

Biotechnology and Shaping the Future of Food Security

Message from Prof M S Swaminathan, Chairman, M S Swaminathan Research Foundation, prepared for the opening ceremony on 1 March 2010 of the FAO international technical conference on Agricultural Biotechnologies in Developing Countries (ABDC-10).

Demographic explosion, environment pollution, habitat destruction, enlarging ecological footprint, co-existence of widespread hunger and unsustainable life styles, and potential adverse changes in climate all threaten the future of human food, water, health and livelihood security systems. 2010 appears to mark the beginning of uncertain weather patterns and extreme climate behaviour. Events like temperature rise, drought, flood, coastal storms and rise in sea level are likely to present new challenges to the public, professionals and policy makers. Biodiversity has so far served as the feedstock for sustainable food and health security and can play a similar role in the development of climate resilient farming and livelihood systems. Biodiversity is also the feedstock for the biotechnology industry. Unfortunately, genetic erosion and species extinction are now occurring at an accelerated pace due to habitat destruction, alien species invasion and spread of agricultural systems characterized by genetic homogeneity. Genetic homogeneity enhances genetic vulnerability to biotic and abiotic stresses. To generate widespread interest in biodiversity conservation, the UN General Assembly has declared 2010 as the International Year of Biodiversity.

Biodiversity: Feedstock for the Biotechnology Industry:

The Global Convention on Biodiversity (CBD) adopted at the UN Conference on Environment and Development held at Rio de Janeiro in 2002, and the International Treaty on Plant Genetic Resources for Food and Agriculture adopted by Member Nations of FAO in 2001 provide a road map for the conservation and sustainable and equitable use of biodiversity. CBD emphasises that biodiversity occurring within a Nation is the sovereign property of its people. Hence, the primary responsibility for conserving biodiversity, using it sustainably and equitably and preserving it for posterity rests with each Nation. This implies that all Nations should subject development programmes to a **Biodiversity Impact Analysis** in order to ensure that economic advance is not linked to biodiversity loss. Inter-generational equity demands that we must preserve for posterity at least a representative sample of the biodiversity existing in our planet today.

Initiatives like the recognition of Globally Important Agricultural Heritage Systems of FAO and the World Heritage Sites of UNESCO are important to generate interest in the conservation and enrichment of unique biodiversity sites. Particular attention will have to be given to protecting the protected areas through public education and social mobilization, in addition to appropriate regulation. Unfortunately, many of the protected areas, National Parks and Biosphere Reserves are facing serious anthropogenic pressures. Based on the model of the Biosphere Trust for the conservation of the Gulf of Mannar Biosphere Reserve in India developed by the M S Swaminathan Research Foundation (MSSRF), Biosphere Reserves could be jointly managed by local communities and Government departments. The concept of participatory forest management should be extended to national parks and biosphere reserves.

Special attention should be paid to biodiversity hotspots. Through public cooperation, they should be converted into biodiversity “happy spots”, where the sustainable use of biodiversity helps to generate new jobs and income. Coastal biodiversity has not received adequate attention. Mangrove wetlands are under various degrees of degradation. The Joint Mangrove Forest Management procedure developed by MSSRF should be implemented wherever mangrove genetic resources still occur.

Biodiversity conservation and sustainable management should become a national ethic. Government agencies including local self-government authorities like **Panchayats** in India could play an important role in both spreading biodiversity literacy through Community Biodiversity Registers and by creating the necessary infrastructure like Gene and Seed Banks. Awareness of the relationship between biodiversity and human health and farm animal survival should become widespread.

Women play a lead role in biodiversity conservation and sustainable use. Mainstreaming of the gender dimension in all conservation and food security programmes is a must. Women conservers should be enabled to continue their conservation ethos, by providing support for essential infrastructure. Agro-biodiversity is the result of interaction between cultural diversity and biodiversity. An important aspect of cultural diversity is culinary diversity. Every step should be taken to recognize and preserve cultural diversity and to blend traditional wisdom with modern science.

Biodiversity is the feedstock not only for food and health security, but also for the management of climate change induced alterations in temperature, precipitation and sea level. Gene banks for a warming planet have become urgent for promoting climate resilient farming systems. We must preserve for posterity a sample of the existing genetic variability in all ecosystems. In this context, the initiative of the Government of Norway in establishing a Global Seed Vault under permafrost conditions at Svalbard near the North Pole is a significant milestone in humankind's battle against genetic erosion. The Defence Research and Development Organisation (DRDO) of India have also recently established under permafrost conditions at Chang La in the Himalayas a National Gene Bank. The prospects for climate change have added urgency to efforts designed to save every gene and species now existing in our Planet.

Good Biosafety: Prerequisite for Successful Biotechnology Enterprises:

The role of farmers and farming in the mitigation of climate change has not so far been adequately recognized and appreciated. Farmers can help build soil carbon banks and at the same time improve soil fertility through Fertilizer trees. Mangrove forests are very efficient in carbon sequestration. Biogas plants can help to convert methane emissions into energy for the household. Hence, a movement should be started at the global, national and local levels for enabling all farmers with small holdings and a few farm animals to develop a water harvesting pond, plant a few fertilizer trees and establish a biogas plant, in every farm. A farm pond, few fertilizer trees and a biogas plant will make every small farm contribute to climate change mitigation, soil health enhancement and water for a crop life saving irrigation.

As a scholar in Genetics at the Cambridge University during 1950-52, I have followed the growth of molecular genetics from the time Watson and Crick discovered the Double Helix Structure of the DNA Molecule. Molecular genetics has opened up uncommon opportunities for solving chronic problems in agriculture and medicine. While all aspects of biotechnology like micro propagation and food processing are important, the hard core of biotechnology is recombinant DNA technology. We are now able to transfer genes across sexual barriers with precision. Marker assisted selection (MAS) has accelerated the pace of progress of plant breeding. Varieties developed by MAS are permitted for use in organic farming.

We have now entered an era of climate change leading to potential adverse changes in temperature, precipitation and sea level. We need new genes for meeting the challenges of a warming planet. The development of new strains possessing resistance to biotic and abiotic stresses like salinity and drought needs the help of genetic engineering.

While there are no serious conflicts, other than ethical, in the field of medical biotechnology, there are apprehensions of threats to human health and the environment in the case food biotechnology. Therefore, every country should have a National Biotechnology Regulatory Authority, which is autonomous, professionally led and which inspires public, political, professional and media confidence. **“The bottom line of our national agricultural biotechnology policy should be the economic well being of farm families, food security of the nation, health security of the consumer, biosecurity of agriculture and health, protection of the environment and the security of national and international trade in farm commodities”.**

I hope the Biotechnology Conference will provide a road map for maximising the benefits of the new genetics and minimizing potential risks. Biotechnology can help to shape the future of sustainable food security.