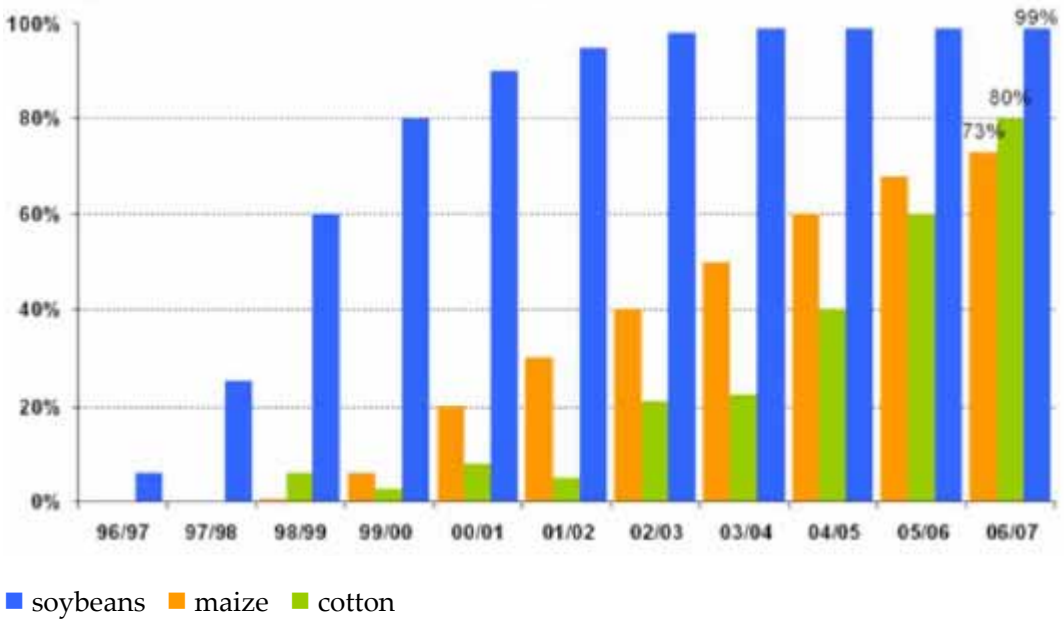

Figure 1 Cultivated areas for GM crops in Argentina (source: ArgenBio, 2007)

Gurling Bothma, Agricultural Research Council (ARC), South Africa, described the status of GM crops in South Africa. Being the only country in the region that has commercially released GM crops, South Africa has conducted commercial transgenic research since 1990 and has a number of products on the market. GM cotton and soybean have particularly high acceptance levels (Table 2). There are also many public bodies conducting transgenic research with a view to commercialization, but they see the "freedom to operate" and licensing as the main difficulties in getting research products to market. He gave an overview of the regulatory application process under the South African GMO act, indicating that a large number of products with various traits were in the pipeline, such as insect-resistant potato, virus-resistant ornamental flowers, starch-modified flower, and virus-resistant groundnut. Drought tolerance in maize is also one of the major topics of ongoing research.

Table 2 GM crop products currently being cultivated in South Africa (source: ISAAA Brief 37, as quoted by G.Bothma)

Crop	Trait	Notes
Maize (white/yellow)	Insect resistant (73%/69%), herbicide tolerant (21%/27%) and stacked (6%/4%)	GM maize occupies 1.6 million ha for white and yellow maize crops (52% and 62% of the total maize planting areas, respectively)
Cotton	Insect resistant (5.5%), herbicide tolerant (5.5%) and stacked (89%)	GM cotton occupies 90% of the total cotton planting area (9,000 out of 10,000ha in 2007)
Soybean	Herbicide tolerant	GM soybean occupies 89% of the total soybean planting area (144,000 out of 180,000ha in 2007)

Public research in South Africa is supported by a national system that guides public institutes through the product development chain. There are however a large number of bottlenecks, including issues such as turning the product concept into reality, high turnover of human capacity at public institutions, intellectual property, public-private partnerships, dealing with activist groups, and compliance with the regulatory system. In conclusion, he predicted that the introduction of new GM crops in South Africa will still be dominated by multinationals due to their solid financial and scientific backing. There is a need for public research institutes such as the CGIAR Centers to find real solutions to real problems; particularly in Africa, this would directly affect public and political acceptance. Africa must also tackle the problems of human capacity within the public sector, as the rampant brain-drain currently makes it difficult to keep research projects alive.

Table 3 Proposed transgenes to be tested in field trials in Mexico upon approval (Source: A. Ortega)

Company	Event	Designation	Source		
Monsanto	MON810	Yield Gard®	Cry1Ab	Bt var. kurstaki	Lepidoptera
Monsanto			Cry3Bb1	Bt spp. kumamotoensis	Root Worm
			cp4	Enzyme 5-enolpiruvilshikimate-3-phosphate synthase of Agrobacterium sp. strain cp4	Glyphosate
Monsanto	NK 603	Solución Faena 2®	cp4	Enzyme cp4 espps of Agrobacterium sp. strain cp4	Glyphosate
Monsanto	MON810 /NK603	Yield Gard® / Solución Faena 2®		Cry1Ab *Bt* var. *kurstaki*	Lepidoptera
			cp4	Enzyme cp4 espps of Agrobacterium sp. cepa cp4	Glyphosate
Dow Agroscience	TC1507		Cry1F	Bt var. aizawai	Lepidoptera
Pioneer	TC 507		Cry1F	Bt var. aizawai	Lepidoptera

Alejandro Ortega Corona, Instituto Nacional de Investigaciones Forestales, Agricolas y Pecuaries (INIFAP), Mexico, gave a presentation on the situation of transgenic maize cultivars in Mexico with a particular focus on their significance in the context of the maize landraces. Maize landraces and Teocinte (an ancestral plant of maize) are widely distributed within Mexico, which overlaps with the general commercially cultivated areas for maize. Limiting the gene flow between the maize in commercial (irrigated) and traditional (rain-fed) agriculture is therefore an important priority. There is also a need to learn about the impact of transgenes on landraces and their ancestors. Research on transgenic maize had

been active in Mexico until 1998, when a moratorium for GM maize testing was established to protect the maize landraces. The current legal framework consists of the GMO law, associated regulations, and a special regime for protection of maize landraces – the last of which is still pending adoption, after which applications for field trials might be considered (Table 3). There are still many areas of research that are needed to evaluate the long-term effects of cross-pollination between the maize landraces, the ancestors and the transgenic commercial varieties. He described some research proposals currently under consideration at INIFAP on transgenic pest-resistant maize, which would promote the use of risk assessment and risk management to comply with the upcoming legal requirements for field trials, with particular focus on the issues of country of origin and maize domestication.

Table 4 List of AATF-brokered transfer of technologies "donated" by the private sector (source: M.Bokanga)

Technology	Partners	Goal
Insect-resistant Maize	BASF/CIMMYT	Control *Striga* in maize fields
Insect-resistant cowpea	Monsanto/CSIRO/IITA	Control *Maruca* pod borer
Disease-resistant banana	Acedemia Sinica/IITA	Control banana bacterial wilt
Drought-tolerant maize	Monsanto/CIMMYT	Reduce impact of drought
Nitrogen efficient rice	Arcadia/WARDA	Improved response to nitrogen
Saline tolerant rice	Arcadia/WARDA	Extend paddy production
Biofortified sorghum	Pioneer/A-Harvest/ICRISAT	Improve human nutrition
Mycotoxin control	USDA/CircleOne/IITA	Reduce peanut aflatoxins
Cassava industrialization	Brazilian industries/IITA	Mechanize cassava operations

Mpoko Bokanga, African Agricultural Technology Forum (AATF), described AATF's role in technology access and delivery to smallholder African farmers. In the current backdrop of declining productivity in African agriculture, adoption of new technologies will play an important role. AATF was established as a mechanism to tap into the products of private sector research, negotiating access to proprietary technology and managing effective partnerships. It aims to improve the efficiency of the value chain by developing better products through innovative ways of creating synergies between the stakeholders. It has been successful in negotiating donation of various technology products by industry, such as the transgenic insect-resistant cowpea and disease-resistant banana. One of the most significant recent achievements is the collaborative effort on drought-tolerant maize (Table 4). On GM regulations in Sub-Saharan Africa, the current rise in food prices may change the attitude of policy makers and speed the acceptance of the technology – however, the major bottleneck was the prohibitive cost of regulatory compliance for the transgenic variety compared to its conventional counterpart. The CGIAR was suggested as a possible body that could assist in providing some of the required regulatory services.

Robert de la Peña, World Vegetable Center (AVRDC), presented the current status of transgenic research at AVRDC. Most of its transgenic work focuses on promoting public-private partnerships, functional analysis of genes, and product development.

Research currently underway at AVRDC includes disease-resistant tomato, and pest-resistant brassica species. He then introduced the CIMBAA project, in particular its development of dual Bt cabbage and cauliflower. He emphasized that these research products were to be introduced as part of the overall Integrated Pest Management (IPM) program, combining conventional and transgenic technologies as necessary. In this context, various surveys and meetings were undertaken to assess the needs for the particular research product, involving a wide range of partners. Risk assessment studies have also been conducted.

Guat Hong Teh, CGIAR Central Advisory Service on Intellectual Property (CAS-IP), continued with the description of the CIMBAA project on Bt Cabbage and cauliflower, noting the project is still at the planning stage. It has so far managed to broker agreements on research and development with a number of partners, and has developed a clear research-to-distribution plan as well as a strategy for material release. CAS-IP hopes to demonstrate through the project that public-private partnerships can be formed for development-oriented research, whose products can be then transferred to national partners.

2.3 CGIAR consortia initiative

Kiran Sharma, ICRISAT, presented the hybrid parental line seed consortium and other initiatives of public-private partnerships at ICRISAT, some of which do not deal with transgenic crops but might present a useful option that could be applied to the dissemination of transgenic products. He noted that the lack of interface between the public and the private sectors had been a bottleneck in agricultural technology transfer, and a congenial relationship between research, technology development, and technology transfer/use was needed in order to enhance synergies. ICRISAT aims to achieve this through a number of mechanisms, one of which is the Hybrid Parent Research Consortia. The Consortia seek to benefit from the comparative advantage of synergistic approach in providing hybrids of sorghum, pearl millet, and pigeon pea. The details of the consortia system, such as the membership, agreement, governance and management, and modes of support, were described. There are also some other public-private partnership activities at ICRISAT, including the planned establishment of a new science-business platform for translating transgenic technology into practical, value-added products.

Achim Dobermann, IRRI, presented the Hybrid Rice Research and Development Consortium. This consortium was developed to enhance the utilization of the IRRI hybrid germplasm (non-transgenics) for the purpose of improving and promoting the hybrid rice technology in Asia, with an aim to increase rice production and farmers' income. The germplasm had historically been freely available to NARS and private sector companies, but the consortium would alleviate some constraints such as limited resources, lack of cost recovery, lack of feedback for IRRI product performance, and product abuse (e.g. by the patenting of IRRI germplasm and products by third parties). The details of the consortium, such as the operational principles, membership fee structure, current membership, and governance – some of which were modeled after the ICRISAT consortium – were described. The consortium is revising its financing model, and is still handling some open questions on efficient product development lines and possible NARS participation.

Discussion

Again the major issue was the cost required for regulatory approval. It became evident that the current situation requires high regulatory costs to be met, which is a challenge for research products developed by the public sector. An agreed set of regulatory requirements, endorsed by multiple countries, might be necessary to avoid over-regulation and corresponding rise in regulatory costs. As government regulators build experience on the approval processes and become familiar with a particular variety – and GM products generally – the requirements and time needed for subsequent rounds of regulatory approvals would tend to reduce. It was also suggested that South Africa's establishment of a platform to assist public research bodies with the regulatory procedures would be extremely useful if it could be replicated in other countries.

Questions were asked as to the benefits of the "consortium approach" to NARS, particularly if they are not able to become partners by the payment of a membership fee. It was clarified that NARS had always had free access to the varieties, but membership of the consortium would allow them priority access to the more-developed product lines and other services.

Agenda Item 3. Small-group discussion on ideal CGIAR Center – NARS interactions

The workshop participants were split into four groups to identify requirements for efficient biotech research-to-product development that meets the needs of smallholder farmers. After deliberations within each discussion group, presentations were given by the rapporteurs.

It was clear that research involving GM crops was still a sensitive subject area for many. No products had yet been developed by the CGIAR Centers and, clearly, special product development mechanisms were needed in order to ensure efficient research-to-use trajectories for crop varieties carrying transgenes.

All groups generally agreed that a very close partnership between CGIAR Centers and NARS was vital. It would be ideal if CGIAR Centers could inform NARS of proposed GM variety development (including for research purposes only in the first instance), so that NARS would have the opportunity of being involved with the product from day one. The same form of partnership could be utilized for project proposals coming from NARS, industry or ARIs collaborating with Centers. A process of this sort would also ensure that the product was of interest to particular NARS.

Several discussion groups suggested that the most appropriate convening vehicle would be a Biotechnology Research Support Network[4], which included CGIAR Centers and NARS. Centers would present their intention to develop GM products via the network and individual NARS could register their interest in joining groups tasked with product development, from concept to delivery to partner NARS.

Membership of Project Steering Committees

Project Steering Committees (PSCs) should work within a formal 'collaboration

[4] As proposed during this meeting and discussed under Part II of the workshop.

agreement'. NARS would have the opportunity to sit on PSCs, in order contribute to, and learn from, the progress of specific research projects. Different NARS representatives might wish to rotate through the planning, development and release phases. NARS destined to be the most immediate point of release of a product might wish to chair the steering committee (or co-chair with the CGIAR Center). Industry, whose technology (donated or licensed) is involved in the project, should also be invited onto the PSC, as should IP Brokers if they are involved. Where similar technologies are being used by different Centers on different crops, cross-Center representation on the PSCs will be valuable.

Role of the Project Steering Committee

The PSC, which will work mostly virtually, will direct the project throughout. Working closely with the CGIAR Center, the PSC will encourage the Center to develop a product that really is needed by the prospective recipient NARS. Varietal backgrounds for the transgenes, for example, will be discussed at the earliest stage. The NARS in turn will be committed to supporting the uptake path by, for example, involving national regulatory bodies at the earliest stage. They will also be making preparations to deliver the product to end-users, particularly small-holders. This might include mobilization of seed companies. Here the ICRISAT model for interaction with SMEs and private seed companies for rapid dissemination within-country was suggested as an example to be considered. Industry members would be valuable as a source of information about the technology and general biosafety risk assessment data. Their involvement, and also of the IP Brokers, should serve to provide some confidence about stewardship issues by both the Center and prospective recipient NARS. Cross-Center membership will aid the flow of information through the System and should diffuse competitive issues.

In addition to the most appropriate varietal backgrounds the Project Steering Committee will also identify general biosafety risk assessment data that will serve all individual country requirements (at present further specific in-country data is likely to be required) that could be prepared at the Center. Ethical and socioeconomic issues will be discussed. Timelines will be understood. Stewardship issues will be debated and agreed. Funding issues at the Center level and for deregulation within country will be discussed and should be in place at the outset.

Roles of a CGIAR Biotechnology Research Support Network

Some discussion centered on other responsibilities of the network beyond facilitating the convening of PSCs. These could include: providing an effective structure for communication, consultation and outreach; sharing biosafety experience and expertise; providing a forum where industry can interact with Centers and NARS, particularly concerning stewardship issues; providing an opportunity to integrate and share biosafety and related IP efforts; providing a centre for capacity building in proof of concept, product development, biosafety and regulatory issues, IPR; encourage, at the very least, regional uniformity in regulatory system and biosafety data requirement; provide a repository for database of validated GM related information.

PART II

Building a Biotechnology Research Support Network: what will it do, and how can it best function?

Agenda Item 4. Existing network and consortia initiatives

David Williams, System-wide Genetic Resource Programme (SGRP), described the various challenges faced by SGRP in implementing a System-wide effort on genetic resources as a crosscutting theme. Emphasizing the global value of genebanks and crop germplasm collections held at the CGIAR Centers, he described how SGRP was created in order to promote coherence, efficiency, and collaboration in the management of genetic resources. He gave an overview of the work of the SGRP, which includes SINGER (Systemwide Information Network for Genetic Resources) as well as policy coordination. He indicated that, with the adoption of the International Treaty on Plant Genetic Resource for Food and Agriculture (ITPGRFA) in 2004, a global system has been put in place to enhance the use of germplasm though engaging the NARS. Further System-wide cooperation is required to ensure that the CGIAR genebanks are sustainable and compliant with the ITPGRFA.

Desiree Hautea, Agricultural biotechnology support project II (ABSP II), gave an overview of the project. The objective of ABSP II is to complement demand-driven national/regional efforts to develop and commercialize safe and effective bio-engineered crops in selected countries (Table 5). The project is funded by USAID and has a cooperative agreement with national and regional partners including university, private sector, NARS, and CGIAR Centers. She emphasized the importance of the product-oriented approach in achieving the objective, which is also crucial in developing capacity for licensing and regulatory approval. Priority-setting was crucial in setting a clear strategy, as well as the development of a holistic approach to product development and commercialization. She presented some examples of projects where public-private partnerships were brokered by ABSP II (Bt Eggplant in India, Bangladesh and the Philippines, late blight resistant potato in India, Bangladesh and Indonesia and GM banana in Uganda), highlighting the different approaches and focus taken depending on the target crop, trait, and country/region.

Table 5 Relevant geographies for deployment in ABSP II (source: www.absp2.cornell.edu, quoted by D.Hautea)

Products/Projects	India	Bangladesh	Indonesia	Philippines	Uganda
Bt eggplant	x	x		x	
Late blight resistant potato	x	x	x		x
PRSV resistant papaya				x	
Drought/salt tolerant rice	x		x		
TSV resistant peanut	x				
GM banana	x				x

Box 2. Evaluated applications for various GM products in Colombia (source: E.Hodson)

GM crop evaluations	
Commercial approvals: ▪ "Blue Blue" carnation (Flores Colombianas) ▪ Bt Cotton (CoaCol) ▪ RR Cotton (CoaCol)	Biosafety evaluations: ▪ Blue roses (Flores Colombianas) ▪ Cotton stacked (RR&Bt) (CoaCol) ▪ Cotton Ready Flex (CoaCol) ▪ Bt maize (Syngenta) ▪ BT maize (CoaCol) ▪ RR maize (CoaCol) ▪ Bt maize (Dupont) ▪ Rice virus resistance (CIAT) ▪ Cassava borer (CIAT) ▪ Cassava amilopectin (CIAT) ▪ Cassava citokinin (CIAT) ▪ Cassava cyanide (CIAT) ▪ Brachiaria grass (CIAT) ▪ Coffee (Broca) Cenicafé ▪ Sugar cane (Cenicaña) ▪ Bt potato (Corpoica) (postponed)
Applications for GM /animal use	
Approvals: ▪ Bt Cotton Feed - RR Cotton Feed Denied: ▪ Tick recombinant vaccine ▪ Avian Infectious Laryngotracheitis recombinant vaccine	Biosafety evaluation: ▪ Yieldgard corn - RR corn ▪ Mycoplasma galliceticum recombinant vaccine Research: ▪ Foot and mouth disease Recombinant vaccine ▪ Silkworm for human albumin expression
GM Food applications	
Approvals: ▪ Refined cotton oil - Bollgard ▪ Refined cotton oil - RR ▪ Refined corn oil – Yieldgard ▪ Refined corn oil - RR ▪ Corn flour -Yieldgard ▪ Corn flour – RR	Biosafety evaluation: ▪ RR soybean ▪ RR sugarbeet

Segenet Kelemu, Biosciences East and Central Africa (BecA), illustrated BecA's strategy to facilitate bioscience in Africa. BecA is a new initiative developed under the framework of "Centers of Excellence for Science and Technology" to address Africa's agricultural problems. She gave an overview of the upcoming BecA hub in ILRI (Nairobi), which will provide a first-class laboratory facility that can be accessed by NARS that needs the service. More importantly, the hub aspires to build a critical mass of African scientists

from various agricultural sectors, based on core platform research teams consisting of CGIAR Center scientists and using external partnerships to build core competencies. BecA also provides various services to African institutions, ranging from technical to capacity-building. Using its flexible operating procedures, BecA could act as a focal point for the African scientific community to conduct relevant high impact cutting-edge research, enhance capacity, reduce research costs, reverse/reduce brain drain, attract investments, and enhance awareness on related policy issues. A number of challenges were described, including getting and maintaining a critical mass of high-quality scientists, translating research results to products, building public-private partnerships, and to engage African governments as key investors in the initiative to achieve ownership and sustainability.

Elizabeth Hodson de Jaramillo, Instituto von Humboldt, Colombia, described the cooperative efforts within the World Bank – GEF Colombia Biosafety Implementation Project. Biotechnology is recognized as a key element of food security in Colombia, and applications of GM crops have been evaluated for a number of products, developed both by private and public sectors, for commercial releases and laboratory use (Box 2). Research in a number of other transgenic plants is also on the way. The World Bank – GEF project has allowed Colombia to establish a unique network of various project partners, including ministries and research institutes covering agriculture, environment and health. She indicated CIAT's role in capacity building and training for scientific risk assessment. Of the achievements under the project, the establishment of the Centers of Excellence network is significant in building south-south cooperation in the region through such activities as the establishment of the inter-institutional GMO detection laboratory and joint research projects. Cooperation by both informal and formal networks has proven to be vital to the sustainability of a regional collaboration, as well as gaining support at the political level.

Discussion

During the discussion, the placement of the germplasm collections held by the CGIAR into a global system of genetic resource conservation and use (under the auspices of the ITPGRFA) was considered significant. On the question of bringing other key national (non-Center) germplasm collections on board the SGRP, a possibility of delegating some function to the national partners, or Center collections acting as duplicate to the national collections, were mentioned as possible modes of collaboration. It was explained that the Center collection could take on the longer-term preservation, while making accessions available at a short notice.

ABSP II's negotiated deal for segmented marketing within India, with OPVs for each region, was acknowledged as a unique method for allowing a private sector partner to commercialize its products while making them available as a public research product in targeted areas. It was noted that each licensing agreement under ABSP II was treated as a separate contract, whose terms depended on the institutional arrangement with ABSP II. ABSP II's role in stewardship was also mentioned as a key determinant for the partners to maintain trust in these arrangements.

With the operations of BecA, the issues of cost recovery and sustainability were discussed. It was emphasized that the ideal mode of operation would be to engage each of the 17 member countries of the platform to contribute, while soliciting support from other donors as well. While the initial BecA staff mostly consisted of CGIAR Center

scientists, it was agreed that BecA still needed to explore further partnership options so as to ensure a strong involvement of NARS scientists in the initiative.

Agenda Item 5. Emerging areas (aquaculture, livestock, trees)

Peter Gardiner, CGIAR Science Council Secretariat, considered the main areas of concern for the CGIAR in the non-crop areas of agricultural biotechnology. He noted that the bulk of the meeting had been considering biotechnology and biosafety as it applied to crop plant improvement and product dissemination. However, the range of agricultural research encompassed by the CGIAR includes livestock and fish for aquaculture as well as plantation and agroforestry trees. Although many of the same approaches used for crop plant biology were applicable to these sectors, it was useful to consider the differences as ideas about System-wide efforts in biosafety are developed.

Current circumstances indicate that future increases in demands for fish will have to be met through aquaculture rather than capture fisheries. Aquaculture is a rapidly expanding sector, where traditional breeding and research into sustainable management are still highly significant. GM fish has been developed for experimental/ornamental purposes as well as for food (principally Atlantic salmon, trout, Nile and hybrid tilapia, carp and loach). Target traits for improvement include growth rate, cold tolerance, disease resistance, metabolic modification, sterility and for synthesis of human pharmaceuticals. A major environmental factor that sets the concerns about transgenic fish apart from crops is the interconnectedness of aquatic environments. Some data suggest that escapee aquaculture fish interbreed, or express competitive behaviors, with their wild relatives. For these reasons, no transgenic food species have been authorized for release to date. For the near to medium term, it seems likely that the CGIAR would focus on quantitative genetic approaches to breeding. Action research on the dissemination of improved strains can broker pathways to new public-private partnerships. Characterization of fish genetic resources would be another area where CGIAR could contribute. There is also a continuing need expressed by national partners for risk assessment in aquaculture.

There is longer experience of farm animal production systems and a number of GM livestock species have been developed. For livestock, the focus is on production traits, disease resistance and on the production of human pharmacological agents in the milk. *Gabrielle Persley, ILRI*, noted that ILRI's continuing focus on biotechnology was likely not to be on GM animals (although the BecA facility would allow national partners to explore this), but rather on genomics and gene discovery, diagnostics and epidemiology, and on animal genetic resources concentrating on conservation of indigenous breeds. There would also be work on live and rDNA vaccines, and in diagnostics. There would therefore be a combination of research, bringing new issues and increasing experience in livestock biosafety. This could feed into the development of cost-effective regulatory procedures for biosafety for production and food safety in relation to markets.

For trees, there are well-established transformation systems for some of the important plantation species such as banana, citrus etc. The first commercial GM tree was virus-resistant papaya developed in 1995, and by 2004 the FAO reported that at least 5 forest trees and at least 10 fruit/ornamental species had been subjected to successful transformation events. The CGIAR is interested in non-timber forest products, such as

cash crops, medicinals, oils, and fruits. It is anticipated that disease resistance in banana will remain an important target for biotechnical approaches. Currently, most work on agroforestry is still at the stage of characterization and domestication. Approaches to other fruit trees are concerned more with diversification and management of systems, characterization, and perhaps market traits, traceability and trade. There will be a role for all types of risk assessments for new species introductions.

In conclusion, in the formation of any CGIAR biosafety research network, working (case) studies in the immediate future are likely to be drawn from transgenic crop plant development programs. However, there are common themes of forming public-private partnerships, risk assessment, food safety, stewardship of third party IP that suggest that the System would gain from the inclusion of these comparative approaches from research on fish, livestock and trees. Many aspects of research approaches and experiences gained could also be entered into common system level databases listing biotechnological approaches and links with the private and regulatory sectors. This more holistic approach to biosafety will remain important for the CGIAR even if partners are contributing different aspects of the biotechnology work in the future in some sectors.

Agenda Item 6. Small-group discussion on network-building

The workshop participants were split into four groups to identify: (a) the need for a network; (b) if so, whether biotechnology and biosafety should be dealt with together or separately; (c) what the network would do; and (d) how it might function.

As a reference to the discussion topic, Gerard Barry presented an example of how the biosafety resource network was established under the Grand Challenges Program 9 Working Group, supported by the Bill and Melinda Gates Foundation, which deals with creating a full range of optimally bioavailable nutrients in a single staple plant through various technologies. He highlighted that there must be an agreed need for a network by all stakeholders in order for it to be successful, with a clear set of objectives, function, structure, and outcomes.

Each of the four groups reported the results of their discussion sessions, followed by an open discussion.

Initial discussion was on the need for a CGIAR-led or CGIAR-coordinated Biosafety Research Network, and on its functions if it were to be established. Guidance had been provided to all participants that an overriding objective of such an entity would be to improve the delivery of CGIAR biotech products. This objective was interpreted broadly by the participants to include areas including best practices, development of business plans, and other aspects of product development and delivery. The Network should focus on the biosafety area of the development of the Centers and NARS biotechnology products, and not on the transactional aspect of biotechnology R&D. It should act as a resource in answering technical and biosafety questions regarding the choice of genes and transformation approaches, for instance.

Recognizing that transfer of agricultural biotechnology components and products can require extensive knowledge and abilities in the areas of intellectual property, licensing, and contracts, the Network should only play a role in the biosafety aspects of technology transfer, e.g., in obtaining import and research approvals from the relevant competent authorities. Many of these transfers will be international and the Network must keep abreast of the processes at the national and international level (i.e. the Cartagena

Protocol on Biosafety). The clarifications in these processes also increase the ability of NARS and their authorities to affect transfers with the Centers.

The Biosafety Research Network could take different forms and include the following options:

- a "virtual" email or listserv network to facilitate the sharing of information, experience, and mentoring within the Centers and between the Centers and NARS, or
- a more formal organization that would have direct involvement in the biosafety aspects of the development of the Centers' biotechnology products within the Center and during and following the transfer to NARS.

In both cases, the management and success of these approaches must leverage and complement the current capacity for biosafety research within the Centers. The second approach brings the developing Center and the Network in more direct contact with a co-developer NARS and may be the approach necessary in many cases.

There was broad agreement that the founding of another Network must be carefully thought out and this provided guidance on important criteria for the success of a Biosafety Research Network. The Network would have to have elements of sustainability including funding, a clear definition of mandate and scope (to avoid dilution), and to build on the networking among scientists that is innate to international research. Agreement on the necessity for the establishment of the Biosafety Research Network is paramount to its success. In part to ensure its sustainability, the core set of expectations and activities of the Network could be defined at first and expanded on the basis of successful experiences.

An essential factor for sustainability is that core staff be dedicated to and funded exclusively to manage the Network - adding a prominent role to the responsibilities of Center scientists is not recommended. This dedicated service would be composed of the secretariat and the information/data and coordinating functions and would in many cases have the necessary information and skills to manage much of the expected outputs from the Network. Center and NARS scientists should be expected to serve as resource persons and to participate as needed on an *ad hoc* basis, and especially as the Network is being established and the base-line skill set and information/data resources are being assembled. In addition, the Network should take every opportunity to make use of resources from related organizations, such as AgBios, Public Research and Regulation Initiative (PRRI), Program for Biosafety Systems (PBS), and other activities already managed by Bioversity International and the International Food Policy Research Institute (IFPRI), for instance. Close coordination with science based biotechnology support organizations, working nationally and regionally would also be important – in some cases, these and similar organizations may also come to rely on the Network for specific assistance.

The Network should be guided by a Steering Committee, and this could be an existing CGIAR body (to minimize costs) if a suitable one could be recommended, and should not engage in activities that increases the risk exposure of the Centers. In assisting partners in preparing dossiers, the Network must be fully cognizant of the national regulations

and ensure that the national partners are as equally conversant with these – failure in either of these instances could lead to serious repercussions. There are no international or national accreditation options for the proposed activities of the Network. While Good Laboratory Practices might be used by some multinationals in the generation of scientific data for biosafety risk assessment dossiers, adoption of these by all partners is not realistic or even needed, and Standard Operating Procedures (SOPs) that might be developed by the Network should match the expectations of the receiving authority, should emphasize the seriousness of data integrity, and should strive to be useful in many countries.

A number of the Centers are already aware that they are trusted sources of accurate scientific information on biotechnology and biosafety for their host country governments, and in some cases also for major donor countries and international bodies. This trust should be capitalized on. The Network could strengthen this advocacy role, interacting with regulators and policy makers, and providing them with relevant technical information so that they can make scientifically well-founded decisions.

The Network could be the focal point for responding to, or voluntarily providing reviews and position papers to fora such as the CBD, the Cartagena Protocol on Biosafety, and others, but should ensure that the Network operates in full consultation and synergy with those in Centers already active in this area. Participation in the Network by Centers could be voluntary, but the case could be made that participation in a competent and reliable Network would reduce risk for the Center and could be reflected in the Performance Indicators.

PART III

Policy issues: How should CGIAR be represented and relate to NARS at the international level?

Agenda Item 7. Setting the scene

Michael Halewood, Bioversity International, provided an overall introduction to Part III concerning policy issues. He referred to the results from small group discussions on network-building (Agenda Item 6), noting that some of the groups had highlighted the importance of the Biotechnology Research Support Network's potential role in policy-related work. Considering that biotechnology policy and research are inseparable, he indicated that the participants should consider integrating CGIAR System-wide representation at Cartagena Protocol on Biosafety (CPB)-related intergovernmental negotiations in the terms of reference for the Biotechnology Research Support Network. He noted the repeated recommendations by CGIAR's Genetic Resource Policy Committee (GRPC) that the CGIAR should have a coordinated System-wide voice at such meetings. He pointed out that single positions on all biosafety-related issues at the System level might not always be possible. Nevertheless, it was necessary to coordinate any presence in those meetings and to consider the Centers' collective interests in the outcomes. He noted that on the recommendation of the GRPC in 2006, the System-wide

Genetic Resources Program (SGRP) had coordinated the development of three technical papers for submission to CPB meetings.[5]

He pointed to the example of the System-wide coordinating role of the SGRP for representation of the CGIAR Centers at international policy meetings concerning genetic resources for food and agriculture. He described the structural and procedural aspects to demonstrate how SGRP assumes this role through preparing official statements and technical papers organizing side-events, and keeping the records through its Website. [6] With the ITPGRFA coming into force and the Centers being directly affected by it, SGRP's System-wide coordinating role is increasing in its importance for the Centers.

In the area of biosafety, Halewood pointed out that some Center scientists have been attending intergovernmental meetings related to the implementation of the CPB in their personal capacity, on behalf of their Centers alone, or under the banner of the Public Research and Regulation Initiative (PRRI). He hoped that this segment of the workshop would allow the participants to look to the processes adopted by the SGRP to coordinate representation of the Centers as examples for how the Biotechnology Research Support Network could coordinate System-wide representation at CPB meetings. He stressed the need for someone, or some combination of people, to take the responsibility for keeping things moving forward by: tentatively identifying issues of significance for the Centers at international biosafety meetings, identifying opportunities at those meetings for the Centers to make technical contributions, facilitating system-wide 'discussions' of the issues at hand, obtaining system-wide endorsement for the technical inputs to be delivered at those meetings, and ultimately, attending the meetings to represent the CGIAR Centers.

Halewood briefly introduced the day's session. The first two presentations would 'set the scene' by first focusing on global level policy developments, and then narrowing in on trends in implementation on a national level, identifying gaps and challenges. They would be followed by examples of regional research initiatives with 'built-in' policy elements, which are among the most dynamic on-the-ground models for addressing gaps in national implementation. Agenda Item 9 would highlight the importance of maintaining transparency and dialogue with all interest groups as part of laying the

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[5]Activity Report on Biosafety Capacity Development Activities. Future Harvest Centres of the Consultative Group on International Agricultural Research (CGIAR). 2006. Available at URL: http://www.sgrp.cgiar.org/Docs/Policy_meetings-satements/Biosafety/GIAR_submission_Capacity_ Development_Biosafety_2006.pdf.

Activity Report on Biosafety Capacity Development Activities of the International Agricultural Research Centres (IARCS) of the Consultative Group on International Agricultural Research (CGIAR). 2007. Available at URL: http://www.sgrp.cgiar.org/Docs/Policy_meetings-statements/Biosafety/ CGIAR_submission_biosafety_23Feb07.pdf.

Biotechnology and Biosafety Related Policies and Activities of the Consultative Group on International Agriculture Research (CGIAR). 2008. Available at URL: http://bch.cbd.int/database/attachedfile.aspx?id=1716.

[6]See URL: http://www.sgrp.cgiar.org/CurrentSGRPInitiatives/Rep_Intl_policy_fora.htm

ground-work for the Centers to be able to maintain their good reputation and role. He hoped that the presentations would allow the workshop participants to make recommendations about how the Centers should coordinate their participation in intergovernmental CPB-related meetings.

Fee Chon Low, United Nations Environment Programme, Division on Global Environment Facility (UNEP-DGEF), introduced the history of the regulatory environment surrounding biotechnology, which led to the negotiation for, and eventual adoption of, the Cartagena Protocol on Biosafety. The overarching objective of the Protocol is to protect biodiversity, environment, and human health, with special focus on transboundary movement of Living Modified Organisms (LMOs). The process is based on the precautionary approach, and is divided into four main pillars: procedure, decision-making, handling transport packaging and identification, and information-sharing. She described the main Articles of the Protocol under these procedures, as well as the details on the administrative procedure for advance informed agreement, possible options for an opt-out , and procedures for commodities. She briefly explained that there were other relevant international agreement that deal with LMOs, including binding agreements such as the CBD, ITPGRFA, the WTO Agreements (GATT, TBT, SPS), The Codex Alimentarius, bilateral agreements, as well as non-binding regional multilateral agreements (such as the EU Directives and Regulations).

She then introduced the UNEP-GEF Biosafety Projects, which has been mandated to implement the Cartagena Protocol. A detailed account of the history behind the project and the currently active sub-projects were given. The final aim of the project is to have a fully operational National Biosafety Framework for developing countries, fully harmonized with national requirements and laws.

In the discussion following the presentations, a number of clarifications were made on how the Cartagena Protocol deals with the various types of LMOs and what the procedures involve. Questions included: the treatment of ethical considerations in decision-making; and the applicability of CPB for livestock fed with GM crops and GM pharmaceuticals for humans. In particular, interest for the CGIAR was on LMOs that were imported initially for laboratory (contained) use, which subsequently becomes necessary for field trials. The significance of differentiated treatment for "LMOs for food, feed, and Processing (LMO-FFPs)"[7], were pointed out. It was pointed out that the Cartagena Protocol leaves some grey zones (for example, some countries use the same pharmaceutical product for both livestock and humans), and each country was required to interpret and implement its own regulation that would be in line with the Protocol.

Agenda Item 8. Regional/international perspectives and initiatives: scientific work and biosafety policy issues

Michael Baum, (ICARDA) presented the biosafety initiatives in the West Asia and North African (WANA) region. He noted that the area of GM crop cultivation is increasing in WANA, with national institutes such as Agricultural Genetic Engineering Research Institute (AGERI), Egypt, taking the lead in plant genetic engineering research (Box 3 and

[7] "LMO-FFPs", otherwise known as "commodities", have been differentiated from GM crops that would be used as seeds for planting.

Table 6). Biosafety regulation in Syria, where ICARDA is located, has been in place since 2001, although ICARDA has only worked on transgenic research under containment so far. Other countries in WANA have also completed, or are currently developing, their national biosafety frameworks, although the main focus of biotech in the region is not on GM technology but rather on the conservation/sustainable use of agricultural biodiversity. These considerations led to the development of the WANA regional project concept on biotechnology and biosafety, for possible funding by the GEF, and whose objectives are to fulfill human and institutional capacity needs at the national level and to facilitate cooperation and information-sharing at the regional level. A parallel effort has been initiated by the Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA), which will work on forming a regional network on biotechnology. In addition, ICARDA has been involved in the establishment of a biosafety containment facility as well as in biotechnical training activities.

Box 3. Status of biotechnology in the CWANA countries (source: M.Baum)

An active biotechnology R&D program: Egypt, Iran

Biotechnology in early stages: Algeria, Morocco, Oman, Saudi Arabia, Syria, Tunisia

Biotechnology for future: Jordan, Lebanon, Libya, Mauritania, Yemen

Table 6 Status of plant genetic engineering at AGERI/Egypt (source: M.Baum)

Discipline	Potato	Tomato	Cotton	Maize	Faba bean	Cucurbits	Wheat	Banana	Date Palm
Virus resistance		x			x	x		x	
Insect resistance	x	x	x	x					
Stress tolerance		x	x		x		x		
Genome mapping and finger printing		x		x					x
Fungal resistance		x		x	x				

Magdy Madkour, Agricultural Genetic Engineering Research Institute (AGERI), Egypt, described the Egyptian biosafety system as an example of a national biosafety framework in the region. He summarized the legal framework, the structure of its national biosafety committees and sub-committees, their activities, and the GM crop approval steps, along with the description of permits issued so far (Table 7).

Table 7 Permits issues by the Egyptian National Biosafety Committee (source: M.Madkour)

	Tomato	Sugar Cane	Cotton	Corn	Squash	Rice	Melon	Cantaloupe	Banana	Wheat	Cucumber	Potato	Total
Release to the BioContainment	1	1	2	2	8	1	2	3	2	4	1	7	34
Release to Open field	2	-	2	6	8	-	1	-	-	5	1	7	32
Placing on the market	-	-	-	1	-	-	-	-	-	-	-	-	1
Total	3	1	4	9	16	1	3	3	2	9	2	14	67

Zaida Lentini, International Center for Tropical Agriculture (CIAT)[8], gave an overview of Technical Capacity-Building in Biosafety in Latin America. She noted that, in contrast to Asia and Africa, Latin American countries received relatively little attention on biosafety system establishment, despite an urgent need for a regulatory mechanism due to the rapid adoption of GM crops in the region. CIAT has formed strategic links with NARS research on biosafety in the region, such as environmental risk assessment research and socio-economic impact assessment, where significant achievements have been seen. Biosafety research on crop species for which Latin America is the center of origin or center of genetic diversity has been an area for research: for example, the study of gene flow between Andean and Mesoamerican gene pools in beans, and on the coexistence of weedy rice and its wild relatives.

CIAT has long worked with NARS on biosafety and biotechnology, which has gained regional support, eventually leading to the World Bank – GEF regional project to strengthen technical capacity. However, there is also some opposition from the NGOs against CIAT's apparent promotion of modern biotechnology. The project emphasizes strategic collaboration among the Latin American countries (Brazil, Colombia, Costa Rica and Peru being the current project members) with complementary expertise, knowledge and experience, working through a consortium represented by country national coordinating agencies. The project aims to form a strong national and regional alliance of its members. There are bottlenecks for the deployment of products developed by the public sector in the region, particularly requiring high-level discussion on IPR, food safety, and liability.

Nizar Mohamed, Development Consultant, presented the status of biosafety regulatory environment in the Greater Mekong Region (Cambodia, China, Myanmar, Laos, Thailand, Vietnam). He gave a description of a project funded by the Asian Development Bank, which aimed to develop a strategic framework for agricultural cooperation in the region and to develop a regional strategy and action plan for biotechnology and biosafety. The project included a number of training workshops, as well as a consultation session where the agricultural and environmental authorities were

[8] Currently Dean of the Natural Sciences Faculty at the University Icesi, Cali, Colombia.

brought together to adopt the strategy and action plan. The focus of the project was to respond to the unique priorities and concerns of each country, while utilizing regional expertise in training human resources and in preparing technical papers/policy briefs.

The major challenge faced by the project countries was in promoting the synergies between biodiversity conservation and agricultural development. Balancing between national priorities and regional cooperation was also a large task, particularly in the presence of regional regulations like those of ASEAN, which has set up food safety standards in order to achieve regional goals in free trade, as well as in the existence of large porous borders where enforcement of regulations is made difficult. There were a number of lessons learned from the project: at the national level, awareness-raising for policymakers was key, stressing both the benefits and risks of biotechnology. There was also a need to take strategic approaches to the application of GM and non-GM biotechnology, and to highlight synergies between biotechnology and agricultural biodiversity. The technical support activities must be tailored to each country's needs, priorities and capacity, as well as be demand-driven in design and delivery, in order to allow flexible implementation of activities and promotion of national ownership. At the regional level, it was important to ensure cooperation for sustainability through shared human and technical resources, viable mechanisms with political backing, harmonizing standards and procedures, and the development of a platform on information-sharing, all of which would promote South-South collaboration building on different capabilities and strengths of all member countries.

John Komen, International Food Policy Research Institute (IFPRI), described his multi-country perspective as the coordinator for the Program for Biosafety Systems, a USAID-funded project that has been active since May 2003. He gave an overview of the PBS portfolio of services, which includes: technical expertise in development and implementation of policies, scientific knowledge and advisory services, policy analysis and advice, capacity-building and skills development. PBS works with a number of countries in East, West, and Southern Africa as well as in South-East Asia. Efforts are made to link with ongoing national initiatives supported by other funding bodies such as GEF. Different achievements can be seen in legal, administrative, and human capacity in each of the project countries. In highlighting these achievements (with examples of Uganda, Ghana, and the Philippines) he demonstrated the flexibility of the PBS in responding to each project country's needs and priorities. Lessons learned from the current activities include the need for a comprehensive consultative approach to the development of biosafety policies and laws. In order to ensure that the project has impact in countries, a solid PBS presence is crucial, working closely with local task forces, advisors and champions, and maintaining a long-term perspective. He noted that PBS has collaborated with some CGIAR Centers on activities such as risk assessment research.

Marc Ghislain, International Potato Center (CIP), explained that the biotechnology and biosafety policy issues of importance to CIP and its national program partners in LAC are almost all directly or indirectly associated with the deployment of biotech potatoes in the centre of origin and center of crop/genetic diversity. The Andes are home to the cultivated potato as well as its wild relatives, which overlap geographically. The need for GM potato in the region is significant, as conventional methods have not been successful for deriving resistance to pests and diseases. He stressed that there has been careful consideration to apply genetic engineering only to modern potato varieties and

not for the native varieties used by subsistence Andean farmers. In introducing the regulatory and legal panorama in Peru, CIP's host country, he noted that there were still some general concerns on the ecological, social and cultural dimensions of genetic engineering. While CIP has been working to take them into account, with the examples of the comparative evaluation of two case studies for Bt potato /sweet potato in Colombia and Uganda, as well as the media course on awareness-building, CIP made a decision in 2007 to place a temporary moratorium on the release of GM potato in the Andean countries in response to the unfavorable reaction towards transgenics in the region. CIP will reconsider this decision when public and regulatory environments become more favorable.

Discussion

Many of the questions centered on the long-term future of CIP's research on genetically modified potatoes. There was a tough decision to be made for the CGIAR Centers when external circumstances (such as socio-economic considerations, public perception, and national capacity) might force research not to be pursued even if it was requested by NARS. It was hoped that, with the continuous evolution of the GM debate in light of new research findings, as well as the changing circumstances in which crop improvement is needed for yield increase, the work of the Centers might also evolve accordingly. In this context the active role of NARS, both in determining research priorities as well as in advocacy, might be an important factor.

Agenda Item 9. Perspectives on CGIAR biotech research and representation in international policy-making fora

Elenita (Neth) Daño, Third World Network (TWN), presented the TWN's perspective on CGIAR's activities, with a particular focus on biotechnology. The NGOs perceive that their relationship with the CGIAR have been difficult in the past few years, which culminated in the suspension of the NGO Committee in 2002. She underlined that a major reason behind this was the CGIAR's failure to place an immediate moratorium on GM crop research, and in its promotion of GM technologies. There is still a serious concern by some NGOs, even for those who have decided to re-engage with the CGIAR, on how much of the CGIAR's resources are allocated to conventional breeding as opposed to GM crop research, and also the extent to which farmers and other stakeholders have been involved in the decision-making of CGIAR's research programs. The CGIAR is expected to promote stringent biosafety measures and lead the development of best practices, particularly in the Centers of Origin. Although there has been an increase in the public-private partnerships in agricultural research in general, there is a strong concern as to how that would impact the mandate of the CGIAR to produce International Public Goods. TWN hopes that the CGIAR would not only welcome more critical engagement by the NGOs but also involve them in scientific and technical advisory roles.

On the issue of CGIAR's presence and representation in international policy-making processes, there is a need to clarify the CGIAR's role as the provider of scientific and technical inputs. Direct involvement in the international policy-making would be seen as active advocacy or lobbying, which is beyond the mandate and not welcomed by the NGOs. In considering the formulation of CGIAR's policy on biotechnology, a strong recommendation was made to involve NARS and other national stakeholders in the process.

Leonardo Montemayor, Federation of Free Farmers (FFF), presented the perspective of a farmer's organization. He noted that the activities of the CGIAR and its Centers are not widely known among the farmers or farmers organizations, which was mostly due to lack of information. There is also distorted/negative image about CGIAR, as its research during the Green Revolution, and more recently, GM crops such as the Golden Rice project are perceived to benefit better-to-do farmers and agribusiness rather than smallholders. There is still great need for better information to be presented by the Centers to the public, as well as for a closer communication and collaboration with national beneficiaries and community partners (such as the FFF-ICRISAT collaboration on community watershed management).

CGIAR's process for defining its research agenda, should also be clearer to the public, and in particular, an interaction with smallholder farmers through representative bodies would be useful. He noted that there is still heated public discussion on the use of genetic engineering in agriculture. In order to gain national and local support, focus must be turned to crop species of local interest and to collaboration with local activities, which would build better understanding among the small farmers regarding the benefit of new technologies. The International Federation of Agricultural Producers (IFAP), in which FFF is a member, is cautious but supportive towards modern biotechnology, as it acknowledges its usefulness as a tool, but is concerned about the products' marketability, food safety, and environmental impact. He stressed that farmers' readiness to plant novel crops stem from many different considerations, including non-scientific factors such as socio-economic and environmental factors, including direct benefits and marketability. In most cases farmers are willing to take a chance with new products as long as safety and marketability are assured.

Kim Meulenbroeks, *Public Research and Regulation Initiative (PRRI),* gave an overview of PRRI's activities and structure. PRRI, a network of public researchers, offers scientists a forum to participate in international agreements relevant to modern biotechnology. She noted that for a long time public researchers did not have an active and united participation in the international policy meetings on scientific research issues that might directly affect their modes of research. PRRI's participation in meetings related to the Cartagena Protocol on Biosafety has been successful, which has encouraged the recent expansion into other discussions relevant to the Convention of Biological Diversity (CBD,) Codex Alimentarius, ITPGRFA, and the Århus Convention.

She described the operational structure of PRRI as well as other details of the initiative, including the funding sources, yearly budget, secretariat, collaborations, and partnerships. Using the current preparations for the Meeting of Parties for the Cartagena Protocol on Biosafety (of the CBD, held in Bonn, 12-16 May 2008), she demonstrated how regional preparatory meetings and participation in side meetings are coordinated to bring all the members up to date on the discussions as well as on the contentious issues, to raise various points of interest on a specific agenda, and to draft a joint position document with feedback. PRRI welcomes the participation of CGIAR in the international policy meetings, which is expected to greatly benefit the CGIAR as well as the policymakers at the meetings. PRRI and CGIAR also have possible avenues for collaboration and coordination in the future.

During the discussion, it was further explained that high initial cost did not seem to be a

strong determinant for the farmers to choose or refuse a seed variety, including GM seeds. There seems to be a trend that, if the environmental and human health safety is assured, the farmers make their own business choices based on the potential returns. It was therefore suggested that the CGIAR might have a role in ensuring that the farmers have the capacity and tools to go through their own decision-making protocols. There is an increasing emphasis at the Center-level to work more with farmers' organizations and communities, but there were also questions as to whether this should extend to the System-level.

Agenda Item 10. Coordinating CGIAR representation concerning biosafety issues at international policy fora

Michael Halewood summarized the day's discussions. He noted that there appeared to be general agreement that System-wide representation at international policy fora should be coordinated through the CGIAR Centers' Biotechnology Research Support Network, if and when such a network comes into existence. There is still a need to establish a system through which Centers can provide inputs on issue identification as well as the preparation of oral statements, and technical papers. The optimal involvement would be at the scientific and technical level, and with substantive support at the Director General level, i.e., through the Alliance Executive. It would also be necessary to make sure that links within and outside the CGIAR System are established. Within the CGIAR, links must be forged/maintained with the CGIAR Genomics Task Force, SGRP, Generation CP, and CAS-IP. Outside the CGIAR, some form of consultation process with Civil Society Organizations, farmers' organizations, and the private sector would also provide essential inputs. The Centers should focus on making technical contributions with the objective of highlighting options for delegates to the meeting, drawing on the Centers' activities and experiences as international public research organizations; they should not be biased or engage in 'political lobbying'. Some Centre or small group of people drawn from a few Centers will need to take responsibility for coordinating the Biotechnology Research Support Network's policy representation role (along with the other network responsibilities). Clearly this work will require additional resources to those already available across the system for biosafety-related work. In this context, it is important to bear in mind that, to date, there have not been regular, informed, System-wide discussions on a number of the issues that would potentially need to be addressed in the intergovernmental meetings concerned. Significant human resource time will be necessary to interject effective System-wide thinking and action into the current state of practice.

While the details of the Biotechnology Research Support Network are being considered, Halewood appealed to the workshop participants to start working together in the spirit of the network, particularly in relation to the upcoming Fourth Meeting of the Parties to the Convention on Biological Diversity (CBD COP/MOP 4), and other meetings in the short term. A draft information document already prepared by SGRP and which was being circulated throughout the System for approval at the level of the Alliance Executive represented a first step in the direction of collaborative representation.

He presented a list of issues of relevance to the Centers that are being addressed in the ongoing negotiations concerning the implementation of the CPB. In discussion, a few additional issues were highlighted. The list includes the following:

- Risk (and benefit) assessment

- Socioeconomic impact
- Sharing experiences of impact of the CPB
- Packaging for LMOs for release into environment (CPB Article 18.2.b)
- Liability and redress
- Technical support for regional cooperation/harmonization
- Roster of experts
- Capacity building
- Biosafety clearing house mechanism.

During the discussion, technical activities that a putative Biotechnology Research Support Network could provide input into were identified, including: a joint study by UNEP and the CBD Secretariat on the socio-economic impact of LMOs, and the GRPC-SC study on product stewardship and liability.

Concerning liability and redress it was noted that options currently being considered in the CPB implementation negotiations were administrative versus binding/civil legal system, with different implications for CGIAR's research. It is too early to come to any agreed position on liability and redress within the CGIAR; as with so many of the issues listed above, more discussion, system-wide, of the options and their implications for CGIAR Centers would be necessary before the Centers could make collective contributions to future meetings. While a number of individuals from the CGIAR have attended the negotiations for a long time in their own name, that of their Centre or PRRI, a more formal Biotechnology Research Support Network would allow those individuals to attend as representatives of the CGIAR System. In the shorter term, these representatives could circulate messages to their counterparts in other Centers highlighting the issues of significance at upcoming meetings, and soliciting inputs of other interested parties from other Centers within the CGIAR System.

In closing the workshop, *Gerard Barry, Mike Gale, Michael Halewood, and Gabrielle Persley* thanked the participants for their participation. The workshop benefited from the discussion of the four original objectives. Going back to the 2004 SC report that originally mandated this workshop, it was important to see that how the recommendations have been implemented since. Much good work is being undertaken, with more opportunities to exchange experience among stakeholders. This workshop has identified additional work to be accomplished, and finding the right mode of engagement, including the funding requirement, would be vital. They looked forward to a continued active engagement from the participants in the successful implementation of the workshop's outcomes.

Workshop Agenda

BIOTECHNOLOGY, BIOSAFETY, AND THE CGIAR

IRRI, 22-24 APRIL 2008

Monday April 21 Participants arrive *(Welcome cocktails and dinner served at IRRI GH)*

Tuesday April 22

Agenda Item 1. Opening and Introduction
Welcome to IRRI – A.Dobermann (DDG-IRRI), M.Gale (SC)

0830-0850 Revisiting the 2004 Report and SC commentary, agreeing on workshop objectives – G.Persley, M.Gale

0850-0910 Current situation: 4 years after the report, what is left to do to implement recommendation 12 – G.Barry

PART I - Getting novel products to market: How can CGIAR Centers best work with NARS to ensure timely delivery to target farmers? Successes, problems, needs and concerns on working with CGIAR Centers: scenarios, highlighting biosafety issues, regulatory systems, dossiers, partnerships. (*G.Persley and J.Adams, Co-chairs*)

Agenda Item 2. Current work on biotechnology
2.1 CGIAR Centers working with NARS
0910-0930 Insect Resistant Maize for Africa (IRMA) – S.Gichuki (KARI)

0930-0950 Status of Golden Rice Breeding in the Philippines - A.Alfonso (PhilRice), G.Barry (IRRI)

0950-1010 Biofortified crops: HarvestPlus CP strategy - K.Sharma (ICRISAT), G.Barry

1010-1030 General discussion

1030-1050 Break

2.2 Existing national initiatives
1050-1110 Getting Bt corn in Philippine corn fields: Policy development and implementation – A.Ilaga (Dept. Agriculture)

1110-1130 Biotechnology research in Argentina – E.Hopp (INTA, REDBIO)

1130-1150 Current Status of GM Crops in South Africa and Products in the Pipeline – G. Bothma (ARC)

1150-1210 Situation of maize landraces and transgenic maize cultivars in Mexico – A.Ortega, M.Arechavaleta (INIFAP)

1210-1230 General discussion

1230-1330 Lunch

1330-1350 AATF's role in technology access and delivery to smallholder farmers in Africa - M.Bokanga (AATF)

1350-1410 Biotechnology and the World Vegetable Center: Overview of the CIMBAA Project **– R.de la Pena (AVRDC), G-H.Teh (CAS-IP)**

2.3 CGIAR consortia initiatives

1410-1420 ICRISAT: hybrid parental line seed consortium - K.Sharma

1420-1440 IRRI: hybrid rice consortium – A.Dobermann

1440-1520 General discussion

Agenda Item 3. Small-group discussion on ideal CGIAR Center – NARS interactions *(M.Gale, lead)*
1520-1700 Identify requirements for efficient biotech research-to-product development that meets the

1700-1740 Reassemble, verbal roundup of groups' progress - 10 minute update from 4 groups

1900 *Dinner reception hosted by IRRI (at IRRI Guesthouse)*

Wednesday April 23

0830-0900 Complete breakout group discussions – agree on conclusions and prepare presentations

0900-0940 Reporting from day 1: pulling together best practice recommendations.
10 minute presentations from 4 groups

0940-1030 General discussion

PART II - Building a Biotechnology Research Support Network: what will it do, and how can it best function?
(M.Bokanga, Chair)

Agenda Item 4. Existing network and consortia initiatives

1030-1050 Managing Genetic Resources as Global Public Goods through Collective Action: the System-wide Genetic Resources Programme (SGRP) of the CGIAR - D.Williams (SGRP)

1050-1110 Network and consortium under ABSPII – D. Hautea (ABSP II Regional coordinator, University of the Philippines at Los Baños)

1110-1130 Break

1130-1150 Strategy to facilitate biosciences in Africa: the role of the Biosciences East and Central Africa (BecA) – S.Kelemu (BecA – ILRI Platform)

1150-1210 Cooperative efforts within the WB-GEF Biosafety project – E.Hodson
(WB-GEF Biosafety Project Coordinator, Colombia; Instituto Alexander Von Humboldt)

1210-1240 General discussion

1240-1340 Lunch

1340-1410 **Agenda Item 5. Emerging areas (aquaculture, livestock, trees) (P.Gardiner – Lead)**

1410-1540 **Agenda Item 6. Small-group discussion on network-building (G.Barry – Lead)**
Do we need a biotechnology & biosafety network? What would it do? How would it work?
(Break to be taken by individual discussion groups)

1540-1620 Presentation of discussion results (10-minute presentations from 3 groups)

1620-1700 General discussion and conclusions

1900 *Dinner outing hosted by SC (venue: Kamayan sa Palaisdaan)*

Thursday April 24

PART III – Policy issues: How should CGIAR be represented and relate to NARS at the international level? (R. Sackville-Hamilton, Chair)

0830-0845 Introduction to the policy session – M. Halewood (Bioversity International)

Agenda Item 7. Setting the scene

0845-0915 The Cartagena Protocol on Biosafety and other international agreements relevant to biosafety development; and UNEP-GEF Project on Implementation of National Biosafety Frameworks: An update – F-C Chong Low (UNEP/DGEF Biosafety Unit)

0915-0945 General discussion

Agenda Item 8. Regional perspectives and initiatives: scientific work and biosafety policy issues

0945-1005 Scientific work and biosafety issues in the WANA region – M.Madkour (AGERI – Egypt), M.Baum (ICARDA)

1005-1025 Latin America Technical Capacity-Building in Biosafety: A multi-country approach for Brazil, Colombia, Costa Rica & Peru - Z. Lentini (CIAT)

1025-1040 Break

1040-1100	ADB TA on "Strengthening Capacity and Regional Cooperation in AAST in the GMS": Experiences, Challenges and Lessons – N.Mohamed (former consultant, ADB)
1100-1115	General Discussion
1115-1135	Getting novel products to market: PBS support to regulatory decision making - J.Komen (PBS/IFPRI)
1135-1155	Biotech potato and center of origin and diversity - M.Ghislain (CIP)
1155-1210	General discussion

Agenda Item 9. Perspectives on CGIAR biotech research and representation in international policy-making fora

1210-1230	Civil society perspective on CGIAR's biotechnology work and representation in the international policy fora - N.Daño (TWN)
1230-1315	Lunch
1315-1430	IRRI seminar on rising rice prices or tour of IRRI
1430-1500	Farmers organizations' perspective on CGIAR's biotechnology work and representation in the international policy fora - L.Montemayor (Federation of Free Farmers)
1500-1530	Involving the public research sector in regulations and international agreements on biosafety - K.Meulenbroeks (PRRI)
1530-1550	General discussion
1550-1610	Break

Agenda item 10. Coordinating CGIAR representation concerning biosafety issues at international policy fora

1610-1700	Discussion: CGIAR's participation in meetings so far and challenges to be addressed – M.Halewood, Lead

Part IV – Conclusions and closing

1700-1730	Closing session: the way forward – G.Barry

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