

*Brainstorming Session*  
*on*  
**ROLE OF SCIENCE AND SOCIETY TOWARDS  
PLANT GENETIC RESOURCES MANAGEMENT –  
EMERGING ISSUES**

New Delhi, 7-8 January 2005

**HIGHLIGHTS AND RECOMMENDATIONS**



*Organized by*

**TRUST FOR ADVANCEMENT OF AGRICULTURAL SCIENCES  
NATIONAL ACADEMY OF AGRICULTURAL SCIENCES  
INDIAN SOCIETY OF PLANT GENETIC RESOURCES  
New Delhi**

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## Role of Science and Society Towards Plant Genetic Resources (PGR) Management – Emerging Issues

A two-day brainstorming session on the 'Role of Science and Society Towards Plant Genetic Resources Management - Emerging Issues' was held from 7–8 January 2005 at the Indian Agricultural Research Institute, New Delhi. It was jointly organized by the Trust for Advancement of Agricultural Sciences (TAAS), National Academy of Agricultural Sciences and Indian Society of Plant Genetic Resources. In all, around 80 participants representing various Government Departments, ICAR, SAUs, stakeholders representing academics, NGOs, private sector and farmers, besides representatives of international agricultural research centres, press and media actively participated in the brainstorming meeting.

The focus of the meeting was to deliberate on issues concerning role of science and society towards plant genetic resources management. Plant genetic resources have played an important role in agricultural development. However, changes in land use pattern, increasing population and over-exploitation of natural resources are threatening the existing genetic diversity. In addition, international treaties such as Convention on Biological Diversity (CBD) and the FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) have led to a significant paradigm shift in the ownership issues and exchange of plant genetic resources. These changes have created more complexity regarding management of valuable genetic resources. Measures are urgently needed to ensure proper access to plant genetic resources and commensurate sharing of benefits with the communities and farmers, who contributed significantly towards these resources, while adhering to the principles laid down under the international treaty and CBD. The brainstorming session was, therefore, held to deliberate on these specific concerns and to see what specific role science and society can play to ensure safe conservation and sustainable use of available genetic resources for future benefits to our society.

The details of the sessions and the recommendations emanating from the two-day brainstorming are presented here:

### INAUGURAL SESSION

The inaugural session was chaired by Professor VL Chopra, Member (Agriculture), Planning Commission,

*Inaugural lamp being lighted by  
Dr. M.S. Swaminathan*



whereas the inaugural address was delivered by Professor MS Swaminathan, Chairman, National Commission Farmers on the topic 'Integrating Science and Society Towards Effective Conservation and Utilization of Plant Genetic Resources'. Professor Swaminathan emphasized the importance of plant genetic resources for future sustainability of agriculture and highlighted the role of both science and society in addressing vital issues concerning the management of plant genetic resources for posterity, while providing needed benefits to farming (especially tribal) communities for managing valuable genetic resources.

Three technical sessions were held. These were on:

### **SESSION I: Role of Science in Plant Genetic Resources Management**

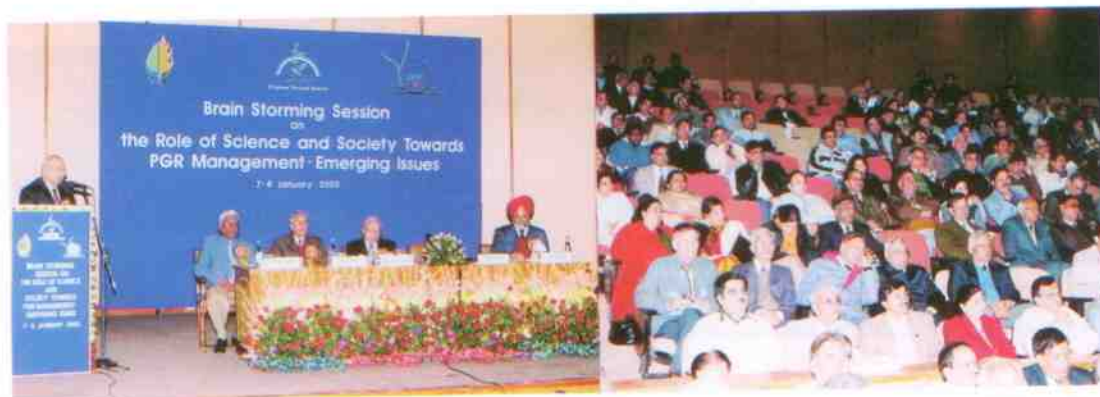
The first technical session was chaired by Professor VL Chopra. Three presentations were made, namely (i) Present and emerging scientific issues in plant genetic resources conservation and utilisation by Dr BS Dhillon, (ii) Advances in biodiversity mapping by Dr PS Roy and (iii) International agreements and legislations: a national perspective by Dr SP Tiwari. Dr PS Ahuja, Dr CLL Gowda and Dr M Anishetty spoke as discussants.

### **SESSION II: Role of Society in Plant Genetic Resources Management: Various Options**

Dr G Kalloo, Deputy Director General (Horticulture and Crop Sciences), ICAR, chaired this session. Three presentations made were: (i) *In situ* conservation by Dr JR Bhatt, (ii) On-farm conservation by Dr MP Upadhyay, and (iii) Client-oriented breeding and on-farm diversity by Dr KD Joshi. Dr DK Ved, Dr NB Singh, Dr RK Singh and Mr Kirit Patel reflected their views as discussants.

### **SESSION III: Capitalising Opportunities Offered by New Regimes**

Professor HK Jain, former Director, IARI chaired this session. There were five presentations, namely (i) Operationalising of benefit sharing mechanisms by Dr P Pushpangadan,



*Dr RS Paroda addressing the audience during the Inaugural Function. Sitting on dais are L to R: Dr S Nagarajan, Professor VL Chopra, Dr MS Swaminathan and Dr BS Dhillon*

(ii) New biotechnological tools and harnessing IPRs by Dr JL Karihaloo, (iii) Reorienting scientific mind set to harness benefits of IPR regime by Dr S Balaravi, (iv) National biodiversity legislation and valuation of biological resources by Dr A Damodaran, and (v) Mechanisms for operationalisation of access to germplasm by Dr CD Mayee. Ms Amarjeet Ahuja, Dr JP Mishra, Dr SP Sharma and Dr Rakesh Arora presented their views as discussants.

All the technical sessions had very open and intensive discussions, reflecting clearly that plant genetic resources management issues have to be addressed on priority and can not be ignored any more in the national interest.

## PLENARY SESSION

The plenary session was chaired by Dr RS Paroda, Chairman, TAAS. The recommendations emanating from different technical sessions were presented by the facilitators, Dr AK Singh (Session I), Dr S Saxena (Session II) and Dr RK Khetarpal (Session III). Based on the discussions and suggestions given by the participants, following important recommendations emerged:

### Scientific Issues

#### Establishment of National Database on Plant Diversity

Around 90 per cent of India's flowering plant diversity is estimated to exist in the forests. These include not only wild and weedy relatives of crop plants but also many species with medicinal properties. A database of national biodiversity on distribution of species and genetic diversity need to be created, under the Ministry of Environment and Forests, using the potential and high-resolution power of remote sensing and GIS. This may be integrated with database on indigenous knowledge to help in conservation/protection of biodiversity rich areas, restoration of fragmented habitats of important species and economic prospecting. This would also facilitate in the identification of specific gaps in plant genetic resources conservation so that pointed collection missions could be mounted on priority.



In relation to agrobiodiversity, inventorisation of available landraces/varieties in the National Agricultural Research System should be the first major step for required gap analysis. This National Database could also serve as a referral point for identification

*Dr MS Swaminathan in conversation with Dr RS Paroda, Dr S Nagarajan, Dr NN Singh, Dr VP Gupta and Dr BS Dhillon*

of stakeholders in conservation and benefit sharing particularly when we start implementing the Protection of Plant Variety and Farmers' Rights Act, 2001 and the Biodiversity Act, 2002. It would also help in restoring appropriate landraces and varieties from areas that are frequently amenable to natural disasters, such as tsunami in the recent past.

#### **Coordinated National Programme for Enhancing Germplasm Evaluation and Utilization**

It is encouraging to note that a large number of accessions have been assembled. However, of these only a few have been used in the breeding programmes. Therefore, there should be greater emphasis on germplasm evaluation to generate information of potential value for the exploitation of landrace diversity, wild and weedy relatives and of the exotic germplasm. The National Bureau for Plant Genetic Resources (NBPGR) alone cannot characterize/evaluate all the germplasm. A national coordinated effort is required by the multi-disciplinary teams of scientists for the characterization, evaluation and appropriate pre-breeding programmes, using biotechnological tools, wherever required. This should be accompanied by molecular characterization and conservation of DNA and genetic material, such as mapping populations, RILs, NILs, mutants, etc. In addition, core collections for important crops need to be developed for effective management and use of available genetic resources. This being a priority issue, it is recommended that a special All-India Coordinated Project on Germplasm Evaluation be initiated with NBPGR providing the facilitation/coordination role.

Breeding for specific adaptations may help in enhanced productivity as well as on-farm diversity. To breed for specific adaptation, indigenous germplasm should be used as one of the parents. This would also provide useful local traits to the varieties developed. Farmers' participation during later stages of evaluation process may be fruitful for identifying appropriate client-oriented products.

There is an urgent need for development of a national information system on crop plant genetic resources with integration of information on passport, evaluation, conservation status, indigenous knowledge etc., to facilitate both protection and rational use of the germplasm.

#### **Developing New Conservation Strategies**

In view of the high energy input for conservation of plant genetic resources as seeds in the gene banks, cost-effective methods of conservation need to be explored. There should be concerted efforts to initiate basic studies on the storage physiology and to revisit the preferred gene bank standards according to the storage potential of various crops. Alternative approaches, such as, ultra-desiccation and storage under permafrost conditions requiring minimal energy also need to be considered. For conservation of perennials and vegetatively propagated materials, alternative methods, such as clonal repositories, *in vitro* conservation and cryopreservation need to be examined and adopted.

## Social Issues

### *In situ* Conservation and Community Participation

The action for conservation of wild and weedy relatives of crop species and most medicinal plant resources has to take place in the forest areas and there is a need to establish a network of *in situ* conservation sites or field gene banks in each bio-geographic region of the country. A network of botanical gardens and seed banks associated to these *in situ* conservation sites, can link these field gene banks to the users. The various regions in the country, which still harbour rich endemic plant diversity, should be recognized by the Ministry of Environment and Forests as gene sanctuaries/genetic resource centres. Mechanisms for maintaining such sites need to be developed, on lines parallel to those of heritage sites.

The areas where rich plant genetic resources for food and agriculture exist, are invariably marginal and associated with lack of development. Farmers and tribals in these areas have conserved these resources not as an institutional concept but more as a compulsion. In some cases, the cultural diversity and rituals have contributed towards their conservation. *In situ* on-farm conservation of the landraces and traditional varieties need to be strengthened in partnership with farmers and the local community. In such areas, the on-going programmes of tribal welfare should also take into consideration agrobiodiversity conservation as one of the important objectives. Various civil society groups working at the grass root level for the welfare of these communities have also to be involved for on-farm conservation and sustainable management of agrobiodiversity.

### Awareness Generation

The major issues related to benefit sharing, rights of communities and farmers, prior informed consent and multilateral system of exchange under ITPGRFA are being discussed in various international and national fora. This has created considerable confusion in the minds of many because of lack of harmonisation. The Department of Agricultural Research and Education/ICAR should constitute a small committee of informed scientists to prepare a status paper summarizing the precise information on decisions which are binding, guidelines which are voluntary and the status of global debates on issues such as access, benefit sharing, prior informed consent etc.

The present level of literacy about various international agreements and national legislations with regard to plant genetic resources is indeed very poor even among the scientific community. There is, therefore, an urgent need to educate the policy makers, planners, science managers, scientists and the general public about the implications of major developments in this field. Multi-pronged strategy needs to be devised in this context for generating awareness at different levels of our society. Policy papers and concept notes will have to be developed and widely distributed. Workshops, seminars and refresher courses will have to be organized involving all stakeholders. The important role of mass media to generate public awareness has to be fully recognised and appreciated.

## Policy Issues

### Strengthening NBPGR as Nodal Organisation

India can take legitimate pride in having established single window system for plant genetic resources through NBPGR. The system needs to be further strengthened and NBPGR fully empowered to deal with exchange of genetic resources in the national interest. In the emerging regimes of intellectual property protection and biotechnology, plant genetic resources will become more important. Hence, NBPGR has to be provided with required facilities and human resources to deal with all emerging challenges in this sector.

### Germplasm Exchange

India has lot of stake in the introduction of exotic germplasm for the enrichment of our genetic resources and for strengthening on-going crop research improvement in different crops. It is imperative that Indian scientists continue getting these new germplasm rather in a free and fair manner. The Biodiversity Act, 2002, which the country has enacted, should facilitate this kind of access. This would be possible only if its operating procedures are considerably simplified and the necessary powers are delegated to the scientists/institutions concerned. The proposed super-structures of various kinds of boards/committees appear to be rather bureaucratic and it becomes all the more important that at operational level there is a great deal of flexibility and decentralization. If India is seen to be restrictive in germplasm exchange, others will reciprocate similarly and in that case our agriculture tends to lose greatly. Much of what India had to offer to the world through plant genetic resources has already been taken away during earlier open-gate policy.

The scope of the material to be designated under the Multilateral System for crops, listed in Annexure 1, of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), requires critical understanding in order to ensure that valuable national plant genetic resources are provided agreed access but at the same time protected from patent regimes elsewhere. Article 12 dealing with facilitated access under the Treaty be also examined in the context of existing national legislations, particularly for the *in situ* genetic variability not yet collected and conserved *ex situ*.

### Streamlining Policy Advisory Measures

The issues concerning agro-biodiversity, particularly in the light of recent national and international developments, cut across the mandate of various ministries and departments. A national level Advisory Committee with representations of the concerned ministries and departments should be constituted to deliberate and provide directions for the development of national policy issues related to various aspects of agro-biodiversity.

### Germplasm Access and Benefit Sharing

The Government of India has enacted the Protection of Plant Variety and Farmers' Rights Act, 2001 and Biodiversity Act, 2002, which shall help us to protect, conserve and utilise



the genetic resources in a sustainable manner. The full benefits can, however, only be realised by the society if these Acts are put to an effective implementation and required Authorities are established at the earliest. The issues to be dealt in future will be highly complex involving controlled access to genetic resources on the one hand and increased utilisation of genetic resources on the other so that maximum benefits can be harnessed for the society and communities. It is, therefore, imperative that there should be least bureaucratisation in implementing the various provisions of these Acts. For this, there is an urgent need to appoint a technocrat to head the proposed Authorities so that facilitated implementation of the provisions is made in the right earnest.

The Biodiversity Act also has a provision for the establishment of a Committee on Agro-biodiversity. This Committee should be set up as early as possible under the chairmanship of Director General, ICAR, and all functions of the National Biodiversity Authority be delegated to this committee, especially relating to agricultural crops.

The efforts for *in situ* conservation can, however, be sustained only if accompanied by appropriate policies that provide commensurate monetary benefits, as well as, non-monetary incentives for individuals and communities. Value-addition and market support for the traditional plant based products would indeed be critical for continued cultivation of these genetic resources. The proposed gene fund (under Protection of Plant Variety and Farmers' Rights Act, 2001) and biodiversity fund (under Biodiversity Act, 2002) could be used to provide such support to the farmers and communities.

#### **Cooperation Between Public and Private Sector**

In the changing environment of plant protection regimes for improved varieties, genes, gene constructs and protocols, it has become imperative that public and private sector institutions work in close harmony. In the absence of this kind of collaboration, India will lag behind in making full use of biotechnology and plant genetic resources. In this context, there is a great need to strengthen the laboratory and field infrastructure in modern biotechnology both in ICAR/SAUs as well as in the private sector. DNA Fingerprinting will become the tool of choice for characterization of improved varieties as well as plant genetic resources in general. This fact needs to be recognised and appreciated for needed support.