



CHAPTER

2

## Global Sustainable—2nd Biotech Congress

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The elucidation of the double-helix structure of the Deoxyribose Nucleic Acid (DNA) molecule in 1953 by Drs. James Watson, Francis Crick, Maurice William and Franklin Rosalind marked the beginning of what is now known as the new genetics. Research during the last 53 years in the fields of molecular genetics and recombinant DNA technology has opened up new opportunities in agriculture, medicine, industry, and environment protection. The ability to move genes across sexual barriers has led to heightened interest in the conservation and sustainable and equitable use of biodiversity, since biodiversity is the feedstock for plant, animal and microbial breeding enterprises.

Considerable advances have been made during the last 25 years in taking advantage of the new genetics in the areas of medical research, production of vaccines, sero-diagnostics and pharmaceuticals for human and farm animal health care. The production of novel bioremediation agents, for example, the development of a new *Pseudomonas* strain for clearing oil spills in oceans, rivers and lakes by Dr. Anand Chakraborty, which incidentally was the first living organism to be granted a patent by the US Supreme Court, is also receiving priority because of increasing environmental and water pollution.

There has also been substantial progress in agriculture, particularly in the area of crop improvement through the use of molecular marker assisted breeding, functional genomics, and recombinant DNA technology. A wide range of crop varieties containing novel genetic combinations are now being cultivated in USA, Canada, China, Argentina and several other countries. A strain of cotton containing the *Bacillus*

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capita availability of arable land and irrigation water and expanding abiotic and biotic stresses. The enlargement of the gene pool with which breeders work will be necessary to meet these challenges. Recombinant DNA technology provides breeders with a powerful tool for enlarging the genetic base of crop varieties and to pyramid genes for a wide range of economically important traits. The safe and responsible use of biotechnology will enlarge our capacity to meet the challenges ahead, including those caused by climate change. At the international level, the Cartagena Protocol on Biosafety provides a framework for risk assessment and aversion. At the national level, there is need for a regulatory mechanism, which inspires public, political and professional confidence.

The Union Ministry of Agriculture set up in May 2003, a Task Force chaired by me, to consider the above issues and offer suggestions on how Indian farm women and men can derive benefit from the new genetics, without taking unacceptable environmental, health and social risks. Agriculture comprising crop and animal husbandary, fisheries, forestry and agro-processing constitutes the backbone of our food, livelihood and ecological security systems. In addition, it is fundamental to national sovereignty and to fighting the famine of jobs. Hence, it will be no exaggeration to say that “if agriculture goes wrong, nothing else will have a chance to go right”. The Task Force, therefore, felt that the bottom line for any biotechnology regulatory policy should be the safety of the environment, the well being of farming families, the ecological and economic sustainability of farming systems, the health and nutrition security of consumers, safeguarding of home and external trade, and the biosecurity of our nation.

Consumers all over the world are concerned with potential health risks associated with GM foods. The nature and extent of concerns vary from country to country, depending upon the confidence the public have in the food and environmental safety regulation systems in place. For example, the Food and Drug Administration (FDA) of the United States attracts greater consumer confidence than the counterpart systems in Europe. The situation in India is similar to that in Europe. Public regard and satisfaction for the regulatory systems currently in place in the field of agricultural biotechnology are, to say the least, low.

In contrast to GM crops, 'life-saving' and 'life-enhancing' GM pharmaceutical products seem to have more ready acceptance. The socio-ethical perspective often defines the public risk perceptions. Bio-ethical norms are as important as biosafety regulations in the case of medical and pharmaceutical biotechnology. The ethical, social, gender equity and economic concerns will have to be considered along with the environmental and health safety aspects. To perform all these tasks in an objective, transparent and trustworthy mode, there is an urgent need for an autonomous, statutory and professionally led National

Biotechnology Regulatory Authority. Such an Authority should be headed by an eminent expert well versed in the science of risk assessment and management, as well as risk communication. The members of such a Biotechnology Regulatory Authority of India should be leading authorities in the areas of environment protection, human and animal health, ethics, gender and social equity and trade and international protocols.

The National Biotechnology Regulatory Authority could have a common chair but two separate wings, one dealing with food and agricultural biotechnology, and the other with medical and pharmaceutical biotechnology. The mandate of our Task Force was confined to agricultural biotechnology, and hence our recommendations relate only to the field of crop and animal husbandry, forestry and fisheries.

The setting up an autonomous, statutory and professionally-led National Biotechnology Regulatory Authority is a must for our country if we are to derive full benefit from this fast growing area of science, including fields like functional genomics, proteomics, bioinformatics and nano-biotechnology, in a safe and responsible manner.

There should be counterpart bodies in all the States and Union Territories to liaise with the proposed National Biotechnology Regulatory Authority. For this purpose, State Governments could set up a Biotechnology Regulatory Advisory Board at the State level, and a Biotechnology Risk Assessment and Communication Committee at the district level (this will be needed only in districts where GM crops are recommended for cultivation). The State Agricultural and Veterinary Universities should be fully involved in all the aspects connected with the evaluation, risk assessment, monitoring and extension advice relating to GMOs at the State, district and village level. They should spearhead a genetic literacy movement in villages, including information on Farmers' Rights under the Protection of Plant Varieties and Farmers' Right Act (2001). Thus, there will be a continuum of communication and common wavelength in understanding benefits and risks from the village to the national level.

Progress in understanding the scientific and environmental issues relating to the safe and responsible use of biotechnology is extremely rapid. Therefore, the regulatory principles and procedures will have to be reviewed periodically by the proposed National Biotechnology Regulatory Authority, so that they are based on advances in scientific knowledge.

The National Biotechnology Regulatory Authority may have an eminent scientist as a common chairperson and two vice chairmen, one dealing with medical and pharmaceutical biotechnology, and the other, with food and agricultural biotechnology. With the emergence of

within the overall framework of biosecurity. This will provide: (i) optimization of scarce human and financial resources, (ii) improving the cohesiveness of advice on all aspects of biosecurity, including biosafety, (iii) recognition of the special importance of biosafety to food and agriculture as well as the special impacts of food and agriculture on biosafety. Further, this will seek the development of appropriate standards, guidelines, and other recommendations for food safety and the protection of plant, animal and aquatic life and health based on risk assessment and taking into account relevant aspects of biosafety, including environmental health. In our country, agricultural biosecurity covering crops, trees, and farm and aquatic animals is of even greater importance since it relates to the livelihood security of nearly 70 per cent of the population, and the food, health, and trade security of the nation.

Our national preparedness and capability in the area of biosecurity are currently issues of widespread concern, following the detection of H5N1 strain of avian influenza virus in a few small pockets in Maharashtra and Gujarat. Biosecurity has wider implications in the areas of biological warfare and bio-terrorism. This area is obviously a matter of serious concern to the National Security Council. In our country, agricultural biosecurity covering crops, trees and farm and aquatic animals is of even greater importance since it relates to the work and income security of 70% of the population, and food security of the nation.

The world is truly becoming a global village with reference to communication and transport. Disease-causing organisms can spread fast through aeroplanes and farm trade. India is also the transitory home for many migratory birds. In a large country like ours, it can be said that the country is becoming a national village with reference to communication, transportation and trade. Therefore, home quarantine assumes as much importance as international quarantine. Border movement of farm goods and animals in the case of neighbouring countries is another area of biosecurity significance.

The National Commission on Farmers undertook a review earlier this year of our present infrastructure and institutional framework in the area of agricultural biosecurity and made recommendations based on such a review that I reproduce below:

We should have in place a National Agricultural Biosecurity System (NABS) to:

- a. safeguard the income and livelihood security of farm and fisher families as well as the food, health and trade security of the nation through effective and integrated surveillance, vigilance, prevention and control mechanisms designed to protect the productivity and safety of crops, farm animals, fishes and forest trees;
- b. enhance national and local level capacity in initiating proactive measures in the areas of monitoring, early warning, education,

research, control and international co-operation, and introduce an integrated biosecurity package comprising regulatory measures, education and social mobilization; and

- c. organize a coordinated National Agricultural Biosecurity Programme on a hub and spokes model with effective home and regional quarantine facilities capable of insulating the major agro-ecological and farming systems zones of the country from invasive alien species of pests, pathogens and weeds.

The NABS should have the following three mutually reinforcing components:

- **National Agricultural Biosecurity Council (NABC):** Chaired by the Union Minister of Agriculture, NABC will serve as a platform for convergence and synergy among the on-going and new programmes of different Ministries and Departments of the Government of India, as well as appropriate international and State Government Agencies and Private Sector Organisations. NABC will serve as an apex policy making and coordinating body and will pay particular attention to strengthening the national capacity in agricultural biosecurity as related to crops, farm animals, forestry and aquatic organisms. The existing infrastructure for sanitary and phytosanitary measures will be reviewed and major gaps filled. Such a multistakeholder apex level NABC would be essential to ensure the livelihood security of nearly 70 crores of our population engaged in agriculture, animal husbandry, fisheries, forestry and agro-processing. While in developed countries, any disaster arising from invasive alien species like H5N1 strain of the Avian Flu may be more of a human health problem, since hardly 2 to 3% of population is engaged in farming. Agriculture is the backbone of the livelihood security system in rural India.
- **National Centre for Agricultural Biosecurity (NCAB):** This National Centre should have four wings dealing with crops, farm animals, living aquatic resources and agriculturally important microorganisms. The major purpose of this centre will be the analysis, aversion and management of risks, as well as the operation of an early warning system. NCAB will maintain databases relating to potential threats to Indian agriculture and human health security from alien invasive species. It will also serve as a watch dog agency helping to initiate proactive action in the case of impending biosecurity threats. NCAB will provide the Secretariat for the National Agricultural Biosecurity Council. Further, it will work on the standardization of surveillance and control methods and help to introduce the latest molecular techniques like micro-arrays for disease diagnosis. NCAB will be largely a virtual organization with considerable capacity in computer aided monitoring and early warning systems. The four different

divisions of NCAB could be located in appropriate existing ICAR Institutes/Agricultural/Animal Husbandry and Fisheries Universities, such as the High Risk Animal Diseases Laboratory of ICAR at Bhopal.

- **National Agricultural Biosecurity Network (NABN):** NCAB will serve as the coordinating and facilitating centre for a National Agricultural Biosecurity Network designed to facilitate scientific partnerships among the many existing institutions in the public, private, academic and civil society sectors engaged in biomonitoring, biosafety, quarantine, and other biosecurity programmes. This will help to maximize the benefits from the already existing scientific expertise and institutional strengths. The National Agricultural Biosecurity Network could have four mini-networks relating to crops and forestry, animals including migratory birds, living aquatic organisms and agriculturally important microbes.

The establishment of a National Biosecurity Council, National Centre for Agricultural Biosecurity and a National Agricultural Biosecurity Network will help us to strengthen considerably our ability to undertake proactive measures to prevent the outbreak of pandemics and the introduction of invasive alien species. Such an Agricultural Biosecurity Compact is an urgent national need since prevention is always better than cure.

### **Agricultural Biosecurity Compact**

Among other areas that require urgent attention from the proposed National Agricultural Biosecurity Council, the following deserve priority:

- a. Review all existing Acts relating to biosecurity and identify and fill gaps in the existing regulatory framework. Based on such a review, develop a National Agricultural Biosecurity Policy for being placed before Parliament and the National Development Council.
- b. Education: Education holds the key to prevent unconscious and ill-informed introductions of invasive alien species. There is need for launching a Biosecurity Literacy Movement in the country. Human resource development is also exceedingly important. A course may be introduced in all Agricultural, Veterinary and Fisheries Universities on Agricultural Biosecurity. This should be done at the basic degree level. A Media Resource Centre should be established by the proposed National Centre for Agricultural Biosecurity to give authentic information to mass media, so that unnecessary panic is not created. The media require authentic and credible information from time to time.
- c. Social Mobilisation: Agricultural Biosecurity should be everybody's business and not merely that of a few government departments or

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identification and verification, derive benefits from our animal genetic resources, and provide needed and timely help to the affected families.

Sustainable biotech involves concurrent attention to ecology, ethics, equity, economics and biosafety and biosecurity. It is, therefore, an interdisciplinary science which needs a new cadre of genome entrepreneurs well versed not only in the technological aspects of biotechnology but also in the social and environmental aspects of the new genetics. Only then, we will be able to convert biodiversity into a tool for biohappiness.