Biodiversity Conservation for Sustainable Agroecosystems Workshop

CO-CHAIRS

MARIE BOEHM
Center for Studies in Agriculture, Law and Environment, University of Saskatchewan

BOB MORGAN
Saskatchewan Wheat Pool

The Biodiversity Conservation for Sustainable Agroecosystems Group considered several aspects of the relationships among biotechnology, biodiversity, and sustainability. Members of the group represented a wide range of backgrounds — from biotechnology and ecology to policy-making — and thus had varying degrees of knowledge of, and expectations for, biotechnologies. Despite this, the group was able to reach consensus on many important issues. It was generally agreed that the new biotechnologies, based on the manipulation of DNA, are different only in degree from the techniques that early farmers and plant breeders have used to select and develop crops. It was recognized that biotechnologies can have both positive and negative affects on biodiversity and that the challenge is to ensure that the impacts are positive, because loss of biodiversity poses a significant threat to agroecosystem sustainability.

PUBLIC AND PRIVATE RESPONSIBILITIES

There was considerable discussion about the roles and responsibilities of publicly funded versus private (for profit) organizations in the development and application of biotechnologically altered crops. Private industry has worked mainly on the development of improvements in major high-value crops that are grown on large areas, where the products developed will likely return a profit on investment. There is an unmet need, however, in regions where crops are more locally adapted and farmers are poor. There may be an important role for public plant breeding in regions of the world where there is large potential to increase the productive capacity of traditional systems, with little possibility of earning much direct economic return on the investment.

Conservation of Genetic Resources

The role of public institutions in the conservation of genetic resources, both *in situ* and *ex situ* was also debated. *In situ* conservation refers to maintaining populations in the location where they evolved, for example in farmers' fields or natural areas. *Ex situ* conservation is maintenance of collected genetic material under controlled conditions away from their place of origin. Given that there is a strong link between biodiversity and sustainability, the group stressed that funding mechanisms to maintain and expand *in situ* and *ex situ* conservation programs in the public interest must be instituted. Management of agricultural sector resources was also mentioned as an important facet, particularly with reference to the major world crops (i.e., cotton). As control of those crops is being concentrated within only a few companies, original genetic resources from other sources are being lost.

Benefit sharing, based on mechanisms designed to ensure fair and equitable distribution of profits from genetic material, particularly between technologically advanced countries and developing countries, was considered to be a major challenge that will have to be addressed so that international, mutually beneficial partnerships can be developed. If developing nations perceive that industry is profiting from their genetic resources without compensation, access to those gene pools may be denied.

Issues

The Biodiversity Conservation for Sustainable Agroecosystems Group identified several issues related to the role of biotechnology for biodiversity in sustainable systems.

Research requirements

Research is required to better understand the role of biodiversity in the sustainability of agroecosystems and natural ecosystems. Three particular areas that require study are:

- Methods of conservation (*in situ, ex situ*). This requirement includes identifying the human, financial and institutional resources to adequately maintain viable *ex situ* collections and for *in situ* preservation of areas that are particularly rich in genetic resources.
- Assessment of the overall value of biodiversity. Diverse genetic resources are a valuable resource to crop breeders and may directly determine the sustainability of agroecosystems. Biodiversity is also important to the persistence of natural systems, which provide ecosystem services that are less directly related to the provision of food and fibre for humans than agroecosystems, but have an important role in the regulation of planetary conditions.
- The impact of biotechnologies on biodiversity. Loss of genetic diversity related to biotechnology occurs as local varieties are replaced

with genetically improved, uniform varieties and where genetic modifications allow crop adaptation to environmentally marginal conditions, replacing natural plant communities.

Sustainability	Environmental	Economic	Social
Ecosystem			
Species			
Gene			

ECONOMICS

- Financial resources are required to maintain germplasm resources. Funding for the continued maintenance of germplasm banks was considered to be an important factor in maintaining genetic diversity. Access could be severely curtailed if intellectual property rights (IPR) allow blocks of germplasm to be tied up for long periods. The group agreed that there is a direct link between intellectual property rights, access and biodiversity.

- Marketplace decisions have implications for biodiversity. It was suggested that a paradigm shift has occurred as funding from tax-based dollars for public plant breeders has been reduced while the role of plant breeders and other researchers for private interests has increased, a trend that is aided by IPR agreements. Modern monoculture systems of major commercial crops are suited to the commercial system, but in traditional agricultural systems a market failure has occurred. Private breeders, under pressure to build on the best varieties, are reducing crop diversity, which will have long-term implications for biodiversity. Examples were cited of the loss of many landraces or varieties of crops, from apples to cotton, over the past thirty years.

- Market value of biodiversity. The overall value of biodiversity is not known. It was suggested that attempts be made to quantify its economic value.

COMMUNICATIONS

- The group felt that communications were important at all levels, from education in schools to education of policy-makers and the public. Scientists have a responsibility to provide information that can be used by the public, who are often presented with "scary" rather than objective, science-based information. Scientists must also educate policy-makers about the long-term consequences of policy and marketplace decisions so that irreversible loss of biodiversity in the long-term can be avoided.

- The group discussed the need for communication efforts among developed and developing countries on the expectations both sides may have of the value of genetic resources in Southern nations. The communication should address both the expectations and the consequences of those expectations so that the parties can work towards developing a relationship/agreement which is fair and equitable to all. If this does not occur, more and more of the discussions become bilateral rather than multilateral, increasing the complexity of international agreement and enforcement. As developed nations begin to establish IPR regulations, and with examples of their exploitation of genetic resources in the past, developing nations are struggling to develop mechanisms to ensure that they receive fair and equitable compensation for the genetic material they have provided. An inability to reach agreement about how to share in the benefits of gene-based technology could result in the refusal of developing nations to provide access and in increased difficulty in creating partnerships based on trust and benefit sharing.

RESPONSIBILITIES/ACCOUNTABILITY

- The group discussed the changing role of government in the area of biotechnology research. As discussed in previous sections, there has been a major shift from plant breeding in the public sector to the private sector. Private industry can serve the requirements of modern agricultural systems that are based on the monoculture of major crops, although there is a danger of reduced genetic diversity if a few adapted cultivars replace many crop varieties. Public support may be required to serve traditional farming systems. Biotechnology could be used to improve traditional systems without requiring a production shift from minor crops with many land races to major, genetically uniform crops; a large direct return on such investment could not be expected.

- The responsibility for development of consistent regulations and enforcement protocols for the biotechnology industry lies with local, national and international governing bodies. Issues ranging from biosafety to food security and IPR to identity preservation will need to be addressed within countries and among nations to ensure continued access by breeders in developed countries to genetic resources in developing countries, to facilitate partnerships between public institutions and private industry, and to allow trade and shipment of commodities among nations. This is particularly important with the globalization of industry and with a technology as fluid as biotechnology.

RECOMMENDATIONS

The potential of biotechnology to further the welfare of humanity with improved biological products such as food, fiber and energy sources is dependent upon the biological bank of genes encompassed by the term biodiversity. It is a serious concern that the preservation of genetic diversity is threatened by changes in social and economic conditions surrounding the agricultural and human food and feed industry.

- *Recognize and communicate, for urgent action by policy makers, the impact of biotechnology on biodiversity of agricultural crops, livestock and natural systems.*

- *Contact appropriate USDA, USAID, and AAFC officials asking that they address issues associated with funding for maintenance and utilization of germplasm banks. The private sector should be encouraged to contribute through in-kind assistance, donations of germplasm, and consideration of biodiversity issues in their research priorities.*

- *Ask the Secretariats of relevant international organizations operating internet web-sites (FAO commission on Genetic Resources, the Convention on Biological Diversity, the Global Environmental Facility, etc.) to structure their sites in such a way that search engines will be able to identify documentation related to biotechnology.*

- *Create win-win situations to preserve and sustain resources, and to ensure fair and equitable sharing of benefits by finding direct mechanisms within the academic and non-governmental organization (NGO) communities to develop effective partnerships between developed and developing nations.*

- *Develop educational programs at all levels emphasizing critical thinking about the role of biodiversity and the implications of biotechnologies.*

- *Recognize that the loss of biodiversity is a significant problem. Stakeholders and governments should develop systems to identify issues, gather information, set policy, build support structures, and monitor and apply policy.*