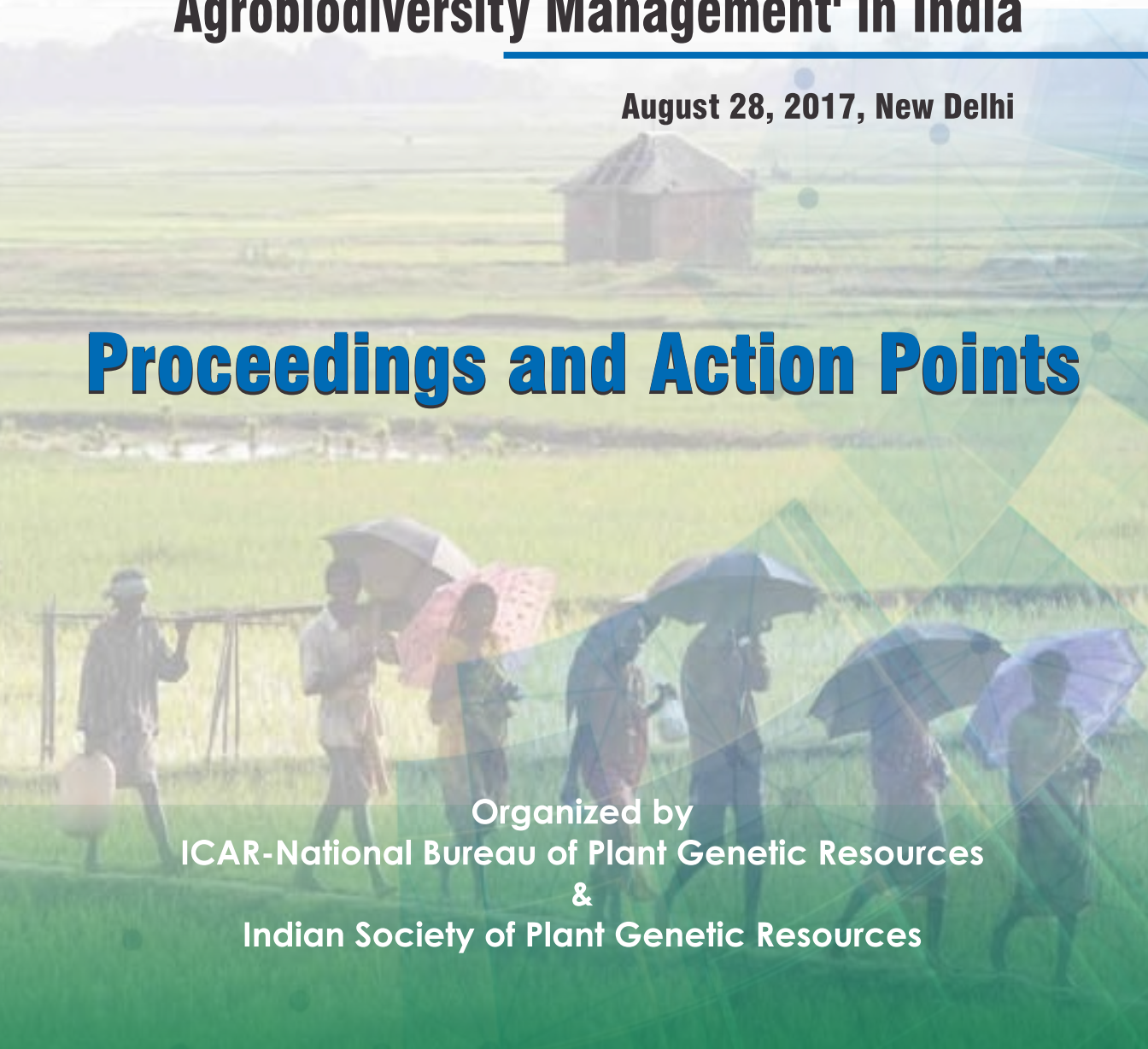
Brainstorming Meeting on

Strategies for Implementation of 'Delhi Declaration for Agrobiodiversity Management' in India

August 28, 2017, New Delhi

Proceedings and Action Points



Organized by

ICAR-National Bureau of Plant Genetic Resources

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CONTENTS

PREFACE

A brainstorming meeting on **Strategies for Implementation of 'Delhi Declaration on Agrobiodiversity Management' in India** was held at the NAAS Lecture Hall, National Agriculture Science Centre (NASC) Complex, New Delhi, on August 28, 2017. The meeting was co-hosted by the Indian Council of Agricultural Research (ICAR), ICAR-National Bureau of Plant Genetic Resources (NBPGR) and Indian Society of Plant Genetic Resources (ISPGR), in collaboration with Bioversity International, Trust for Advancement of Agricultural Science (TAAS), Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA) and Indian Society of Genetics and Plant Breeding (ISGPB). The objective was to chalk out a plan for effective implementation of the 12-point **Delhi Declaration on Agrobiodiversity Management**, adopted by the **1st International Agrobiodiversity Congress (IAC 2016)**, an event co-organized by ISPGR and Bioversity International.

The brainstorming meeting was attended by 97 participants belonging to ICAR institutes, NBA, PPV&FRA, State Biodiversity Boards, CGIAR centers and experts from various fields of agrobiodiversity management. This document summarises the deliberations of the meeting and more importantly comprises of the proposed action plan for management of genetic resources of different commodities (plants, animals, fish, insects and microbes) keeping in view the key issues, ongoing activities and perceived gaps in various domains. The follow-up action on Delhi Declaration is expected to draw the roadmap for genetic resources management in India to achieve the Sustainable Development Goals and Aichi target.

The organizers are very grateful to Dr T. Mohapatra, Secretary, Department of Agricultural Research and Education (DARE) & Director General, Indian Council of Agricultural Research and Dr R.S. Paroda, President (ISPGR) and Chairman (TAAS) for Co-Chairing the meeting and providing the necessary guidance.The success of the meeting was due to enormous support provided by distinguished experts including Drs B. Meenakumari (Chairperson, NBA), A.K. Srivastava (Chairman, ASRB), R.B. Singh (Chancellor, CAU, Imphal), R.S. Rana (Member, NBA), J.S. Sandhu (President, ISG&PB), R.C. Agrawal (Registrar General of PPV&FRA), N.K. Krishna Kumar (Bioversity International), Arabinda Kumar Padhee (ICRISAT), Sukhwinder Singh (CIMMYT) and Mr Ajay Vir Jakhar (Chairman, Bharat Krishak Samaj). Special thanks are accorded to Directors of the five Genetic Resources Bureaux of ICAR (Drs Kuldeep Singh, Arjava Sharma, Kuldeep Lal, Anil Saxena and Chandish Ballal), for their very critical inputs during the meeting as well as in preparing action points.

We thank all the members of the various sub-committees of this Brainstorming Meeting for their immense contributions in smooth conduct of the event. Special thanks to Drs Kavita Gupta, Rakesh Bhardwaj, Sherry Rachel Jacob, Era Vaidya Malhotra and Rajeev Gambir for their inputs as rapporteurs of various sessions. We are grateful for the excellent support provided by staff of NBPGR, ISPGR, TAAS and NAAS in technical and logistic matters. Financial support received from ISPGR, TAAS, PPV&FRA and Bioversity International is sincerely acknowledged. Finally, we thank all dignitaries and delegates who participated in the meeting.

By developing the action plan, it is hoped that future programs and projects on agrobiodiversity management will get prioritized and streamlined. We expect this to serve as a reference document to various stakeholders for shaping the policy, guidelines and procedures related to genetic resource management.

Editors

ACRONYMS

ABindex	Agrobiodiversity Index
ABS	Access and Benefit Sharing
ABT	Aichi Biodiversity Targets
ADG	Assistant Director General
AICRP	All India Coordinated Research Project
AnGR	Animal Genetic Resources
APAARI	Asia Pacific Association of Agricultural Research Institutes
AqGR	Aquatic Genetic Resources
ASRB	Agricultural Scientists' Recruitment Board
BDA	Biological Diversity Act, 2002
BKS	Bharat Krishak Samaj
CAU	Central Agricultural University
CBD	Convention on Biological Diversity
CEBPOL	Centre for Biodiversity Policy & Law
CGIAR	Consultative Group of International Agricultural Research
CGRFA	Commission on Genetic Resources for Food and Agriculture
CIMMYT	International Maize and Wheat Improvement Centre
CSR	Corporate Social Responsibility
CWR	Crop Wild Relatives
DARE	Department of Agricultural Research and Education
DBT	Department of Biotechnology
DUS	Distinctness, Uniformity and Stability
FAO	Food and Agriculture Organization of the United Nations
FGR	Fish Genetic Resources
FRI	Forest Research Institute
GCDT	Global Crop Diversity Trust
GRFA	Genetic Resources for Food and Agriculture
GIS	Geographic Information System
IAC 2016	Ist International Agrobiodiversity Congress, Nov 6-9, 2016, New Delhi
ICAR	Indian Council of Agricultural Research
ICRAF	International Council for Research in Agroforestry
ICRISAT	International Centre for Research in Semi-arid Tropics
IPR	Intellectual Property Right
IPTM	Intellectual Property & Technology Management
ISGPB	Indian Society of Genetics and Plant Breeding

ISPGR	Indian Society of Plant Genetic Resources
InGR	Insect Genetic Resources
ITK	Indigenous Technical Knowledge
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
MGMG	*Mera Gaon Mera Gaurav*
MiGR	Microbial Genetic Resources
MoEF&CC	Ministry of Environment, Forest and Climate Change, Government of India
MTA	Material Transfer Agreement
NAAS	National Academy of Agricultural Sciences
NARS	National Agricultural Research System
NBA	National Biodiversity Authority
NBT	National Biodiversity Targets
NBAGR	National Bureau of Animal Genetic Resources
NBAIM	National Bureau of Agriculturally Important Microorganisms
NBAIR	National Bureau of Agricultural Insect Resources
NBFGR	National Bureau of Fish Genetic Resources
NBPGR	National Bureau of Plant Genetic Resources
NGOs	Non-Governmental Organizations
NP-ABS	Nagoya Protocol on Access and Benefit Sharing
PME	Research priority setting, monitoring and evaluation
PAU	Punjab Agricultural University
PGR	Plant Genetic Resources
PGRFA	Plant Genetic Resources for Food and Agriculture
PPV&FRA	Protection of Plant Varieties and Farmers' Rights Act, 2001 Protection of Plant Varieties and Farmers' Rights Authority, New Delhi
QTL	Quantitative Trait Loci
R&D	Research and Development
SAARC	South Asian Association for Regional Cooperation
SAUs	State Agricultural Universities
SBB	State Biodiversity Board
SDGs	Sustainable Development Goals
SeeD	Seeds of Discovery
SMTA	Standard Material Transfer Agreement
SNP	Single Nucleotide Polymorphism
TAAS	Trust for Advancement of Agricultural Sciences
TRIPs	Trade Related Intellectual Property Right
UBB	Uttarakhand Biodiversity Board
WFCC	World Federation of Culture Collection

1. CONTEXT OF THE BRAINSTORMING MEETING

A 12-point **Delhi Declaration on Agrobiodiversity Management** (hereafter referred to as *Delhi Declaration*, text provided in Annexure 1) was adopted by the participants of the **1st International Agrobiodiversity Congress (IAC 2016)**[1] as a roadmap for conservation and utilization of genetic resources to achieve Sustainable Development Goals (SDGs)[2] and Aichi Biodiversity Targets (ABT)[3].

The IAC 2016 was inaugurated by Shri Narendra Modi, Hon'ble Prime Minister of India. The *Delhi Declaration* advocates developing a shared vision of sustainable use of agrobiodiversity, employing every modern technology for trait discovery in genetic resources, and investment by public and private sectors in agrobiodiversity utilization. The *Delhi Declaration* demands promotion of complementary conservation strategies, recognition of the importance of traditional knowledge, and harmonization of biosecurity system. It also reiterates necessity of global exchange of genetic resources using bilateral and multilateral instruments, organizing public awareness programs as well as capacity building of researchers in managing and using genetic resources across commodity domain.

The *Delhi Declaration* drew attention of the Government of India for its significance and relevance to strengthen ongoing programs on agrobiodiversity management. The Indian Council of Agricultural Research (ICAR) has initiated to draw strategies for its implementation through its institutes, particularly all the five Bureaux (NBPGR, New Delhi; NBAGR, Karnal; NBFGR, Lucknow; NBAIM, Mau; NBAIR, Bengaluru) which are managing diverse genetic resources. The uniqueness of IAC 2016 was that it brought researchers and stakeholders involved in genetic resources of plants, animals, fishes, insects and microbes related to food and agriculture together, for the first time. This has catalyzed in developing a holistic approach of management of genetic resources for food and agriculture (GRFA), with sharing of experiences.

Objective of the Brainstorming Meeting

The Brainstorming meeting was proposed to deliberate on the issues highlighted in the *Delhi Declaration*, and to develop an action plan/roadmap for its effective implementation through National Bureaux of ICAR to meet the SDGs. The areas specially targeted were research, capacity building, enhanced use, policy issues and public awareness with respect to GRFA.

[1] *https//ispgr.nbpgr.ernet.in/IAC*
[2] *https://sustainabledevelopment.un.org/sdgs*
[3] *https://www.cbd.int/sp/targets/*

2. INAUGURAL SESSION

Dr RS Paroda (Chairman, TAAS and President, ISPGR), Dr Meena Kumari (Chairperson, NBA) and Dr RB Singh (Chancellor, CAU) graced the occasion. Scientists from genetic resources bureaux of ICAR, NBA, PPV&FRA, Bioversity International, CIMMYT, ICRAF, ICRISAT along with domain experts and farmers' representative participated in the session.

Dr Kuldeep Singh, Director, ICAR-NBPGR, welcomed the delegates and underscored the significance attached to *Delhi Declaration* by the Government of India.

Dr RS Paroda, in his opening remarks, emphasized the urgent need for implementation of *Delhi Declaration*. The major points he stressed upon were enhanced utilization of crop wild relatives (CWRs), effective characterization and documentation of conserved germplasm, arresting agrobiodiversity erosion by giving high priority to species present in the biodiversity hotspots, streamlining of germplasm exchange within the purview of national interests, pro-active efforts for providing holistic support to marginal farmers involved in PGR activities and development of National Gene Fund. He called for the need to utilize the existing legal framework for access and benefit sharing including public private partnership, and having a shared vision for agrobiodiversity management. He concluded with a recommendation to work out specific action plans at institutional level.

Dr B Meenakumari, drew attention on the synergies of BDA and *Delhi Declaration* in achieving SDGs through conservation, sustainable use and access and benefit sharing. She stated that out of the 20 Aichi Targets (that have been subsequently synthesized as the 12 National Biodiversity Targets) three targets (5, 7 and 11) are already in line with the Delhi Declaration.

Dr Sunil Archak, ICAR-NBPGR, highlighted the unique position of *Delhi Declaration* in comparison to such previous documents in terms of addressing agrobiodiversity as a whole. He drew attention of the participants to the fact that *Delhi Declaration* must be viewed as a great opportunity rather than a fresh set of targets themselves, and its role in guiding stakeholders to achieve the SDGs, Aichi Targets and National Biodiversity Targets. He pointed out that strategies to implement *Delhi Declaration* will have to balance frontier technologies with indigenous traditional knowledge, comprehensive conservation strategies with ecosystem services, public with private participation, enhanced germplasm exchange with robust biosecurity and quarantine system, capacity building programs with establishing Agrobiodiversity Index.


R.B. SINGH
R.S. PARODA
B. MEENAKUMARI
A.K. SRIVASTAVA
Reserved

3. TECHNICAL PRESENTATIONS

Dr Kuldeep Singh, informed that the ongoing activities of ICAR-NBPGR were in line with the *Delhi Declaration* recommendations on conservation, characterization, exchange and quarantine, whereas programs on use of frontier technologies in enhancing PGR utilization required strengthening. He proposed that by launching programs on mainstreaming landraces and CWRs in crop breeding will address *Delhi Declaration* recommendations. This would be achieved by improving nutrient content and quality of crop germplasm, training womenfolk in modern agriculture, climate resilience and conserving traditional knowledge. He said that ICAR-NBPGR can develop models of on-farm agrobiodiversity conservation, but implementation required coordinated work with NBA and PPV&FRA. He emphasized that NARS system was lagging behind in development of Agrobiodiversity Index, with special emphasis on hot spots (point 8) and public-private partnership initiatives (point 9) of *Delhi Declaration*.

Dr Arjava Sharma, Director, ICAR-NBAGR, Karnal, informed the house that out of 14 animal species used world over for human food, 12 are found in India. He stressed on the fact that indigenous population of AnGR is reducing and requires serious push for conservation. He also highlighted the need of a clear legal mechanism for global exchange of AnGRs.

Dr. Kuldeep Lal, Director, ICAR-NBFGR, Lucknow, highlighted the shortage of trained taxonomists and curators. He further emphasized the need to study evolutionary aspects of aqatic genetic resources (AqGR) in Indian context, stressing that there is a need of investment in phenology. He also spoke about the importance of aquaculture and how it is growing consistently over the last two decades, stating that only three indigenous species are contributing to production in spite of the vast diversity of fish available, which still lie as an untapped resource.

Dr. Anil K Saxena, Director, ICAR-NBAIM, Mau, emphasized the need for work on taxonomy and bio-systematics using latest scientific tools. He suggested that policy changes are needed for facilitating exchange and ABS in line with Aichi Targets, Nagoya Protocol and *Delhi Declaration*.He further emphasized the limitation faced by the NBAIM as 'type strains' deposited in Indian cultures are not recognized as valid deposits for publication since they are not available to researchers abroad. He also highlighted a few gaps, such as foreign culture collections refuse to accept microbial cultures of Indian origin as in India, Nagoya Protocol is not followed fully. He suggested actions on promoting the use of low-cost microbe based formulation; microbe-based reclamation of problem and degraded soils; screening of microalgae for nutritional quality, food grade pigments and bio-energy production; conservation of unique habitats with rare microbes; fail-safe deposit of core collection of agriculturally important microorganisms in permafrost; omics-based studies of microbiome community in different agro-climatic zones of India; functional metagenomics for next generation enzymes, antibiotics and anti microbials; and development of indicator microorganisms for soil fertility, degraded soils and pesticide residue.

Dr Chandish R Ballal, Director, ICAR-NBAIR, Bengaluru, informed that NBAIR houses the largest live insect repository in Asia, which is actively supplying parasitoids, predators, host insects and insect derived resources to different indentors. Action points suggested by her included: collection of traditional methods of pest management and utilization of insects as food and feed; local names of insects and associated knowledge in different states; developing *in situ* and *ex situ* conservation strategies and characterization of insect genetic resources; nano-technological approaches in pheromone technology; computation tools for identifying potential molecules for pest management; global exchange of insect genetic resources; preparation of electronic databases, pamphlets, brochures (in local languages) and short documentaries for creating public awareness.

Dr RC Agrawal, Registrar General, PPV&FR Authority, spoke of how PPV&FR Act (2001) has supported farmers and breeders in registering varieties. He also informed about the status of gene fund. Dr RS Paroda suggested that PPV&FR Authrority should use gene fund in supporting the farmers who are conserving the traditional crops and landraces. He also emphasized the urgency for registering all notified public varieties.

Dr NK Krishna Kumar, Regional Coordinator, Bioversity International, conveyed that *Delhi Declaration* is universally accepted and developing an Agrobiodiversity Index (ABindex) is a global necessity. He suggested that ABindex should not be limited to political boundaries and ABindexing can be split to several components such as soil, PGR, AqGr, AnGR, InGR, MiGR and shall be based on agro-ecosystem based approach. He proposed that Sustainability Index should be developed.

Dr RB Singh, Vice Chanellor, CAU, Imphal, emphasized on harnessing of agrobiodiversity to develop the New India free from malnutrition. He stressed on the need to check erosion of AnGRs due to wrong policy in animal breeding. He also highlighted the important issue of science being sidelined and its intervention getting blocked by the ill-informed communities. He suggested declaring North East India as Natural Economy Zone.

4. BRAINSTORMING SESSION

Dr RS Rana, Member, NBA, Chennai, suggested that (i) National Biodiversity Target 7 needs to be executed by assigning specific responsibility to institutions; (ii) efforts should be made to map genebank accessions on agro-ecological regions; (iii) On-farm conservation, being a very complex activity, needs to be undertaken by involving all relevant stakeholders like central and state institutions; (iv) possibilities to be explored to award custodial rights to local communities who have developed and are maintaining native breeds.

Dr JS Sandhu, President, ISGPB, Delhi,suggested that all scientific societies in India be made a part of the deliberations pertaining to *Delhi Declaration*. **Dr PK Chakrabarty,** ADG (Plant Protection) ICAR, stressed on taxonomic studies for PGR management. **Dr AK Srivastava,** Chairman ASRB, Delhi, emphasized that indigenous animal breeds need to be characterized and conserved on priority. Policy guidelines for livestock exchange need to be developed and focus given on capacity building for enhanced use of animal genetic resources.

Mr Ajay Vir Jakhar, Chairman, Bharat Krishak Samaj, underscored the fact that monoculture practiced extensively in India since green revolution, is the root cause for loss of genetic diversity. Although biodiversity should be linked with sustainability, they are inversely proportional to each other. He suggested to develop region-specific Agrobiodiversity Index and notify specific areas in each village based on cropping intensity and protect it from any form of human interference.

Dr Arabinda Kumar Padhee, Director, Country Relations and Business Affairs, ICRISAT, New Delhi, emphasized that it is imperative to involve state and local agencies for any agrobiodiversity related action plan to be successful. **Dr Sukhwinder Singh,** Senior Scientist, Seeds of Discovery Team, CIMMYT, Mexico, suggested that utilization of genebank accessions to suit farmers' needs should guide the strategies and actions. Use of CWR and chalking out a clear roadmap for use of genebank accessions are a must to promote the utilization of trait specific germplasm amongst breeders.

Dr Pratibha Brahmi, Principal Scientist, ICAR-NBPGR, drew attention to the need for promoting establishment of water harvesting in every institutional farm and planting of non–crop species as pollinator attractants.

5. CONCLUDING SESSION

Dr RS Paroda, in his closing remarks, again emphasized the importance of implementation of the *Delhi Declaration* to achieve the SDGs. He suggested that work should be taken up on the following aspects:

1. Breeding efforts using conserved germplasm should be accelerated.

2. Efforts need to be made to ensure minimal loss of genetic variability.

3. There needs to be more coordination and convergence among the different institutes dealing with biodiversity. For this purpose the Board of Agrobiodiversity may be reconstituted.

4. Efforts may be made to capitalize on the available biodiversity in the face of global climate change.

5. The taxonomic impediments for germplasm conservation and characterization need to be addressed on priority.

Dr T Mohapatra listed specific points as below:

1. A committee, involving stakeholders from all sectors, shall be constituted to spearhead activities to achieve the *Delhi Declaration*. Each recommendation in the Declaration may be dissected and addressed in detail by the committee. An action plan may then be devised to achieve each target. The committee may meet every six months to review the progress made. The committee may come up with a comprehensive action plan, with a time line for achieving each of the set goals. The roles of different institutions and departments may also be clearly identified so that specific actions may be taken up in a strategic manner.

2. Efforts for trait discovery in the existing germplasm need to be accelerated.

3. There is an urgent need to look for additional funding support for conservation activities. For this public private partnership models may be explored.

The session ended with vote of thanks by **Dr RK Tyagi**, General Secretary, ISPGR.

6. ACTION POINTS ON *DELHI DECLARATION*

All the five Genetic Resources Bureaux of ICAR have been carrying out several activities suggested in the *Delhi Declaration*. However, helps prioritize and strengthen the core activities (*Delhi Declaration*). Following key areas were identified:

1. Research projects to focus on enhancing nutritional security through the use of genetic resources.
2. Generate Biodiversity Index; work on genebank enrichment index; utilization index etc.
3. Outreach programs (e.g. farmers' days, agrobiodiversity day, farmer first, MGMG, etc.) and trainings to focus on women conserver/farmer participation.
4. Awareness programs on agrobiodiversity focusing school children, civil society, etc.; among breeders and other researchers regarding MTA; popularize agrobiodiversity as an option of CSR.
5. Work with global agencies in terms of capacity building for researchers from Africa, Central Asia, SAARC, etc.
6. Inventorize ITK related to genetic resources; publish and make these available to all stakeholders to increase recognition of the custodians.
7. Focus on *in situ* on-farm conservation and scientific studies on different crops; making native people partners of conservation efforts and greater engagement with farmers.
8. Specific allocation of funds like Tribal Support Project and North East to focus on community-based seed bank efforts.
9. Modernization of genebanks for reducing environmental impact and cost, and increase efficiency.
10. Focus on CWRs for collection, conservation and pre-breeding; establishing facilities for maintenance of CWRs.
11. Use of genomics, space, computational and nano-technology in basic and strategic research proposals to add value to genetic resources and to enhance their utilization.
12. Increase germplasm exchange through collaborative research projects.
13. Efficient documentation and implementation of ABS as and when necessary.
14. Enhanced research back-up on quarantine activities

Based on the (i) technical presentations of the Directors of Genetic Resource Bureaux; (ii) ensuing discussion during the brainstorming session and (iii) recommendations of the DG (ICAR), the five Genetic Resource Bureaux have identified **key issues** with respect to each recommendation of the *Delhi Declaration*, listed the **ongoing activity** and **perceived gaps** against each of those issues and have **Proposed Action Plans** to implement the *Delhi Declaration*, which have been summarized for each genetic resource in the ensuing tables.

PGR: Plant Genetic Resourse; AnGR: Animal Genetic Resources; FGR: Fish Genetic Resourse; MiGR: Microbial Genetic Resources; InGR: Insect Genetic Resources

Delhi Declaration 1: We call upon nations to accord top priority to the shared vision of agrobiodiversity conservation and sustainable use towards achieving the Sustainable Development Goals (SDGs) and the Aichi Targets of the Convention on Biological Diversity addressing poverty alleviation, food, nutritional and health security, gender equity and global partnership.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Conserve genepool (Aichi13, NBT7)	*Ex situ* conservation of >0.4 million accessions	• Inadequate representation of CWR in genebank • Perennial horticultural germplasm	• Targeted collecting and conservation of CWR from hotspots • Strengthening networking with horticultural institutes and SAUs
Mainstreaming biodiversity (Aichi2, NBT2)	Germplasm characterization	Poor utilization of native germplasm	Mainstreaming landraces in breeding programs
Enhance resilience (Aichi15)	Germplasm characterization	Identification of trait specific germplasm	Focused identification of germplasm tolerant to moisture stress in select crops
Reduce invasive species (Aichi9, NBT4)	Plant quarantine activities	Need to enhance technologies and scale	Development and use of novel technologies for identification and salvage
AnGR			
Characterization and documentation of Farm AnGR	Phenotypic and genetic characterization along with documentation of AnGR	About 55% population is still non-described/ non-documented	• Characterization and documentation of AnGR by targeting 30% region of the country by 2022 • Registering 50 new indigenous breeds/ strains of livestock and poultry by 2022
Identification and evaluation of pharmaceutical and nutritional properties of biomolecules in animal produces/products	• Assessing health implication of A2 milk • Biochemical and quality evaluation of milk and meat from farm animals	Nutraceutical properties of milk and meat of specific livestock breeds	• Assessing therapeutic properties of milk and milk products of different species • Research on value addition of animal produces
Branding of indigenous animal produces and products and developing niche market	Increasing awareness about A2 milk of indigenous cow	Less awareness about useful properties of products from indigenous AnGR	• More awareness programs among stakeholders • Suggestive policies for developing livestock herds with characteristics products
FGR			
Harmonizing research and policies between nations sharing water and	No specific policy initiative or funding mechanism in place		

Key issues	Ongoing activity	Perceived gap	Proposed action plan
genepools, in the following areas			
Documentation of resources and genetic diversity in complete native distribution of the common species	NBFGR conduct research on prioritized species for documenting genetic diversity	Complete picture does not become available on genetic diversity, phytogeography as research is not undertaken across the whole native distribution of the species	Opportunities for research and documentation of research with common operating practices, for common prioritized species
Introduction of exotic fish species, policies and regulations	India has mechanism for risk assessment allowing introduction of exotic fishes and thereafter imports	Introduction in other countries without risk assessment mechanism, add risk of invasive species in India, as unauthorized species find way through porous borders/ escape to rivers	Need for joint mechanism for genetic resources management and conservation between the countries sharing waters
Access to indigenous genetic resources	Biological Diversity Act 2002 implemented in India	Access to a common genetic resource by a third country from next to India geographical locality, for commercial gain will reduce impact of BDA in India	
• Science driven conservation and utilization strategies and plans	Ongoing programs in India, NBFGR and other aquaculture institutes		
MGR			
Agrodiversity conservation	Survey tours are regularly conducted to collect water and soil samples for isolation and conservation of microbial diversity	Many extreme environments and hot spots of agrodiversity are still to be surveyed and microbial diversity to be identified and conserved	Exploration and conservation of microbes isolated from different unexplored niches of the country.
Food, nutritional and health security	• Validating microbial technologies helpful for maintaining soil health and soil biological diversity through reduction in chemical inputs. • Several microbe based agro-inputs have been developed	• Multi location field testing of the microbe based technologies developed. • Popularization of technologies for its greater utilization. • Identification of microorganisms to be used for reclamation of	• Promoting utilization of the low-cost microbe based formulation by farmers for enhancing crop productivity as well as soil health for maintaining long-term sustainability • Improving nutrient use efficiency through microbial interventions for sustainable crop production and maintenance of soil health

Key issues	Ongoing activity	Perceived gap	Proposed action plan
	and has been successfully validated like biofertilizers viz; Bio NPK, BioPhos, Biophos^{+}, BioZinc, BioPotash etc. • Validation of microbial consortium for alleviation of salinity and drought stress • Improving nutrient use efficiency through microbial interventions for sustainable crop production and maintenance of soil health • Microbial genetic resource management for combating biotic stress in the changing climate scenario	problem and degraded soils	• Microbial genetic resource management for combating abiotic and biotic stress in the changing climate scenario • Reclamation of problem and degraded soils by utilization of microorganism • Screening of microalgae for nutritional quality, food grade pigments and bio-energy production (Project mode). • Microbe based technologies for biofortification of crops and fruits/seeds with Fe, Zn, Se and other micronutrients that help improvement of human health (Project mode)
InGR			
Conservation of native pollinators (*Apis* and non *Apis*)	Documentation of pollinators foraging flora	Inadequate documentation of potential non-Apis pollinator species in hotspot areas	• Documentation of potential non-Apis pollinator species • Conservation and augmentation of off-season flora • Preparation of region specific floral calendars • Optimization of pollinator requirement for major crops
Conservation of natural enemies	Documentation of parasitoids, predators and microbials	• Lack of studies on conservation methods like push pull strategy • Lack of studies on natural enemies fauna in chemical intensive cultivation	• Identification and utilization of banker plants • Intensified studies on push pull strategy and other conservation methods to enhance the efficiency of natural enemies
Reduce invasive species	• Identification of indigenous natural enemies against introduced insect pests • Suppression of invasives through conservation of indigenous natural enemies	• Lack of awareness on utilization of potential natural enemies • Lack of knowledge on Identification of the species and augmentation technologies	Identification and conservation strategies for natural enemies to combat invasive pest species

Delhi Declaration 2 : We recognize the importance of traditional agrobiodiversity knowledge available with farm men and women, pastoralists, tribal and rural communities and its central role in the conservation and use for a food secure and climate resilient world. We, therefore, call upon countries to develop the necessary legal, institutional and funding mechanisms to catalyze their active participation.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Respect and conserve traditional knowledge (AICHI18 and NBT11)	Germplasm collecting is accompanied by recording traditional knowledge	Compilation and validation of crop-biodiversity related traditional knowledge	Extensive compilation and selective validation of available traditional knowledge related to crop germplasm
AnGR			
ITKs related to management of AnGR	Documentation of ITK regarding AnGR management	• Less documentation of ITK on Animal husbandry in tribal and remote areas • No database available for ITK in animal husbandry	Documenting and developing database of ITKs related to livestock management in country
Access and benefit sharing among breeders	Developing ABS protocols for Ongole, Gir and Kankrej breeders	Lack of ABS policy	Formulating ABS policy for communities rearing AnGR
Acts and regulations	Breed registration through ICAR committee	• Constitutional validity of Breed registration and Gazette notification of registered breeds • Lack of acts/legislation for indigenous breeds/ keepers right	• Formulating suitable draft for legislation acts about - Protection of Animal Breeds - Animal Keeper's rights - Pasture protection • Providing constitutional validity of Breed registration and Gazette notification
MGR			
Use of traditional microbial diversity knowledge in the conservation and use for food secure and climate resilient world	There is no ongoing activity in this area	No attempts have been made to collect information on traditional microbial diversity knowledge	• Collection of traditional knowledge for enhancing soil fertility, productivity and antimicrobial activity • Collection and conservation of microbial accessions from different traditional fermented food and beverages • Cataloging of indigenous probiotic microbes from traditionally consumed food products for health benefits

Key issues	Ongoing activity	Perceived gap	Proposed action plan
InGR			
Apiculture/Sericulture/Lac insect	Support to tribals and rural communities to enable sustainable utilization of these insect resources	• Non availability of adequate number of quality nucleus bee colonies • Over reliance on European bee neglecting the native Indian honey bee • Erosion in area under apiculture, sericulture and lac culture • Poor remuneration for produce from these resources	• Capacity building and provision of initial colonies and kits • Production of quality nucleus bee colonies • Identification of vulnerable areas for protection • Provision of low cost input
Insects as food and feed	Development of production protocols for insect resources to be used as fish and poultry feed	• Lack of awareness • Lack of information on insect species suitable as food	• Identification and documentation of insect species suitable for food and feed • Documentation of ITKs related to entomophagy

Delhi Declaration 3: We urge researchers and the policymakers to initiate, strengthen and promote complementary strategies to conserve agrobiodiversity through use, including greater emphasis on using crop wild relatives. We call for them to ensure a continuum between *ex situ, in situ*, on-farm, community based and other conservation methods with much greater and equal emphasis.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Genetic diversity of cultivated plants and their wild relatives is maintained Strategies developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity (NBT7 and AICHI13)	India has strong ex situ collection and conservation programs (>4 lakh accessions including CWR)	In situ and on farm strategies	Develop novel in situ and on farm strategies in a program mode (e.g. GEF project) with collaborating agencies like NBA and PPV&FRA
AnGR			
Genetic improvement and conservation of AnGR	• Conservation of breeds through ICAR National Project. • Breeding plans and Policy planning for AnGR	Conservation of less utilized indigenous breeds	• Genetic improvement *vis-à-vis*conservation of less utilized indigenous breeds • Creating livestock farms in native tract as in-situ conservation centres • Developing models for in situ conservation of indigenous farm animals
Participation of Breed societies and stakeholders	• Facilitating formation of breed societies • Conducting awareness programs through societies	Societies for few breeds only	Facilitating formation of more breed societies for sustainable utilization, conservation and improvement of breeds for upliftment of livestock keepers
National Animal Germplasm Repository	Cryoconservation of germplasm at National Genebank and Semen Freezing Stations	• Unavailability of germplasm for some breeds and livestock species	• Strengthening National Genebank • Creating zonal repositories and their networking • Enhancing capacity for embryo cryopreservation (for endangered breeds)
FGR			
Characterization and evaluation of prioritized cultivable species	• Characterisation of intra-specific diversity using molecular markers;	• Spatial and temporal changes in the diversity pattern of the	Initiated on-farm evaluation of new discovered species, with culture potential,

Key issues	Ongoing activity	Perceived gap	Proposed action plan
and their wild relatives for sustainable aquaculture	done for 26 species. • Explored fish genetic resources validated for systematics involving molecular markers and discovered new fish species.	genetic resources for decision on status and decline of wild populations, or specific genetic stock declining. • On-farm evaluation of genetic stocks of important species, to discover better performers at individual or subpopulation level. • To discover adaptations to stress/ trait specific germplasm. • Linking *ex-situ,* on farm *in-situ* conservation, for community based livelihood improvement. • Specific protocols for fish germplasm evaluation	genetic stocks from different agroclimatic condition through network of live germplasm centres of prioritised indigenous fish species
MGR			
Complementary strategies to conserve agrobiodiversity	• Optimization of methods of preservation of lyo-recalcitrant microbes (archaea, strict anaerobes; non- sporulating fungi) • Development of low cost silica based techniques for preservation of cyanobacteria	• *In situ* conservation of microorganisms • Microbiomes of wild relatives not deciphered • Microbiota of endangered plants and animals not attempted	• ICAR-NBAIM in collaboration with MoEF&CC develop strategies for unique microbes by conserving their unique habitats (place, endangered animal/plant etc.) to save such rare microbes which are metabolically active and having compounds of different nature that could be utilized in industry and agriculture. • Deciphering the microbiome of important crop plants along with their wild relatives and its ex situ conservation • Development of safe deposit of core collection of agriculturally important microorganisms in permafrost regions
InGR			
Parasitoids, predators, microbials and Entomopathogenic nematodes	*Ex situ* conservation of a large repository of natural enemies including insects and insect derived resources	• Limited number of natural enemies in use at present • Reduction in vigour of natural enemies under prolonged *ex situ* culture	• Identification of novel natural enemies • Rejuvenation of natural enemies by crossing with wild population to overcome inbreeding depression

Delhi Declaration 4: We propose that researchers employ modern technologies including, but not limited to, genomics, biotechnology, space, computational, and nano-technologies for genetic resources characterization, evaluation and trait discovery. The aim must be to achieve efficiency, equity, economy and environmental security through diversified agricultural production systems and landscapes.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Genomic technologies for identification of trait specific germplasm	Marker based characterization of core and mini core collections	Speed and scale need to be enhanced by adopting more efficient technologies for phenotyping (phenomics, drones) and genotyping (genomics)	SNP-based high throughput approach to characterize germplasm
Space technologies	GIS based analysis of gaps in collections	Use of hyper-spectral data; satellite imageries, etc. for identification of hot-spots, erosion of habitats, identification of CWRs, identification of drought tolerant spans, etc.	Develop and implement specific programs in collaboration with ISRO and other govt. agencies
AnGR			
Genomic tools	Characterization and Identification of QTLs/ SNPs	• High density genetic maps • Breed signatures	• Targeting genome wide SNPs for trait specific QTL discovery and breed signatures in indigenous breeds • Developing buffalo genome wide SNP chip for early selection for milk production
Bioinformatics	Database for AnGR	Insufficient and isolated information	Upgradation of database on information of indigenous AnGR involving various states and other agencies
FGR			
Development of genomic tools for economic traits	• Draft genome assembly of *Labeo rohita*, *Clarias batrachus* and *Tenualosa ilisha*. • Identification of signature genes for environmental adaptation of the species	• Genes and their function in regulation of economic traits not identified in the species. • Availability of evaluated germplasm for characterization using the developed genomic	Genes for economic traits identification through comparative genetics, transcriptomics for differential gene expression real time validation of gene(s) and proteomic approach and their evolutionary linkages.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
	• Molecular markers developed forover 30 fish species (Microsatellite) • Genomic for disease management	tools • Need for putting genomic data on evolutionary scale	
Development and maintenance of germplasm repository for security	Developed fish cell lines and maintaining sperm, fish cell lines and live germplasm and using spermatogonia as stem cell etc.	Protocol for storage of diploid fish germplasm and its retrieval	Stem cell/ other diploid cell banking and retrieval protocol from fish for conservation and storing improved or trait specific germplasm
MGR			
Employing modern technologies	• Developing DNA based diagnostic kits for important agriculturally important microorganisms • Draft genome sequencing • Development of indicator microorganisms for soil fertility, degraded soils and pesticide residue	• Information on shifts in microbial communities with intensive agricultural practices is lacking • Non culturable microorganisms have not been tapped for industrially important molecules	• Studying the community shift of the microbiome in different agro-climatic zones of India using 'Omics' approaches, with reference to various agricultural practices prevalent in the zone • Functional metagenomics for next generation enzymes, antibiotics and anti microbials
InGR			
To develop abiotic stress and pesticide tolerant strains and genetic improvement of beneficial insects and microbials with superior performance attributes	Maintenance of temperature, pesticide and salinity tolerant strains and development of strains with higher searching ability and pest specific strains	• Lack of natural enemies with different improved traits to combat climate change and specific target pests • Lack of extensive field data on the performance attributes of the superior strains	Development of climate resilient and other superior strains of natural enemies

Delhi Declaration 5: We reemphasize the necessity of global exchange of plant, animal, aquatic, microbial and insect genetic resources to diversify agriculture as well as our food basket and to meet the ever-growing food and nutritional needs of all countries. To ensure this, nations need to be catalysed to adopt both multi-lateral (as envisaged in the International Treaty on Plant Genetic Resources for Food and Agriculture) and bilateral (as per the Nagoya Protocol) instruments to facilitate the exchange of genetic resources, while ensuring equitable access and benefit sharing opportunities.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Germplasm exchange (Aichi16, NBT9)	Compliant to Treaty and Nagoya Protocol requirements; exchange is ongoing process	Number of species and accessions designated to be shared as per Annex 1 of ITPGRFA limited (nine out of 64 spp.)	Number of species and accessions designated to be shared as per Annex 1 of ITPGRFA need to be enhanced
Policy back-up	Policy back-stopping to all Govt. departments of India wrt PGR policy	Collective participation across nodal ministries in policy process	To promote collective participation across nodal ministries in policy process
AnGR			
Germplasm exchange	Germplasm utilization for supporting *in situ* conservation of indigenous AnGR	Weak legal mechanisms for germplasm exchange and biopiracy	Developing strong legal mechanisms for germplasm exchange of AnGR to prevent biopiracy
MGR			
Global exchange of microbial genetic resources to diversify agriculture	ICAR- NBAIM is an affiliate member of World Federation of Culture Collection (WFCC)	Global exchange is regulated by NBA	• ICAR-NBAIM will promote microbes of global interest for their exchange under the ambit of BD Act 2003 through regulatory mechanisms developed by National Biodiversity Authority (NBA). As repository of agriculturally important microorganisms, ICAR-NBAIM will request NBA to develop mechanisms for trans-boundary exchange of such useful material for various purposes including for taxonomic study while ensuring equitable benefit sharing with country of origin

Key issues	Ongoing activity	Perceived gap	Proposed action plan
			• NBAIM emphasize the exchange of microbial commons for global benefit which should be free from any levies and duties
InGR			
Exchange of natural enemies (both multi- and bi-lateral) for global biological control	Import of natural enemies on case to case basis	Absence of modalities and policies for regular exchange of natural enemies for global biocontrol initiatives	Streamlining the modalities for exchange of biocontrol agents for global biocontrol initiatives

Delhi Declaration 6: Countries are also expected to harmonize their existing biosecurity systems, including phytosanitary and quarantine, and enhance their capacities to facilitate safe trans-boundary movement of germplasm.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Quarantine to facilitate safe import of germplasm	NBPGR has been given the responsibility on behalf of the Government of India to carry out quarantine checks on the plants/ planting material meant for research purposes for both public and private sectors	Limited technologies and infrastructure	• Establishment/upgradation of quarantine facilities • Protocol-refining research and implementation
AnGR			
Biosecurity	Framing guidelines for germplasm exchange for research	Insufficient biosecurity measures	Strengthening biosecurity facilities for exchange of germplasm
FGR			
Ecological risk assessment of exotic fish	• Risk assessment of *L. vannamei*, *Pangasianodon hypopthalmus*, and *Piaractus brachypomus* completed • Risk assessment of sucker mouthatfish is underwa	• Predicting the likely impacts of establishment of exotic fish • Information on breeding and feeding biology of exotic fish not known under Indian conditions • Risk benefit model, for use in biodiversity rich country like India not in place to support decision making quantitatively	• Risk assessment models of exotic fish species will be developed • Field/Lab studies on breeding and feeding biology of exotic fish will be done
Assessment of fish germplasm for immunity and disease risks	• Monitoring of fish germplasm for fish pathogens is being done under National surveillance programme on aquatic animal diseases in 16 states and 2 union territories of India • Diagnostic capability for OIE	• Diagnostic capacity for unknown/ emerging pathogens at state/ regional level • Information on disease risk factors • Information on immune profile of fish germplasm	• Development of Diagnostic capacity for unknown/emerging pathogens • Regular monitoring of fish germplasm for fish pathogens • Epidemiology to identify risk factors for disease outbreaks • Generate information on immune gene

Key issues	Ongoing activity	Perceived gap	Proposed action plan
	listed pathogens. • Immune assessment in different populations of *C. magur* is underway		polymorphisms and its association with fish disease
Threat to fish biodiversity by biotic stressors with emphasis on introduction/spread of pathogens of concern	• Isolation and identification of pathogens of concern. • Identification of virulence factors and host immune response against *Aphanomyces invadans.*	• Host immune response to pathogens. • Characterization of pathogens and its mode of virulence.	• Understanding host immune response to pathogens through "omics" approach • Application of pathogenomics for characterization of pathogens
MGR			
Harmonising existing biosecurity systems	ICAR-NBAIM is supporting DPPSQ in import of microbes from abroad.	Diagnostic kits needs to be developed for rapid identification of microbial pests	Capacity building for development of diagnostics for microbial pests
InGR			
Quarantine at port of entries	Identification and destruction of invasive pests at ports of entry	Non-rigorous and non-uniform implementation of quarantine regulations	Rigorous implementation of regulations
Quarantine to prevent movement of infested plants and plant produce between the states of the country	None in place	No regulatory mechanism	Formulation of regulations for state quarantine

Delhi Declaration 7: We also expect that the governments and civil societies lay much greater emphasis on public awareness and capacity enhancement programs on agrobiodiversity conservation in order to accelerate its effective and efficient use.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Public (including school children) awareness programs on agrobiodiversity conservation and use	Stalls in all possible Melas, visits by school children, etc.	• Greater space needed on social media and electronic media • Low awareness about agro-biodiversity among bureaucrats	• Effective use of social media; connect with school children • Awareness programs to bureaucrats particularly from academies
AnGR			
Human resource development and Capacity building	Training for researchers and field eterinarians	Inadequate knowledge about indigenous livestock and their characteristics among professionals	Incorporating courses on AnGR conservation and management at UG & PG levels. Capacity building and developing a cadre of professionals to support management of AnGR on long-term basis
Awareness programmes	Holding Kisan Melas and other meetings with livestock keepers	Awareness about importance of indigenous livestock upgradation	Educating livestock keepers about sustainable utilization and conservation of indigenous livestock and skill
FGR			
To enhance awareness of various stakeholders towards importance and conservation of agrobiodiversity (Aquatic biodiversity)	Organising awareness programmes for farmers, fishermen/women and state fisheries officials	Larger sections of stakeholders not reached	Concerted efforts and coordinated actions involving a variety of concerned institutions from both public sector and civil society for up scaling
Capacity enhancement of stakeholders towards sustainable use of agrobiodiversity for livelihood generation and nutritional security at the regional/local level (Aquatic biodiversity)	• Exploration, documentation and evaluation of fish diversity to increase knowledge base about indigenous diversity. • Conducting short-term training programs for various stakeholders on aquatic diversity, its conservation and utilization for increasing aquaculture production	• Valuable empirical data and other field information is yet to be adequately utilized in resource enhancement and aquaculture development programs • Capacity development programs are at small scale	• Conceptualization models and test in field the linkage and flow of information from fish diversity exploration to utilization in propagation and conservation programs • Scaling up the capacity development programmes for greater knowledge and skills enhancement on sustainable utilization of aquatic biodiversity for livelihood generation

Key issues	Ongoing activity	Perceived gap	Proposed action plan
MGR			
Public awareness and capacity enhancement programs on agrobiodiversity conservation	• ICAR-NBAIM creates awareness about agro-microbial wealth of India among school going children • Spreading awareness among people regarding microbial diversity conservation and maintenance at various fora like Kisan Goshtis, Mera Gaon Mera Gaurav, Swacch Bharat Campaign and training programs at the Bureau	Large scale efforts are lacking in this area	• ICAR-NBAIM will make video and also print booklet/pamphlet on microbial wealth and their usefulness in Hindi and English for general public • ICAR-NBAIM will conduct awareness programmes all over the country in consultation with SBB and NBA • Spreading awareness among people regarding microbial diversity conservation and maintenance at various fora like Kisan Goshtis, Mera Gaon Mera Gaurav, Swacch Bharat Campaign and training programs at the Bureau • Popularizing community composting program at the village or block level. The primary goal of the Community Compost project is to create a regional organic recycling facility that produces enriched compost for use in the farmer's fields. The secondary goal is to create a revenue source through sale of compost to farms
InGR			
Awareness programs for public, school and college students, print and electronic media	Trainings being conducted, databases hosted in Institute website, Popular articles/programs put up in print/electronic media	Funding constraints	Incorporation of module on insects as components of agrobiodiversity conservation in school and college curriculum for students, intensification of awareness programmes through mass, electronic and social media for public, and dissemination of information through printed publications like leaflets, folders, bulletins, pamphlets, etc. and through radio talks and TV shows and you tube uploading

Delhi Declaration 8: We recommend the development and implementation of an Agrobiodiversity Index to help monitor on-going genetic resource conservation and management efforts, with particular emphasis on agrobiodiversity hot spots.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Agrobiodiversity Index (ABI)	None	Identify elements involved in computing ABI	Work in collaborative mode with Bioversity International and other genetic resources Bureaux (begin with a workshop)
AnGR			
Monitoring of indigenous AnGR	Breed-wise livestock census	Weak monitoring of breeds under threat	• Identifying breeds under threat and preparation of breed watch list • Establishing National Register (database) of breeders/communities • Designating "Hot spots" for AnGR biodiversity
MGR			
Development and implementation of an Agrobiodiversity Index	Agrodiversity studies in different agroecological zones	No attempts have been made to develop microbial maps and diversity indices in different hot spots of the country	• Deciphering the structural and functional diversity of agriculturally important microorganisms and to develop "microbial map" and diversity indices for microbes in certain benchmark sites of the country • Developing a digitized database of the species and genetic diversity of fungi, bacteria, actinomycetes, cyanobacteria and archaea through making the existing ones comprehensive and sustainable
InGR			
Insect biodiversity index in agrobiodiversity hotspots	Nil	• No biodiversity indices available for agrobiodiversity hotspots • No quantification of ecosystem services by crop associated insect fauna	• Assessment of insect biodiversity through sampling, diversity indices, developing distribution maps, etc. • Quantification of ecosystem services by insect fauna

Delhi Declaration 9: It is also urged that public and private sectors and civil societies henceforth actively invest in and incentivize the utilization of agrobiodiversity to mitigate malnutrition, increase the resilience and productivity of farms and farming households and enhance ecosystem services. Such efforts should lead to equitable benefits and opportunities, with particular emphasis on women and youth.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Greater involvement of individuals and corporate entities in investment	None	No programs to attract philanthropic activities	Generate specific programs on agrobiodiversity to be included in Corporate Social Responsibility (CSR)
AnGR			
Incentive	Awards for AnGR conservation	Wider utilization of animal produces in farming	• Research on useful aspects of animal produces in farming • Instituting National level Breed Conservation Award for livestock keepers • Incentivizing to encourage the use of AnGR in organic farming
MGR			
Public and private sectors and civil societies henceforth actively invest in and incentivize the utilization of agrobiodiversity	Front line demonstrations of microbe based technologies like biofertilizers and biopesticides and rapid composting	• No partnership of private sector except for licensing of one technology to the company • Incentivizing rural youth through skill development	• Development of new concept of 'Microbio-Villages' to incentivize farmers to adopt microbe based technologies like bioinoculants, fortified compost, biopesticides etc. • Skill development for the establishment of Biofertilizers and Biopesticides units: It will help in setting up of new enterprise and also generation of employment for rural youth
InGR			
Technologies for organic farming through enhanced utilization of biocontrol agents	Identified bioagents for inoculative and inundative releases against target pests	Commercial availability of natural enemies in large quantities Easy access to chemical pesticides due to readily available means to manage insect pests	Large scale utilization of quality natural enemies to reduce pesticide load

Key issues	Ongoing activity	Perceived gap	Proposed action plan
Pollinators in polyhouses / open fields for increased pollination and higher yield	Potential pollinators being identified Pollinator friendly crops being identified	• Lack of availability of suitable species for pollination in polyhouses • Pollinators being missing links in polyhouses	Identification, introduction and conservation of crop specific pollinators
Developing production units of biocontrol agents for rural women and youth	Nil	• Lack of incentives and financial support	Training and establishment of small scale biocontrol agents production units for rural women and youth

Delhi Declaration 10: We urge countries to reprioritize their research and extension with increased investments to support the conservation and use of agrobiodiversity. Furthermore, we strongly recommend to create an International Agrobiodiversity Fund as a mechanism to assist countries and communities in scientific *in situ* and *ex situ* conservation and enhanced use of agrobiodiversity.

Key issues	Ongoing activity	Perceived gap	Proposed action plan
PGR			
Public and private funding for PGR conservation and management	Basal level of government expenditure	Limited funding for agrobiodiversity conservation	Increased government investment to develop research programs focusing on climate resilient germplasm, trait-specific germplasm, direct-to-consumer pilot programs, etc.
AnGR			
Funds for preserving AnGR diversity	Limited out funded projects are being run for AnGR preservation	Insufficient funding for undertaking activities related to AnGR conservation	• Mega research proposals for funding for research and other related activities in agrobiodiversity • Creation of international, national and state fund for conservation of animal genetic resources
MGR			
Increased investments to support the conservation and use of agrobiodiversity	A joint meeting of all the Bureaux was held on 29.8.2017 at ICAR-NBPGR to discuss about preparation of project on Agrodiversity and identification of funding agency for the same.		ICAR-NBAIM would emphasize creation of separate funds for conservation of microbial resources under the ambit of International Agrobiodiversity Fund and India would be one the partners in funding such international body to avoid loss of such useful genetic resources
InGR			
Funds for *in situ* and *ex situ* conservation of insect genetic resources and insect derived resources	None	Lack of funding and streamlined policies	• Policy issues to be streamlined, will be projected in relevant fora • Different sponsoring bodies to be tapped for conservation of insect genetic resources and insect derived resources

Annexure 1

Delhi Declaration On Agrobiodiversity Management[1]

Preamble

- Agrobiodiversity includes crop varieties, livestock and fish breeds, and agriculturally useful insect and microbial species. Significant progress has been made towards the documentation, collection, conservation and use of agrobiodiversity related genetic resources, yet much more needs to be done towards their sustainable use, greater exchange and knowledge and technology transfer.
- If conserved and used sustainably, agrobiodiversity could make an important contribution towards resolving problems of hunger, food insecurity, malnutrition and climate change, thus help in attaining the Sustainable Development Goals (SDGs) and the Aichi Targets of the Convention on Biological Diversity.
- Limitations in policies, investment, infrastructure, technical capacity as well as cross-sectoral coordination and partnerships have often prevented efficient use of agrobiodiversity. This is particularly alarming since it is projected that the world, where almost 795 million people go hungry today, will need 70% more food to feed 9.6 billion people by 2050 (FAO, 2015). Hence, high priority and policy support by world leaders and organizations is warranted for enhanced use of agrobiodiversity.
- The world is also facing rapid loss and extinction of biodiversity. It is estimated that species are being lost at 1,000 to 10,000 times the rate at which natural extinction took place at any time during the past 66 million years mainly due to explosive population growth and overexploitation of natural resources. Extinction of agrobiodiversity and associated traditional knowledge is an irreversible process and hence must receive priority attention. In fact, loss of a gene is a major loss for our future generations.

Declaration

1. We call upon nations to accord top priority to the shared vision of agrobiodiversity conservation and sustainable use towards achieving the Sustainable Development Goals (SDGs) and the Aichi Targets of the Convention on Biological Diversity addressing poverty alleviation, food, nutritional and health security, gender equity and global partnership.
2. We recognize the importance of traditional agrobiodiversity knowledge available with farm men and women, pastoralists, tribal and rural communities and its central role in the conservation and use for a food secure and climate resilient world. We, therefore, call upon countries to develop the necessary legal, institutional and funding mechanisms to catalyze their active participation.
3. We urge researchers and the policymakers to initiate, strengthen and promote complementary strategies to conserve agrobiodiversity through use, including greater emphasis on using crop wild relatives. We call for them to ensure a continuum between *ex situ, in situ*, on-farm, communitybased and other conservation methods with much greater and equal emphasis on each.

4. We propose that researchers employ modern technologies including, but not limited to, genomics, biotechnology, space, computational, and nano-technologies for genetic resources characterization, evaluation and trait discovery. The aim must be to achieve efficiency, equity, economy and environmental security through diversified agricultural production systems and landscapes.
5. We reemphasize the necessity of global exchange of plant, animal, aquatic, microbial and insect genetic resources to diversify agriculture as well as our food basket and to meet the ever-growing food and nutritional needs of all countries. To ensure this, nations need to be catalysed to adopt both multi-lateral (as envisaged in the International Treaty on Plant Genetic Resources for Food and Agriculture) and bilateral (as per the Nagoya Protocol) instruments to facilitate the exchange of genetic resources, while ensuring equitable access and benefit sharing opportunities.
6. Countries are also expected to harmonize their existing biosecurity systems, including phytosanitary and quarantine, and enhance their capacities to facilitate safe trans-boundary movement of germplasm.
7. We also expect that the governments and civil societies lay much greater emphasis on public awareness and capacity enhancement programs on agrobiodiversity conservation in order to accelerate its effective and efficient use.
8. We recommend the development and implementation of an Agrobiodiversity Index to help monitor on-going genetic resource conservation and management efforts, with particular emphasis on agrobiodiversity hot spots.
9. It is also urged that public and private sectors and civil societies henceforth actively invest in and incentivize the utilization of agrobiodiversity to mitigate malnutrition, increase the resilience and productivity of farms and farming households and enhance ecosystem services. Such efforts should lead to equitable benefits and opportunities, with particular emphasis on women and youth.
10. We urge countries to reprioritize their research and extension with increased investments to support the conservation and use of agrobiodiversity. Furthermore, we strongly recommend to create an International Agrobiodiversity Fund as a mechanism to assist countries and communities in scientific in situ and ex situ conservation and enhanced use of agrobiodiversity.
11. We urge the United Nations to consider declaring a 'Year of Agrobiodiversity' in order to draw worldwide attention and catalyse urgent actions for effective management of genetic resources by the global community.
12. Finally, we recommend that the International Agrobiodiversity Congress be held every four years, with Bioversity International playing the facilitator's role, to maintain the momentum gained in 2016 and continue emphasizing the need to implement the 'Delhi Declaration on Agrobiodiversity Management' and monitor the progress so made by the different stakeholders and countries

[1]The **1st International Agrobiodiversity Congress**(IAC 2016) held in New Delhi, India, from 6-9 November, 2016 was attended by over 1000 participants from 60 countries. The delegates discussed various aspects of conservation, management, access and use of agrobiodiversity in 16 technical sessions, four satellite sessions, a genebank roundtable, a public forum, a farmers' forum and poster sessions. Based on detailed deliberations, the delegates unanimously adopted the Delhi Declaration in the concluding session on November 9, 2016, the text of which is reproduced here.

Annexure 2

Program

Inaugural Session		
2:00 – 2:05 PM	Welcome	**Dr Kuldeep Singh,** Director, ICAR-NBPGR
2:05 – 2:10 PM	Opening remarks	**Dr RS Paroda**, Chairman, TAAS & President, ISPGR
2:15 – 2:20 PM	Highlights of Delhi Declaration	**Dr Sunil Archak**, National Fellow, ICAR-NBPGR
Technical Session		
2:20 – 2:30 PM	Presentation on PGR	**Dr Kuldeep Singh**, Director, ICAR-NBPGR
2:30 – 2:40 PM	Presentation on AnGR	**Dr Arjava Sharma**, Director, ICAR-NBAGR
2:40 – 2:50 PM	Presentation on FGR	**Dr Kuldeep Lal**, Director, ICAR-NBFGR
2:50 – 3:00 PM	Presentation on MiGR	**Dr Anil Saxena**, Director, ICAR-NBAIM
3:00 – 3:10 PM	Presentation on InGR	**Dr Chandish R Ballal**, Director, ICAR-NBAIR
3:10 – 3:20 PM	PPV&FRA	**Dr RC Agrawal**, Registrar General, PPV&FRA
3:20 – 3:30 PM	Presentation on Bioversity International	**Dr NK Krishna Kumar**, Regional Representative, South and Central Asia (Bioversity International)
Brainstorming Session		
3:30 – 3:45 PM	Tea	
3:45 – 4:45 PM	Suggestions for developing strategies for implementation of 'Delhi Declaration on Agrobiodiversity Management in India'	**Dr B Meena Kumari**, Chairperson, NBA **Prof RB Singh**, Chancellor, CAU, Imphal **Dr RS Rana**, Former Director, ICAR-NBPGR & Member, NBA **Dr JS Sandhu**, President, ISGPB **Dr AK Srivastava**, Chairman, ASRB **Dr Arabinda Kumar Padhee,** Director, Country Relations and Business Affairs, ICRISAT **Dr Sukhwinder Singh**, Wheat Leader, SeeD, CIMMYT
4:45 – 5:15 PM	Open session	Participants
Concluding Session		
5:15 – 5:25 PM	Final remarks by the Chairman	**Dr RS Paroda**, Chairman, TAAS &President, ISPGR
5:25 – 5:50 PM	Closing Remarks	**Dr T Mohapatra**, Secretary, DARE & DG, ICAR
5:50 – 6:00 PM	Vote of thanks	**Dr RK Tyagi**, General Secretary, ISPGR
6:00 – 6.30 PM	Tea	

Annexure 3

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Annexure 4

List of Committee Members from ICAR-NBPGR, New Delhi for Organization of Brainstorming Meeting

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Anuradha Agrawal	Co-Chair
Kavita Gupta	Member
Rakesh Bhardwaj	Member
Sherry Jacob	Member
Era Vaidya Malhotra	Member
Rajiv Gambhir	Member

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SP Singh	Member

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Anjali Kak	Co-Chair
K Pradheep	Member
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Ruchi Bansal	Member
Monika Singh	Member
S Niveditha	Member

	Stage and Hall Committee	
1.	Lalit Arya	Chair
2.	Manjusha Verma	Co-Chair
3.	Ruchira Pandey	Member
4.	Kuldeep Tripathi	Member
5.	Vijay Mandal	Member
6.	Arun Sharma	Member
7.	Ramesh Chamola	Member

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1.	Sushil Pandey	Chair
2.	KK Gangopadhyay	Co-Chair
3.	RS Rathi	Member
4.	SK Yadav	Member
5.	PK Malav	Member
6.	NS Panwar	Member
7.	SS Ranga	Member
8.	Satya Prakash	Member
9.	SK Singh	Member

	Finance and Purchase Committee	
1.	Anuradha Agrawal	Chair
2.	DB Parakh	Co-Chair
3.	Sunil Archak	Member
4.	DPS Meena	Member

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