



**WORKSHOP ON AGRICULTURAL
BIOTECHNOLOGY AND RURAL DEVELOPMENT
PRIORITIES FOR THE WORLD BANK
3-4 JUNE 1999**

Approximately 100 participants from the World Bank, international and non-governmental organizations, the academic community and the private sector gathered at World Bank Headquarters in Washington, D.C. from 3-4 June 1999 for a workshop on agricultural biotechnology and rural development. The workshop sought to contribute to the process of policy making and consensus building within the World Bank with respect to agricultural biotechnology. Participants discussed key issues and recent developments in the field, reviewed the draft background paper "Agricultural Biotechnology and Rural Development, Issues and Options for the World Bank," which is being prepared by the World Bank's Biotechnology Task Force, and considered specific priorities for World Bank lending, partnerships and other activities.

Participants met in Plenary sessions on the first day to outline the major issues and provide background information on recent developments and controversies in the field. They broke into small groups during the second day to discuss World Bank priorities and actions on specific topics. Participants proposed a variety of World Bank actions, including capacity building within the Bank and developing countries, support for agricultural research in the public sector, and examination of the relationship between biotechnology, intellectual property rights (IPR) and poverty alleviation, and best practices to link these variables. The World Bank's Biotechnology Task Force intends to use the workshop's output as they establish priorities for short and long term action.

PLENARY SESSIONS

Participants met in four Plenary sessions on Thursday, 3 June to hear introductory statements and consider three issues: biodiversity, biosafety and food safety; IPR; and ethical and social issues in biotechnology applications for agriculture. They also met in Plenary on Friday morning, 4 June to discuss partnerships and cooperation between relevant actors.

OPENING PLENARY

INTRODUCTION AND WELCOME: Alexander McCalla (World Bank, Rural Development) opened the meeting by welcoming participants and outlining the workshop format for the ensuing two days of discussion. He highlighted the significant potential of biotechnology for reducing poverty and assisting small-scale farmers, but stressed the need to address the economic, social, political and ethical concerns reflected in public debates. He stated that the World Bank

needs input, comments and views regarding its role in utilizing biotechnology in its lending and other activities, and hoped that the workshop could provide such guidance.

WORKSHOP OBJECTIVES: Derek Byerlee (World Bank, Rural Development) outlined the workshop's objectives and structure. He noted the Bank's significant support for agricultural research and extension services, and current low levels of support for biotechnology through project lending and the Consultative Group on International Agricultural Research (CGIAR) system. He said the workshop's two objectives were to formulate specific principles, priorities and guidelines for the Bank, and to update Bank staff on the latest developments and concerns in biotechnology. The workshop's focus would include a broad definition of biotechnology (from tissue culture to genetically modified organisms [GMOs] for both crops and livestock), research and technology issues, as well as special attention to small and medium-sized countries. He stressed the need to address Bank involvement at three levels: project lending, country policy dialogues, and global and regional initiatives on biotechnology.

He said the workshop would provide recommendations on how biotechnology should be prioritized within the World Bank Group, what global and regional activities should be supported or developed, how private sector investment could be fostered, and how biotechnology could be related to cross-cutting activities in the Bank (e.g., thematic teams; work on health, higher education, environment and technology). He said input was necessary for the Bank on how to upgrade staff skills and capacity, including safeguard policies, access to external skills, training needs and priorities for partnerships. Finally, he outlined the next steps, which would include continuing consultations, outlining a working position, formulating a two-year plan of action and discussing results with Bank management.

AGRICULTURAL BIOTECHNOLOGY AND THE WORLD BANK: Robert Herdt (Rockefeller Foundation, United States) reviewed the Kendall Report, "Bioengineering of Crops," and discussed the needs of the Bank and its clients. He reminded participants that the Kendall Report's recommendations include calls for the Bank to support training in developing countries, high-quality research programs and implementation of formal national regulatory structures. In reference to Bank needs, Herdt stressed that the Bank should keep technology in perspective: an appropriate macro-policy is important, and many countries prioritize action on other issues, such as girls' education and AIDS. He also noted the need for non-discriminatory agricultural policies, well-functioning markets, information exchange and well-adapted agricultural technologies.

Herdt stressed the need for the Bank to understand biotechnology-related issues, including scientific and regulatory considerations and the interaction between technological changes and institutions. He noted that regulatory issues include food safety, environmental safety,

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international agreements, and intellectual property concerns. Herdt emphasized that low-income Bank clients are highly dependent on agriculture and that many have areas with low agricultural production, although some have areas of high and declining productivity. He stated that biotechnology has the potential to address both situations and that no biotechnology products currently address developing countries' urgent needs. He noted that low-income client countries' first priority is food security. Additional concerns he highlighted included the increasing involvement of private companies and their differing priorities from the public in terms of crop traits, the limited biotechnology capacity in low-income client countries, and the domination of ethical and social issues by the North.

Herdt suggested that the Bank: address the biotechnology issue from a food security perspective; design loans and programs to build capacity; encourage the development of a minimum of five to ten scientists at the Ph.D. level and five to ten policy experts per country; educate the public about biotechnology; support research facilities and their linkages with the international system; and help build national regulatory frameworks for food safety, the environment and intellectual property.

THE CLIENTS' VIEWS: Speakers from Costa Rica, Hungary and the Philippines introduced considerations and concerns for actors in their countries with respect to biotechnology.

Ana Sittenfeld (University of Costa Rica) briefly reviewed the economic capacity of Costa Rica as well as its high concentration of biodiversity resources. She highlighted the integration of country priorities to conserve bio-resources, develop inventories and knowledge on their application and thereby promote sustainable use. While over 20 percent of the country's land area is protected, the remainder is used intensively for agriculture with significant use of chemicals, raising the primary problem of how to integrate agriculture and conservation activities. She noted the very low level of investment in science and technology and the consequent dependence on external sources of support. Efforts to promote development of bio-resources have been promoted through biodiversity prospecting frameworks combining business development and strategic planning, biodiversity information management and technology access with macro-policies. Such development requires partnerships with the private sector, facilitated access to technology and product development that combines bio-resources with potential markets (e.g., pharmaceuticals, phytomedicines, herbal supplements, seeds, industrial enzymes).

The central challenges include concretely defining and implementing these bioprospecting frameworks; developing multidisciplinary teams covering science, law, conservation and business interests; and distributing the benefits from bio-products for improving biotechnology capacity along with biodiversity management and conservation. Finally, she highlighted ongoing work at the University of Costa Rica focusing on native strains of wild rice and efforts to isolate pest resistant characteristics for commercial application.

Zoltan Bedo (Hungarian Academy of Sciences) discussed a survey carried out by the Plant Breeding Commission of the Hungarian Academy of Sciences to monitor the opinion of farmers on the future introduction of GMOs. He first reviewed Hungary's agricultural sector, which is relatively developed and export-oriented. He noted that production decreased 30 percent during the transitional period and that the role of agriculture is changing in Hungarian society. The government passed a Biotechnology Act in 1998 that is based on the EU Council Directives.

The Academy's survey was mailed to 500 farmers, 159 of whom responded. Eighty-eight percent of the respondents had heard of transgenic or GMO plant varieties and hybrids developed using biotechnological methods. Seventy-three percent believed transgenic plant varieties or hybrids could make their farm more profitable in the long

run. In response to how these products would sell in the home market, 36 percent of respondents thought that traditional products would be easier to sell, while 35 percent thought there would be no difference. Thirty-five percent thought production would be cheaper with transgenic plant varieties because yields would increase, while 33 percent thought it would not be cheaper because seeds would cost more. Seventy percent said they would test an untried transgenic variety on a small area first. Sixty-nine percent said they would sow the seeds if a neighbor were successful. Sixty-two percent said they would give their own family food or medicine or their animals fodder produced by means of genetic engineering, while 21 percent said they would only give such fodder to their animals and 11 percent said they would not serve such products to their family or animals.

In summary, Bedo noted that farmers support the use of genetically manipulated plants and animals and consider it an important tool for long-term agricultural development. He also noted the importance of maintaining freedom of choice between GMOs and non-GMOs in agricultural production, and the increasing economic gap between small- and large-scale farmers.

Ananias Loza (PAKISAMA, Philippines) presented the experiences of small-scale Philippine farmers with agricultural technology developments and concerns regarding the application of biotechnology. He highlighted past government programs to support farmers, including the promotion of high-yield varieties of rice during the Green Revolution (Masagana 99) and cultivation of snails (Golden Snails Program). He noted that while the initial outcomes and payoffs of such programs were encouraging, their longer term environmental and socioeconomic impacts precluded continued application and in some cases created more difficulties. Ultimately, both programs professed to promote the food and income needs of small farmers, but failed to foresee future negative impacts or to consult with or facilitate participation of farmers. Such experiences have made Philippine farmers wary of government efforts to promote the introduction of biotechnology. Specific concerns include: affordability; impacts on the environment, human health and indigenous knowledge; profitability for farmers and not just landowners or business people; safeguard policies; and ethical considerations regarding application and patenting.

Regarding the Bank's efforts, Loza appreciated its concern for poverty alleviation, but noted that the problems of small farmers are primarily structural (e.g., tenure, infrastructure, post-harvest facilities), which cannot be addressed by biotechnology. Additionally, he emphasized that: capacity building efforts should not be limited to government, commercial and academic sectors; biotechnology strategies should be country specific; the Bank should support other modes of agricultural development, such as sustainable agriculture; consultations should be multi-stakeholder and multi-level; existing International Agricultural Research Centers (IARCs) should include farmers and fishers in their policies at all levels and facilitate access to their collections; and research results, especially those derived from the private sector, should be made available to others that need them.

Questions raised during the discussion of these opening statements included inquiries as to how the small farmers in Costa Rica benefited, whether farmers' views were collected in countries other than Hungary and if responses were related to the farmers' level of sophistication, and how the Bank can economically justify more lending or policy analysis to address the issues raised. Sittenfeld noted that, in a small country such as Costa Rica, anything that improves the economy affects all parts of society. She also noted difficulties and costs to distribute products once their benefits for commercialization are identified. Bedo noted the impression in Eastern Europe that biotechnology is only for large-scale farmers, but said it may be more beneficial for small-scale farmers. Loza agreed and stressed the importance of capacity building for small-scale farmers.

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BIODIVERSITY, BIOSAFETY AND FOOD SAFETY

KEYNOTE SPEAKER: Ariel Alvarez (Center for Research and Advanced Studies, Mexico) briefly reviewed the fundamental differences between traditional breeding techniques and those of genetic modification, which overcome biological barriers between species. Specific qualities that can be developed through biotechnology include resistance to insects, viruses and herbicides; delayed ripening; aluminum tolerance; and altered composition. Potential risks involved in the release of GMOs include: generation or strengthening of new weeds; increased resistance of pests to pesticides; generation of new viruses; alterations to the environment; and deleterious effects on non-target organisms. He cautioned that evaluation of environmental risks cannot ensure total absence of risk, and that long-term ecological predictions are difficult to assess at the approval stage for introductions. However, potential adverse ecological effects of GMOs are enhanced by the presence of sexually compatible species; complex ecological relations involving different species of plants, animals and micro-organisms; and the total amount of biodiversity exposed to the transgene. Of specific concern is that higher biodiversity concentrations (most often located in developing countries) entail higher ecological risk, possibly leading to greater environmental impacts.

Alvarez then reviewed Mexico's experience with developing a biosafety framework for the introduction of transgenic varieties through the formation of the National Committee for Agricultural Biosafety (CNBA) in 1988. The CNBA consists of seventeen representatives from agricultural and research institutes, the Ministry of Health and the biotechnology industry. It operates as a scientific advisory committee to review and approve applications for GMO introductions, visit test sites and review final reports. A significant problem for the approval system is the general lack of knowledge and the self-defeating cycle that no approvals results in no new knowledge and thereby no means to judge other introductions. In light of this problem, Alvarez recommended limited field trials with long-term monitoring and evaluation to build the knowledge base. He recommended that such committees focus exclusively on scientific and technical issues and be limited to eight to fifteen committed members. Additionally, there should be strong financial and political support for the committee, as well as adequate resources to inform and consult with the public.

He outlined challenges for the future, including: harmonizing criteria among government agencies; training people in all stages of the process; and undertaking further research on safer alternatives. Finally, Alvarez provided some specific requirements for other countries developing biosafety frameworks, including: a core group to manage an advisory committee; a core group of scientists from different areas trained in risk evaluation; properly trained personnel to monitor field trials; sufficient resources to establish an information system accessible to the public; special programs with participation of representatives from industry, academia and government to implement long-term monitoring; programs for research on the ecology and reproduction of wild relatives of GMOs; and programs to address specific risk-related issues in centers of origins and/or diversity.

DISCUSSANTS: Michael Hansen (Consumers Union, United States) stressed his concern with transgenic crops. He noted that engineered biotechnology is fundamentally different from traditional breeding because the sites where the constructs will be introduced usually are not known during their development, which introduces the possibility for unexpected effects if inserted in the wrong place. He highlighted that such engineering employs measures to overcome natural defense mechanisms, which also could create unexpected effects. He reviewed a number of cases that illustrate that the US regulatory system does not adequately review food safety issues before placing products on the market. He suggested that the Bank could examine whether genetic engineering helps alleviate poverty, and indi-

cated that political and other considerations were more important than productivity. He also noted that no insurance company will insure against the environmental and health risks associated with bioengineered crops and asked why, if the products are safe, can no such insurance be obtained?

John Wafula (KARI, Kenya) stressed the need for regulatory mechanisms to minimize risks, and asked what are the driving forces to develop such structures. He reviewed Kenya's experience in developing a biotechnology policy. He said joint activities between Kenyan and American actors sought to develop, in separate arrangements, a vaccination and a new strain of sweet potato, but they met resistance in moving the product out of the laboratory because biosafety structures were not in place. He said a biosafety committee was established; it gained the attention of ministries and pressured them to work on the issue; governmental task forces were created; drafts were circulated; and a final document was adopted in 1998. In May 1999, the first application, for the sweet potato, was approved.

DISCUSSION: Several participants emphasized that to date biotechnology has not addressed the needs of developing countries and the poor, and cautioned that discussions not be overtaken by emotional interests. One participant stressed the need to examine the environmental consequences of not employing biotechnology, such as the use of pesticides and herbicides. Hansen stressed the need to look beyond the question of biotechnology versus chemical inputs by focusing on ecologically friendly techniques, such as integrated pest management or those developed through traditional knowledge. In response to comments supporting capacity building and development of regulatory frameworks at the regional level, Wafula noted that countries are at different levels and, given his experiences in East Africa, common goals and understandings are an essential precondition.

To address the needs of farmers, Alvarez suggested that the Bank identify specific problems at the local level, which can be addressed by techniques already developed within the private sector. Another participant further noted that biotechnology is being used to develop specific traits, which can then be introduced into different plant varieties, increasing the range of potential applications. Another speaker said the Bank's capacity building efforts should not duplicate work already undertaken in the private sector, but should help tailor relevant work for further application. Others stressed the need for resources to ensure that regulations and legislation already in place can be properly enforced. Several participants underscored the need to include farmers in these discussions, whether within the Bank, during the development of national frameworks or in applications at the local level.

INTELLECTUAL PROPERTY RIGHTS

KEYNOTE SPEAKER: John Barton (Stanford University, United States) noted the radically expanding number of patents for biotechnology products and processes. He highlighted the costs involved with patenting, including US\$20,000-30,000 to file, US\$1,800 to process the application, and approximately US\$500,000 for litigation, and said donors must realize that they will need to incorporate such expenses. He noted that reciprocal patent infringement claims provide the opportunity to negotiate resolutions between companies, and that mergers are the ultimate form of settlement for patent infringement claims. He discussed the implications of intellectual property trends, including the fact that some issues, such as water shortages and nitrogen cycles, are not addressed by the private sector, and public research priorities should take these issues into account.

Barton stressed the need for people who understand how to make alliances with multinational corporations, and said there is no such thing as a model alliance. He noted that simply buying technology for developing countries is not always the best solution and called for independent centers of innovation in the developing world. He said patent systems and competition law are both important for developing coun-

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tries. He stressed that free trade in information-intensive goods has different characteristics than the goods Adam Smith considered, and these differences should be kept in mind. Regarding possible roles for the Bank, Barton emphasized the need to educate people in developing countries so they can argue persuasively with their developed country counterparts. He also suggested helping developing countries decide what are nationally appropriate patent policies.

DISCUSSANTS: Maria-José Sampaio (EMBRAPA, Brazil) noted the rapid consolidation of life sciences and agro-chemical industries throughout the MERCOSUR countries. This is a global phenomenon that reflects the increasing control by transnational corporations over agricultural industries and involves the appropriation of both germ-plasm resources and marketing structures. This consolidation is supported by the development of umbrella patents cross-licensed by a small pool of corporations. Collaboration between the private sector and public universities or institutions has also raised concerns about intellectual property protection for technologies developed. She further stressed the need to recognize knowledge that currently exists in the public sector, as well as means to use the knowledge of more developed countries as a bridge to develop applicable technologies at local levels.

Judy Chambers (Monsanto, United States) noted the presumed assumption that the private sector can contribute to agricultural research and the needs of developing countries, whether through biotechnology, traditional breeding or systems research. She stressed that the private sector, both transnational corporations and national industries, needs the assurance of financial returns to continue investment. This requires strong IPR and supporting government regulations, such as patents for plant varieties. Chambers emphasized that proper IPR and access to technology are only a small part of the overall conditions necessary to support economic growth, which also include basic business contract law, crop insurance, access to credit, technology transfer laws, and tenure, among others. She also noted the substantial amount of information in the public sector, as well as the need to examine such issues within the pharmaceuticals industry. Specific recommendations for the World Bank include: capacity building for developing countries to participate in biotechnology development; assistance to countries for developing IPR systems; a focus on capacity building within a larger systems approach to agricultural and economic development; and support for farmers' groups to participate in stakeholder discussions.

Doreen Stabinsky (California State University/Council for Responsible Genetics, United States) expressed opposition to patents on life, a sentiment she said exists throughout the world for material as well as cultural reasons. Such resistance centers around the privatization of a public good essential for the production of food. She said this issue is especially disconcerting in view of the increased consolidation of IPR within the agricultural industry and monopoly of rights over seeds. She noted how patenting of genes can inhibit research by preventing access to research materials. This situation also reflects a particular type of cultural and economic hegemony, which gives preference to knowledge developed in laboratories and through modern science as opposed to developments by farmers in the field. She stated that it was difficult to envisage how IPR can help small farmers, and that IPR are not necessarily in keeping with ensuring food security and poverty alleviation. Stabinsky recommended that the Bank: work to keep as much plant, microbial and animal genetic resources in the public sector as possible, potentially using the CGIAR system; work with the CGIAR to access proprietary technologies on preferential or concessional terms; assist in the development of *sui generis* regimes to protect plant varieties outside of the International Union for the Protection of New Plant Varieties (UPOV); and support capacity building to develop IPR systems distinct from US or European systems.

DISCUSSION: Comments in the ensuing discussion included a call for the Bank to be a stronger advocate for public investment in agricultural research. One participant noted the variety of levels and actors that could benefit from capacity building, including scientific research institutes, patent offices and the private sector, and asked where priorities should be placed. Barton suggested: educating twenty to thirty young people from developing countries about the relevant economics, science and law; organizing workshops for employees of patent offices, research centers, etc. to help them understand their needs and priorities; and organizing meetings to identify how to modify intellectual property law and determine priorities for trade negotiations. Sampaio suggested that the workshops be two months in length. One speaker also noted that public research can fail to create products. Barton agreed that it is crucial to move technology from the public sector to commercial applications and suggested that individuals from developing countries would benefit from spending time in businesses in developed countries.

ETHICAL AND SOCIAL ISSUES IN BIOTECHNOLOGY APPLICATIONS FOR AGRICULTURE

The Chair of the Plenary discussion on ethical and social issues, Peter Matlon (UNDP), noted that biotechnology involves ethical concerns regarding life forms not found in nature, social concerns regarding ownership of the building blocks of life, and risks to biodiversity, ecosystems, human health and social and economic equity.

KEYNOTE SPEAKER: Derek Burke (United Kingdom) briefly reviewed the recent public furor in the UK over genetically modified foods, which has generally forced UK retailers to pull genetically modified (GM) foods from their shelves. He discussed the reformation of the UK's institutions to oversee and assess food safety issues given increased public skepticism over food safety and transparency of decision making. The UK government has recently established two new bodies – the Human Genetics Commission and the Agriculture and Environment Biotechnology Commission – to complement the existing body addressing food safety. Their mandates include a strategic analysis of biotechnology developments, scope to address broader issues such as ethical considerations, identification of gaps in regulatory and advisory frameworks, and distillation of lessons learned from individual decisions. All committees will adopt new guidelines on transparency, including publishing their advice to Ministers. Such changes reflect how far public interests have pushed the debate in the UK.

He noted criticisms expressed earlier regarding the possible impacts of GM crops on the environment, but stated his view that they are essentially no more controversial than non-GM crops. However, the introduction of GM animals into the food market raised significant questions with regard to religious and dietary preferences. Such concerns essentially point to the consumer's right to choose, which he said can be accommodated through labeling. However, introduction of US GM soya mixed into regular soya without labeling spurred domestic concerns in the UK, which helped to prompt removal of all GM foods from retailers' shelves. Burke noted that this development is not only a setback for Monsanto and other biotechnology companies, but is also ultimately a reduction in consumer choice.

Burke emphasized the rights of consumers, especially with regard to the safety of all foods, which requires an open regulatory process that is sensitive to cultural and social issues. Additionally, he noted the duty to care for the environment while recognizing that the world will continue to change, especially given population and resource pressures. He asked how the Bank could work on food crops not developed by transnational corporations, but important to the developing world, as well as how the Bank and governments can protect the independent sector in developing countries. Finally, he stressed that, at the level of international trade negotiations, the World Trade Organization has to recognize the importance of ethics and consumer rights, which are not addressed by market forces.

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DISCUSSANT: Paddy Cunningham (Trinity College, Dublin, Ireland) discussed biotechnology applications for livestock. He noted that genetic engineering is more expensive in animals; the time horizon is longer; and the business structure is different, making it harder to recover research investments.

He presented a framework for considering ethical questions, which assists in the identification of tradeoffs between utilitarian and ethical considerations. The framework uses a two-dimensional grid to measure benefit/harm and freedom/fairness for all stakeholders on a particular issue. He demonstrated how it could be used for three examples: transgenic cattle with increased resistance to disease, transgenic pigs with extra growth hormone genes, and transgenic sheep secreting human pharmaceuticals in their milk. He used the model to identify the range of benefits and fairness for developing country societies, animals, consumers in developing countries, livestock farmers, firms and patients, as appropriate. Cunningham also identified benign aspects of technology, including examination of pig DNA to determine which pigs have received vaccines and development of a cheap microbiological alternative for an enzyme from a calf's stomach necessary to produce cheese in Mali, leading to a doubling in productivity.

DISCUSSION: One participant raised the issue of public acceptance of risk assessment procedures and the credibility of science, stating that such issues must be addressed in developed countries before introducing biotechnologies into the developing world. Burke noted that the greatest difficulties occur in cases where the risk is low and that there is a need to examine the potential benefits as well. He recommended opening the process to public input and placing the ultimate responsibility for decisions with publicly elected officials. He also stressed the need for discipline and peer review in the scientific process, but noted that scientists have no greater authority with regard to ethical issues. Additionally, scientists need to recognize and accept the fact that the public has a different set of criteria that may not accord with the precepts of the natural sciences. Another participant stated that science is a public issue and that biotechnology is not seen as partial or independent given its links to the private sector. Cunningham stressed the need for standards in which the public has confidence, such as certification schemes and standards such as those developed under the International Standards Organization. He said nutritional labeling has served as a key mechanism to increase public assurance, regardless of whether consumers read such information.

Concern was expressed regarding the discussion's general focus on developed country publics and markets, which the speaker said do not reflect the reality of illiterate populaces and questionable market policies in developing countries. He specifically cautioned against promoting biotechnologies that have been rejected by developed country publics, citing the dumping of DDT and other harmful pesticides by transnational corporations in developing countries. The Chair stated that technologies that may be benign in terms of impacts may not be benign in terms of their introductions into other social, cultural or economic contexts. Finally, questions were posed regarding the role of public policy in promoting biotechnologies as well as social analysis of potential winners and losers in biotechnology introductions.

PARTNERSHIPS AND COOPERATION

The Chair of the Plenary discussion on partnerships and cooperation, Ralph von Kaufmann (International Livestock Research Institute), highlighted several aspects of the workshop's background paper, including the difficulty that small countries and farmers have in following biotechnology issues and attracting the attention of large companies. He noted the need for large institutes to link with smaller ones and for models of public and private collaboration.

KEYNOTE SPEAKER: Ken Fischer (International Rice Research Institute [IRRI]/Stanford University, United States) discussed the need for the public sector to determine its role in rice science in relation to

the private sector, to maintain a flow of diverse germplasm for long-term sustainability, and to work with the private sector to offer choices to farmers. He noted that the public sector, including IRRI, has traditionally operated under a culture that freely shared its goods. He said this culture of free exchange must change to one of "owning the products we share": the public sector should think more corporately about its products, understand its assets, and use them accordingly when dealing with others who have assets that it needs.

Fischer stressed the need to maintain the flow of diverse germplasm to build on strong networks and help them make necessary changes, and to look at new platforms for sharing. He presented a proposed model for IPR relationships, with IRRI-private sector relationships for research only and agreements for commercialization between the private sector and National Agricultural Research Systems (NARS). He suggested that the Bank could help maintain the flow of germplasm in part by supporting regional bodies on matters related to ownership of germplasm. He noted the need for consortia to operate in areas where there is less commercial interest. He highlighted gene discovery as one area where the public and private sectors are starting to work together successfully, but stressed the need to link these genes to their functions. He also noted that very strong national systems exist, highlighted their emerging roles and suggested that they be strengthened.

DISCUSSANT: D. Balasubramanian (Hyderabad Eye Research Foundation, India) noted that agriculture still has a very strong link to culture, given its position as the bedrock of civilization and its relation to conceptions of individual, family and community rights. Shifts towards large agri-business raise feelings of marginalization and exploitation among small farmers, which are exacerbated by inadequate information, disinformation and ideological positioning. He stated that unlike other high-tech industries, agricultural biotechnology is more user-friendly and does not demand the same level of sophistication in the practitioner, which is advantageous to developing countries.

Balasubramanian suggested that the World Bank could: help develop systems to exchange germplasm and plant genetic materials across laboratories and nations; catalyze a "freedom to operate" model and serve as an "honest broker" in technology transfer; promote research on traditional crops, orphan grains and special country materials, not just cash crops; facilitate the interaction of international agricultural centers (e.g., CGIAR, International Crops Research Institute for the Semi-Arid Tropics) with local universities and laboratories; promote the concept of "internationally owned goods" (e.g., the bio-banana proposal); fund novel approaches to problems that have not been addressed (e.g., economic potentials for water hyacinth, regeneration technologies of animal wastes); initiate a "World Bank Laboratory for Land Fellowships" for the exchange of scholars, scientists and farmers; help establish regulatory mechanisms at national and regional levels; and help allay farmers' fears about private enterprise.

DISCUSSION: During the ensuing discussion, one participant asked how the presence of IPR laws in host countries have impacted the ability to move forward with the types of partnerships described. Fischer said IRRI is just developing the capacity to work closely with national legislation in this respect. One speaker noted that other international actors, including the Convention on Biological Diversity (CBD), are addressing biotechnology guidelines and asked where the Bank fits into these debates. A representative of the UN Food and Agriculture Organization (FAO) noted that FAO is receiving requests to help countries establish biosafety regulations and said it would appreciate partnerships with other institutions, as it is too much work for one organization. She also suggested that the Bank stop cutting its funding for national centers. Another participant noted that various actors' gaps in understanding hamper implementation of the CBD; for example, developing countries think they are rich since they are rich in biodiversity but they do not understand what it takes to develop a product, while industry fails to recognize a country's needs to conserve biodiversity.

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SMALL GROUP RECOMMENDATIONS

Workshop participants broke into small groups on Friday, 4 June to consider priorities for the World Bank in its lending and economic and sector work and in the global policy dialogue. Nine small groups convened, with each developing recommendations for World Bank action on a different topic -- IPR; biodiversity, biosafety and risk management; ethical and social issues; food safety and consumer concerns; biotechnology and poverty alleviation; networks, collaboration and communication; research -- organization and priority setting; the position of smaller countries; and World Bank policies -- safeguards and oversight. Each group was asked to report recommendations back to a Plenary meeting of the workshop. These recommendations and subsequent Plenary discussions are summarized below.

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The working group on IPR specifically discussed World Bank priorities, capacities and skills needed within the Bank as well as key partnerships. Priorities for Bank activities included:

- continued support to the CGIAR centers to strengthen public agricultural research and the availability of genetic resources within the public domain;
- support for regional collaboration, such as coordination among patent offices or development of biosafety guidelines;
- capacity building to train trainers, facilitate information exchange and develop awareness of IPR;
- assistance to countries in accessing privately owned technology; and
- the formation within the Bank of an international center of excellence on the economics of IPR.

Capacities and skills needed within the Bank included:

- a core group following IPR developments and discussions;
- expertise in the economics of IPR and science and not so much in the legal aspects of IPR; and
- access to networks of experts.

Key organizations with whom the Bank should develop partnerships included:

- the World Intellectual Property Organization, especially for training;
- regional associations such as the Association for Strengthening Agricultural Research in East and Central Africa and Conférence des Responsables de la Recherche Agronomique Africains;
- FAO in regards to information sharing; and
- CGIAR centers, especially the International Service on National Agricultural Research.

Finally, it was mentioned that the Bank needs to follow the global policy dialogue on IPR.

DISCUSSION: Speakers during the Plenary discussion raised concerns over more general training needs of a wider group of Bank staff. In response to a question on facilitating access to proprietary technology, it was noted that there can be no single rule as each case is specific, thereby requiring a range of possibilities. The CGIAR centers and regional consortia are two possibilities for accessing such technologies. On the specifics of regional formulations, group members clarified that the central concern was not format, but efficiency in coordination. Formats could range from informal communications to a small number of regional patent offices. One participant emphasized the political obstacles to creating regional frameworks or legislation.

BIODIVERSITY, BIOSAFETY AND RISK MANAGEMENT

The small group that considered biosafety noted that it is a controversial and complex issue for societies and that distinctions must be made between what would be nice to know and what needs to be known. In this respect, they proposed that the Bank develop a list of the issues and questions requiring answers, starting by identifying what is needed in local-level agricultural systems.

The group further recommended that the World Bank:

- use its lending program to build national and regional research capacity;
- build national regulatory frameworks;
- invest in education and public awareness, including for World Bank staff, on biosafety issues;
- support efforts to foster regional harmonization of policies and guidelines and to hold policy dialogues; and
- work through an interagency task force, which should include regional organizations, CGIAR centers, FAO, UNEP and universities.

DISCUSSION: Discussion on these recommendations focused on the comment that biosafety research, not simply research, should be supported. One member of the group clarified that the proposal was not to build general research capacity but capacity in risk assessment and risk management principles and procedures. Another participant suggested that regional guidelines be developed prior to development of national guidelines to reduce later difficulties in regional harmonization. Another group member noted that agencies often work at cross-purposes in the same country and highlighted the possibilities for achieving greater efficiency through an interagency task force.

ETHICAL AND SOCIAL ISSUES

This group posed and answered five questions regarding ethical and social issues. In response to whether the Bank has a role in promoting public awareness, the group proposed that the Bank augment and redirect resources and develop the necessary technical, communication and cultural skills to competently perform the roles of broker and "persuader" of governments. With regard to biotechnology, the Bank currently lacks a "critical mass" to perform these roles. In answer to whether the Bank should promote the establishment of "ethical panels," the group suggested that it promote "public awareness panels" first. Ethical panels also could be fostered on a country-by-country level. They should include poor farmers and first consider whether technology should be used to solve a specific problem. If the answer is yes, the panel should consider how the advantages for the poor can be maximized and the disadvantages minimized. They said the panels should be able to act rapidly and flexibly, since new issues arise quickly.

In response to whether the Bank should provide periodic reports about funding in the field of biotechnology, the group suggested that, in addition to reporting on projects that are funded, the Bank should make transparent the process of decision making that leads to funding decisions. In response to the question of whether the Bank should take a position on the possible domination of a few companies, the group suggested that the Bank help countries create and maintain conditions that are competitive. This framework should include competition between technologies and the number of companies, and would require anti-trust legislation and transparent market structures. Finally, in response to what the Bank should do in cases where biotechnology offers a solution, the group suggested that it should do a better job in reaching the poor.

DISCUSSION: A group member commented that the group believed the Bank should either redirect existing resources or build up new resources on biotechnology issues. One speaker also suggested ensuring that Bank management is more involved in biotechnology issues. Some speakers asked if the Bank acts as a watchdog on other issues, such as energy, to ensure competition. They were told that the Bank does not act as a watchdog but helps countries develop frameworks to ensure competition and that such activity should not be confined to the biotechnology sector. Another participant noted that the Bank has a sector that deals with the private sector and suggested greater communication between this sector and those working on biotechnology issues.

SUSTAINABLE DEVELOPMENTS

FOOD SAFETY AND CONSUMER CONCERNS

The discussion group on food safety and consumer concerns arrived at four main conclusions:

- there should be a focus on the first generation of GM plants with agronomic traits for which there is more adequate health testing;
- the Bank should not disregard safety problems raised in developed countries;
- products deemed safe in developed countries may not be safe in client countries given differences in market integration and nutritional levels; and
- it is not cost-effective for any individual client country to develop the full capacity to evaluate health impacts of GM plants, especially given other investment priorities.

Such conclusions raised the question of what are the minimum requirements for client countries to create effective consumer safety programs. Specific actions for the Bank in the area of food safety and consumer concerns addressed capacity, advocacy and Bank project development. At the national and regional levels, there is a need to build capacity to ensure that client countries can trace products (both exports and imports) and decide whether or not they should be consumed. Advocacy is necessary to: promote full public access to information on food and health safety; promote general public awareness and mechanisms to support consumer awareness; and identify and support an independent arbitrating agency to serve as a clearinghouse to facilitate information on food safety concerns among developed and developing countries. Finally, the Bank should conduct food safety impact assessments in its projects.

DISCUSSION: Plenary discussion highlighted the need to coordinate with the Codex Alimentarius on food safety and the importance of addressing food safety issues with policy makers before mounting consumer and public awareness campaigns. One participant noted the lack of data even in the developed world on GM products and food safety, and another emphasized the cost-effectiveness of regional work. Finally, it was stressed that the Bank should focus on more general food safety concerns in developed countries (e.g., from industrial pollution or pesticides) before focusing on biosafety issues.

BIOTECHNOLOGY AND POVERTY ALLEVIATION

This group emphasized the need for the Bank to identify best practices, develop pilot projects, and monitor and evaluate them to develop methods to use biotechnology effectively to reduce poverty.

Their five proposals for Bank action called for:

- empowered participation to establish research and development priorities, including through the assessment of potential risks and benefits;
- assessment and definition of the new role that the public sector has to play, including through assessments of farmers' demands and identification of best practices for partnerships with the private sector;
- mobilization of the private sector through partnerships, contracts, subsidies, market development and donations;
- support for institutional development, such as the establishment of biosafety regulations; and
- identification of win-win situations, such as trades between farmers' rights and royalties, and implementation of pilot experiments.

DISCUSSION: One speaker noted that the group had focused on crops and overlooked the role that animal husbandry could play in poverty alleviation. Another asked if the group focused on rural poverty or poverty in general, since solutions for one may not be the same for the other. The Chair of the group agreed, noting that the group had discussed the direct and indirect effects of technology and that indirect effects, such as consumer or nutritional benefits, may be important but may not directly help small farmers. Another workshop participant noted that the recommendations relied on technology packages and

their transfer, which goes against the demand-driven approach of development. The Chair stressed that biotechnology is only one part of any package.

NETWORKS, COLLABORATION AND COMMUNICATION

The group discussing networks, collaboration and communication suggested that the World Bank:

- promote and use cooperation, including through new or existing regional arrangements;
- support networks for specific crops, thematic topics, etc., through the CGIAR and global and regional fora;
- examine why public-private partnerships are not more numerous, including through an assessment of the role of IPR and the Bank's procedures;
- promote increased and improved communication through networks, knowledge management and public debate; and
- build capacity within the Bank and NARS. Within the Bank, the group suggested identifying a "chief biotechnology expert," developing an internal network and devoting more resources to biotechnology.

DISCUSSION: One speaker suggested that the proposal to document best practices was relevant to this group's conclusions. Another noted the problem of funneling Bank funds to any actor that is not a sovereign government, but said there are ways to avoid this to lend to regional groups. Several speakers questioned the proposal to designate a "chief biotechnology expert." Group members, however, emphasized the need for a staff member to act as a coordinator and focal point for biotechnology issues in the Bank. A speaker noted that some local, small companies may be relevant when developing public-private partnerships, rather than the large, multinational companies that usually come to mind. Another participant recalled that the International Finance Corporation has experience with such partnership activities.

RESEARCH: ORGANIZATION AND PRIORITY SETTING

The group on organization and priority setting in research discussed the issues of national-level investments, collaborative arrangements, strategic objectives and priorities, policy frameworks and development of human resources. Regarding investments at the national level, they proposed that the Bank focus on biosafety, tissue culture and other country-specific priorities. This should be combined with a study of the payoffs of these options. They suggested that support for collaborative arrangements address upstream and more complex research issues, contracting possibilities, the role of competition, better use of existing capacity, and earmarking funds for collaboration, including regional and other arrangements. Their strategic objectives and priorities for the Bank included development of a blueprint to define its role, capacity building and assessment, identification and promotion of specific tools and methods, and information, including market analyses. They identified central elements for addressing policy frameworks to include public and private considerations, funding mechanisms, linkages to sector policies, institutional strengthening and quality assessments. Finally, they stressed that development of human resources should include scientific capacity, managerial capacity to make contractual arrangements with various institutions (e.g., the private sector, research organizations, universities), and business development.

DISCUSSION: One participant stressed that support for educating relevant officials and stakeholders about the scientific basics of biotechnology should precede capacity building for biosafety frameworks. Without such understanding, biosafety frameworks may operate without a fundamental understanding or assessment of the issues, thereby failing to reflect national priorities. Another expressed concern about focusing on managerial training, as more civil servants will not strengthen developing countries' scientific and economic sectors.

SUSTAINABLE DEVELOPMENTS

THE POSITION OF SMALLER COUNTRIES

This group noted that the definition of a "small" country varies depending on what is examined, such as purchasing power, export value, biodiversity, scientific capacity, or livestock/planted area. These factors determine investment attractiveness and development capacity. The group considered countries at an early stage of biotechnology capacity and recommended that the World Bank:

- support the development of a minimum knowledge base among policy makers, a core cadre of researchers and administrators, the general public and farmers;
- support cost-benefit analyses of investments in biotechnology research and adaptation;
- build on existing regional structures to identify where capacity can be developed in a region and complement existing activities with regional initiatives on regulatory frameworks, partnership guidelines, IPR and biosafety through a combination of national loans and regional grants;
- serve as an "honest broker" for private sector-small country partnerships, using organizations with relevant expertise and appealing to the commercial and altruistic instincts of private companies; and
- promote transparency in commodities and food aid through the provision of information on the safety of products and development of capacity to screen for GMOs.

DISCUSSION: Some speakers emphasized the importance of small niches and said networks should be used to link these niches with other relevant actors.

WORLD BANK POLICIES: SAFEGUARDS AND OVERSIGHT

The group addressing this topic began its discussion with the questions of whether the risks of biotechnology are acceptable or too controversial for Bank involvement and whether Bank safeguard policies are needed. Currently, the Bank does not have safeguard policies for biotechnology, however other safeguard policies (e.g., environmental assessments, pest management, natural habitat, forestry) could address biotechnology concerns for the time being. The group suggested that it is necessary to educate Bank staff on how such safeguard policies specifically relate to biotechnology. The group proposed that the Bank not advocate genetic engineering, but instead concentrate on less controversial molecular biological approaches to plant and animal breeding. They also proposed that the Bank work with governments to identify capacity needs, while balancing support for scientific research with the scientific capacity for risk assessment. The group said the Bank should learn from experiences in the area of pesticides, which is especially relevant given the development of regulatory mechanisms in developing countries without adequate enforcement capacity. Such enforcement is especially important given efforts by the private sector to push products at the national level. Finally, in developing internal policies on biotechnology, the group said the Bank should assess existing work, including the UNEP Technical Guidelines for Safety in Biotechnology and the guidelines on risk assessment recently produced by a team of US scientists.

DISCUSSION: One participant expressed concern about promoting the UNEP Guidelines or other work on biosafety frameworks in developing countries, given present disagreements in the negotiation of a Biosafety Protocol to the CBD. It was clarified that such resources would be used for the Bank's internal policies. Another participant expressed concern about the lack of a recommendation to develop a specific safeguard policy on biotechnology, noting that such policies are important for the safety of borrowing countries as well as to protect the Bank from liability issues. A group representative stated that the international debate over biotechnology and biosafety needs to mature

before the Bank could develop a safeguard policy acceptable to its country constituents. Finally, one participant stressed the need to assess the range of traditional and alternative scientific options available to address problems instead of immediately resorting to biotechnology applications.

SYNOPSIS OF MAIN RECOMMENDATIONS AND CLOSING STATEMENTS

Douglas Forno (World Bank, Rural Development) opened the final session of the workshop and highlighted the broader Bank process into which the workshop fits, as outlined by Derek Byerlee (World Bank) during the opening Plenary. He said the general sequence would be for the Bank to develop a clearer position on biotechnology, then to develop a specific plan of action to be considered by Bank management.

Eugene Terry (World Bank, Rural Development) reviewed and summarized the proposals for Bank action and recommendations for stronger emphasis in the workshop's background paper.

Participants recognized the substantial list of unprioritized recommendations for Bank activities and suggested that the proposals and recommendations be clustered. The Bank should also consider whether its more general approach should be proactive or responsive to developments in biotechnology. It was recommended that the Bank develop a paper on the state-of-the-art of developing partnerships, including those involving NGOs, universities, research centers and the private sector. The analysis could address the benefits and failures of such arrangements and assist in developing best practices. Another suggestion was to analyze how alternative systems of IPR could serve the needs of the poor, which could be done in conjunction with the CGIAR units focusing on intellectual property issues. This could also result in a set of guidelines.

It was noted that the workshop discussions spanned a range of disciplines and that the Bank needs to ensure multi-sectoral cooperation among agriculture, health, education and environment interests, both internally as well as within client countries. One speaker suggested that the Bank become involved in other external biotechnology discussion groups, such as those under the auspices of UN agencies. Finally, a participant recommended investigating the modalities to expand lending beyond countries to include projects and other means of support at the regional level.

Acknowledging that the two days of discussion had produced numerous unprioritized and sometimes contentious ideas, Terry mentioned that the Bank's Biotechnology Task Force would have to take the next steps to synthesize and cluster the recommendations. Additionally, future discussions would be necessary to operationalize the recommendations as they relate to the Bank's lending programs, country policy dialogues and global partnerships.

Derek Byerlee (World Bank, Rural Development) noted that the Biotechnology Task Force's plate is full. He said the next steps would be to review the workshop's output and establish clear priorities for the short and long term. He said that an action plan for the next few years is likely to include internal capacity building and identification of best practices and case studies and guidelines for public-private partnerships, IPR, etc. He noted that the Task Force would also try to reach out within the Bank to other areas dealing with biotechnology and IPR issues. Finally, the Task Force will look at areas where they can work together with other international agencies, such as on the regional harmonization issue. Byerlee said that the Task Force is committed to report to the World Bank's Rural Sector Board on the outcome of the workshop and recommended follow-up activities.