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FINAL REPORT ON THE ESTABLISHMENT OF THE NATIONAL INFORMATION SHARING MECHANISM (NISM) ON THE IMPLEMENTATION OF THE GLOBAL PLAN OF ACTION (GPA) FOR THE CONSERVATION AND UTILIZATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE IN BANGLADESH

November 2007

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Bangladesh Agricultural Research Council
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Foreword

Prior to the Convention on Biological Diversity (CBD) in 1992, Biological resources particularly the plant genetic resources were regarded as human heritage. This meant free access to all genetic resources anywhere. The CBD declared sovereign rights of nation states over the genetic resources within their own geographical region. This limits the access to genetic resources of one nation state by another. Thus, it is important that each nation state now has the responsibility of conserving and developing its own plant genetic resources.

Plant genetic resources provide the basic inputs for agricultural technology development with focus on improved crop varieties. In order for crop breeding to enjoy sustained advances and for continuous improvement of the crop cultivars for product quality and production efficiency, the primary moving force comes from a broad-based genetic variability. The local and biotic resources are not only numerous but also genetically variable to adapt to adverse biotic and abiotic stresses. Unfortunately very little of these valuable resources have been conserved, documented and utilized.

During the past decades rapid agricultural development led to the disappearance of many of our landraces and wild/indigenous plant species. Due to the introduction of modern high yielding varieties, crop cultivars became more uniform, and the genetic diversity of cultivars greatly diminished.

The National Agricultural Research System (NARS), ARIs and other related organizations are engaged in exploration, conservation and utilization of plant genetic resource. Conservation of diverse plant materials is often useful for research and educational purposes.

Global awareness has grown for conservation of these valuable resources for the benefit of the society and for posterity. Coinciding with the establishment of the Global Plan of Action – National Information Sharing Mechanism Global Plan of Action (NISM-GPA) as computer software, this report has been prepared through the technical assistance of the Food and Agriculture Organization of the United Nations (FAO). I thank Dr. Md. Abdur Razzaque, Member-Director (Crops) of Bangladesh Agricultural Research Council (BARC) and the National Focal Point, for spearheading participatory process in preparing this report with inputs from national stakeholders' organizations. We would like to thank Dr. N. Quat Ng, Chief Technical Adviser of the project for his technical guidance in implementation of the project and preparation of the NISM-GPA report. We would like to express our thanks to FAO for technical and financial assistance to the project. We are grateful to the Government of Japan for their financial support to the project.

I congratulate the National Focal Point and representatives form stakeholder organizations for their efforts in bringing out this report, which indeed is very timely. I feel confident that environmentalists, germplasm collectors, plant breeders and policy planners will find the report useful.

M. Nurul Alam, Ph D
Executive Chairman
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Preface

Plant genetic resources are the key components of any agricultural production systems-indeed of any eco-system. These are the raw materials for the fast-growing plant breeding and biotechnology industries. They are and will remain the sources of genes and gene sequences for conventional and biotechnology based plant improvement programmes. Agricultural science and forestry would not have materials for introduction, selection and hybridization for improving/developing crop varieties without the genetic variability that exist in nature or created artificially. Conserving and maintaining genetic variability is thus important. Genetic resources, therefore, will continue playing important roles in the development of new cultivars possessing unique characteristics. For development to be sustainable, conservation and use of genetic diversity must be at its core.

Interest and concern about plant genetic resources conservation and management for sustainable use has increased considerably in recent times. The world's biological wealth is being depleted at an ever-increasing rate and this will adversely affect future well being of people. The opportunity to exploit wild relatives as potential breeding materials is increasingly limited under Bangladesh conditions. Little or insufficient effort has been made in the past to ensure the conservation of agro-biodiversity in the face of the extensive destruction of habitats, species extinction and genetic erosion. We do not have yet a complete inventory plan. Moreover, small farmers who are maintaining landraces/genetic resources have no incentive to continue to maintain them. The challenge therefore is to find mechanism that internalizes the costs of conservation within the cost of production.

The intense pressure on plant genetic diversity will continue to increase unless appropriate measures for conservation and sustainable use are taken. The development of appropriate conservation strategies requires detailed knowledge of the extent and location of genetic diversity and adequate assessment of any threats to diversity. The ever-increasing need to produce more food advocates the use of large arrays of genetic diversity, particularly of the native landraces, primitive cultivars and their wild relatives.

Bangladesh has long been involved in the introduction, collection, maintenance and utilization of plant genetic resources. Bangladesh Agricultural Research Council (BARC) is the nodal organization for undertaking and coordinating activities related to plant genetic resources for food and agriculture under the technical assistance of FAO. It has developed a national network involving different stakeholders working in the area of plant genetic resources for food and agriculture.

This report on plant genetic resources for food and agriculture is an outcome of the project "Establishment of a National Information Sharing Mechanism on the

Implementation and Monitoring of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture" (GCP/RAS/186/JPN) supported by FAO. The contents of the report are dealt with in 3 Sections that cover wide range of issues and databases. Section I provides the Executive Summary. Section II the Introductory Chapter- An Introduction to Bangladesh and Its Agriculture, presents an overview of Bangladesh agriculture, the geographical location, topography and soil, climate, farming systems, crops/plant products, the state of food security, the changing scenario in agriculture, the seed supply systems, the process followed in preparing the report.

Under Section III, Chapter 1 deals with the State of Diversity of major crops, minor crops and under-utilized species, wild plants related to cultivated crops and their state of diversity, threats of genetic vulnerability, diversity of modern varieties, diversity of landraces, assessment of genetic erosion, future needs and priorities. Chapter II, 'The State of *In situ* Management' provides information on surveying and inventorying PGRFA, supporting on farm management, assisting farmers in disaster situation and promoting *in situ* conservation Chapter 3, the State of *Ex Situ* Management, covers sustaining *Ex situ* collections, regenerating threatened *Ex situ* accession, supporting targeted collecting and expanding *Ex situ* conservation activities. Chapter 4, The State of Use provides information on expanding characterization and evaluation and core collection to facilitate use, increasing genetic enhancement and base-broadening efforts, promoting sustainable agriculture through diversification of crop production and commercialization of underutilized crops and species seed production and distribution, seed quality standards and developing new markets for local varieties and "Diversity-Rich" products. Chapter 5 deals with the State of National Programmes, Training Needs and Legislation in relation to building national programmes, promoting networks for PGRFA constructing information systems for PGRFA, developing monitoring and early warning system, expanding and improving education and training and promoting public awareness of the value of PGRFA conservation and use.

It was a Herculean task to produce a report in such an elaborate subject. The Focal Point organized four-training workshop for the relevant scientists, extension providers and policy makers in preparing the report and on the development of the databases employing FAO computer software databases. We would like to thank all the representatives of the relevant Ministries, Departments, Research Organizations and Universities as well as the representatives of NGOs and Private Sectors for their valuable contributions in preparation of the NISM-GPA report. Dr. M. Gul Hossain, former Director, Technology Transfer and Monitoring Unit, Bangladesh Agricultural Research Council (BARC) helped me in shaping and finalizing the report. Mr. Abeed Hossain Chowdhury, Director (Computer), BARC extended his cooperation in developing NISM-GPA database following the software of FAO. I have always been

in constant touch with Dr. N. Quat Ng, Chief Technical Adviser (CTA), NISM-GPA Project to get his advice in the finalization of the report. It was a very useful backstopping technical service provided by the CTA, FAO. We record our sincere gratitude to N. Quat Ng, who in various ways contributed in the preparation and finalization of this document. We are also grateful to Dr. M. Nurul Alam, Executive Chairman, BARC for his consistent encouragement in bringing this report. We would like to specially thank FAO for their technical and financial support for the preparation of this report. We are indebted to the Government of Japan for their financial support to the project. The report contains comprehensive scientific viewpoint and databases in different facts of plant genetic resources for food and agriculture.

I am confident that the report "Establishment of the National Information Sharing Mechanism on the Implementation and Monitoring of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture" the first of its kind is expected to stimulate interest in the field of (Plant Genetic Resources) PGR among scientists, researchers, teachers, policy makers, users and all those who are interested in safeguarding plant genetic resources for food and agriculture to promote sustainable agricultural development. I hope that this report will set the platform for initiating the research and development activities and in sharing the information in the area of plant genetic resources for food and agriculture both nationally and internationally.

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Participants from the stakeholder organizations at the 4th training-workshop on "The Implementation of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (GCP/RAS/186/ JPN)" held on 10-11 January 2007.

Acronyms

ACUC	Asian Centre for Underutilized Crops
AEZ	Agro Ecological Zone
ARIs	Agricultural Research Institutes
AVRDC	Asian Vegetable Research and Development Centre
BAAG	Bangladesh Academy of Agriculture
BADC	Bangladesh Agricultural Development Corporation
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BAU	Bangladesh Agricultural University
BFRI	Bangladesh Forest Research Institute
BGASA	Bangladesh Golden Agricultural Seed Associates Ltd.
BINA	Bangladesh Institute of Nuclear Agriculture
BJRI	Bangladesh Jute Research Institute
BLRI	Bangladesh Livestock Research Institute
BNH	Bangladesh National Herbarium
BRAC	Bangladesh Rural Advancement Committee
BRRI	Bangladesh Rice Research Institute
BSF	Bangladesh Seed Federation
BSGDMA	Bangladesh Seed Growers, Dealers and Merchants Association
BSMRAU	Bangabandhu Sheikh Mujibur Rahman Agricultural University
BSRI	Bangladesh Sugarcane Research Institute
BTRI	Bangladesh Tea Research Institute
CARD	Centre for Agriculture and Rural Development
CARE	Cooperation for Assistance and Relief Everywhere
CBD	Convention on Biological Diversity
CDB	Cotton Development Board
CDP	Coastal Development Partnership
CFC	Common Fund for Commodity
CG	Contract Grower
CGIAR	Consultative Group on International Agricultural Research
CIMMYT	International Maize and Wheat Improvement Centre
CIP	International Potato Centre
COGENT	Coconut Genetic Resources Network
CS	Certified Seed
CTA	Chief Technical Adviser
CWR	Crop Wild Relative
DAE	Department of Agricultural Extension
DNA	Deoxy Ribonucleic Acid
DUS	Distinction Uniform Stability
E&C	Exploration and Collection
EIA	Environmental Impact Assessment
EWS	East West Seed (Bd.) Ltd. (Now Lal Teer Seed Limited)

FAO	Food and Agriculture Organization of the United Nations
FD	Forest Department
FBSE	Farmer Based Seed Enterprise
FCD	Flood Control and Drainage
FCDI	Flood Control, Drainage and Irrigation
GATT	General Agreement on Trade and Tariff
GEP	Germplasm Evaluation Programme
GIS	Geographical Information System
GKF	Grameen Krishi Foundation
GOB	Government of Bangladesh
GPA	Global Plan of Action
GTZ	German Technical Assistance
HRC	Horticulture Research Centre
HYV	High Yielding Varietiy
IAEA	International Atomic Energy Authority
IARC	International Agricultural Research Centre
ICARDA	International Centre for Agricultural Research in Dry Areas
ICPPGR	International Conference and Programme for Plant Genetic Resources
ICRISAT	International Crop Research Institute for the Semi Arid Tropics
ICUC	International Centre Under-utilized Crops
IJO	International Jute Organization
IJSG	International Jute Study Group
INGER	International Network for Genetic Evaluation of Rice
INIBAP	International Network for Banana and Plantation
INIBAP	International Network for Banana and Plantain
IPGRI	International Plant Genetic Resources Institute
IPSA	Institute of Post-Graduate Studies in Agriculture
IRRI	International Rice Research Institute
ISO	International Sugar Organization
ISTA	International Seed Testing Association
ICT	Information Communication Technology
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Natural Resources
JICA	Japan International Cooperation Agency
MAS	Molecular Aided Selection
MHAT	Moist Hot Air Treatment
MOEF	Ministry of Environment and Forest
MoU	Memorandum of Understanding
NARS	National Agricultural Research System
NBPGR	National Bureau of Plant Genetic Resources
NCPGR	National Committee on Plant Genetic Resources
NGO	Non Government Organization

NISM-GPA	National Information Sharing Mechanism – Global Plan of Action for Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture
NSB	National Seed Board
NSP	National Seed Policy
NZ	New Zealand
OECD	Organization for Economic Cooperation and Development
OP	Open Pollinated
ORC	Oilseed Research Centre
PBD	Plant Breeding Division
PC	Personal Collection
PGR	Plant Genetic Resources
PGRFA	Plant Genetic Resources for Food and Agriculture
PPB	Participatory Plant Breeding
PRC	Pulses Research Centre
PRSP	Poverty Reduction Strategy Paper
PVS	Participatory Variety Selection
RAPD	Random Amplified Polymorphic DNA
SAARC	South Asian Association for Regional Cooperation
SANPGR	South Asian Network of Plant Genetic Resources
SAVERNET	South Asian Vegetable Research Network
SCA	Seed Certification Agency
SDC	Swiss Agency for Development and Cooperation
SSR	Simple Sequence Repeat
TAMNET	Tropical Asia Maize Network
TLS	Truthfully Labelled Seed
TRIPS	Trade Related Aspects of Intellectual Property Rights
TTMU	Technology Transfer and Monitoring Unit
UBINIG	Policy Research for Development Alternative
UNDP	United Nations Development Program
UNFPA	United Nations Fund for Population Activities
USA	United States of America
USDA	United States Department of Agriculture
VCU	Value for Cultivation and Use
WARDA	West Africa Rice Development Authority
WCR	Wild Crop Relatives
WPF	Wild Plants for Food Production
WRC	Wheat Research Centre
WTO	World Trade Organization

Section I

Executive Summary

Bangladesh Agriculture

1. Contributions from agricultural research coupled with the toils of some 14 million farm households, mostly small and marginal, brought in sight the country's long cherished dream of "food self sufficiency". The challenges the country faces now are not only sustaining and further increasing land and labour productivity to feed its population of 140 million (growing presently at 1.48%), but also conserving the rapidly declining natural resource bases: the agricultural land and its fertility, the forest resources and the biodiversity, the water and the energy resources.

2. Bangladesh agriculture has traditionally been subsistence in nature. Farmers, in order to supplement cash requirements, often pursue off-farm activities. Marginal and small farm households, together with landless households, constitute more than 70% of the farm families. Most farmers pursue raising field crops, homestead vegetables, trees (for fuel, fruits and timber), rear cattle and poultry, and undertake aquaculture in many cases. However, two noticeable changes have been discernible these days: one is lesser use of animals as draft power that are being replaced by mechanical power (power tillers), and the other is the gradual transformation of Bangladesh farming into commercial agriculture. Nonetheless, intensive use of land for production of a large array crops throughout the year, multiple farm components (livestock, poultry, fish) and various on-farm and off-farm activities pursued by farmers make farming systems in Bangladesh highly diversified.

3. Farming Systems: The National Agricultural Research System (NARS) started cropping systems research, a component of farming system research, as far back as in 1974. But it was soon recognized that since livestock and other components are, in practice, inseparable from crop production systems, especially in small farms, the farming system research should address the holistic "farming systems", rather than "cropping systems" only.

4. Achievements in Farming System Research & Development: While farming system research and development aimed at total farm production, special focus was given to crop diversification. A number of potential cropping patterns were identified. In short, cropping pattern is gradually transforming from traditional practices to improved practices and with improved varieties.

5. In an era of globalisation and free trade that we are in, there is the need for intensified farming system research and development efforts in the country to help small producers survive, do better and to become competitive.

6. Crops/Plant Products: Rice, wheat, potato, sugarcane, pulses, oilseeds, vegetables, spices and fruits are the main food crops. The other major crops are tea, jute, cotton and maize. In addition, medicinal plants, forest species including bamboo, fodder plants play important roles in the economy. Ornamental plants have become important item in the commodity market these days.

7. With a rapid increase in vegetable production, some vegetables are now exported to a number of countries in the Middle East and the European Union. The country is grossly deficient in timber production.

8. Recent studies demonstrated that Bangladesh has comparative advantage in the production of a number of crops, e.g. a number of vegetable crops (eggplant, radish, cucumber, yard long bean, taro, tomato and cabbage). However, high risks of marketing and difficulties in producing rice as well as non-rice crops in the same service unit stand as obstacles to the exploitation of this potential, as rice cultivation has become the year round practice since the introduction of high yielding varieties (HYVs) in late 1960s. The main problem lies in the high cost of crop production (as compared to other Asian countries) and the observed "yield gaps" between farmers' yield and the yield obtained in experiment stations.

9. The State of Food Security: Despite a significant progress in domestic food grain production in recent decades, poverty and food insecurity are widespread in the country. The long-term strategy warrants addressing the problem from at least two fronts: (a) a steady supply of food at a price affordable to the general mass of the people, and (b) increasing and/or diversifying income opportunities for the poor that would ensure their purchasing power. In meeting these pre-conditions, the government aims to ensure increased food production through (i) improved efficiency in production, (ii) an increased efficiency the food distribution system and (iii) increased trade and commerce.

10. Agriculture - a changing scenario with the onset of commercial agriculture: Bangladesh agriculture is gradually transforming from the subsistence production system to commercial agriculture. Under the traditional subsistence farming practices the farmers produced crops mainly for household consumption, and the surplus, if any, was sold in the market. The importance of traditional cash crops (jute, sugarcane, tobacco, etc.) of Bangladeshi farmers has diminished with time. Of necessity, farmers are now turning towards food crops like rice, wheat, fruits and vegetables for commercial production and for cash earning. In brief, the traditional subsistence crop production system is currently transforming into commercial agriculture and this is clearly visible nowadays in the production systems being followed by the farmers.

11. The seed supply system: With the change of subsistence crop production system to commercial agriculture, an accompanying change in the seed supply system is now noticeable. Farmers now look for quality seeds in the market. Up until 1990s, the officially recognised seed production and distribution agency was the Bangladesh

Agricultural Development Corporation (BADC), a public sector organisation, Agricultural Research Institutes, Universities and others involved in crop variety development and supply Breeder Seeds to BADC and private sector and non-governmental organizations for production of Foundation Seed and Certified Seed. The National Seed Policy (NSP) introduced in 1993 made provisions for private sector involvement in seed production and distribution. Since then the supply of quality seeds has been increasing steadily.

12. However, in the absence of organised seed producing enterprises within the country many seed traders appeared in the market. These traders supply seeds often of unknown origin and of unknown quality. Simultaneously multinational companies made easy inroads to the seed business of the country, mostly through importation. Of late, some private sector seed companies have started seed production within the country.

13. Plant genetic resources are the key components of not only the agricultural production system but also of the eco-system. Agricultural science would not have the basic material for Introduction, Domestication and Breeding Programmes without plant genetic resources. However, the predominant pattern of agricultural growth has led to the erosion of plant genetic resources for food and agriculture, jeopardizing, in turn, productivity and food security and to broader sense social costs. This necessitates scientific management of these natural resources, which has assumed greater significance over time.

In view of the above facts, data base on the state of diversity, the state of *in situ* and *ex situ* management of plant genetic resources, their state of use and the skill in the development in their conservation and utilization, as embodied in the 20 priority areas of Global Plan of Action on PGRFA, have been globally recognized as common agenda for all nations of the world so that information can be shared among the countries in their common interest. This report is an outcome of the FAO funded network project, "Establishment of the National Information Sharing Mechanism on the Implementation and Monitoring of the Global Plan of Action for Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture", involving Bangladesh, India, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam.

Process Followed in Preparing the Report

Research, extension, seed multiplication agencies, universities, private sector, NGO and representatives from different ministries involved with plant genetic resources, directly or in policy making, were invited to join in stakeholders' training-workshop on National Information Sharing Mechanism (NISM).

Four training-workshops were organized with the participants of the stakeholder organizations on the FAO developed software for data management and data collection on the 20 priority areas of PGRFA, identified in the Global Plan of Action (GPA). The first workshop clarified the responsibility of the stakeholders in relation to data

management and the second on the 20 priority areas of PGRFA. The Chief Technical adviser of FAO, Dr. N. Quat Ng and Dr. Paul Quek gave hand-on training on the computer-based software and Mr. Abeed Hossain Chowdhury, Director, Computer Centre of BARC facilitated the training. Dr. Md. Abdur Razzaque, Member-Director (Crops), BARC, explained the objectives of programme. Dr. N. Quat Ng provided training on the technical issues and on the 20 priority areas of PGRFA.

Stakeholders prepared their report initially on their respective institutional, personnel, projects and publications. Finally, they filled in the answers of the questionnaire developed by FAO, using the data based software. This report was prepared based on the answers provided by the stakeholder organizations.

Chapter 1: The State of Diversity

Major Crops

13. The Major Crops under the Multilateral System: The major crops of Bangladesh include a good number of crops beyond the list of crops included in the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). These include jute, tea, sugarcane and a number of vegetable crops.

14. The State of Diversity of Major Crops: The state of diversity of rice is enormous with 12,000 germplasm but most of these are currently threatened. Similarly there were 4,111 germplasm of jute, 556 of wheat, 900 of sugarcane, 854 of pulses, 242 of bottle gourd, 103 of bitter gourd, 248 of eggplant, 126 of chillies, 200 of mango, 475 of tea and 40 of jackfruit (Table III.1). While the diversity of traditional varieties is decreasing fast, there is an increasing trend in the diversity of modern varieties. Data on the diversity of most crops are not available but there is a decreasing trend for all traditional varieties

15. Minor Crops and Under-utilized Species: There are a good number of minor and under-utilized crops grown in the country. The state of diversity of minor and underutilized crops has hardly been monitored. Many of these are important for food security and nutrition of the rural people, especially the poorer sections of the population. Due to intensive agriculture with modern varieties, the diversity of minor crops and under-utilized species is decreasing fast.

16. Wild Plants Related to Cultivated Crops and Their State of Diversity: More than 300 wild indigenous species of plants have been identified that are relatives to the cultivated crops grown in Bangladesh. But in recent times these have been seriously threatened.

17. Recognizable threats of genetic vulner*abi*lity include, among other things, replacement of traditional varieties by modern varieties, forest clearance and forest encroachment, and the disappearance of homestead backyard forests. The first volume

of Red Data Book (2001) identified 106 species of vascular plants that are threatened and some of which are no longer traceable. The diversity of land races/farmers' varieties has decreased significantly over the years.

Factors influencing the state of plant genetic diversity

18. Changing relative importance of crops: The relative importance of a number of crops has changed over the years. There was very little *Boro* (winter) rice cultivation in the past but currently *Boro* contributes about 50% of the rice produced. This led to a significant reduction of *Aus* rice. Similarly the area under jute, a major cash crop, has reduced drastically. Of late, vegetable production has been increasing as a result of the commercialisation trend in agriculture and better access to markets through improvement of rural roads and transport facilities. In recent years maize cultivation has also been increasing.

Factors identified as responsible for genetic erosion in Bangladesh

19. The factors responsible for genetic erosion in Bangladesh are many and each of these play important part in the erosion of genetic resources. These include the following:

- Unplanned conversion of agricultural land to non-agricultural uses.
- Urbanisation and human population growth.
- Use of high yielding crop varieties at the expense of traditional varieties/landraces.
- Riverbank erosion, leading not only to the direct loss of land and homesteads along with biodiversities but also to driving the affected peoples out to areas previously used for agriculture or left for wild/forest flora.
- Disappearance of backyard forests due to scarcity of land.
- Construction of flood control embankments leading to habitat destruction.
- Water logging and drainage problems arising from Flood Control and Drainage (FCD) Projects and/or Flood Control Drainage and Irrigation (FCDI) Projects.
- Shrimp monoculture in coastal areas leading to salinity increase practically eliminated crop culture and/or the growth of wild flora in these fragile ecosystems.
- Unscrupulous forest clearance and overexploitation of forest species.
- Settling plain land farmers in forest areas who attempt plain land cultivation practices there. Forest dwelling people previously used to manage these forests with their traditional knowledge.
- Felling of trees in village groves to meet the demands for timber and fuel.
- Hill cutting.
- Flood.
- Construction of barrage (e.g. Farakka Barrage upstream in India).
- Environmental effects – cyclones, tidal surges, environmental pollution, and sea level rise, and salinity increase in coastal areas as mentioned above.
- Introduction of invasive alien species (especially *Acacia* and *Eucalyptus*)

- Plant diseases (especially red rot disease in sugarcane has been identified as a major cause of loss of sugarcane diversity)
- Lack of knowledge of multiple use of species, lack of value addition and overexploitation of plant genetic resources.

Improving the understanding of the state of diversity

20. For improving the understanding of the state of diversity, the following issues should be given attention to:

- Loss of soil fertility and the desertification process ensued in northern parts of Bangladesh.
- National and institutional priorities for undertaking PGR surveys should be established.
- For capacity building, especially for assessing genetic erosion and improving responses to genetic erosion, staffs have to be trained and adequate trained staffs have to be deployed.
- Strategic direction for biodiversity conservation with appropriate policy should be in place along with research and management facilities.
- Logistic supports to be made available for awareness creation on biodiversity and their conservation.
- Regional and international cooperation and support should be sought.
- Evaluation and characterization of genetic material have to be strengthened.
- Genetic finger printing facilities should be made available for assessing diversity.
- Preservation facilities for genetic material need to be improved.
- Necessary financial supports need to be ensured.

Chapter 2: The State of *In Situ* Management

Activity Area 1: Surveying and Inventorying of Plant Genetic Resources for Food and Agriculture

21. Some sporadic surveys on wild PGR have been undertaken in Bangladesh. The priority areas for survey and inventory of plant genetic resources in Bangladesh have been identified. Bangladesh Agricultural Research Institute has identified 2 *in situ* locations for Pigeon Pea and 2 *in situ* locations locations for year round Jack Fruit; Bangladesh Rice Research Institute has identified 5 *in situ* locations for rice; and Bangladesh Tea Research Institute has identified 100 Estates as *in situ* locations for Tea germplasm (Table II.2(a)).

22. Constraints in surveying and monitoring

- The draft Acts related to PGRFA, "The Plant Variety and Farmers' Rights Protection Act of Bangladesh" and "the Biodiversity and the Community Knowledge Protection Act of Bangladesh," submitted to the Government. These draft Acts are under process by the concerned Ministries.

- The Government needs to be persuaded to implement the proposal submitted for establishing the National Institute for Plant Genetic Resources. The proposed institute was expected to organize comprehensive PGRFA activities including surveying and monitoring.

23. In addition, the following constraints are to be addressed with urgency:

- National priorities on biodiversity *vis-à-vis* PGRFA identified in the National Workshop in 1997 need to be revisited and new set of priorities, as deemed necessary with the passage of time, be established.
- Insufficient financial support for PGRFA.
- Insufficient staff in PGRFA.
- Existing staffs do not have sufficient advanced knowledge and skills.

24. Needs and priorities for surveying and monitoring

- Awareness campaigns on conservation of plant genetic resources should be strengthened and widened. (Bioversity International and FAO can be of assistance).
- Organisational responsibilities for carrying out PGRFA activities should be established and coordinated. At the moment the responsibility is diffused with a number of institutes but none with a comprehensive responsibility.
- Surveying and monitoring of PGRFA should be taken up with urgency. (Bioversirty International and FAO can be of assistance).
- Adequate trained staff for carrying out PGRFA should be deployed.
- Training needs in PGRFA, especially in surveying and monitoring, should be properly assessed and training provided. Where necessary, training of existing staff to upgrade skills should be organised. (Biovarsity International and FAO can be of assistance).
- Adequate funds for carrying out activities related to PGRFA, including surveying and monitoring, should be made available.
- Collaboration and sharing of information on PGR with countries of the region and international organisations/institutions should be strengthened. (Bioversity International FAO can be of assistance).
- Priority areas for survey and monitoring have been identified. Such surveys and monitoring activities need to be organised and implemented. (Bioversity International and FAO can be of assistance in taking initiatives).

25. Opportunities

- Bangladesh is a signatory to the CBD (1992) and the government is committed to the implementation of the Global Plan of Action (GPA) for Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture.
- Through a collaborative National Workshop on Plant Genetic Resources in 1997, involving the National Committee on Plant Genetic Resources (NCPGR), the Bangladesh Agricultural Research Council and the Bioversity International, the national priorities in PGR have already been identified. These need be revisited and

if necessary, a new set of priorities should be established keeping in view the national, regional and international scenario.

- The National Committee on Plant Genetic Resources needs to be reactivated.
- The Acts related to Plant Variety and Biodiversity have been drafted. These need to be formalised and operationalised.
- Priority ranks for surveys have already been identified (Table III.2).
- Some survey and inventory work have already been undertaken by stakeholder institutions/organisations (see Appendix Table III.6). Support is needed for strengthening and for widening survey and inventory work.

Activity Area 2: Supporting On-Farm Management and Improvement of Plant Genetic Resources for Food and Agriculture

26. Programmes/projects/activities on *in situ* conservation of Wild Crop Relatives and Wild Plants for Food and Agriculture (WCR/WPF) have so far been poor in Bangladesh.

27. Major limitations to on-farm conservation and improvement of PGRFA

- On-farm management and improvement of PGRFA are yet to be regarded as a national priority.
- Lack of incentives to farmers for on-farm conservation and improvement of PGRFA.
- Insufficient number of staff for conservation work.
- Insufficient skills of staff.
- Inadequate staff training.
- Limited financial support.
- Insufficient seed or planting material.
- A small minority of landowners, who are usually absentee landlords, owns a major portion of the cropland, especially in southern coastal region. They are unaware of on-farm conservation of PGR.
- Increasing population and scarcity of land warrant more crop production from the same limited land area.
- Traditional varieties with lower yield have a low premium to the mass of farmers.

Priority needs

28. For promoting on-farm management and improvement of PGRFA, the following should be given attention to:

- Awareness building on indigenous PGRFA, their extent and significance, their erosion, and their potentials for improvement, through seminars, publication of booklets and agrobiodiversity fairs.
- Awareness building on the causes of changes/erosion of PGRFA.
- Promoting the uses of traditional varieties in identified pocket areas (rainfed areas and marginal lands) where farmers still depend on them. These farmers should be given production support for conservation and promotion of traditional varieties.

- Developing markets for products originating from traditional and underutilized crop varieties.
- There have been initiatives from the private sector[1] for developing, at the local level, small-scale seed production enterprises. Such initiatives should be supported.
- Providing incentives, including awards, to farmers for on-farm conservations, management and improvement of PGRFA.
- Providing training on on-farm management and improvement of PGRFA with special emphasis on:
  - Seed enhancement.
  - Preservation.
  - Processing and packaging.
  - Consumption.
- Organizing visits to successful models of on-farm management.
- Creating facilities for genetic finger printing.

Activity Area 3: Assisting Farmers in Disaster Situation to Restore Agricultural Systems

29. Bangladesh is vulnerable to natural disasters such as floods, cyclones, tornadoes, tidal surges and occasional droughts. River bank erosion is a silent disaster. Till today this disaster has not been addressed in a comprehensive way even though this is an important threat to people, their livelihood, for that matter to plant genetic resources. A national plan to assist farmers, to recover and preserve PGRFA following disasters, is yet to be developed so that the genetic resources lost as a result of natural disasters could be restored. Awareness campaigns on the loss of genetic resources should be undertaken with a sense of urgency.

30. Community genebanks: Community genebanks are yet to be promoted. However, modest attempts have recently been made by an NGO (UBINIG), Bangladesh Agricultural Research Institute (BARI) and Bangladesh Rice Research Institute (BRRI).

31. Local seed supply system: Identification of appropriate germplasm for reintroduction, following a disaster, has hardly been given attention to.

32. Constraints to restoration of locally adapted germplasm: Pre-disaster information on PGRFA is hardly available. The Bangladesh Agricultural Research Council should take policy initiatives, among other things, towards post-disaster restoration of agriculture in collaboration with plant genetic resources centres of NARS institutes.

[1] For example, Bangladesh Golden Agri Seed Associates (BGASA), with about 40 small-scale farmer based seed enterprises (FBSEs) as members and spread throughout the country, have been producing quality seeds with assistance from GTZ and BADC. The number of companies has been steadily increasing with time and these FBSEs are contributing to the seed requirement at the local level. The enterprises have benefited from credit support from a National Commercial Bank against security money provided by GTZ but for a

Activity Area 4: Promoting In Situ Conservation of Wild Crop Relatives and Wild Plants for Food Production

33. Bangladesh has not yet been able to develop a plan for *in situ* conservation though some sporadic attempts have been made by some stakeholder organizations. Up till now, no organised programme/project/activity to raise public awareness of the value of crop wild relatives and wild food plants in food security and plant breeding has been undertaken. The draft Biodiversity and Community Knowledge Protection Act proposes policy/regulatory changes that could have a positive impact on conservation of wild crop relatives and wild food plants.

Needs

34. For promoting *in situ* conservation of Crop Wild Relatives and Wild Plants for Food (CWR/WPF), the following needs were identified:

- The draft Biodiversity and Community Knowledge Protection Act should be formalized and implemented without any further delay.
- R&D activities on *in situ* conservation of CWR/WPF should be promoted and strengthened.
- Model testing of *in situ* methodology, especially in marginal land, should be initiated.
- Homestead forestry, agroforestry and fodder raising programmes should be strengthened.
- Livelihood supporting species should be identified and their conservation promoted.
- Concerted efforts should be made to preserve traditional knowledge related to PGR, with special reference to CWR/WFP.
- Regional approach in *in situ* conservation of PGR should be undertaken.
- Regional and international collaboration and support should be sought for promoting *in situ* conservation of CWR/WPF.

Chapter 3: The State of *Ex Situ* Management

Activity Area 5: Sustaining Ex Situ Collections

35. *Ex situ* programmes/projects/ activities have been undertaken by some stakeholder organizations. Some of the important species covered include *Triticum aestivum*, *Hordeum vulgare*, *Sorghum bicolor*, *Lathyrus sativus*, *Lens culinaris*, *Brassica campestris*, *Brassica oleracea*, *Lablab purpureus*, *Luffa cylindrica*, *Musa sp.*, *Aegle marmelos*, *Mangifera indica*, *Zea mays*, *Oryza sativa*, *Gossypium arboreum*, *Gossypium hirsutum*, *Corchorus capsularis*, *C. olitorius*, *Camellia spp.etc* (Table III.8(a). But the capacity and storage conditions of stakeholders vary. After 1996, BARI undertook 3 exploration missions; BRRI undertook 6, East West Seed (Bd) Ltd. 8, BSRI 4 exploration missions, while BINA, BSMRAU, CDB and BTRI undertook one exploration mission each. Total germplasm (seeds) stored in genebanks are about 12,000 in mid-term storage and about 10,000 in long-term storage (Table III.10). Data

on conservation in field genebanks of BSRI and BTRI are available but for other crops and non-crop species data were not available [Table II. 8(b)]. Total germplasm collections (genebank plus field genebank) in different stakeholder organizations up to 1996 were 17,957 and collections between 1996 and 2006 were 13,018. Publications related to *ex situ* collection are mainly in hard copies (printed material). Different stakeholder organizations use different information systems on collections.

Needs and Priorities

36. Needs and priorities in *ex-situ* management are:

- Support to existing genebanks should be strengthened, with particular reference to their modernization.
- The proposal for establishing the National Plant Genetic Resources Institute should be revived and implemented for coordinated and coherent activities on PGR, especially for *ex situ* collection, evaluation, characterization, and management.
- Regeneration activities should be improved for maintaining the germplasm collected and safeguarding against their losses and degeneration.
- Arrangements should be strengthened for staff training in stakeholder organizations and retaining them so that the PGR system becomes stronger in the future. It is rather weak at present.
- Continuous support should be ensured in terms of trained staff and finance, particularly for active collections, to prevent their losses.
- Participatory *ex situ* conservation system should be developed with the involvement of local farmers/peoples so that collection of indigenous germplasm can be strengthened, information on local knowledge and practices, as well as information on the uses of indigenous PGR can be gathered, documented and preserved. For this, establishment of Community Genebanks and their networks would be an opportune approach. Activities of Community Genebank should be linked with *ex-situ* genebank.
- Contingency plans for and buffer stock of indigenous PGR should be developed to support farming systems following disasters.
- Regional/international collaboration should be strengthened. Bangladesh has fallen behind in attracting regional/international collaboration in comparison to neighbouring countries. A regional SAARC programme on PGR *vis-à-vis* genebank may be developed in order to strengthen regional PGR activities.
- Arrangements should be made for maintenance of duplicate germplasm samples with other national genebanks as well as with regional/international genebanks (i.e. IRRI, CIMMYT, AVRDC, etc).
- Botanical Gardens/National Parks should be brought under the purview of PGR conservation.
- Fairs on biodiversity may be arranged to stimulate public interest in PGR.

37. There are instances of attempts for collections and conservation of gemplasm by community organizations. These indicate community interests in conservation, which, if properly nurtured, can lead to the establishment of community genebanks.

Activity Area 6: Regenerating Threatened Ex situ Accessions

38. Regeneration of *ex situ* accessions is weak, even though some stakeholder organizations have had regeneration projects.

39. Needs

- Availability of adequate fund.
- Improving regeneration facilities.
- Regional and international collaboration.
- Continuous dialogue and free flow of information between concerned organizations.
- Technical assistance.
- Developing facilities for molecular characterization/developing genetic finger printing facilities.
- Developing documentation facilities.
- Improving facilities for long term conservation.
- Germplasm collection from remote areas.
- Developing cryo-preservation facilities.
- Human resources development in PGR with emphasis on germplasm conservation.
- Strengthening/developing field genebank for fruit and forest species.

40. Priorities

- Human resource development in the areas of *in vitro* regeneration techniques.
- Technical assistance in regeneration of germplasm.
- Free flow of information.
- Documentation of threatened PGRFA using ICT.
- Molecular characterization (Genetic finger printing) facilities.
- International collaborative programmes.
- Financial support.

41. In particular, work on identification of threatened species should be strengthened; site-specific facilities for regeneration of threatened species/accessions should be developed with farmers' participation; exchange of germplasm between countries of the region should be promoted; and storage facilities (short, medium and long-term) should be improved.

Activity Area 7: Supporting Planned and Targeted Collecting of Plant Genetic Resources

Collecting missions undertaken: Collecting missions have been undertaken by different stakeholder organizations but there are many gaps in collection. Gaps

detected were: incomplete coverage of targeted taxa, incomplete geographical coverage, missing historical/known cultivars/landraces.

43. Collecting rare and endangered species for *ex situ* conservation: The stakeholder organizations having provision for rare and endangered species are Bangladesh Agricultural Research Institute, Bangladesh Rice Research Institute, Bangladesh Jute Research Institute and Bangladesh Sugarcane Research Institute.

44. Needs and priorities: Collection exploration needs to be strengthened in all stakeholder organizations; periodic surveys of germplasm should be undertaken to assess changes with time; and virtually all stakeholder organizations need support in skill development, in characterization and evaluation as well as in identification of gaps in collections. The establishment of the proposed National Plant Genetic Resources Institute with specific mandate to look into the needs of developing policy plans, PGR collection, conservation and their management as well as promotion of community genebanks, would help overcoming most of these technical constraints.

Activity Area 8: Expanding Ex situ Conservation Activities

45. Expanding *ex situ* conservation activities, covering vegetatively propagated materials and recalcitrant seeds, needs special attention in Bangladesh. Research on management of PGR, for that matter on conservation methodology, is extremely weak and need strengthening. Promotion of community genebanks and linking them up with existing genebanks and the proposed National Plant Genetic Resources Institute has a high potential for expanding both *in situ* and *ex situ* conservation of germplasm. This would also warrant not only training of staff but also training of farmers involved in community genebank and entrepreneurship development. In general, there is the need for capacity building for *ex situ* conservation in most of the stakeholder organizations and a focused national attention on *ex situ* conservation of PGR.

Chapter 4: The State of Use

Activity Area 9: Expanding the Characterization, Evaluation and Number of Core Collections to Facilitate Use

46. Characterization and evaluation work is still in preliminary phases in Bangladesh. Studies on core collections are yet to take off.

47. Obstacles to establishing core collections

- Widespread lacking in the understanding of the concept of core collection.
- Limited number of trained personnel.
- The need for core collection is yet to be recognized.
- Methodology not known/available.

48. Needs and priorities: Research on establishment of methodologies for core collection should be initiated with backstopping support from regional and international

organizations (Bioversity International, FAO, etc). Also networking projects to share knowledge, experience, and facilitation in the exchange of expertise should be developed and implemented.

Activity Area 10: Increasing Genetic Enhancement and Base-broadening Efforts

49. Of the two broad approaches for genetic enhancement/pre-breeding, 'Introgression' and 'Base-broadening', some introgression programmes have been undertaken by some stakeholder organizations. But for base-broadening, very modest attempts are being made in some of the stakeholder organizations (e.g. BINA, BJRI, BRRI, BARI, BSMRAU).

50. Constraints

- Insufficient number of trained and skilled staff and lack of adequate knowledge of appropriate germplasm.
- Inadequate fund.
- Lack of incentives for good work.

51. Needs

- Strong staff training on embryo rescue techniques.
- Strengthening breeding programmes, with special reference to enhancing genetic base including molecular techniques.
- Strengthening germplasm collection, characterization, evaluation and documentation for easy flow of information.
- Germplasm exchange with regional and international organizations.
- Fund for improving research and facilities for genetic enhancement and base broadening.
- Inter-institutional linkages should be strengthened.

Activity Area 11: Promoting Sustainable Agriculture through Diversification of Crop Production and Broader Diversity in Crops

52. Since the introduction of green revolution technologies, monoculture of modern crop varieties with narrow genetic bases has intensified. Monoculture of modern varieties has posed threats of genetic vulnerability *vis-à-vis* reduced diversity. Therefore, an assessment and improvement of genetic diversity has become an impending need. But the programmes undertaken are scanty in relation to the diversity of crop species, especially in fruit trees and forest species.

53. Constraints in diversifying crop production and broadening diversity

- Absence of niches for marketing diversity-rich products.
- There is no incentive programme for diversified crop production, processing or marketing.

- Breeding programmes are, in general, weak especially for diversification of crop production.
- Broadening diversification in crops for improvement is limited.
- Reporting references are poor.

54. Needs

- Breeding programmes with the objectives of crop diversification should be promoted.
- Incentives for researchers, producers and processors of diversified crops should be introduced.
- Market niches for diversified crops should be created and promotional activities undertaken.
- Marketing incentives should be introduced for diversified crops.
- Regional/international programmes for food security should be undertaken through crop diversification. Under such programmes, innovative breeding programmes should be encouraged and trials of breeding lines, fixed lines and finished varieties through exchange programmes may be undertaken.
- International Agricultural Research Centres (IARCs), (ICRISAT, IRRI, CIMMYT, Bioversity International, ACUC and ICUC) should be encouraged to support national programmes on crop diversification.
- Molecular lab facilities for research and development of diversified crops should be created.

55. Priorities

- Breeding programmes with the objectives of development of Open Pollinated (OP) varieties, particularly in cross-pollinated crops.
- Breeding programmes with the objectives of crop diversification taking into consideration the ecological peculiarities.
- Regional/international programmes for food security through crop diversification.
- Incentives for researchers, producers, processors of diversified crops.
- Development of market niches and promotional activities for diversified crops.
- Memorandum of Understanding (MoU) with IARCs on programmes of crop diversification.
- Development of molecular lab facilities.

Activity Area 12: Promoting Development and Commercialization of Under-utilized Crops and Species

56. There are nearly 100 under-utilized crops grown in Bangladesh and these are important for food security, especially for rural poor people**.** Development efforts for these crops are scanty, and programme/project/activity related to commercialization of under-utilized crops is practically non-existent. Policy/legal framework needs to be developed to promote development of under-utilized crops and their commercialisation

in view of their large number, their market potentials and their value in nutrition and food security.

Needs and Priorities: Development of national programmes for under-utilized crops should be promoted, with especial emphasis on their identification for large-scale consumption/industrial use, through market development. Improving seed supply systems along with processing and storage of under-utilized crops and species need to be given attention to. Regional/international programmes should be undertaken for development and commercialization of under-utilized crops and species. Such regional/international programmes would help promote national activities on under-utilized crops. IARCs like ACUC, ICUC, AVRDC, ICRISAT may take initiatives in developing regional/international programmes. FAO can take special projects on under-utilized crops on priority basis. Incentives to researchers, producers, processors should be created. Marketing of under-utilized crops/species needs to be promoted at the same time.

Activity Area 13: Supporting Seed Production and Distribution

58. The Agricultural Research Institutes (ARIs) supply the breeder seed while the Bangladesh Agricultural Development Corporation (BADC) is responsible for production and distribution of foundation and certified seeds (in the public sector). However, currently the private sector is playing a significant role in seed distribution. But quality of such seeds is not always up to the mark. East West Seed (Bd) Ltd has nonetheless established itself as quality seed producer and supplier for vegetable crops. Similar initiatives should be supported.

59. Variety Registration and Agencies: The agency responsible for variety registration is the Seed Wing of the Ministry of Agriculture with assistance from the National Seed Board (NSB) where ARIs, Department of Agricultural Extension, Seed Certification Agency, Bangladesh Agricultural Development Corporation, Seed Company Representatives and Farmers' Representatives are members.

60. Seed Quality Standards: For seed-quality standards, the International Seed Testing Association (ISTA) rules are generally followed along with nationally defined rules (e.g. rules for notified crops).

61. Constraints in making seed of new varieties available in the market

- Delay in the availability of basic/foundation seed through the public sector seed distribution system.
- Private sector seed companies are less interested in seed enhancement/augmentation of NARS released varieties.
- Delayed and insufficient availability of commercial seeds.
- Inadequate/poor seed production, processing and storage facilities system.
- Adulteration, inadequate availability and high cost of inputs for seed production.
- Low physical purity of seed.
- Poor germination.

- Long distance to seed supplier.
- Seed price is often too high compared to commodity price. This, however, does not seem to deter farmers in procuring quality seed (with high cost), provided they (farmers) are convinced of a good harvest.

62. Cultivated varieties: Cultivated varieties are numerous. However, a list of recommended varieties has been provided in the report (Appendix Table III.13). Proportions sown to modern varieties ranges from 20% (in oilseed crops) to 95% (in maize) with *Boro* rice 98% and *Aman* rice about 70%. In recent times, the use of modern varieties of vegetables appears to be increasing fast mainly through the private sector. The use of hybrid seed is gaining ground in farmers' fields.

63. Policy and regulatory framework to develop and expand local seed systems: There is no regulatory framework in place for developing and expanding local seed systems for crops and local crop varieties important to small-scale farmers.

64. Incentive for quality seed production of local varieties and/or under-utilized crops: No realistic programme has so far been developed for quality seed production in the country (except what is produced by BADC), let alone local varieties and/or under-utilized crops. As such there is no incentive for seed production of local varieties/ under-utilized crops.

65. Seed growers' organization: There is no legal barrier for organization of local seed growers' association, but no formal mechanism exists for developing seed growers' organization. However, with donor project support, one seed growers' association of small-scale seed producers, the Bangladesh Golden Agri Seed Associates (BGASA) and the Bangladesh Seed Federation (BSF) have come into existence. The latter is yet to get a formal recognition of the Ministry of Commerce. BGASA is, however, thriving on its own. Bangladesh Seed Growers, Dealers and Merchants Association (BSGDMA) is the umbrella organization of Bangladesh Seed Men's Society, Bangladesh Seed Growers' Association, Bangladesh Seed Merchants' Association but the activities of these associations in terms of seed production is rather weak.

66. Constraints

- Lack of awareness of the importance and potentials of local varieties.
- Decreasing availability of seeds of local varieties.
- Lack of incentive and support for seed production of local varieties.
- Poor market promotion efforts for local varieties.
- Absence of policy/regulatory framework and programmes for traditional/local varieties.
- Very low production and availability of quality seeds.
- Availability of quality seeds and planting materials to farmers is constrained by the poor seed distribution system.

- Local varieties are still grown in many parts of the country but there is no organized system for their seed supply.

67. Needs

- Awareness creation of the loss of traditional/local varieties.
- Development of national programmes for purification, seed production and supply of traditional/local varieties.
- Creation of incentives for production of traditional/local varieties.
- Market promotion of traditional/local varieties.
- Promotion of Seed Growers' Association.
- Identification of crops/varieties that have large-scale consumption and industrial use potential.
- Regional/international programmes for seed production of traditional varieties should be undertaken.
- Contingency stock of seeds of traditional varieties by the public sector to meet demands in emergencies (e.g. crop failures following floods or droughts, disease epidemics, salinity intrusion etc) should be developed.

68. Opportunities

- A significant percentage of crops grown belongs to traditional/local varieties.
- Some seed growers are coming up in the private sector that produce local popular varieties like rice varieties Chinigura, Kalizira, Nizershail, etc.
- Some seed growers' association(s), with small-scale seed enterprises at the local level, has of late come into existence (e.g. BGASA) that deserve(s) support.
- The private sector is now thriving with seed production of improved as well as traditional varieties.
- Tissue cultured materials for potato and banana are gaining popularity.
- Nursery owners are now investing in the production and supply of seeds and saplings.

Activity Area 14: Developing New Markets for Local Varieties and "Diversity-Rich" Products

69. Numerous locally adapted traditional varieties of crop plants have been replaced by modern varieties. Consequently, informal exchange and formal commodity markets are dominated by fewer improved varieties and farmers are losing interest in maintaining genetically diverse traditional varieties and landraces. This trend can be slowed and even reversed by promoting the demand for genetically diverse traditional varieties and diversity-rich materials in the market place. This would need special efforts that would encourage farmers to maintain locally adapted diversity on-farm as 'living collections' of PGRFA.

70. Legal policy/framework to support new market development and "diversity-rich" products: Regional/international programmes for traditional varieties/diversity

rich materials involving IARCs would encourage stakeholders to undertake such programmes.

71. Market situations

- Markets well established and expanded for modern varieties.
- A limited number of new markets developed for traditional varieties (e.g. aromatic rice and vegetables).

72. Efforts towards developing value-added processing of "diversity-rich" products for commercial purposes and the state of their incentives: There does not appear to be any effort for developing value added processing of "diversity-rich" products for commercial purposes. No incentive is known to be given by any agency for value-added processing of "diversity-rich" products.

73. Critical Constraints to increasing markets for local varieties and 'diversity-rich' products

- Lack of awareness about the intrinsic value of local varieties and diversity rich products.
- Lack of value addition and processing facilities.
- Problems in seed production and distribution of local varieties and 'diversity-rich' products.
- Lack of communications and transport facilities in marketing (e.g. vans/ transport vehicles with cooling facilities).
- Low yield of local/traditional varieties.
- Lack of incentives for local varieties and "diversity-rich" products in the country.
- Insufficient seed or planting material.
- Emphasis on modern cultivars of staple crops.
- Development/establishment of markets for local variety is not yet a national priority.
- Industrial processing limitations for diversity rich products.

74. Needs

- A national programme should be undertaken for value addition, processing and creating awareness about nutritional value of 'diversity-rich' products and for export in overseas markets.
- The distribution points of seeds should be within the reach of seed dealers for quick availability of seeds.
- Farmwomen need training in modern methods of post harvest processing, preservation and storage of seeds.
- Enhancement of productivity of indigenous varieties that are disease resistant, flood-drought-salinity tolerant and capable of being grown 'organically'.
- Training of farmers and farmwomen in modern methods of cultivation.
- Extension approach should include small and marginal farmers.

- Studies to be undertaken for developing new markets for local varieties/ 'diversity-rich' products.
- Policy and legal framework towards promoting cultivation of local varieties, 'diversity-rich' products should be developed and implemented.
- Research on gossypol free cotton seed products should be encouraged.
- Rural based small industries of diversity-rich products should be promoted.
- Traditional varieties need to be promoted (through enhancement of productivity of indigenous varieties that are disease and pest resistant, flood-drought-salinity tolerant and capable of growing organically).
- Developing new markets for local varieties and diversity-rich products should be given importance.
- Manpower in value added processing of diversity rich products should be strengthened through training.
- Strengthening laboratory facilities for research on traditional and 'diversity-rich' products.
- Financial support.
- Characterization and evaluation of local varieties.
- Nutritional evaluation of traditional varieties.
- Advice by physicians and nutritionists for the consumption of traditional varieties rich in nutrition.

75. Priorities

- A national programme for value addition and processing of traditional varieties.
- Creating awareness on nutritional value of diversity rich products.
- Exploring overseas markets for local varieties and 'diversity-rich' products.
- Decentralization of the seed production and distribution system.
- Extension approach should include small and marginal farmers also.
- Training of farmers and farmwomen in modern methods of cultivation.
- Training of farmwomen in modern methods of post harvest processing, preservation and storage of seeds.
- Enhancement of productivity of indigenous varieties that are disease resistant, flood-drought-salinity tolerant, capable of being growing 'organically'.
- Policy and legal framework towards promoting cultivation of local varieties vis-à-vis 'diversity-rich' products should be developed and implemented.
- Studies to be undertaken for developing new markets for local varieties/ 'diversity-rich' products.
- Market for local varieties should be promoted and incentive system for production of local varieties and 'diversity- rich' products should be introduced.
- The seed supply system for traditional varieties should be improved.
- Work on identification of economic potentials of local varieties and diversity 'rich-products should be geared up.

76. In addition, R&D activities on post harvest processing; preservation and storage technologies suitable for rural areas/households should be emphasized. Nutritional

awareness on diversified products should be created. Organic farming should be promoted. Packaging of products and marketing channels should be developed for local varieties and 'diversity-rich' products.

Chapter 5: The State of National Programmes and Training Needs

Activity Area 15: Building Strong National Programmes

77. Bangladesh established the National Committee on Plant Genetic Resources (NCPGR) soon after the FAO Technical Meeting on PGR held in Leipzig, Germany in 1996. The Committee, among other things, mobilized the national network on PGR and prepared initial draft Acts related to PGR in 1998. A new network formed in 2004 under FAO programme is promoting PGRFA activities. Bangladesh Agricultural Research Council is coordinating the activities of the network. So far 4 training-workshops organized under the programme since 2004 with 20 stakeholders including NARS institutions and development organizations.

Since the time of the First Report on PGR (1995) the following new PGR facilities have been developed:

- **At the Bangladesh Agricultural Research Institute (BARI)** (i) clonal gene bank in 30 acres of land have been established for conservation, maintenance and propagation of germplasm, (ii) a space of 500 sq. ft. have been added to the seed genebank for short-term storage of germplasm at 20^0 to 25^0C; 700 sq.ft. to the medium term storage for conservation at 4^0 to 6^0C and 650 sq.ft. to the long term storage for conservation at -12^0 to -16^0C. (iii) a seed processing space of 300 sq.ft. under controlled temperature of 20^0 to 25^0C. Also facilities for germination testing, *in vitro* cryo-preservation and a DNA Lab are under development (Table III.40).

- **At the Bangladesh Rice Research Institute** short-term storage at 18^0 to 20^0C, medium term storage at 4^0C, and long-term storage at -20^0C have been established. Also a seed processing space and lab facilities both at 18^0 to 20^0C have been added to the gene bank (Table III.40).

- Similarly **at the Bangladesh Jute Research Institute** medium term storage at 4^0C, long term storage at -20^0C, and seed processing space/short term storage at around 20^0C at the headquarters genebank and Manikganj and Rangpur Stations have been added and/or established. In addition, at the Nashipur (Dinajpur), a new Seed Multiplication Farm has been established (Table III.40).

78. National programmes for the conservation and sustainable use of PGRFA

- With the assistance of Bioversity International the NCPGR organized a National Workshop on PGR in collaboration with Bangladesh Agricultural Research Council

in 1997. The workshop recommendations included, *inter alia*, the development of national policy framework/legislation in pursuance of the principles of CBD.

- Based on this recommendation, the NCPGR drafted two Acts related to PGR:
  - Biodiversity and Community Knowledge Protection Act of Bangladesh; and
  - Plant Variety and Farmers' Rights Protection Act of Bangladesh.

79. These drafts were submitted to the Ministry of Agriculture in 1998. The Ministry of Agriculture has revised the draft of the Plant Variety and Farmes' Right Protection Act in 2005. These are under process at government level. Meanwhile, two documents:

- a report on Plant Genetic Resources of Bangladesh (by Bangladesh Agricultural Research Council/ Bangladesh Academy of Agriculture, 2001); and
- a Red Data Book of Vascular Plants of Bangladesh (by Bangladesh National Herbarium, 2001) has been published, based on survey of literature, studies on herbarium specimens, other local herbaria as well as field work.

Legal framework regulating establishment of the national strategy of PGRFA

80. **The proposed Biodiversity and Community Knowledge Protection Act aims:**

- To ensure the conservation and sustainable use of biological resources and related knowledge, culture and practice and to maintain and improve their diversity.
- To protect biological resources and related knowledge, culture and practice from destruction, erosion and pollution.
- To protect and support the rights, knowledge, innovations and practices of local and indigenous communities and national scientific and research institutions with respect to conservation, use and management of biological resources.
- To provide an appropriate system of access to biological resources and related knowledge based on prior informed consent of the state and of the concerned local or indigenous communities.
- To promote appropriate mechanism of a fair and equitable sharing of benefits arising from the use biological resources and related knowledge and technologies.
- To ensure participation and agreement of concerned communities in making decisions regarding the distribution of benefits which may be derived from the use of biological resources.
- To promote and encourage the building of national scientific and technological capacity relevant to conservation and sustainable utilization of biological resources.
- To promote new innovations and discoveries to reproduce, manage and enhance biodiversity.
- To ensure that the transfer and movement of biological resources and the knowledge of the community takes place in a transparent manner.
- To protect biological and ecological environment of the country from all pollution, particularly from potential hazards of biological pollution caused by genetic

engineering technology and the release of genetically modified organism in the environment.

81. The Proposed Plant Variety and Farmers' Rights Protection Act stipulates that:

- The Plant Variety and Farmers' Rights Protection Act will be governed by Plant Variety Protection Authority. The Authority shall grant Plant Variety Protection Certificates, providing the plant breeder's rights, and de-register such varieties as and when needed.
- There shall be a permanent Register of Protected Plant Varieties which will be available for consultation and check by anyone interested, except for certain materials for which breeders have given some limits as justifiably approved by the Authority.
- The Plant Variety Certificate shall be granted only where the variety is (a) New, (b) Distinct, (c) Uniform, (d) Stable, and (e) the subject of a denomination pursuant to the provision of this Act.
- The Authority shall receive applications for variety protection. For each application, the Authority will designate an examiner to test the application against the criteria.
- The holder of the New Plant Variety Certificate shall have an exclusive right to exploit the protected variety commercially for the following purposes:
  (i) production or reproduction (multiplication);
  (ii) conditioning of the purpose of propagation;
  (iii) offering for sale;
  (iv) selling or otherwise marketing;
  (v) exporting, importing, and
  (vi) stocking for any of the purposes mentioned in (a) to (e), above.

- The Plant Variety and Farmers' Rights Protection Authority of Bangladesh shall restrict the use of the Breeder's Rights for reasons of public interest in the following cases:
  (i) when the necessity arises for the prevention of human diseases, the preservation and conservation of the environment and biological diversity and for the maintenance of public welfare.
  (ii) the prevention of misuse of trade monopoly.

- The Authority shall declare a Breeder's Rights null and void when it is established -
  (i) that the variety was not new or distinct at the issuing of the New Plant Variety Certificate, or
  (ii) that the certificate has been granted to a person who is not entitled to it, unless it is transferred to the person who is so entitled.

- The Authority shall cancel a Breeder's Rights when it is established that the variety is no longer uniform and stable.
- The period of protection shall be:
  (i) 25 years for fruit trees, other tree species and vines of perennial habit; and
  (ii) 20 years for all other plant species.
- The Plant Variety and Farmers' Rights Protection Authority shall protect and promote Farmers' Rights, which will constitute the following:
  (i) The rights of farmers and their communities to protect their traditional knowledge relevant to plant genetic resources for food and agriculture.
  (ii) The right to equitably participate in the sharing of benefits arising from the utilisation of plant genetic resources.
  (iii) The right to participate in making decisions on matters related to the conservation and sustainable use of plant genetic resources.
  (iv) The right of farmers to seek cancellation and/or retribution, as the case may be, for appropriation by formal sector breeders of denominations traditionally in use for their varieties.
  (v) The right that farmers have to grow, save, use, exchange, and sell farm-saved seed of any variety except selling of seed of a protected variety for the purpose of reproduction under commercial marketing arrangements.
  (vi) The right to have access to all information relevant to the exercise of their rights with respect to plant varieties.
- A Citation of Recognition can be awarded by the Authority in the form of a certificate to encourage and recognise the contribution of individuals, communities, or agencies in the development of a New Plant Variety.
- The Authority shall constitute a "Gene Fund"

82. PGRFA relevant international agreement signed/ratified by Bangladesh

- The Convention of Biological Diversity (CBD).
- World Trade Organization (WTO).
- Trade Related Aspects of Intellectual Property Rights (TRIPS).
- International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

83. Constraints

- Weak follow up activities of international agreements.
- Lack of clear organizational responsibilities to follow up international agreements.
- Weak national coordination on matters related to PGR.
- Focal points are not always clearly identified with clear responsibilities and accountability.
- Insufficient fund for PGRFA.

84. Needs and Priorities

- Establishment of a national coordination body (such as the dormant NCPGR at BARC) to follow up international agreements vis-à-vis all other activities related to PGR.
- Clear identification of focal points with defined responsibilities. Recently the Government has nominated **Dr. Md. Abdur Razzaque, Member Director (Crops),** Bangladesh Agricultural Research Council as the Focal Point for Plant Genetic Resources for Food and Agriculture (PGRFA).
- Fund to PGR activities.

Activity Area 16: Promoting Networks for PGRFA

85. Establishing network(s) of organizations within the country as well as setting national, regional and global priorities in germplasm conservation, genetic enhancement and enrichment are all critical for the progress in PGR activities. Unfortunately, the awareness within Bangladesh on matters related to PGRFA is still very low. This also has had impact on active participation of the country in regional and international networks. However, Bangladesh is a member of some regional/international networks. Establishing network(s) of organizations within the country as well as setting national, regional and global priorities in germplasm conservation, genetic enhancement and enrichment are critical for the progress in PGR activities.

86. Major benefits gained by the country through PGRFA networks

- Increased stakeholder participation in PGR activities.
- Sharing of responsibilities of network activities.
- Training for national programme scientists and development practioners.
- Increased awareness of PGRFA.

87. Major constraints to effective participation of the country in regional and/or international PGRFA networks

- Material flow is not uniform.
- Dearth of trained manpower.
- Limited visits of scientists within participating countries.

88. Programmes/projects/activities carried out by different stakeholder organizations in collaboration with any PGRFA network

- BARI-AVRDC collection of germplasm, conservation and utilization of indigenous vegetables.
- Collection of breeding lines from International Maize and Wheat Improvement Centre (CIMMYT).
- Collaboration with International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

- Collaboration through Rice-Wheat Consortium.
- Exchange of Sugarcane Varieties, human resources development and development of sugarcane database software (Cane Point) through Common Fund for Commodity (CFC)/International Sugar Organization (ISO).
- Coconut germplasm collection and training through Coconut Genetic Resources Network (COGENT).
- Banana germplasm collection, conservation and training through International Network for Banana and Plantain (INIBAP).
- International Germplasm trials through collaboration with International Network for Genetic Evaluation of Rice (INGER).
- Collection, conservation and training through Safeguarding Biodiversity of Rice Genepool – SDC/IRRI/BRRI.
- Germplasm evaluation of hybrid maize varieties through Tropical Asia Maize Network (TAMNET).
- Development of conservation facilities of Germplasm through Japan International Cooperation Agency (JICA).
- Germplasm exchange and evaluation of vegetables through South Asia Vegetable Research Network (SAVERNET).
- Collection, characterization, documentation and evaluation of Jute, Kenaf and Mesta in collaboration with International Jute Study Group (IJSG) and Bioversity
- Collection of germplasm and training for Potato and Sweet Potato (CIP).
- Collaboration in rice research through International Rice Research Institute and Bangladesh Rice Research Institute (IRRI-BRRI Collaboration).
- Triticale based fodder/feed development through collaboration between Bangladesh Livestock Research Institute and International Maize and Wheat Improvement Centre.
- Germplasm collection, exchange and training on Molecular characterization of Lentil and Barley through collaboration between Bangladesh Agricultural Research Institute and International Centre for Agricultural Research in Dry Areas (ICARDA).

89. Comments by stakeholders on promoting networks for PGRFA: Stakeholders feel that the linkage between research organizations working in the field of PGRFA, within and outside the country, should be strengthened. The South Asian Network for PGRFA under South Asian Association for Regional Cooperation (SAARC) may be created and Bioversity may play an important role in such a network.

Activity Area 17: Constructing Comprehensive Information Systems for PGRFA

90. Stakeholder organizations are reasonably equipped with computer facilities, which may be strengthened to facilitate the information systems for PGRFA. Data management and information systems in different stakeholder organizations need to

be standardized and harmonized. These stakeholder organizations have started collaboration with international PGR information system.

91. Constraints

- Lack of adequate awareness.
- Inadequate number of trained staff.
- Lack of standard documentation system (Software).
- Paucity of fund.
- Lack of high speed internet connectivity.

92. Needs

- Awareness creation.
- Staff training.
- Appropriate software.
- Financial support.
- Development of facilities including internet connectivity.

Activity Area 18: Developing Monitoring and Early Warning System for PGRFA

93. There are a number of recognizable threats of genetic erosion and genetic vulnerability mentioned below:

- The number of local crop varieties in farmers' fields has reduced drastically since the introduction of green revolution technologies.
- An estimated 73,000 hectares of forest has been lost through encroachment for aquaculture and agriculture during 1970s and 1980s. About 8,000 hectares of forest are lost annually to homestead establishment, urbanisation and deforestation. With these disappeared or are threatened numerous plant genetic resources for food and agriculture, both in current use and with potential use in the future.
- The first volume of the Red Data Book published by National Herbarium in 2001 (BARC funded) identified 106 species of vascular plants that are threatened at various degrees and many of these are no longer traceable in the country.

94. Apparently, the losses of genetic materials have not been reported to the FAO Global System on PGRFA authorities in any formal way in the past.

95. Assessing genetic erosion: There is no formal mechanism in the country for assessing genetic erosion. The only exception, however, is the publication of the first volume of the Red Data Book in 2001 by the Bangladesh National Herbarium through the financial support of the Bangladesh Agricultural Research Council. The need for assessing genetic erosion is strongly felt in the country.

96. Constraints to monitoring genetic erosion: The major constraints the country faces to monitoring genetic erosion are:

- Lack of a coherent national programme.
- Dearth of skilled personnel.

- Paucity of financial resources.
- Lack of clear institutional responsibilities.

97. Participation of stakeholder organizations in assessing genetic erosion: The status of participation of stakeholder organizations in projects relating to the assessment of magnitude and rate of genetic erosion is indeed poor.

98. Constraints

- Projects on monitoring and early warning systems for PGRFA are yet to be undertaken.
- Limited number of trained manpower.
- Inadequate financial support.
- PGR erosion in *ex situ* collections.

99. Needs

- Development of early warning system.
- Manpower development.
- Supporting planned and targeted collection.
- Surveying, inventorying and collection of local and wild germplasm.
- Monitoring of PGR erosion.
- Infrastructure development.

Activity Area 19: Expanding and Improving Education and Training on PGR

100. Course curricula to address PGR issues, in general, are weak in the education system. There are no courses/programmes worth the name on population biology, ecology, ethno botany, *in situ* management in the universities. Experts on Taxonomy have become increasingly scarce. However, training courses covering the 20 GPA priority areas have been imparted to the staff of stakeholder organizations through financial and technical assistance of FAO.

101. Training areas considered as priority for staff by stakeholder organizations

- Molecular characterization of germplasm.
- *In vitro* and Cryo-preservation of germplasm.
- Germplasm documentation.
- Geographical information system and bio-informatics.
- Statistical analysis.
- Regeneration of species conserved *ex situ.*
- Developing monitoring and early warning system for loss of PGRFA.
- *In situ* and *ex situ* conservation including core collection and methodologies for *in situ* conservation.
- Marker aided selection.
- Management of Genebank.

- Information technology (IT) systems for PGR with special reference to information sharing mechanism on implementation of GPA for conservation and sustainable utilization of PGRFA.
- Clonal Genebank and vegetative propagation techniques.
- Community Genebank Management.
- Taxonomy of PGRFA.

102. Statement that best describes education and training for PGRFA in the country: There is no national strategy yet for education and training on PGRFA

103. Greatest obstacles to training in PGRFA in the country:

- Little awareness of the training needs within the country.
- Paucity of resource materials to improve existing training programme.
- Limited resource persons with advanced training on PGR.

Activity Area 20: Promoting Public Awareness of the Value of PGRFA Conservation and Use

104. Bangladesh is a country with rapid and large-scale genetic erosion. Unfortunately hardly any public awareness programme on PGRFA has been undertaken except some sporadic television clips and that is confined mainly to tree species.

105. NGOs and well-known personalities, identified by stakeholder organizations, involved in public awareness activities in the country:

- UBNIG.
- Coastal Development Partnership.
- GETCO Agro Vision.

106. There is no regional or international organization yet that provides the country with support for public awareness activities on PGRFA.

107. Constraints in promoting public awareness of the value of PGRFA conservation and use:

- Little effort for public awareness of the importance of PGRFA.
- Staff does not have sufficient skill and knowledge.
- It is not clear which organizations is responsible for promoting public awareness of PGRFA.
- No National strategy for education and training on PGRFA.
- Lack of support for PGRFA conservation and use.
- Increasing density of population warrants producing more crops from less area and makes *in situ* conservation difficult.

108. Needs

- Training, publication and telecasting on PGRFA.
- Audio-visual presentation, communications and consultations to promote public awareness on PGRFA.
- Setting national priorities in relation to PGRFA.
- Clear identification of an organization responsible for PGRFA conservation, use and awareness building.
- Financial support.
- Institution and capacity building for conservation and use of PGRFA.
- Public awareness building.
- Education and training on PGRFA conservation and use and development of concerned course curricula.
- Technical assistance from regional and international, organizations.
- Financial support from regional and international organization for conservation, use and awareness building.
- Support, especially for *in situ* conservation.
- Awareness building on conservation and use of PGRFA for scientists, plant breeders and farmers should be promoted.
- A separate unit/division for PGRFA should be created within the concerned Ministry of the Government.
- Training facilities and infrastructure development.
- External support needed for capacity building in increasing public awareness.
- National policy formulation on PGR.

Priority Activity Areas for Bangladesh

National Centre for PGRFA

- Establishment of a National Genebank for conservation, use and enhancement of biodiversity with appropriate infrastructure for conservation of orthodox and recalcitrant seeds, vegetatively propagated materials, including facilities for a Cryo bank and a DNA bank.

Assessment of PGR

- An assessment of genetic diversity, the rate and extent of PGR erosion and prioritization of PGRFA activities.

Development of national framework for PGRFA

The national framework for PGRFA needs to be formulated. The framework, among other things, should include the following:

- a *sui generies* system of plant variety protection.
- access to and exchange of plant genetic resources.

- recognition of farming communities, their conservation and use of PGR, and their indigenous knowledge (Farmers' Rights) and benefit sharing.
- adopting means to curb biopiracy.
- arrest genetic erosion and threat to conservation of biodiversity.
- protection of habitats rich in native diversity.
- biosafety regulation.
- seed policies and other such concerns.
- *in situ* and *ex situ* conservation including long term seed bank, *in vitro* bank, field repositories for tree species, root and rhizome crops, National Herbarium for cultivated plants.
- cryo preservation of germplasm.
- documentation of germplasm.
- geographical information system.

Coordination

- A strong coordination among different stakeholders involving research, the public and the private sector, NGOs, farmers organizations, etc. should be strengthened. Bangladesh Agricultural Research Council should lead the activities related to PGRFA for strengthening national programmes and international collaboration.

Capacity building

- Human resources development and capacity building in PGR in various fields that needs to be prioritized both for professional staff and technicians. (FAO and Bioversity International can be of assistance).

PGR plan of Activities

- Development perspective plan: vision 2025
- A national plan: a) to priorities PGR activities in germplasm collection, characterization, evaluation, documentation and conservation, (b) to prepare inventories of such resources for their better utilization; and (c) to develop a national database (including a sharing mechanism with NISM-GPA database).
- Strengthening and integration of national PGR network including field genebanks.
- Strengthening of national varietal improvement progrmmes and an integration of such programmes with PGR activities.
- Biochemical and molecular characterization of germplasm and its facility development.

  (FAO may provide technical/financial assistance in the above activities)

Awareness building

- To promote dissemination of information and national concern on biodiversity conservation through increased public awareness (including introduction of course

curricula in PGR/biodiversity in educational institutions at different levels), with participation of farming communities, NGOs and other partners.

Regulatory issues

- Development of a well structured national plant quarantine system/policy for import and export of materials (seeds, plant propagules, *in vitro* cultures),
- Strengthening of short-and medium-term storage facilities at existing genebanks at other institutes will be required.
- Drafting of policy and legal document (eg. MTA, policy on PGR, Biodiversity Act, Plant Variety and Farmers' Rights Protection Act, Development of conceptual paper etc.).

Training and Monitoring

- Methodologies of *in situ* conservation and on farm management.
- Regeneration of species conserved *ex situ*.
- Developing monitoring and early warning system for PGRFA.
- Marker Aided Selection.
- Information Technology system (data base management) with special reference to information sharing on conservation and sustainable utilization of PGR.
- Management of gene bank.
- Negotiating skill development.
- Back-up research on conservation regime and protocols.
- Eco-tourism activities to be promoted.

Cross cutting issues

- A strategic plan should be developed to expand scientific and technical education programmes, while promoting collaboration between government research institutes, academia and domestic and foreign entities.
- PGR activities should address entreprenurship development, project management, and marketing skills as well as scientific and technical training.

Section II

An Introduction to Bangladesh and its Agriculture

Bangladesh emerged as an independent nation in 1971 following a liberation war that shattered the already weak economy. The country has made a triumphant recovery during the last two decades. Contributions from agricultural research coupled with the toils of some 14 million farm households, mostly small and marginal, brought in sight the country's long cherished dream of "food self sufficiency". Food grain (cereal) production increased from about 9 million tons in 1960 to about 28 million tons in 2005-2006. The challenges the country faces now are not only sustaining and further increasing land and labour productivity to feed its population of 140 million, but also conserving the rapidly declining natural resource bases: the agricultural land, the forest resources and biodiversity, the water and the energy resources.

Geographical Location

Bangladesh has a total land area of 147,570 sq. km, stretching between $20^0$34' and $26^0$38' in the north latitude and between $88^0$01' and $92^0$41' east longitude. The country is surrounded by Indian territories in the west, the north and the east, except a small strip in the southeast by Myanmar. The Bay of Bengal lies in the south.

Topography and Soil

The landmass of Bangladesh is flat, with some upland in the northeast and the southeast. The land elevation varies from 3m to 45m (Mondal, 1990). In Chittagong Hill Tracts in the southeast, however, the hilltop reaches an elevation of about 100m.[2] The geo-morphology of the country comprises of a large portion of floodplains (75%), some terraces (13%) and hilly areas (12%). The Ganges-Brahmaputra-Meghna river system with some 400 tributaries forms a maze of interconnecting network of channels. Traditionally the rich water systems not only inundated land during the monsoon season (June–September) that bestowed the soil with alluvial sedimentation replenishing soil fertility, but also provided enormous varieties of freshwater fish, the traditional protein diet of the people. However, heavy silt deposits in recent times in riverbeds, lakes and ponds on the one hand, and flood control embankments on the other, have halted and/or created hindrances to the monsoon inundation in most croplands and hindered the natural replenishment of the soil. This has led to the loss of soil fertility and consequent land degradation. A declining trend in land productivity is now evident[3] virtually in all of the thirty agro-ecological zones (AEZs) of the country

BARC. 1995. Country Report – Bangladesh for the International Conference and Programme for Plant Genetic Resources (The First Bangladesh Report on PGR).

[3] BAAG. 1997. Environmrnt and Agricultural Productivity in Bang;ladesh. Proceedings of a National Seminar on Environment Degradation and Agricultural Productivity held on December 7, 1996 at BARC, Farmgate, Dhaka. Bangladesh Academy of Agriculture (BAAG).

(Figure 1). The process also contributed to habitat destruction of aquatic resources, leading to a rapid decline in traditional open water fisheries.

Climate

The climate is sub-tropical monsoon, marked by sweltering temperature in summer months (March–May). Six seasons are locally recognised, of these four are conspicuous: winter (December-February), summer (March–May), monsoon (June–August) and autumn (September to November). Farmers, however, recognise two main cropping seasons: the *Rabi* for the drier cooler months (October–February) and the *Kharif* for the hot and wet months (March-September).

Temperature ranges from 5^0C to 28^0C in winter and 22^0C to 40^0C in summer months. Humidity ranges from 60 to 70 per cent in winter and 80 to 98 per cent during the wet summer months.

Rainfall varies from 1429 mm in the north and northwest parts to 4338 mm in the east and southeast parts. About 60 per cent of the total rainfall is concentrated in the monsoon season, with occasional shower in the summer, and hardly any rainfall in the autumn and the winter.

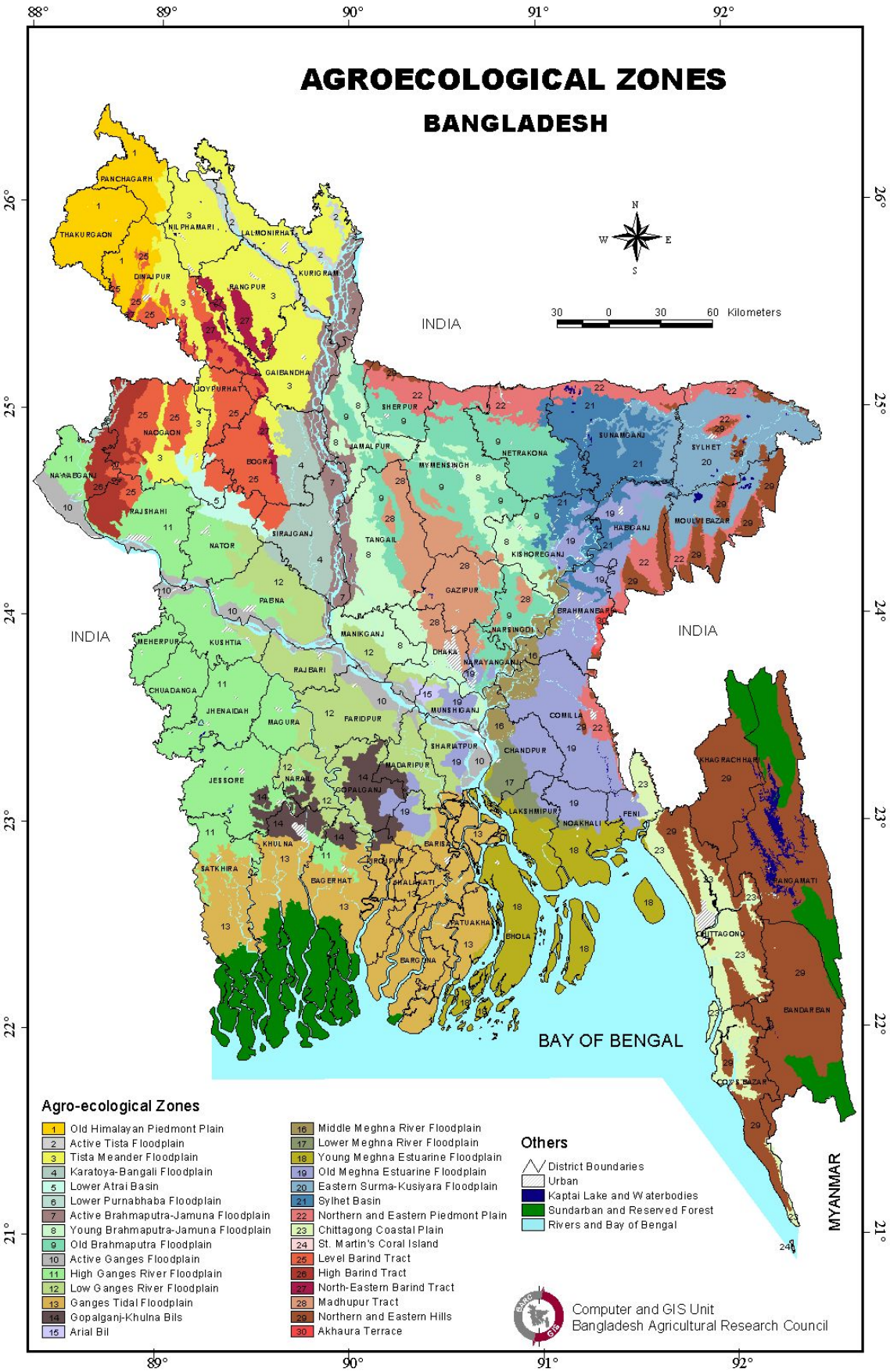
During the months from March to September (covering the summer and the monsoon seasons) natural calamities like cyclones, tornadoes, floods and tidal surges often hit the country and cause widespread destruction to life and property including PGR. In addition, riverbank erosion devours, on an average, 1,305 sq. km annually that not only drives about one million people to utter destitution by washing away their lands including homesteads[4], but also causes loss of crops and numerous other plant genetic resources. In the interest of protecting the people from this regular disaster *vis-à-vis* protecting plant genetic resources.

The Human Population and Trend

Population at the end of 2005 was predicted about 141.8 million with a growth rate declining to 1.48 per cent from 2 per cent in 2005. The population of the country predicted earlier to be 254.6 million by 2050 is now expected to be 242.9 million. The United Nations Fund for Population Activities (UNFPA) report also showed that under-five children-mortality rate marked progress in 2005 at 72 per 1,000 live births, down from 85 in 2004. Similarly infant mortality rate also declined to 54 per 1,000 live births as against 64 in 2004. However, an estimated 12,000 mothers die every year in Bangladesh from pregnancy related complications and those who survive suffer 30 times morbidity. Thus, maternal mortality remains a major concern in Bangladesh, even though demographic indicators on an average are on the progressive trend.

[4] Nazem, N. I. and K. M. Elahi. 1990. Impacts of riverbank erosion on land settlements in Bangladesh. Proceedings of a Seminar on People and Environment in Bangladesh, Dhaka, February 1990. UNDP/UNFPA.

Figure 1. Map of Bangladesh Showing AEZs



Farming Systems

Bangladesh agriculture has traditionally been subsistence in nature. This meant that the farm households produced diversified crops mainly for home consumption and the surplus, if any, was sold in the market. Farmers, in order to supplement cash requirements, often pursue off-farm and on-farm activities. Most farmers raise field crops, homestead vegetables, trees (for fuel, fruits and timber), rear cattle, and poultry, and undertake aquaculture in many cases. However, two noticeable changes have been discernible these days: one is lesser use of animals as draft power that are being replaced by mechanical power (power tillers), and the other is the Bangladesh farming is gradually transforming into commercial agriculture.

Nonetheless, intensive use of land for production of a large array crops throughout the year, multiple farm components (livestock, poultry, fish) and various on-farm and off-farm activities pursued by farmers make farming systems in Bangladesh highly complex.

Marginal and small farm households, together with landless households, constitute more than 70% of the farm families. For most of them, subsistence farming is the way of survival and in doing so they usually combine various components based on their means. This does not, however, preclude the facts that better off farmers do not combine different components in their farming practices. Rather, in many cases the better-off farmers have more opportunities to combine several different components, ranging from various types of crops to livestock, poultry and more frequently then ever before, the fish culture, as mentioned above, for commercial purposes. The complex farming practices in Bangladesh agriculture, as far as one can foresee, will continue in days to come.

The National Agricultural Research System (NARS) started cropping systems research, a component of farming system research, as back as in 1974. But it was soon recognised that since livestock and other components are, in practice, inseparable from crop production systems, especially in small farms, the farming system research should address the holistic “farming systems”, rather than “cropping systems” only.

Achievements of farming system research and development

While farming system research and development aimed at total farm production, special focus was given to crop diversification. Emphasis was laid on production of pulses, oilseeds and tubers. Improvement of soil fertility through green manuring and soil nourishing crops in the cropping system was also an important component.

A number of potential cropping patterns were identified. However, some of the new trends in cropping patterns were: in highlands the cropping pattern is increasingly accommodating summer and winter vegetables and summer onion; sesame is gaining popularity in drought prone areas in the southwest. Mungbean is gaining popularity in

the south and the southwest parts during August-November, in medium highland to highlands in February.

Lands that remained fallow in *Rabi* season is now increasingly devoted to wheat, potato or chilli following T. *Aman* cultivation. A small amount of highland is now devoted to year-round vegetable production.

A large number of fruits, vegetables and spices were grown in homesteads where improved varieties are now replacing the indigenous varieties. Agroforestry is also gaining popularity in many parts of the country. Hill farming was dominated by pineapple, ginger, sesame and aroids.

In short, cropping pattern is gradually transforming from traditional practices to improved practices and with improved varieties.

In an era of globalisation and free trade that we are in, there is the need for intensified farming system research and development efforts in the country to help small producers survive, do better and to become competitive.

Crops/Plant Products

With the introduction of green revolution technologies in the late 1960s, rice production increased at the expense of many other crops including jute, pulses, oilseeds and spices. On the other hand, cropping intensity has now surpassed 180 per cent[5]. Recent trends in the production of some major crops are shown in Appendix Table II.1.

Rice, wheat, sugarcane, pulses, oilseeds, potato and vegetables are the main food crops. The other major crops are tea and jute. Among the crops, rice occupies the principal position and its yield has steadily increased, by more than 60% between 1984-85 and 2001-02[6]. The country reached virtual self-sufficiency in rice, for the first time in the living memory, towards the end of 1990s. Jute and tea are the two major agricultural export items. With a rapid increase in vegetable production, some vegetables are now exported to a number of countries in the Middle East and the European Union. The major imports include wheat, pulses, edible oil and oilseeds, sugar, spices, fruits, raw cotton and cotton yarn, and tobacco products. The country is grossly deficient in timber production.

Recent studies[7] demonstrated that Bangladesh has comparative advantage in the production of a number of crops, e.g. rice for import substitution and a number of vegetable crops (eggplant, radish, cucumber, yard long bean, taro, tomato and cabbage). However, high risks of marketing and difficulties in producing rice as well as non-rice crops in the same land unit stand as obstacles to the exploitation of this potential, as rice cultivation has become the year round practice since the introduction of high yielding varieties (HYVs) in late 1960s. The main problem lies in the

[5] MoA, 2004. Actionable Policy Brief and Resource Implications. Agriculture Sector Review (ASR), Ministry of Agriculture, Government of Bangladesh.
[6] MoA. 2004. Actionable Policy Brief. *Loc.cit.*
[7] Shahabuddin, Q. and Paul Dorosh. 2002. Comparative advantage in Bangladesh crop production. IFRI, Washington D.C., October 2002.

differences in unit cost of production (as compared to other Asian countries) and the observed "yield gaps" between farmers' yield and the yield obtained in experiment stations. Even with the observed "yield gaps", many crops are nonetheless profitable (Appendix Table II.2).

The State of Food Security

Despite a significant progress in domestic food grain production, poverty and food insecurity are widespread in the country. About one-half of the population lacks the resources to acquire enough food and they remain below the poverty line.

However, between 1985/86 and 2000, the proportion of people below the poverty line dropped by about 10 per cent[8]. Extreme poverty also decreased at a similar rate. However, the gains in nutritional intake do not reflect a similar picture. Even though the average calorie intake slightly increased during the last decade, consumption of protein practically remained unchanged[9]. About three-fourths of the calorie intake comes from cereals, mostly rice. That even differs among regions and income groups.

There are again differences in food intake between urban and rural consumers. For example, intake of meat and eggs in urban areas has almost reached the satisfactory level, but their consumption in rural areas falls far short of the desirable level[10]. Increased intake of cereals and low intake of vegetable and animal protein lead to high incidence of anaemia and other micronutrient deficiency symptoms.

The Government attempted to address the food security problems through a number of policy interventions since 1988. Of these, the National Food and Nutrition Policy, 1997 and the National Plan of Action for Nutrition are more comprehensive. Their implementation status, however, are yet to be assessed.

The long-term strategy warrants addressing the problem from at least two fronts: (a) a steady supply of food at a price affordable to the general mass of the people, and (b) income opportunities for the poor that would ensure their purchasing power.

In meeting these pre-conditions, the government aims to ensure increased food production through (i) improved efficiency in production, (ii) an increased efficiency in the food distribution system and (iii) increased trade and commerce. The first warrants investments in research and extension of improved agricultural technology. The second will warrant support to traders and entrepreneurs (i.e. the private sector) in the form of credit, removing legal barriers in trade and commerce, improvement in law and order situation. Finally, the increased trade and commerce in the perspective of foods calls for liberalisation of import and export of food items.

[8] Planning Commission. 2004. **Unlocking the Potential** – National Strategy for Accelerated Poverty Reduction (PRSP, December 2004). General Economic Division, Planning Commission,. GOB.
[9] *Ibid.*
[10] *Ibid.*

As for the last pre-condition, increased trade and commerce, Bangladesh has made a significant progress by liberalising food import and export but for investment in agricultural research as well as for an efficient food distribution system, the country has yet to go a long way. In addition, policy measures are needed to make the agricultural production system competitive at the farmers' level, apparently through easy access to credits and inputs, at comparable costs that prevail in the countries of the South and South East Asia.

Agriculture – a changing scenario

Agriculture is the driver of the economy. An estimated 62.93 per cent of the total labour force of the country was engaged in agriculture (crops, livestock and fisheries) in 1999-2000. In 1989 this share was 72.47 per cent[11]. The crops sector contributed 23.46 per cent to the Gross Domestic Products (GDP) in 2002-03. Within broad agriculture, the share of the crops sub-sector was 57.1 per cent. About 98 per cent of food comes from agriculture. Agriculture and agro-based commodities accounted for 11.2 per cent of export in 2003-04. The GDP grew at about 5.0 per cent during 1992-93 to 2002-03, agriculture at 3.1 per cent and the crop sector at 2.2 per cent[12].

The rate of agricultural growth was on an average higher than the rate of population growth during the last couple of decades. Yet, some two million mouths are added every year that has to be fed from the existing resources. The budgetary allocation to agriculture declined over the years, from 31 per cent in 1971-72 to less tan 3 per cent in 2003-04[13]. Nonetheless, the dominance of agriculture in Bangladesh economy remains overwhelming and this will continue to be so in the foreseeable future.

Marginal and small farm households dominate Bangladesh agriculture. Also there are landless farmers, who do not own farmland as such but earn livelihood means as agricultural wage labourers and/or work as sharecroppers using lands owned by larger farmers/absentee landlords. The farming households in Bangladesh are classified large, medium, small, marginal and landless based on their farm sizes, as shown in Appendix Table II.3.

Commercialisation in Bangladesh Agriculture – a recent trend

Bangladesh agriculture is gradually transforming from the subsistence production system to commercial agriculture. Under the traditional subsistence farming practices, as mentioned earlier, the farmers produced crops mainly for household consumption, and the surplus, if any, was sold in the market. The importance of traditional cash crops (jute, sugarcane, tobacco, etc.) of Bangladeshi farmers has diminished with time. Of

[11] Ministry of Agriculture, Handbook of Agricultural Statistics, May 2003.
[12] MoA. 2004. Actionable Policy Brief and Resourcew Implications (Chapter 1 Overview of Agriculture)). Agriculture Sector Review MoA/FAO/WB/Danida

[13] Share of Agriculture in total budget (in per cent)

1971-72	1976-81	1984-90	1991-95	1995-2000	2001-01	2003-04
31.0	14.0	7.0	5.9	4.7	4.5	<3.0

Source: Actionable Policy Brief, MoA/FAO/WB/Danida, 2004.

necessity, farmers are now turning towards food crops like rice, wheat, fruits and vegetables for commercial production and for cash earning. In brief, the traditional subsistence crop production system is currently transforming into commercial agriculture and this is clearly visible nowadays in the production systems being followed by the farmers of the country[14].

The Seed Supply System

With the change of subsistence crop production system to commercial agriculture, an accompanying change in the seed supply system is now noticeable. Farmers now look for quality seeds in the market. While under subsistence agriculture the seed market was rudimentary, one can nowadays see many seed shops are coming up, not only in cities and towns but also in market places in rural areas. Fifteen or twenty years ago hardly any of these shops existed.

Up until 1990s, the officially recognised seed production and distribution agency was the Bangladesh Agricultural Development Corporation (BADC), a public sector organisation. Agricultural research institutes, universities and others involved in crop variety development supply Breeder Seeds to BADC for production of Foundation Seed and Certified Seed. The quality control of seeds has been the responsibility of Seed Certification Agency (SCA) of the Ministry of Agriculture.

Experiences, over the decades since 1960s, have shown that BADC could not surpass the 5–6 per cent limit in the supply of seeds required in country. And that even confined to a limited number of crops (rice, jute, wheat and some vegetables). The crop varieties that BADC have been dealing with are only the varieties released by research institutes in the recent past. Beyond these, farmers still grow many local popular varieties and many more crops are yet to be brought under research agenda. The public sector does not have provisions for the supply of all such seeds.

The National Seed Policy (NSP), introduced in 1993, made provisions for private sector involvement in seed production and marketing. This eased the way to fill in the gaps between seed demand and supply. The NSP accorded permission to private sector organisations to market Truthfully Labelled Seeds (TLS). Since then the supply of quality seeds has been increasing steadily (Appendix Table II 4).

However, in the absence of organised seed producing enterprises within the country many seed traders appeared in the market. These traders supply seeds mostly through importation. Some NGOs, like Bangladesh Rural Advancement Committee (BRAC) and Grameen Krishi Foundation (GKF), came in a big way in the seed business. But they have technical weaknesses in the maintenance of seed-quality. On the other hand, so far the lone private seed company, East West Seed (Bangladesh) Limited, equipped with technical backstopping, appear to be making a steady progress, especially in vegetable seed supply.

[14] Hossain, M. G. Bangladesh Agriculture: A critique on performances and the challenges of Tomorrow. Jatiya Shahitya Prakashoni, Purana Paltan, Dhaka. pp.100-101.

The annual requirement of various seeds is estimated at about 0.95 million tons[15]. Of the total quantity of seeds used in the country, only about 13 per cent is said to be of good quality; the balance is deemed inferior. There is thus a genuine dearth of quality seeds that are genetically pure, healthy (free from diseases and insects), and free from mechanical mixtures and have a high rate of germination. The role of the private sector appears to be important to fill in the gaps in days to come.

Rationale of the project

Plant genetic resources are the key components of not only the agricultural production system but also of the ecosystem. Agricultural science would not have the basic material for Introduction, Domestication and Breeding Programmes without plant genetic resources. However, the predominant pattern of agricultural growth has led to the erosion of plant genetic resources for food and agriculture, jeopardizing, in turn, productivity and food security and to broader social costs. This necessitates scientific management of these natural resources that has assumed greater significance over time.

In view of the above facts, data base on the state of diversity, the state of *in situ* and *ex situ* management of plant genetic resources, their state of use and the skill in the development in their conservation and utilization, as embodied in the 20 priority areas of Global Plan of Action on PGRFA, have been recognized as common agenda for all nations of the world so that information can be shared among the countries in their common interests. This report is an outcome of the FAO funded network project, "Establishment of a National Information Sharing Mechanism on the Implementation and Monitoring of the Global Plan of Action for Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture", involving Bangladesh, India, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam.

Process Followed in Preparing the Report

FAO Regional Office for Asia and the Pacific, Bangkok organized the First Regional Focal Point Consultation Meeting on Implementation of the Global Plan of Action (GPA) for Plant Genetic Resources for Food and Agriculture (PGRFA) involving Bangladesh, India, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam in Bangkok, Thailand from October 12 to 15, 2003. The meeting agreed to establish the project **"National Information Sharing Mechanism for Global Plan of Action (NISM-GPA) for Plant Genetic Resources for Food and Agriculture".**

The objectives of the project were:

- To draw/assess the current status of Plant Genetic Resources for Food and Agriculture (PGRFA) in order to fill in information gaps in each of the participating countries and to identify their needs and priorities for the conservation and sustainable utilization of PGRFA within the framework of Global Plan of Action for the Conservation and Sustainable Utilization of PGRFA.

[15] MoA. 2004. Actionable Policy Brief, Agriculture Sector Review (ASR). MOA/FAO/WB/Danida.

- To improve national capacity in monitoring PGRFA activities within the framework of the GPA by empowering them with tools for leading efficient decision-making processes, evaluating and developing PGRFA policies at the national level.
- To share with the region successful experiences in the implementation of GPA priority activity areas related to *in situ* conservation and on-farm management and to improve national capacity in carrying out PGRFA *in situ* conservation and on-farm management.

The meeting agreed on the following outputs:

Expected outputs:

A country driven national information sharing mechanism on the implementation of the GPA for the conservation and sustainable utilization of plant genetic resources for food and agriculture established in each of the participating countries for sharing information and monitoring the GPA implementation;

- Current status of PGRFA in the countries assessed and the needs and priorities for the future identified;
- The implementation of the GPA activities promoted and experiences on *in situ* conservation and the development shared;
- National capacities in carrying out activities related to *in situ* conservation research and development enhanced;
- Regional cooperation improved.

First National Stakeholder Meeting

Following the above Regional Focal Point Meeting the project was prepared and agreement signed. Bangladesh Focal Point, Dr. Md. Abdur Razzaque, Member Director (Crops) of the Bangladesh Agricultural Research Council, organized the First National Stakeholders Meeting on November 28-29, 2004. The participating organizations (stakeholders) included:

1. Bangladesh Agricultural Research Council (BARC)
2. Bangladesh Agricultural Research Institute (BARI)
3. Bangladesh Rice Research institute (BRRI)
4. Bangladesh Jute Research Institute (BJRI)
5. Bangladesh Institute of Nuclear Agriculture (BINA)
6. Bangladesh Sugarcane Research Institute (BSRI)
7. Bangladesh Tea Research Institute (BTRI)
8. Bangladesh National Herbarium (BNH)
9. Bangladesh Forest Research Institute (BFRI)
10. Bangladesh Livestock Research Institute (BLRI)
11. The Ministry of Agriculture (MoA)
12. The Seed Certification Agency (SCA)

13. Bangladesh Agricultural Development Corporation (BADC)
14. The Department of Agricultural Extension (DAE)
15. Forest Department (FD)
16. Bangladesh Agricultural University (BAU)
17. Banglbandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU)
18. Coastal Development Partnership (CDP)
19. East West Seed (Bd.) Limited (Now Lal Teer Seed L
20. Bangladesh Rural Advancement Committee (BRAC)

The Hon'ble Minister of Agriculture, Government of the Peoples Republic of Bangladesh formally inaugurated the meeting held under the Chairmanship of Dr. M. Nurul Alam, Executive Chairman, Bangladesh Agricultural Research Council. Dr. Md. Abdur Razzaque, Member Director (Crops) and the Focal Point of PGRFA, welcomed the participants. Dr. N. Quat Ng of FAO, the Chief Technical Adviser (CTA) of the Project outlined the Global Plan of Action, with special emphasis on the background, objectives and activities of the project.

The meeting laid emphasis on maximum interaction of the participants (stakeholders) and their commitment to the project.

Dr. N. Quat Ng explained the means of accomplishment of the objectives of the project through: (a) an assessment of the present status of PGRFA for identification of the needs and strategies for conservation and utilization of PGRFA, (b) the establishment of a country driven National Information Sharing Mechanism on GPA (NISM-GPA) for sharing information and enhancing the coordination of plans and activities, (c) sharing of experience on methodologies for *in situ* and on-farm conservation and development, (d) capacity building and training for strengthening the National PGRFA programmes, and (e) cooperation among the participating countries on conservation and utilization of PGRFA.

Dr. N. Quat Ng, CTA and Dr. Paul Quek of Bioversity International, with assistance of Mr. Abeed Hossain Chowdhury, Director Computer Centre of BARC, demonstrated the software on NISM-GPA to the participants. The CDs of the software were distributed among the participants for hands-on exercise on data entry and management of GPA information. The participants were expected to gather and fill in information, first on organization, personnel, projects related to PGRFA and a reference tables on publications (The Common Table), and hand these back to the National Focal point for compilation.

Mr. Md. Abeed Hossain Chowdhury, with assistance from the National Focal Point, followed up the filling-in-process of the Common Table by stakeholder organizations and provided backstop services through visits to the organizations as well as inviting stakeholder representatives to the BARC Computer Centre where the national data were compiled. .

A Steering Committee, headed by the Executive Chairman of BARC, was formed to monitor the progress of activities and to facilitate the timely completion of project activities and establishing the NISM-GPA database for Bangladesh.

Second Regional Meeting

The Second Regional Meeting was held in Chiang Mai, Thailand from February 21-22, 2005 to review the progress of NISM-GPA activities by member countries and to help countries to prepare plans for the Second Report on the State of World PGRFA. Member countries agreed to hold an *in situ* conservation workshops and organize Geographical Information System (GIS) Training to enhance their national capacity in the use of information system for PGR. FAO organized the *in situ* workshop and GIS training from August 29 to September 2, 2005 in Bangkok. Member countries presented their *in situ* experiences in the workshop and underwent training on 'DIVA GIS'.

Second National Stakeholder Meeting

Second Stakeholder Meeting was organized from March 23-24, 2005 to coincide with the arrival of Dr. N. Quat Ng and Dr. Paul Quek. Dr. N. Quat Ng arrived on March 21, 2005, two days before the schedule of the meeting, to assist the Focal Point and Information Technology (IT) Specialist, Mr. Abeed Hossain Chowdhury, to have a full understanding about the NISM database management. His assistance in demonstrating and explaining the database was highly appreciated. Dr. Quat Ng also expressed his satisfaction on the achievements made so far.

Dr. Quat Ng, Dr. Quek and Mr. Abeed Hossain Chowdhury made a joint presentation in the meeting of the NISM-GPA software. The participants were given the Stakeholder CDs containing the questionnaires for "Indicators" and "Reporting Formats" for monitoring the implementation of the 20 priority areas of the GPA. The priority areas were grouped under four major categories as follows:

(i) *In Situ* Conservation and Development,
(ii) *Ex Situ* Conservation,
(iii) Utilization of PGR, and
(iv) Institutional Capacity Building.

The participants made twenty computers available for hands-on practices on the use of the software. The exercise generated a lot of interests/queries by the participants and the answers given by Dr. Ng Quat and Dr. Paul Quek helped participants in data handling of NISM-GPA. The trainers made it clear that the NISM-GPA was a time sequence database and open to periodic updating and that the Focal Point would have the authority to accept or reject information provided by stakeholders.

Third Stakeholders Meeting

Before the third meeting, the stakeholders prepared the Common Tables and filled in the questionnaires of 20 priority activity areas under four categories mentioned above (*In situ, Ex situ,* Utilization and Capacity Building). The Focal Point compiled the answers provided by stakeholder organizations and prepared a Draft Report based on the inputs. A copy of the Draft Report was given to participants from stakeholder organizations for review.

The Third Stakeholder Meeting was held from July 26 - 27 July 2006. The Hon'ble Minister of Agriculture was the Chief Guest and FAO Resident Representative In-Charge attended the inaugural session as the Special Guest. Dr. N. Quat Ng, Chief Technical Adviser of the project participated in the meeting chaired by Dr. Dr. Nurul Alam, Executive Chairman of BARC.

In technical session Dr. Md. Abdur Razzaque, the Focal Point, presented the salient features of the draft report and invited discussions on it. Dr. N. Quat Ng facilitated the discussion. The meeting dealt at length on Core Collection, *In situ* and on-farm conservation, Regeneration of germplasm, Monitoring and the Future needs, and emphasize the need for inclusion of data on the progress made in collection, conservation, utilization of germplasm after 1996, covering the 20 priority areas of the GPA. Dr. Md. Abdur Razzaque and Dr. M. Gul Hossain, in consultation with Dr. N. Quat Ng, prepared a format for inclusion of the additional information. The format was discussed in the meeting and participants agreed to provide the information within August 2006.

Dr. Quat Ng. presented the Indian GPA Database for familiarization of the stakeholders. Participants expressed the view that about a 7-day training would be required to capture the essence of the database. Mr. Abeed Hossain Chowdhury presented the compiled database of different stakeholders and pointed out the information deficiencies. Based on the discussions in the meeting, stakeholder organizations were requested to provide further information to make the database and the report comprehensive. A schedule was prepared for representatives of stakeholders' organizations to work with Mr. Abeed Hossain Chowdhury at BARC for incorporating the inputs in the national database and to make up for the deficiencies.

Fourth Stakeholders Meeting

Prior to the Fourth Stakeholders Meeting, further information from stakeholder organizations were collected and incorporated in the draft report. The revised Draft Report was sent to representatives of stakeholder organizations for review.

The Fourth Stakeholders Meeting was held on January 10-11, 2007. The report was updated in the meeting, with active participation and inputs provided by participants from stakeholder organizations. Mr. Abeed Hossain Chowdhury explained the

deficiencies in information, specifically on crop cultivars, and requested them to provide the information soonest possible.

The NISM-GPA database and the Reports (the main report and the paper on "The Second Report on the Plant Genetic Resources for Food and Agriculture : The Status of Activities" were then finalized.

Benefits derived form the PGRFA activities

The following benefits were derived from the present project activities:

- Increased stakeholder participation in PGRFA activities;
- An increased awareness on PGRFA;
- Sharing of responsibilities of network activities;
- National stakeholders trained in PGRFA activities; and
- Finally, the NISM-GPA database of Bangladesh, for sharing information at national and international levels, was established.

Summary

Farmers, in order to supplement cash requirements, often pursue off-farm and on-farm activities. The National Agricultural Research System (NARS) started cropping systems research, a component of farming system research, as back as in 1974. But it was soon recognised that since livestock and other components are, in practice, inseparable from crop production systems, especially in small farms, the farming system research should address the holistic "farming systems", rather than "cropping systems" only. While farming system research and development aimed at total farm production, special focus was given to crop diversification. A number of potential cropping patterns were identified. In short, cropping pattern is gradually transforming from traditional practices to improved practices and with improved varieties.

Rice, wheat, sugarcane, pulses, oilseeds, potato and vegetables are the main food crops. The other major crops are jute and tea. The country is grossly deficient in timber production.

Within the broad agriculture, the share of the crops sub-sector was 57.1 per cent. About 98 per cent of food comes from agriculture. Marginal and small farm households dominate Bangladesh agriculture.

Bangladesh agriculture is gradually transforming from the subsistence production system to commercial agriculture. Of necessity, farmers are now turning towards food crops like rice, wheat, fruits and vegetables for commercial production and for cash earning. In brief, the traditional subsistence crop production system is currently transforming into commercial agriculture and this is clearly visible nowadays in the production systems being followed by the farmers of the country.

With the change of subsistence crop production system to commercial agriculture, an accompanying change in the seed supply system is now noticeable. Agricultural research institutes, universities and others involved in crop variety development supply Breeder Seeds to BADC for production of Certified Seed and Foundation Seed. In recent times, private sector has been playing an increasing role in seed production and supply.

Agricultural science would not have the basic material for Introduction, Domestication and Breeding Programmes without plant genetic resources. Research, extension, seed multiplication agencies, universities, private sector, NGO and representatives from different ministries involved with plant genetic resources, directly or in policy making, were invited to join in stakeholders' training on National Information Sharing Mechanism (NISM). Four training workshops were organized with the participants of the stakeholder organizations on the FAO developed software for data management and data collection on the 20 priority areas of PGRFA, identified in the Global Plan of Action (GPA).

Section III

Chapter 1: The State of Diversity

Major Crops

(a) The Major Crops under the Multilateral System: The major crops of Bangladesh that are included in the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA) are given in Appendix Table III.1A.

(b) Major Crops Beyond the List of Crops under the Multilateral System

There is a good number of crops grown regularly by Bangladeshi farmers that fall beyond the list of the crops under the Multilateral System of PGRFA. These are major crops of the country and are shown in Appendix Table III.1B.

(c) The State of Diversity of Major Crops

Table III.1. The state of diversity of some major crops of Bangladesh

Crop	Scientific name	State of diversity	
		Present state of diversity	Diversity trend
Cereals			
Rice	*Oryza sativa L.*	About 12,000 local germplasm were identified through surveys that are all threatened. The causes of threats identified were: replacement of these varieties by modern varieties; disturbances of natural habitats by construction of coastal and flood control embankments; drainage and water logging problems resulting from development projects; lack of development of value chain and business development for traditional varieties (e.g. fine grain and aromatic rice); declining soil quality especially due to lack of organic matter and micro-nutrients.	While the diversity of traditional varieties is decreasing, there is, however, an increasing trend in the diversity of modern rice varieties through release of new varieties from research institutes. (For example, BRRI has released 47 new modern rice varieties since its establishment in 1970).
Wheat	*Triticum aestivum L.*	Some 565 accessions of wheat are being maintained in BARI gene bank (*ex situ* collection). Of these 140 cultivars were mentioned.[16]	Increasing with new introductions and variety development
Pulses (Grain legumes)		A total of 854 species under 98 genera represent the Legume flora of Bangladesh. Out of these, 21 species are used as food (vegetables or pulses) and 722 species were recorded as medicinal plants [17]. A total number of 9342 accessions are recorded to be in BARI gene bank but their species/variety wise data were not available.	The diversity of traditional varieties is decreasing but new varieties have added to the diversity of modern varieties.
Chickpea	*Cicer arietinum*	752 accessions available	Decreasing in traditional varieties but new varieties have added to the diversity of modern varieties.
Grass pea	*Lathyrus sativus*	Some 1845 accessions available. Closely related species available include *Lathyrus aphaca* and *L. odoratum*	Decreasing
Lentil	*Lens culinaris*	466 accessions available	The diversity of traditional varieties is decreasing but new varieties have added to the diversity of modern varieties.

[16] Khan, M. S. & F. Ahmed. A tentative List of Plant Genetic Resources (Wild and Cultivated). Mimeo.
[17] Source: BARI: Islam, MT and M.M. Haque (2005).Listing medicinal plants in Bangladesh, Plant Genetic Resources Centre, BARI. pp 1-64.

Crop	Scientific name	State of diversity	
		Present state of diversity	Diversity trend
Mung bean	*Vigna radiata*	41 accessions available. Closely related species available include *Vigna aconitifolia. V. adenantha, V. luteola, V. mungo, V. pilosa, V. umbellate, V. mungo, V. unguiculata, V. diphylla.*	The diversity of traditional varieties is decreasing but new varieties have added to the diversity of modern varieties.
Oilseeds			
Coconut	*Cocos nucifera*	Data on diversity were not available. However, two cultivars were mentioned.	Decreasing
Groundnut	*Arachis hypogaea*	99 accessions are available.	Decreasing
Mustard	*Brassica spp.*	154 accessions are available. However, 344 oil-producing *Brassica* species were mentioned.[18]	Decreasing
Vegetables			
Ash gourd	*Benincasa hispida*	A total of 154 accessions are available.	Increasing with the release of new varieties, but traditional varieties decreasing.
Bitter gourd	*Momordica charantia*	103 accessions were mentioned.[19]Closely related species available include *M. cochinchinensis* and *M. dioica.*	Increasing with the release of new varieties, but traditional varieties decreasing.
Bottle gourd	*Lagenaria siceraria*	Data on diversity not available. However, a total of 242 accessions of Cucurbits in BARI genebank were mentioned[20].	Increasing with the release of new varieties, but traditional varieties decreasing.
Hyacinth bean	*Lablab purpureus (Dolichos lablab)*	Data on diversity not available. However, some 551 cultivars were mentioned.[21]	Increasing with the release of new varieties, but traditional varieties decreasing.
Cucumber	*Cucumis sativus*	Some 65 accessions of *Cucumis sativus* were mentioned.[22] Closely related species available include *C. callosus, C. mel var. melo*[23]	Increasing with the release of new varieties, but traditional varieties decreasing.
Okra	*Abelmoschus esculentus*	Some 226 accessions were mentioned. Closely related species available include *A. hostilis*, *A. manihot*, and *A. moschatus*.[24]	Increasing with the release of new varieties, but traditional varieties decreasing.
Papaya	*Carica papaya*	Six accessions were mentioned.	Increasing with the release of new varieties, but traditional varieties decreasing.
Pumpkin	*Cucurbita maxima (C. moschata)*	Data on diversity not available. However, 92 accessions were mentioned.[25] Closely related species available include *C. moschata* and *C. pepo*[26]	Increasing with the release of new varieties, but traditional varieties decreasing.
Radish	*Raphanus sativus*	Data on diversity not available. However, 19 accessions were mentioned.[27]	Increasing with the release of new varieties, but traditional varieties decreasing.
Ribbed gourd	*Luffa acutangula*	Some 124 accessions were mentioned.[28] Closely related species available include *L. cylindrica, L. echinata* and *L. graveolens.*	Increasing with the release of new varieties, but traditional varieties decreasing.
Snake gourd	*Trichosanthes anguina*	Some 122 cultivars were mentioned.[29] Closely related species available *include T. bracteota, T. cordata, T. cucumerina, T. dioica, T. himalensis* and *T. listeri.*	Increasing with the release of new varieties, but traditional varieties decreasing.
Tomato	*Lycopersicon esculentum*	Data on diversity not available. However, 73 accessions were mentioned.[30]	Increasing with the release of new varieties, but traditional varieties decreasing.
Brinjal (Eggplant)	*Solanum melongena*	Some 248 accessions were mentioned.[31] Closely related species available include *S. torvum, S.erianthum, S. nigrum, S. barbisetum, S. trilobatum, S. sysmbrifolium. S. capsicoides, S. virginianum*.	Increasing with the release of new varieties, but traditional varieties decreasing.

[18] *Ibid.*
[19] *Ibid.*
[20] *Ibid*
[21] *Ibid.*
[22] *Ibid.*
[23] *Ibid.*
[24] *Ibid.*
[25] *Ibid.*
[26] *Ibid.*
[27] *Ibid.*
[28] *Ibid.*
[29] *Ibid*
[30] *Ibid*
[31] Source: Khan, M. S. and F. Ahmed. A Tentative List of Plant Genetic Resources (Wild and Cultivated). Mimeo.

Crop	Scientific name	State of diversity	
		Present state of diversity	Diversity trend
Arum	*Colocasia esculenta*	Data on crop diversity not available. However, a total of 53 accessions less than 20 genera represent the family Araceae in Bangladesh. Of these, 10 species are used as vegetables and 15 species are of medicinal value. Some 16 species were found endemic which were not found during the survey.[32]	Not known
Potato	*Solanum tuberosum*	A total of 23 cultivars were mentioned.[33]	Increasing with new introduction
Sweet potato	*Ipomoea batatas*	Some 14 wild species available i.e. *I. imolucrata, I. learii, I. nil, I. purpurea, I. rubens, I. aspera, I. longiflora, I. illustris, I. peniculata, I. pescaprae, I. reptans, I. salicifolia, I. obscura, I. sepinria,, etc.*	Not known
Fibre crops			
Jute	*Corchorus sp.*	4,111 germplasm of jute have been conserved in the genebank of BJRI.	Traditional varieties are decreasing due to introduction of modern varieties.
Kenaf and Mesta.	*Hibiscus spp.*	1520 germplasm have been conserved in BJRI genebank	Traditional varieties are decreasing due to introduction of modern varieties.
Cotton	*Gossypium hirsutum*	Some 460 accessions are being maintained in Cotton Research Farms, Mahiganj in Rangpur District, Sripur in Gazipur District and Sadarpur in Dinajpur District and Jagdishpur in Jessore District	Increasing with new introduction
	Gossypium arboreum	Some 30 accession at Balaghata Farm in Bandarban District	-
Spices			
Chilli	*Capsicum annum, C. frutescens*	Data on diversity are not available. However, 126 accessions were mentioned.	Increasing with the release of new varieties, but traditional varieties decreasing.
Garlic	*Allium sativum*	Data on diversity not available. However, three cultivars were mentioned[34]. Four other species available i.e. *A. ascalonicum, A. tuberosum, A. ampeloprasum, A. cepa*.	Decreasing
Ginger	*Zingiber officinale*	Five wild species occur in Bangladesh i.e. *Z. casumunare, Z. zerumbet, Z. capitatum var. elata.*	Not known
Onion	*Allium cepa*	Four cultivars were mentioned.[35] Four other species available i.e. *A. ascalonicum, A. tuberosum, A. ampeloprasum, A. sativum*	Not known
Turmeric	*Curcuma domestica/longa*	About 20 species occur in Bangladesh, e.g. *C. angustifolia, C. leucorrhiza, C. zedoaria, C. caesia, C. ferruginea, C. rubescens, C. amada, etc.*	Not known
Fruits			
Banana	*Musa* sapientum, M. paradisica.	. Some 10 varieties were mentioned.[36] One wild species, *M. ornate, occurs in Bangladesh*	Decreasing
Guava	*Psidium guajava*	Data on diversity not available. However, 10 accessions were mentioned.[37]	Inreasing through introduction
Jackfruit	*Artocarpus heterophyllus*	Some 40 varieties were mentioned.[38]Two wild species occur in Bangladesh i.e. *A. chaplasha and A. lacucha*.	Traditional varieties decreasing.
Litchi	*Litchi chinensis*	Data on diversity not available. However, three varieties were mentioned.	Decreasing
Mango	*Mangifera indica*	More than 200 varieties were mentioned.[39] Two wild species occur in Bangladesh i.e. *M. sylvatica* and *M. longipes.*	Decreasing
Papaya	*Carica papaya*	See under vegetables above	Increasing with the release of new varieties, but traditional varieties decreasing.
Watermelon	*Citrullus lanatus*	At least one wild species occurs in Bangladesh i.e. *C. calocynthes*	Increasing with the release of new varieties, but traditional varieties are decreasing.
Sugar crops			

[32] Source: Bangladesh National Herbarium (Taxonomic study of the family Araceae).
[33] *Ibid*
[34] *Ibid.*
[35] *Ibid.*
[36] *Ibid.*
[37] *Ibid.*
[38] *Ibid.*
[39] *Ibid.*

Crop	Scientific name	State of diversity	
		Present state of diversity	Diversity trend
Sugarcane	*Saccharum officinarum, S. spontaneum*	About 900 cultivars were mentioned. At least two wild species occurs in Bangladesh i.e. *S. robustum and S. spontaneum.*	Increasing with the release of new varieties, but traditional varieties are decreasing.
Beverage			
Tea	*Camellia sinensis*	Data on diversity are not available. However 475 accessions of Camellia *sinensis* collected.	Increasing with new collections and release of new varieties.

Minor Crops and Under-utilized Species

There are a good number of minor and under-utilized crops grown in the country. A tentative list of such crops with their relative importance is given in Appendix Table III.2A.

State of diversity of minor and underutilized crops: The state of diversity of minor and underutilized crops has hardly been monitored and as such their status of diversity is not known with any degree of certainty. However, the information available has been summarised in Appendix Table III.2B.

Wild Plants Related to Cultivated Crops and Their State of Diversity

The Bangladesh Country Report on Plant Genetic Resources, 1995 (The First Report, FAO/ICPPGR) identified more than 300 wild indigenous species of plants that are relatives to the cultivated crops grown in Bangladesh (Appendix Table III.3)[40]. A list of wild rice maintained in gene bank is given in Appendix Table III.4[41]. The diversity of wild plants, in general, is decreasing, in most cases much faster than in cultivated species. The reasons are summarised below under **"Factors influencing the state of plant genetic diversity".**

Recognizable threat of genetic vulnerability resulting from loss of diversity grown by farmers:

There are a number of recognizable threats of genetic erosion and genetic vulnrability in the country. These include:

- The number of crop varieties in farmers' fields has reduced drastically since the introduction of green revolution technologies. For example, it was reported that some 12,000 rice cultivars existed in this region.[42] At present farmers grow mostly the improved varieties released from research institutes and their number does not exceed more than a few dozens.
- An estimated 73,000 hectares of forest has been lost through encroachment for aquaculture and agriculture during 1970s and 1980s. About 8,000 hectares of forest are lost annually to homestead establishment, urbanisation and deforestation.[43]

[40] ICPPGR, Country Report – Bangladesh. 1995 (Appendix Table III.3
[41] Wild rice maintained in Bangladesh (Appendix Table III.4
[42] Ahmad, Q. K. and S. M. Hasanuzz*Aman*. 1998. Agricultural Growth and Environment. In: Faruquee, R. Bangladesh Agriculture in the 21st Century. The University Press Limited, Dhaka. Pp. 81-107.
[43] See Hossain, M. G. 2005. Bangladesh Agriculture: A Critique on Performances and the Challenges of Tomorrow. Jatoya Shahitya Prakashani, Dhaka 1000. pp. 34.

With these disappeared numerous plant genetic resources for food and agriculture, both in use currently and with potential use in the future.

- The first volume of the *Red Data Book* published in 2001 identified 106 species of vascular plants that are threatened at various degrees.[44]
- Some of the threatened species identified in The *Red Data Book* are no longer traceable in the country.

Diversity of modern varieties

The diversity of modern varieties is increasing with the introduction of new varieties from NARS institutes, imports by private enterprises and also through the release of new varieties by private enterprises (e.g. East West Seed Bd. Ltd. for vegetables). Indicative data are given in Table III.1 above and Appendix Table III.2B. Comprehensive data, however, are not available.

Diversity of landraces/farmers' varieties

The diversity of land races/farmers' varieties has decreased significantly over the years. Indicative data are given in Tables III.1 above and Appendix Table III.2B. Comprehensive data, however, are not available.

Factors influencing the state of plant genetic diversity

Changing relative importance of crops: The relative importance of a number of crops has changed over the years. Prior to the introduction of HYV rice since late 1960s and 1970s, *Aus* and *Aman* rice grown in the hot and wet months of the year (*Kharif season*) were the most important crops. There was very little *Boro* (winter) rice cultivation. The introduction of photo insensitive HYV rice varieties grown with irrigation during the drier cooler months of the year (*Rabi* season) paved the way to a rapid increase in *Boro* rice cultivation, for that matter in total rice production in the country. It is estimated that currently 50% of the rice grown in the country comes from (winter) *Boro* rice.

This led to a significant reduction in the cultivation of *Aus* rice and dry season crops (pulses, oilseeds, winter vegetables and spices like onion, garlic, etc). Also the area under the major cash crop, jute as well as cotton has reduced significantly due the overriding importance of growing cereal food crops, coupled with less demand for jute in international market because of the competition from synthetic fibres. In general, jute cultivation has now been driven to marginal lands.

However, of late, vegetable production has been increasing as a result of the commercialisation trend in agriculture and better access to markets through an improvement in rural roads and transport facilities. In recent years maize cultivation is also increasing due to its increasing demand as poultry feed.

[44] Khan, M. S. et al. (Eds.). 2001. Red Data Book of Vascular Plants of Bangladesh. Bangladesh Agricultural Research Council/Bangladesh National Herbariumm Dhaka,

Assessment of genetic erosion of PGR

The Bangladesh National Herbarium published a preliminary list of 106 threatened plant species in 2001.[45] The list is shown in Appendix Table III.5. Apart from this, there are no serious studies undertaken for assessment of erosion of PGR. Undertaking further studies is indeed important to determine the expanse of genetic erosion *vis-à-vis* the endangered/threatened species and their conservation measures.

Factors identified as responsible for genetic erosion in Bangladesh

The factors responsible for genetic erosion identified in Bangladesh are as follows:

- Unplanned conversion of agricultural land to non-agricultural uses (housing, construction of roads and highways, industrialization and other infrastructures).
- Urbanisation and human population growth.
- Use of high yielding crop varieties at the expense of traditional varieties/landraces.
- Riverbank erosion, leading not only to the direct loss of land and homesteads along with biodiversities but also to driving affected peoples out to areas previously used for agriculture or left for wild /forest flora.
- Disappearance of backyard forests of homesteads due to scarcity of land[46].
- Transformation of rainfed agriculture into irrigated farming through the use of ground water.
- Construction of flood control embankments leading to habitat destruction.
- Water logging and drainage problems arising from Flood Control and Drainage (FCD) Projects and/or Flood Control, Drainage and Irrigation (FCDI) Projects.
- Shrimp monoculture in coastal areas leading to salinity increase that practically drove out crop culture and/or the growth of wild flora in these fragile ecosystems.
- Unscrupulous forest clearance and overexploitation of forest species.
- Settling plain land farmers in forest areas who attempt plain land cultivation practices there. Forest dwelling people previously used to manage these forests with their traditional knowledge.
- Felling of trees in village groves to meet the demands for timber and fuel.
- Hill cutting.
- Flood.
- Construction of barrage (e.g. Farakka Barrage upstream in India).
- Environmental effects – cyclones, tidal surges, environmental pollution, and sea level rise, and salinity increase in coastal areas mentioned above.
- Invasive alien species (especially *Acacia* and *Eucalyptus*).
- Plant diseases (especially red rot disease in sugarcane has been identified as a major cause of loss of sugarcane diversity)[47].

[45] Khan, M. S., M. M. Rahman and M. Arshed Ali. 2001. Red Data Book of Vascular plants of Bangladesh, Bangladesh National Herbarium.
[46] The backyard forest was a characteristic feature in rural Bangladesh with flora of wild, medicinal and/or harvestable plant species. These have now virtually vanished with the disappearance of backyard forests.
[47] Source: Bangladesh Sugarcane Research Institute, Ishurdi.

- Limited knowledge of multiple use of species, lack of value addition and overexploitation of plant genetic resources.
- Loss of soil fertility and desertification process ensued in northern parts of Bangladesh.

Future Needs and Priorities

Improving the understanding of the state of diversity

In order to improve the understanding of the state of diversity, comprehensive surveys and monitoring have to be undertaken periodically. This is by no means a small work and it demands a planned approach, skill and financial support. The survey work undertaken so far is considered too scanty. For example, the Bangladesh National Herbarium states, "only 40 per cent of floristic survey has so far been completed by Bangladesh National Herbarium" since the liberation of Bangladesh in 1971. Habitat destruction, over exploitation, climate changes have adversely affected biodiversity of the country during the intervening period. Many species have become threatened and some might have already become extinct. For improving the understanding of the state of diversity, the stakeholder organisations made the following suggestions:

- National and institutional priorities for undertaking surveys should be established. (Status of the organisation undertaking surveys should be strong and in this respect BNH is considered not to be strong enough).[48]
- For capacity building, especially for assessing genetic erosion and improving responses to genetic erosion, staffs have to be trained and adequate trained staffs have to be deployed.
- Strategic direction with appropriate policy should be in place along with research and management facilities.
- Logistic support to be made available.
- Regional and international cooperation and support should be sought.
- Evaluation and characterization of genetic material have to be strengthened.
- Genetic finger printing facilities should be made available.
- Preservation facilities for genetic material need to be improved.
- Necessary financial support needs to be ensured.

Summary

The Major Crops under the Multilateral System*:* The major crops of Bangladesh include a good number of crops beyond the list of crops included in the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA). These include jute, tea, sugarcane and a number of vegetable crops.

[48] Source: BNH: Answers to Question 1.7 of 'Indicators and Reporting Format for Monitoring the Implementation of Global Plan for Conservation and Utilization of PGRFA.' (2005)

The State of Diversity of Major Crops: The state of diversity of rice is enormous with 12,000 germplasm but these are currently threatened. While the diversity of traditional varieties is decreasing fast, there is an increasing trend in the diversity of modern varieties. Data on the diversity of most crops are not available but there is a decreasing trend for all traditional varieties.

Minor Crops and Under-utilized Species

There are a good number of minor and under-utilized crops grown in the country. State of diversity of minor and underutilized crops has hardly been monitored. Many of these are important for food security of the rural people, especially the poorer sections of the population.

Wild Plants Related to Cultivated Crops and Their State of Diversity

More than 300 wild indigenous species of plants have been identified that are relatives to the cultivated crops grown in Bangladesh. But in recent times these have been seriously threatened. Recognizable threats of genetic vulnerability include, among other things, replacement of traditional varieties by modern varieties, forest clearance and forest encroachment. The first volume of Red Data Book (2001) identified 106 species of vascular plants that are threatened some of which are no longer traceable. The diversity of land races/farmers' varieties has decreased significantly over the years.

Changing relative importance of crops: The relative importance of a number of crops has changed over the years. There was very little *Boro* (winter) rice cultivation in the past but currently *Boro* contributes about 50% of the rice produced. This led to a significant reduction of *Aus* rice. Similarly, the area under jute, a major cash crop, has reduced drastically. Of late vegetable production has been increasing because of the commercialisation trend in agriculture, better access to markets through improvement of rural roads and transport facilities. In recent years, maize cultivation has also been increasing.

Factors identified as responsible for genetic erosion in Bangladesh

The major factors responsible for genetic erosion are:

- Unplanned conversion of agricultural land to non-agricultural uses.
- Urbanisation and human population growth.
- Use of high yielding crop varieties at the expense of traditional varieties/landraces.
- Riverbank erosion, leading not only to the direct loss of land and homesteads along with biodiversities but also to driving affected peoples out to areas previously used for agriculture or left for wild/forest flora.
- Disappearance of backyard forests due to scarcity of land.
- Transformation of rain-fed agriculture to irrigated farming.
- Construction of flood control embankments leading to habitat destruction.

- Water logging and drainage problems arising from Flood Control and Drainage (FCD) Projects and/or Flood Control, Drainage and Irrigation (FCDI) Projects.
- Shrimp monoculture in coastal areas leading to salinity increase that practically drove out crop culture and/or the growth of wild flora in these fragile ecosystems.
- Unscrupulous forest clearance and overexploitation of forest species.
- Settling plain land farmers in forest areas who attempt plain land cultivation practices there. Forest dwelling people previously used to manage these forests with their traditional knowledge.
- Felling of trees in village groves to meet the demands for timber and fuel.
- Hill cutting.
- Flood.
- Construction of barrage (e.g. Farakka Barrage upstream in India).
- Environmental effects– cyclones, tidal surges, environmental pollution, and sea level rise, and salinity increase in coastal areas mentioned above.
- Invasive alien species (especially *Acacia* and *Eucalyptus*)
- Plant diseases (especially red rot disease in sugarcane has been identified as a major cause of loss of sugarcane diversity)
- Lack of knowledge of multiple use of species, lack of value addition and overexploitation of plant genetic resources.
- Loss of soil fertility and desertification process ensued in northern parts of Bangladesh.

Improving the understanding of the state of diversity

- National and institutional priorities for undertaking surveys should be established.
- For capacity building, especially for assessing genetic erosion and improving responses to genetic erosion, staffs have to be trained especially in Taxonomy and adequate trained staffs have to be deployed.
- Strategic direction with appropriate policy should be in place along with research and management facilities.
- Logistic supports to be made available.
- Regional and international cooperation and support should be sought.
- Evaluation and characterization of genetic material have to be strengthened.
- Genetic finger printing facilities should be made available.
- Preservation facilities for genetic material need to be improved.
- Necessary financial supports need to be ensured.

Chapter 2: The State of *In situ* Management

Activity Area 1: Surveying and Inventorying of Plant Genetic Resources for Food and Agriculture

Some sporadic surveys on wild PGRFA have been undertaken in Bangladesh. These are shown in Appendix Table III.6. However, a few *in situ* locations for some crop species have been identified by concerned stakeholder organizations. These are given in Table III.2 (a) below.

Table III.2 (a). *In situ* locations of crops identified by stakeholder organizations

Stake-holder	Crop	No. of *in situ* locations identified	Name of location	Present status	Future programme
BARI	Pigeonpea	2	• Forest of Rajendrapur • Forest of Khagrachhari	The plants are vulnerable and threatened	On-farm conservation
	Jack fruit (Year round fruiting)	2	• Khagrachhari • Gazipur	Well managed	On-farm conservation and development of propagation system
BRRI	Rice	5	• Madhupur National Park • Sonagazi, Feni • Betagi, Borguna • Sonadia, Cox's Bazar • Kalapara, Patuakhali	Follow up studies are yet to be undertaken	• On-farm conservation of traditional varieties (Birpala, Sadamota, Sobrimaloti, Horibhog and Horishankar) may be undertaken in Southwest of Bangladesh • On-farm conservation of traditional varieties (Kataribhog, Chinigura, Dadkhani) may be in Northwest of Bangladesh • On-farm conservation of deep water rice varieties (Khama, Chamara and Aswina) may be undertaken in 'deep water areas' of Bangladesh. • *In situ* conservation of wild rice and relatives to be undertaken in identified fileds (Madhupur, Sonadia, Patuakhali reas)
BTRI	Tea	About 100 tea estates	• Old seed orchards and tea sections of the estates in Sylhet, Moulavibazar, Hobiganj, Chittagong and Rangamati districts	These orchards and tea sections are being cleared by uprooting old plants to be replaced by new / improved varieties of tea	-

Priority Areas for Survey and Inventory

The priority areas for survey and inventory of plant genetic resources in Bangladesh have been identified Table III.2 (b).

Table III.2 (b). Ranking priority areas for survey and inventory of plant genetic resources

Name of priority area	Priority ranking	Major threats to PGRFA	Stakeholder
1. North and Eastern Hilly Region of Bangladesh	High	Wild and crop related wild species are in danger due to habitat loss, indiscriminate use of land including promotion of rubber plantation and pineapple cultivation through clearance of forests and hilly areas.	Bangladesh Agricultural Research Institute (BARI), Bangladesh Forest Research Institute (BFRI), Bangladesh National Herbarium (BNH) and Bangladesh Jute Research Institute
2. BADC Farms – Horticultural Development Farms, Agro Service Centres, Seed Multiplication Farms, Vegetable Farms, and Jute Farms	Medium	Traditional varieties/land races are discarded due to low productivity. BADC does not usually produce/multiply seeds of traditional varieties or of all crops. BADC produce/multiply usually seeds of varieties that have been released from NARS institutes.	Bangladesh Agricultural Development Corporation (BADC)
3. Chittagong and Chittagong Hill Tracts including areas affected by Kaptai Lake	High	Habitat destruction due to deforestation and inundation of valleys due to Kaptai Hydro-electric Project, illegal encroachment, hill cutting, and over exploitation of forest produce.	Bangladesh National Herbarium (BNH) and Bangladesh Jute Research Institute
4. Southwest Coastal Region of Bangladesh, including Sundarbans and areas of shrimp culture	High	Salinity, floods, cyclones, tidal surges, impeded river flows from and deforestation/ indiscriminate tree felling/forest clearance in upstream areas, illegal poaching (Sundarbans), unplanned shrimp culture, sea level rise, environmental pollution	Coastal Development Partnerships (CDPs)
5. Madhupur/Bhawal Garh and the Garo Hill	High	Habitat destruction due to deforestation, illegal encroachment, rubber plantation, pine apple and banana farming following forest clearance, monoculture of invasive species (e.g. *Acacia* and *Eucalyptus* plantation), and over exploitation of forest produce.	Bangladesh Forest Research Institute (BFRI) / Bangladesh National Herbarium (BNH)
5. Sugarcane Growing Areas of Bangladesh	Medium	Red rot disease	Bangladesh Sugarcane Research Institute (BSRI)
6. All over Bangladesh	Low to medium	Monoculture of modern varieties of crops, population-pressure, shortage of fuel and timber, infrastructure development, industrialisation, denudation of village groves, lack of land use planning and/or implementation.	Bangladesh Rice Research Institute (BRRI), Bangladesh Agricultural Research Institute (BARI), Bangladesh Institute of Nuclear Agriculture (BINA), Bangladesh Forest Research Institute (BFRI), Bangladesh National Herbarium (BNH), Bangladesh Agricultural University (BAU), Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Cotton Development Board (CDB).
7. Hilly, haor and coastal areas of Bangladesh	Priority high	Jhum cultivation is decreasing due to human disturbances, expansion of modern variety cultivation in haor areas, disturbances in natural habitats both by human and natural calamities.	Banglaesh Rice Research Institrute

Constraints in Undertaking Surveys and Inventories

- The National Committee on Plant Genetic Resources (NCPGR)[49] formed in 1997 is currently inactive. The Committee should be reactivated not only for planning and organising surveys and monitoring of PGRFA but also for developing strategies, plans and programmes, related to PGRFA in a participatory manner and for their implementation in a coherent manner.

[49] The National Committee on Plant Genetic Resources (NCPGR), Bangladesh was formed soon after the Leipzig Conference in 1996 by Gazette Notification of the Ministry of Agriculture (1997). The Committee is currently inactive. It is important to reactivate the committee for gathering momentum in PGRFA matters.

- The drafts of Plant Varieties and Farmers' Right Protection Act of Bangladesh and Biodiversity and the Community Knowledge Protection Act of Bangladesh[50], submitted to the Government, which need to be formalised without delay. .
- The Government needs to be persuaded to implement the proposal submitted for establishing the National Institute for Plant Genetic Resources[51]. The proposed institute was expected to organize PGRFA activities including surveying and monitoring.

In addition, the following constraints are to be addressed with urgency:

- National priorities on biodiversity *vis-à-vis* PGRFA identified in a National Workshop in 1997[52] needs to be revisited and new set of priorities, as deemed necessary with the passage of time, are established.
- Insufficient financial support for PGRFA.
- Insufficient number of staff in PGRFA.
- Existing staffs do not have sufficient skills.

Needs and Priorities

- Awareness campaigns on conservation of plant genetic resources should be strengthened and widened. (Bioversity can be of assistance).
- Organisational responsibilities for carrying out PGR activities should be clarified and coordinated.
- Surveying and monitoring of PGRFA should be taken up with urgency. (Bioversity and FAO can be of assistance).
- Adequate staff for carrying out PGRFA should be deployed.
- Training needs in PGRFA, especially in surveying and monitoring, should be properly assessed and training provided. Where necessary, training of existing staff to upgrade skills should be organised. (Bioversity and FAO can be of assistance).
- Adequate funds for carrying out activities related to PGRFA, including surveying and monitoring, should be made available.
- Collaboration and sharing of information on PGR with countries of the region and international organisation/institutions should be strengthened. (Bioversity and FAO can be of assistance).
- Priority areas for survey and monitoring have been identified (Table III. 2(b). Such surveys and monitoring activities need to be organised. (Bioversity and FAO can be of assistance in taking initiatives).
- Organization of National workshop and consultation meeting in order to assess the national states progress and future priority activities.

[50] With the initiatives of the NCPGR, drafts of the twin Acts (Plant Varieties and Farmers Right Protection Act of Bangladesh, and Biodiversity and Community Knowledge Protection Act of Bangladesh) were subnitted to the government in 1998. These Acts, among other things, spelled out mechanisms for surveying and monitoring of PGRFA.

[51] The NCPGR organised a National Workshop on Plant Genetic Resource in 1997. The workshop recommended the establishment of the National Institute for Plant Genetic Resources for adressing issues related to PGRFA including surveying and monitoring. A proposal for establishing such an institute was submitted to the government and the government took steps towards establishing the institute. The matter died down after an initial thrust.

[52] Ibid.

Opportunities

- Most of the research institutes have Genetic Resources Units.
- Bangladesh is a signatory to the CBD (1992) and the government is committed to the implementation of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture.
- Through a collaborative National Workshop on Plant Genetic Resources in 1997, involving the National Committee on Plant Genetic Resources, the Bangladesh Agricultural Research Council and the Bioversity and FAO, the national priorities in PGR have already been identified.
- The Institutional Focal Point identified for the PGRFA activities.
- The Acts related to PGR have been drafted. These need to be formalised and operationalised.
- Priority ranks for surveys have already been identified [Table III.2(b) above].
- Some survey and inventory work have already been undertaken by stakeholder institutions/organisations (see Appendix Table III.6). Support is needed for strengthening and for widening survey and inventory work. (FAO can be of assistance).

Activity Area 2: Supporting On-Farm Management and Improvement of Plant Genetic Resources for Food and Agriculture

Programmes/projects/activities on *in situ* conservation of Wild Crop Relatives and Wild Plants for Food and Agriculture (WCR/WPF) have so far been poor in Bangladesh. On-farm management of PGRFA has not received the priority it deserves (see Appendix Table III.7) and its integration with national programmes is yet to be initiated. It is, therefore, not surprising that there is no incentives to promote on-farm management on PGRFA in the country.

Major Limitations to On-farm conservation and Improvement of PGRFA

The major limitations identified by stakeholder organisations in on-farm conservation and improvement of PGRFA were as follows:

- On-farm management and improvement of PGRFA are not yet a national priority.
- Lack of incentives to farmers.
- Insufficient number of staff for conservation work.
- Insufficient skills of staff.
- Limited staff training.
- Inadequacy of financial support.
- Insufficient seed/planting material.
- Livelihood and conservation activities have not been linked.
- Cost of conservation is not known.
- Conservation methodologies are yet to be developed.

The other constraints identified were:

- A small minority of landowners who are absentee landlords owns a major portion of the cropland, especially in southern coastal region. They could careless for on-farm conservation of PGR.
- Increasing population and scarcity of land warrant more crop production from the limited land area. Traditional varieties with lower yield have a low premium to the mass of farmers.

Priority needs

For promoting on-farm management and improvement of PGRFA, the following should be given attention to:

- Awareness building on indigenous PGRFA, their extent and significance, their erosion, and their potentials for improvement, through seminars, publication of booklets and biodiversity fairs.
- Awareness building on the causes of changes/erosion of PGRFA.
- Promoting the uses of traditional varieties in identified pocket areas (rain-fed areas and marginal lands) where farmers still depend on them. These farmers should be provided incentives or production support.
- Developing markets for products originating from traditional and underutilized varieties and crops.
- There have been initiatives from the private sector[53] for developing, at the local level, small-scale seed production enterprises. Such initiatives should be supported.
- Providing incentives, including awards and certificates, to farmers for on-farm conservations, management and improvement of PGRFA
- Providing training on on-farm management and improvement of PGRFA with special emphasis on:
  - Seed enhancement.
  - Preservation.
  - Processing and packaging.
  - Consumption.
- Organising visit to successful models of on-farm management.
- Creating facilities for genetic finger printing.
- Re-introduction of organic crop production practices in a limited scale but production support and market linkages.

[53] For example, Bangladesh Golden Agri Seed Associates, with about 40 small-scale farmer based seed enterprises (FBSEs) as members spread throughout the couintry, have been producing quality seeds with assistance from GTZ and BADC. The number of companies has been steadily increasing with time and these FBSEs are contributing to the seed requirement at the local level. The enterprises have benefited from credit support from a National Commercial Bank against security money provided by GTZ but for a limited time. Such credit facilitation needs to be continued and widened to encourage local level quality seed production, skill development, enterprise and and income generation in rural areas.

Activity Area 3: Assisting Farmers in Disaster Situation to Restore Agricultural Systems

Bangladesh is vulnerable to natural disasters such as floods, cyclones, tornadoes, tidal surges and occasional droughts.

There is yet another silent disaster occurring on a regular basis, the riverbank erosion. It affects some 150 Upazilas of 50 districts of Bangladesh and takes place at more than 250 places along the banks of 16 rivers[54]. An estimated 1,305 sq. km is washed away annually affecting about one million people who lose their homestead and agricultural land often with standing crops. Unfortunately, till today this disaster has hardly featured as an important threat to people, their livelihood, for that matter to plant genetic resources.

The natural disasters, mentioned above, cause significant disruption of the agricultural systems in affected areas, or, the country as a whole, with consequent losses of plants and seeds of local ecotypes, varieties and strains. The losses adversely affect agricultural productivity and sustainability. The mechanism for facilitating acquisition, multiplication, distribution and cultivation of reintroduced germplasm is practically left to the affected farmers themselves. The mechanism adopted by the government, if at all, virtually excludes farmers' participation or their choice. A national plan to assist farmers, to recover and preserve PGRFA following disasters, is yet to be developed so that the genetic resources lost as a result of natural disasters could be restored. Awareness campaigns on this should be undertaken with a sense of urgency.

Community genebanks

Community genebanks are yet to be promoted. However, a local NGO, UBINIG, in Tangail district has reportedly established community genebank. The example of UBINIG demonstrates that with proper guidance, community genebanks can be established in the country that can make germplasm easily available to farmers, especially following natural disasters, or, as and when they want to use such germplasm.

Local seed supply system

The local seed supply system, for all practical purposes, is a domain of the farmers themselves (farmer to farmer exchange) and the public sector involvement, if anything, is partial. Reliable information on the local seed supply system is hardly available. However, the public sector, through the BADC plays a role in the seed supply system as it (BADC) sells some quantity (around 5% of the requirement) of foundation seeds, and that practically belong to modern varieties (hardly any seeds of traditional varieties). Therefore, identification of appropriate germplasm for reintroduction, following a disaster, has hardly been given attention to. An assessment is usually made

[54] Nazem, N. I. and K. M. Elahi. 1990. Impacts of riverbank erosion on Land settlement in Bangladesh. Proceedings of a Seminar on People and environment in Bangladesh. Held in Dhaka, February 1990 under the *Au*spices of UNDP and UNFPA.

of the damages caused by a disaster but hardly of post-disaster restoration with any emphasis on PGRFA.

Constraints to restoration of locally adapted germplasm

The greatest constraint to restoration of locally adapted germplasm following disasters is that disaster response in terms of restoration of locally adapted varieties/germplasm has not received the priority it deserves. For the same reason, PGRFA are not collected and inventoried, and pre-disaster information on PGRFA is hardly available.

As there is no organised approach in place to restore the agricultural systems following disasters, similarly no organisation can be clearly identified with this specific responsibility. Bangladesh Agricualtural Research Council in cooperation with research and development organizations related to PGR should initiate planning and organizing surveys and monitoring of PGRFA. They should also develop strategies, plan and programmes related to PGRFA in a participatory manner and their implementation in coherent manner.

Activity Area 4: Promoting In situ Conservation of Wild Crop Relatives and Wild Plants for Food Production

Crop wild relatives (CWR) and wild plants for food and agriculture (WPF) are valuable genetic resources as the sources of new genes for developing new varieties of crops. Wild species are best conserved *in situ* in their natural habitats to allow evolution and adaptive changes.

Unfortunately, Bangladesh has not yet been able to develop a plan for *in situ* conservation of PGRFA except an attempt to conserve forest genetic resources by the Bangladesh Forest Research Institute. However, some sporadic attempts have been made towards *in situ* conservation by some stakeholder organisations. These are summarized in Table III.7 below.

Up till now no organised programme/project/activity to raise public awareness of the value of crop wild relatives and wild food plants in food security and plant breeding have been undertaken. This is inspite of the fact that rural people often use many wild plants as food, not necessarily in times of food crisis or famine, but also in their everyday life. However, with time, such sources of food are disappearing fast because niches of wild plants have been converted to either agricultural land or used for infrastructure of one kind or the other.

Table III.7. Programmes/projects/activity towards *In situ* conservation undertaken in Bangladesh

Stake-holder	Programme/ project/activity	Conservation area	Taxon	Taxon group	Identification criteria	Additional topics covered
CDP	Rice Diversity and Production in the Southwest of Bangladesh	Southwest coastal region	*Oryza*	Wild food plant	Tolerance to salinity	Management practices for maintaining high level CWR/WPF genetic diversity; plans for encouraging public participation, *ex situ* conservation of threatened and endangered CWR/WPF.
CDB	Chittagong Hill Tracts Integrated Development and Rehabilitation Program (CDB Part)	Hill area: Balaghata, Bandarban; Kawkhali, Rangamati; Matiranga, Khagrachhari , and Raicha	*Gossypium arboreum*	Crop Wild Relatives	Short fibre length	Management practices for maintaining high-level CWR/WPF genetic diversity, involvement of hill communities, plans for encouraging public participation.
BRRI	On-Farm Conservation of Rice	Madhupur in Tangail district and Betagi in Borguna District	*Oryza*	Crop Wild Relatives	Long and short plant types, open type panicles with shattering tendency	Management practices for maintaining high level CWR/WPF genetic diversity.
BARI	On-farm conservation of indigenous vegetables	Chittagong HillTracts and Madhupur Hills	Cucurbits, Hyacinth Bean, Solaneceous spp.	Crop Wild Relatives	Baseline survey for identification of diversity	Community Seed Bank and *in situ* conservation.

Appendix Table III. 3 shows that there are some 300 crop wild relatives in Bangladesh. With lack of awareness, clearance of forestlands and absence of programmes/project activities to conserve crop wild relatives and wild food plants, it is apprehended that either many of these species are on their way out or some might have already become extinct. It is, therefore, important that appropriate *in situ* conservation and utilization of CWR/WPF strategies be developed in the country in the interest of both long and short-term food security. It is unfortunate that the national policy is indifferent towards conservation of CRW/WFP. Even though environmental impact assessment (EIA) is mandatory in Bangladesh prior to the approval of a project, unfortunately EIA does not extend to crop wild relatives.

The draft "Biodiversity and Community Knowledge Protection Act" proposes policy/regulatory changes that could have a positive impact on conservation of wild crop relatives and wild food plants. It is thus important that the draft Act is formalized in the soonest possible.

Needs

Thus, for promoting *in situ* conservation of CWR/WFP, the following needs were identified:

- The draft Biodiversity and Community Knowledge Protection Act should be formalized and implemented.

- R&D activities on *in situ* conservation of CWR/WFP should be promoted and strengthened.
- Model testing of *in situ* methodology, especially in marginal land, should be initiated.
- Homestead forestry, agroforesty and fodder raising programmes should be strengthened.
- Livelihood supporting species should be identified and their conservation promoted.
- Concerted efforts should be made to preserve traditional knowledge related to PGR, with special reference to CWR/WFP.
- Regional approach in *in situ* conservation of PGR should be undertaken.
- Regional and international collaboration and support should be sought for promoting *in situ* conservation of CWR/WFP.

Summary

Activity Area 1: Surveying and Inventorying of Plant Genetic Resources for Food and Agriculture

Some sporadic surveys on wild PGRFA have been undertaken in Bangladesh. The priority areas for survey and inventory of plant genetic resources in Bangladesh have been identified. Bangladesh Agricultural Research Institute has identified 2 *in situ* locations for pigeon Pea and 2 *in situ* locations for year round Jack Fruit; Bangladesh Rice Research Institute has identified 5 *in situ* locations for rice; and Bangladesh Tea Research Institute has identified 100 Estates as *in situ* locations for Tea germplasm [Table II.2(a)]. Proposed National Plant Genetic Resources Institute was expected to organize PGRFA activities including surveying and monitoring. Insufficient staff in PGRFA and Insufficient financial support for PGRFA awareness campaigns on conservation of plant genetic resources should be strengthened and widened. The national priorities in PGR have already been identified through a collaborative National Workshop on Plant Genetic Resources in 1997, involving the National Committee on Plant Genetic Resources, the Bangladesh Agricultural Research Council and the Bioversity.

Activity Area 2: Supporting On-Farm Management and Improvement of Plant Genetic Resources for Food and Agriculture

Programmes/projects/activities on *in situ* conservation of Wild Crop Relatives and Wild Plants for Food and Agriculture (WCR/WPF) have so far been poor in Bangladesh. Major limitations to On-farm Conservation and Improvement of PGRFA include: On-farm management and improvement of PGRFA are not yet a national priority; insufficient number of staff for conservation work; lack of trained staff; insufficient seed/planting material. Priority needs include: Providing incentives, including awards, to farmers for on-farm conservations, management and improvement of PGRFA.

Activity Area 3: Assisting Farmers in Disaster Situation to Restore Agricultural Systems

Pre-disaster information on PGRFA is hardly available. Thus, the greatest constraint to restoration of locally adapted germplasm following disasters is that disaster response in terms of restoration of locally adapted varieties/germplasm has not received the priority it deserves. For the same reason, PGRFA are not collected and inventoried, and pre-disaster information on PGRFA is hardly available. Community genebanks need also be promoted. The National Committee for Plant Genetic Resources (NCPGR) should be revived or new committee should be formed to undertake initiatives, among other things, towards post-disaster restoration of agriculture and to identify its (NCPGR) institutional base with the proposed National Institute of Plant Genetic Resources.

Activity Area 4: Promoting In Situ Conservation of Wild Crop Relatives and Wild Plants for Food Production

For promoting *in situ* conservation of CWR/WFP, the following needs were identified:

- The draft Biodiversity and Community Knowledge Protection Act should be formalized and implemented.
- R&D activities on *in situ* conservation of CWR/WFP should be promoted and strengthened.
- Model testing of *in situ* methodology, especially in marginal land, should be initiated.
- Homestead forestry, agroforesty and fodder raising programmes should be strengthened.
- Livelihood supporting species should be identified and their conservation promoted.
- Concerted efforts should be made to preserve traditional knowledge related to PGR, with special reference to CWR/WFP.
- Regional approach in *in situ* conservation of PGR should be undertaken.
- Farmers' awareness building efforts on conservation should be promoted.

Chapter 3: The State of *Ex situ* Management

Activity Area 5: Sustaining Ex situ Collections

***Ex situ* Programmes/Projects/Activities:** Table III.8(a) below gives the summary of *ex situ* programmes/projects/activities undertaken in Bangladesh.

Table III.8(a). *Ex situ* programmes/projects/activities undertaken and species covered by different stakeholders

Stake-holder	*Ex situ* programmes/ projects/ activities	Type of activity	Species covered[55]
BARI	Conservation of germplasm	Collection, long, and medium term conservation in genebank storage, and also conservation in field genebank	**Cereals** :*Triticum aestivum, Setaria italica, Panicum miliaceum, Sorghum bicolor, Zea mays, Hordeum vulgare, Fagopyrum esculentum, Triticale cereale, Pennisatum americanum, Eragrostis abyssinica, Avena sp.* **Pulses***: Lathyrus sativus, Lens culinaris, Cicer arietinum, Vigna mungo, Cajanus cajan, Vigna radiata, Macrotyloma uniflorum, Vigna unguiculata, Pisum sativum, Phaseolus vulgaris, Canavalia gladiata, Psophocarpus tetragonolobus,* including some wild legumes like 'Bazari', 'Hinta' etc. **Oilseeds:** *Brassica campestris sub-sp. campestris, Arachis hypogaea, Sesamum indicum, Glycine max, Ricinus communis, Linum usitatissimum, Guizotia abyssinica* **Vegetables:** *Lablab purpureus, Brassica oleracea, B. oleracea var. botrytis, Raphanus sativus, Amaranthus spp., Cucurbita moschata, Solanum melongena, Lagenaria vulgaris, Hibiscus abelmoschus, Benincosa hispida, Luffa cylindrica, Vigna sinensis subsp sesquipedalis, Luffa acutangula, Trichosanthes anguina, Momordica charantia, Lycopersicon esculentum, Basella alba, Spinacea oleracea, Faba vulgaris, Phaseolus vulgaris, Hibiscus subdariffa, Canavalia gladiata, Ipomoea aquatica, Psophocarpus tetragonolobus, Cucumis melo, Trichosanthes dioica, Dioscorea spp. Emblica officinalis, Moringa oliefera, , Citrus sinensis, Amorphophalus campanulatus, Ficus carica, Momordica cochinchinensis* (wild) **Fruits:** *Persia americana, Musa spp. Aegle marmelos, Averrhoa bilimbi, Syzygium cumini, Annona reticulata, Madhuca indica, Baccaurea sapida, Averrhoa carambola, Carrissa carandus, Prunus avium, Cowa mangostrin, Annona squamosa, Phoenix sylvestris, Dillenia indica, Flacourtia jangomas, Crescentia cujete, Spondalis mangifera, S. heterophyllus , Zizyphus mauritania, Citrus sinensis, Nephelium longana, Flacourtia indica, Mangifera indica, Artocarpus lakoocha, Citrus sinensis, Passiflora edulis, Punica granatum, Nephelium lappaceum, Diospyros peregrina, Tamarindus indica, Antidesma ghaesembilla, Diospyros discolor, Syzigium samarangens, Artocarpus champeden, Mangifera sylvetica, Feronia elephantum, Vitis vinifera, Psidium guajava, Loea spp. Citrus grandis.* **Root and Tuber Crops:** Aroids, Potato, Yams and Sweet Potato. **Others:** Some ornamental and medicinal plants as well as some under-utilized PGRFA.
BADC	Seed Processing and Storage	Seed processing and short-term storing. (including field gene bank)	Seeds of cereals, jute, vegetables, pulses, oilseeds and potato.
BRAC	Storing Maize Germplasm	Short-term storing (including field gene bank)	*Zea mays*

[55] Species names given under stakeholders are not essentially exhaustive .

Stake-holder	*Ex situ* programmes/ projects/ activities	Type of activity	Species covered[55]
CDP	Rice Diversity and Production in Southwest Bangladesh	Short-term storing (including field genebank) and on-farm conservation	*Oryza sativa*
CDB	• Chittagong Hill Tracts Integrated Development and Rehabilitation Programme (CDB part) • Strengthening Cotton Research, Seed Production and Extension	Short-term storing (including field gene bank) Short-term storing	*Gossypium arboreum* *Gossypium hirsutum and Gossypium barbadense*
BINA	Evaluation of Germplasm	Characterization and evaluation of HYV, mutants, exotic varietries and landraces	*Oryza sativa and Lens culinaris*
EWS (Bd) Ltd.	• Collection, Conservation, Evaluation and Characterization of Germplasm (mostly vegetable seeds) • Short-term Preservation Programme of Vegetable Seeds	Short-term storing (including field gene bank)	*Momordica charantia, Lagenaria vulgaris, Luffa acutangula, Citrullus lanatus, Cucurbita moschata, Trichosanthes anguina, Cucumis sativus, Benincosa hispida, Lycopersicon esculentum, Capsicum annuum, Solanum melongena, Allium cepa, Raphanus sativus, Brassica oleracea var. capitata, B. oleracea var. botrytis, Daucus carota, Brassica oleracea var. italica, Vigna unguiculata, Lablab purpureans, Abelmoschus esculentus, Carica papaya, Amaranthus gangeticus, A. tricolor, Spinacea oleracea, Basella alba, Ipomoea spp., Coriandrum sativus.*
BAU	• Collection, Conservation, Evaluation and Characterization of Landraces and Wild Relatives of Some Important Vegetables and Fruits • Screening of Brassica Germplasm for Salinity Tolerance and Their possible Use . • Tree Development Programme, Germplasm Centre • Genetic Study on Traits Related to Nitrogen Use Efficiency in Spring Wheat • Development of Varieties, Production Technology, Food and Fish Feed Uses of Soybean	• Short-term storing (including field gene bank) • Germplams storing in arboretum (including field gene bank) • Long-term storing (including field gene bank)	*Cucumis melo, C. sativus, Cucurbita moschata, Benincosa hispida, Trichosanthes dioica, Momordica dioica, Luffa acutangula, Momordica charantia, Solanum melongena, Trishosanthes anguina, Vigna unguiculata, Lagenaria sciceraria, Abelmoschus esculentus, Citrus aurantifolia, Citrus limon, C. grandis, C. jambhiri, C. assamensis, C. macroptera, C. sinensis, C. reticulata, Citrus sp. (Mexican lime), Artocarpus heterophyllus, Mangifera indica, Mangifera longipes (wild), Brassica juncea, B. campestris, B. napus, Triticum aestivum, Solanum melongena, Psidium guajava, Litchi sinensis, Persia americana, Pyrus communis, Garcinia mangostana, Sandoricum indicum, Nephelium lappaceum, Annona squamosa, Chrysophyllum cainito, Phyllanthus emblica, Punica granatum, Averrhoa carambola, Cocos nucifera, Zizyphus mauritiana, Vitis vinifera, Ficus indica, Achras sapota, Corchorus capsularis, C. olitorius, Hibiscus cannabinus, Hibiscus sabdariffa.*
BJRI	Characteerization and Evaluation of White Jute, Tossa	Long- and short-term storing	*Corchorus capsularis C. olitorius, Hibiscus cannabinus, H. sabdariffa and 13 wild Corchorus spp. and 20 wild Hibiscus spp.*

Stake-holder	*Ex situ* programmes/ projects/ activities	Type of activity	Species covered[55]
	Jute, Kenaf , Mesta and their wild relatives.		
BRRI	Characterization and Evaluation of Germplasm Accessions	Long, medium and short-term storing (including field gene bank)	*Oryza* spp. (traditional varieties/land races/wild rice and oryza coarchtata
BSRI	Collection and Conservation of Indigenous and Exotic Germplasm of Sugarcane	Short-term storing (field gene bank)	*Saccharum spp.*
BSMRAU	Short-term Preservation Programme of Aromatic Grain Legumes, Rice and Vegetable Germplasm	Short-term storing (field gene bank)	*Oryza sativa, Raphanus sativus, Pisum sativum, Vigna radiata and V, mungo*
BTRI	Collection and Conservation of Indigenous and Exotic Germplasm of Tea	Field Ggnebank	*Camellia sinensis, Camellia assamica, Camellia assamica sub-spp. lasiocalyx*

Collection of Germplasm

Germplasm collection by different stakeholder organizations prior to and after the First Report on Plant Genetic Resources (1996) are shown in Table III.8 (b) below.

Table **III.8 (b). Germplasm collection by different stakeholder organizations prior to and after the first report on plant genetic resources, 1996.**

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
BARI	**Cereals**						
	Wheat	*Triticum aestivum*	216	349	565	Weat Research Centre (WRC), *Aus*tralia, Ethiopea	Donated by WRC
	Foxtail Millet	*Setaria italica*	510	5	515	Bogra, Comilla, Dhaka, Dinajpur, Jamalpur, Noakhali, Pabna, Rangpur, Sherpur, Tangail, China, Japan, India	Donated by Plant Breeding Division. (PBD)
	Proso millet	*Panicum miliaceum*	209	-	198	Bogra, Comilla, Jalmalpur, Jessore, Noakhali, Pabna, Rangpur, Serajganj, Tangail, France, India, Japan	Donated by PBD
	Sorghum	*Sorghum vulgare*	185	-	185	Locally collected from allover the country.	Donated by PBD
	Maize	*Zea mays*	52	17	69	Bandarban, Khagra-chhari, Rangamati, Chauadanga, Chittagong, Cox's Bazar, Gazipur, Jamalpur, Tangail, Thailand	Donated by PBD
	Barley	*Hordium vulgare*	27	3	30	Jamalpur, Bogra, Faridpur, Tangail, Pabna, Thailand, India, Syria, Mexico.	Donated by PBD

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Buckwheat	*Fagopyrum esculentum*	0	5	5	Thakurgoan, Napal	Exploration & Collection, Introduction
	Triticale	*Triticale cereale*	1	4	5	Ethiopea, Locally collected	Introduction
	Pearl millet	*Pennisetum americanum*	2	-	2	ICRISAT, India	Introduction
	Teff	*Eragrostis abyssinica*	0	2	2	Ethiopea	Introduction
	Oat	*Avena sp.*	0	1	1	Locally collected	Donated by Farm division, BARI
	Total	-	**1191**	**386**	**1577**	-	-
	Pulses						
	Grasspea	*Lathyrus sativus*	1845	0	1845	Bogra, Brahmanbaria, Chandpur, Chittagong, Chuadanga, Comilla, Dhaka, Dinajpur, Faridpur, Gazipur, Gopalganj, Ishurdi, Jamalpur, Jessore, Jhenaidah, Joypurhat, Kurigram, Lalmanirhat, Madaripur, Manikganj, Munshiganj, Chapai Nababganj, Naogaon, Narayanganj, Narsingdi, Natore, Nawabganj, Nilphamari, Nogaon, Pabna, Rajbari Rajshahi, Rangpur, Satkhira, Serajganj, Shariyatpur,Sirajganj, Tharkurgaon	Exploration and collection (E&C), and donated by Pulse Res. Centre (PRC)
	Chickpea	*Cicer arietinum*	752	`0	752	Bogra, Faridpur, Gaibandha, Jessore, Jhenaidah, Joypurhat, Khulna, Kurigram, Kushtia, Magura, Mexico, Naogaon, Natore, Nowabganj, Pabna, Rajbari, Rajshahi, Satkhira, Tangail India, Iran.	E&C and Pulses Research Centre (PRC)
	Lentil	*Lens culinaris*	362	44	406	Bogra, Joypurhat, Kurigram, Lalmonirhat, Natore, Nilphamari, Noagaon, Chapai Nowabjanj, Rajshahi, Rangpur	E&C and PRC
	Blackgram	*Vigna mungo*	89	0	89	Barisal, Faridpur, Jamalpur	E&C and PRC
	Pigeonpea	*Cajanus cajan*	22	62	84	Chittagong, Comilla, Cox's Bazar, Dinajpur, Feni, Gazipur, Habiganj, Jamalpur, Kustia, Moulovi Bazar, Natore, Nilphamari, Panchagar, Rajshahi, Rangamati, Rangpur, Sherpur, Sunamganj, Sylhet, Tangail'	E&C and PRC
	Mungbean	*Vigna radiata*	71	0	71	Jamalpur, Jessore, Naogaon, Nawabganj, Rajshahi, Sherpur	E&C and PRC
	Horse gram	*Macrotyloma uniflorum*	4	52	56	Locally collected	E&C and PRC

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Cowpea	*Vigna unguiculata*	28	0	28	Bandarban, Chittagong, Cox's Bazar, Feni, Gazipur, Mymensing, Potuakhali	E&C and PRC
	Kali motor	*Phaseolus spp.*	1	1	2	Locally collected	E&C
	Total	-	**3174**	**159**	**3333**	-	-
	Oilseeds						
	Mustard	*Brassica campestris*	51	293	344	Chittagong, Rajbari, Tangail, Sweden	E&C and Oilseed Res. Centre (ORC)
	Sesame	*Sesamum indicum*	83	0	83	Chittagong, Comilla, Dinajpur, Jamalpur, Jessore, Natore, Panchagarh, Rajbari, Rajshahi, Rangpur, Thakurgaon, Chandpur, Faridpur, Khulna, Kustia, Narayanganj, Pabna, Satkhira	E&C and ORC
	Soybean	*Glycine max*	16	66	82	India, Indonesia, Itali, Korea, Nepal, Nigeria, Nigeria, Sri Lanka, Taiwan, Thailand, USA, Vietnam	E&C and ORC
	Sunflower	*Helianthus annuus*	0	46	46	Locally collected	ORC
	Ground nut	*Arachis hypogea*	20	3	23	Locally collected	ORC
	Flax (Linseed)	*Linum usitattissimum*	10	8	18	Bandarban, Cox's Bazar, Faridpur, Munshiganj, Narail, Netrakona, Rajbari, Sherpur, Tangail	E&C and ORC
	Niger	*Guizotia abyssinica*	2	0	2	Jamalpur	E&C and ORC
	Castor	*Ricinus communis*	0	1	1	Locally collected	
	Total	-	**182**	**417**	**599**	-	-
	Vegetables						
	Amaranth	*Amaranthus spp.*	106	514	620	B. Baria, Borguna, Chandpur, Chittagong, Chuadanga, Comilla, Cox's Bazar, Faridpur, Feni, Jamalpur, Jhalkati, Khagrachari, Kushtia, Lakhmipur, Mymensingh, Naogaon, Natore, Noakhali, Potuakhali, Rajbari, Rangamati, Tangail, Pabna, Magura, Natore, Nawabganj, Gaibandha, Chittagong, Rajshahi, Rangamati, *Aus*tria	E&C and Horticulture Research Centre (HRC)

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Hyacinth-bean	*Lablab purpureus*	30	521	551	Barisal, Borguna, Chittagong, Comilla, Cox's Bazar, Dinajpur, Feni, Gaibandha, Gazipur, Gopalgonj, Hobiganj, Jessore, Jhalkati, Khagrachari, Lakhimpur, Magura, Mymensingh, Naogaon, Natore, Netrokona, Noakhali, Pabna, Panchagarh, Pirozpur, Potuakhali, Rajshahi, Rangamati, Rangpur	E&C and HRC
	Pumpkin	*Cucurbita maxima*	18	374	392	B. Baria, Barisal, Chandpur, Chauadanga, Chittagong, Comilla, Cox's Bazar, Dhaka, Faridpur, Feni, Gazipur, Gopalganj, Hobigonj, Jamalpur, Jessore, Jhalkati, Jhinaidah, Kurigram, Kushtia, Lakhmipur, Lalmonirhat, Magura, Meherpur, Naogoan, Natore, Nawabgonj, Noakhali, Pabna, Pirozpur, Potuakhali, Rajbari, Rajshahi, Rangpur, Sirajganj, Tangail, Chittagong, Cox's Bazar, Gazipur, Jamalpur, Khagrachari, Natore, Nawbabgonj, Pabna, Rangamati, Sherpur	E&C and HRC
	Brinjal	*Solanum melongena*	208	40	248	Bandarban, Barisal, Chauadanga, Chittagong, Comilla, Cox's Bazar, Dinajpur, Faridpur, Gaibanda, Jamalpur, Jessore, Kurigram, Kushtia, Magura, Mynensing, Naogaon, Nawabganj, Netrokona, Nilphamari, Noakhali, Pabna, Panchagarh, Potuakhali, Rajbari, Rajshahi, Rangamati, Rangpur, Sherpur, Sirajganj, Tangail, Thakurgoan	E&C and HRC
	Bottle gourd	*Lagenaria vulgaris*	12	230	242	Chauadanga, Chittagong, Gaibanda, Gazipur, Hobigonj, Jessore, Kushtia, Magura, Meherpur, Mymensingh, Naogaon, Natore, Chapai Nawabgonj, Pabna, Rangpur, Sirajganj	E&C and HRC

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Okra	*Hibiscus esculentus*	93	133	226	Barisal, Borgona, Chanpur, Chauadanga, Chittagong, Comilla, Cox's Bazar, Faridpur, Feni, Gazipur, Gopalganj, Jamalpur, Jessore, Jhinaidah, Kushtia, Lakhmipur, Magura, Meherpur, Mymensingh, Narail, Natore, Netrokona, Nilphamari, Noakhali, Pabna, Panchagor, Rajbari, Rangamati, Rangpur, Sherpur, Sirajganj, Tangail, Japan, *Aus*tria	E&C and HRC
	Ash gourd	*Benincasa hispida*	15	139	154	Chittagong, Gazipur, Jamalpur, Khagrachari, Mymensingh, Natore, Pabna, Rajshahi, Rangamati, Sherpur	E&C and HRC
	Pea	*Pisum sativum*	111	43	154	Feni, Khagrachari, Noakhali, Pabna, Pabna, Rangpur, Sirajganj	E&C and HRC
	Sponge gourd	*Luffa cylindrica*	5	143	148	B. Baria, Chandpur, Chauadanga, Chittagong, Comilla, Faridpur, Jamalpur, Jessore, Kushtia, Lakhmipur, Lalmonirhat, Magura, Mymensingh, Naogoan, Narail, Natore, Chapai Nawabganj, Netrokona, Noakhali, Pabna, Patuakhali, Rajbari, Sirajganj, Tangail	E&C and HRC
	Yard longbean	*Vigna sesquipedalis*	1	146	147	Bandarban, Barisal, Borguna, Chandpur, Chauadanga, Chittagong, Comilla, Cox's Bazar, Dhaka, Faridpur, Feni, Gaibandha, Jamalpur, Jessore, Jhalkati, Jhenaidah, Khagrachari, Kushtia, Lakhimpur,Mymensingh, Narail, Natore, Noakhali, Pabna, Potuakhali, Rajbari, Rajshahi, Rangpur, Tangail, Rangamati	E&C and HRC
	Ridge gourd	*Luffa acutangula*	12	112	124	Chauadanga, Chittagong, Comilla, Cox's Bazar, Dhaka, Faridpur, Jamalpur, Khagrachari, Kushtia, Lakhmipur, Naogoan, Natare, Nawabganj, Netrokona, Noakhali,Pabna, Patuakhali, Rajbari, Rangamati, Rangpur, Sirajganj	E&C and HRC

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Snake gourd	*Trichosanthes anguina*	11	111	122	B. Baria, Chandpur, Comilla, Faridpur, Feni, Jamalpur, Lakhimpur, Magura, Mymensingh, Noakhali, Rajbari, Tangail, Barisal, Chittagong, Cox's Bazar, Gazipur, Gopalganj, Jamalpur, Khagrachari, Pabna, Potuakhali, Rangamati	E&C and HRC
	Bitter gourd	*Momordica charantia*	33	70	103	Chauadanga, Chittagong, Comilla, Cox's Bazar, Dhaka, Dinajpur, Faridpur, Gazipur, Jessore , Jhinaidah, Khagrachari, Kushtia, Lakhimpur, Meherpur, Mymensingh, Narail, Natore, Chapai Nawbabgonj, Netrokona, Pabna, Rajbari, Rajshahi, Rangpur, Sherpur, Tangail	E&C and HRC
	Tomato	*ycopersicon esculentum*	47	26	73	Faridpur, Jessore, Rangpur	E&C and HRC
	Cucumber	*Cucummis sativus*	17	48	65	Barisal, Chauadanga, Comilla, Feni, Kushtia, Lakhmipur, Magura, Mymensingh, Narail, Netrokona, Potuakhali, Rajbari, Sirajganj, Tangail, Gazipur, Jamalpur, Mymensingh, Nawbabganj, Pabna, Rajshahi, Sherpur	E&C and HRC
	Indian spinach	*Basella alba (white)*	3	31	34	Bandarban, Barisal, Chittagong, Chuadanga, Cox's Bazar, Dinajpur, Faridpur, Jessore, Jessore, Kushtia, Magura, Meherpur, Narail, Panchagor, Rajbari, Rajshahi, Rangamati, Rangpur, Sirajganj	E&C and HRC
	Spinach	*Spinacia oleracea*	3	23	26	Chauadanga, Chittagonj, Cox's Bazar, Faridpur, Gazipur, Kushtia, Meherpur, Rajbari, Sirajganj, Indian	E&C and HRC
	Radish	*Raphanus sativus*	12	7	19	Kurigram	E&C and HRC
	French bean	*Phaseolus vulgaris*	4	10	14	Manikganj, Dinajpur, Tangail, Chittagomg	E&C and HRC
	Ricebean	*Vigna umbellata*	0	6	6	Comilla	E&C and HRC
	Sorrel	*Hibiscus sabdariffa*	0	6	6	Chittagong, Bandarban, Rangamati	E&C
	Sword bean	*Canavalia gladiata*	0	5	5	Jessore, Kushtia, Netrokona	E&C
	Patchai	*B. chinessis*	2	1	3	Chittagong	E&C
	Chinese cabbage	*Brassica pekinensis*	1	2	3	Chittagong	E&C
	Cabbage	*B. oleracea chinensis* var capitata	2	0	2	Locally collected	E&C

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Garden pea	*Pisum sativum*	0	1	1	Chittagong	E&C
	Faba bean	*Faba vulgaris*	20	0	20	Dhaka and Rangpur region	E&C
	Cauliflower	*B. oleracea chinensis* var botrytis	0	1	1	Locally collected	E&C
	Cheena sak	*Brassica spp.*	0	1	1	Locally collected	E&C
	Kangkong	*Ipomoea reptans*	1	0	1	Locally collected	E&C
	Lia sak	*Brassica sp.*	0	1	1	Locally collected	E&C
	Napa sak	*Malva verticillata L.*	0	1	1	Locally collected	E&C
	Valvat bean	*Phaseolus sp.*	0	1	1	Locally collected	E&C
	Winged bean	*Psophocarpus teragonolobus*	1	1	2	Locally collected	E&C
	Total	_	**768**	**2748**	**3516**	_	_
	Spices						
	Chilli	*Capsicum frutescens*	28	98	126	Bandarban, Chandpur, Chauadanga, Chittagong, Comilla, Cox's Bazar, Faridpur, Gazipur, Jamalpur, Jessore, Kushtia, Magura, Meherpur, Mymensingh, Netrokona, Rajbari, Rajshahi, Rangamati, Tangail, Germany, Thailand	E&C
	Coriander	*Coriandrum sativum*	10	8	18	Chittagong, Comilla, Faridpur, Jessore, Joydebpur, Khagrachari, Kushtia, Tangail	E&C
	Black cumin	*Nigella sativa*	6	0	6	Gazipur	E&C
	Fenugreek	*Trigonella foenum-graceum*	4	0	4	Ethiopea and local	E&C
	Ajowan	*Carum copticum*	1	0	1	Locally collected	E&C
	Dill	*Peucedanum graveslens*	1	0	1	Locally collected	E&C
	Total		**50**	**106**	**156**	-	-
	Fruits						
	Marua	*Eleusine corocana (L) Gaertn.*	0	1	1	Local	E&C
	Musk melon	*Cucumis melo*	5	83	88	Chauadanga, Chittagong, Comilla, Cox's Bazar, Faridpur, Jamalpur, Kushtia, Meherpur, Mymensingh, Naogaon, Pabna, Rajbari, Sirajganj, Tangail	E&C
	Total	-	**5**	**84**	**89**	-	
	Others						

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Tobacco	*Nicotiana spp.*	64	0	64	Rangpur (former Tobacco Research Station)	Donated by PBD
	Sunnhemp	*Crotalaria spp.*	2	3	5	Cox's Bazar	E&C
	Yam bean	*Pachyrrhizus erosus*	1	2	3	Locally collected	E&C
	Total		67	5	72		
	Field gene bank						
	Pointed gourd	*Tricosanthes dioica*	0	83	83	Rangpur, Bogra, Chittagong, Gaigandha, Gazipur, Jessore, Kustia, Maherpur, Natore, Nawabganj, Pabna, Rajshahi, Rangpur, Sherpur	E&C
	Yam	*Dioscorea* spp	56	6	62	Dhaka, Bogra, Chittagong, Comilla, Cox's Bazar, Dhaka, Dinajpur, Jessore, Mymensingh, Pabna, Rajshahi, Rangpur, Sylhet	E&C
	Amla	*Phyllanthus emblica*	0	1	1	Gazipur	E&C
	Avocado	*Persea americana* Miller	0	1	1	Gazipur	Introduction
	Banana	*Musa* spp L.	0	1	1	Dhaka	E&C
	Bel fruit, Bael	*Aegle marmelos* L.	0	1	1	Gazipur	E&C
	Bilimbi	*Averrhoa bilimbi* L.	0	1	1	Locally collected	E&C
	Blackberry	*Antidesma ghaesembilla* Gaertner	*0*	1	1	Gazipur	E&C
	Bullock's heart	*Annona reticulata* L.	0	1	1	Gazipur	E&C
	Butter tree (Mahua)	*Madhuca indica*	0	1	1	Gazipur	E&C
	Burmese grape	*Baccaurea ramiflora* Lour.	0	1	1	Gazipur	E&C
	Carambola	*Averrhoa carambola*	0	1	1	Gazipur	E&C
	Carunda	*Carissa carandas*	0	1	1	Gazipur	E&C
	Cherry	*Prunus avium* L.	0	1	1	Gazipur	E&C
	Cowa	*Cowa megostrin*	0	1	1	Gazipur	E&C
	Custard apple	*Annona squamosa* L.	0	1	1	Gazipur	E&C
	Date palm	*Phoennix sylvestris*	0	1	1	Gazipur	E &C
	Dillenia	*Dillenia indica*	0	1	1	Gazipur	E&C
	Drum stick	*Moringa oleifera*	0	1	1	Rajshahi	E&C
	Elephant foot Yam	*Amorphophallus campanulatus*	0	1	1	Gazipur	E&C
	Fig	*Ficus racemosa* L.	0	1	1	Gazipur	E&C
	Flacourtia	*Flacourtia jangomas* (Lour.)	0	1	1	Locally collected	E&C

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Galabadh tree	*Grescentia cujete*	0	1	1	Sylhet	E&C
	Hogplum	*Spondias mangifera*	0	1	1	Gazipur	E&C
	Jackfruit	*Artocarpus heterophyllus* Lamk.	0	1	1	Gazipur	E&C
	Jujube	*Zizyphus mauritiana*	0	1	1	Gazipur	E&C
	Lemon	*Citrus aurantifolia*	0	1	1	Gazipur	E&C
	Longan	*Dimocarpus longan* Lour.	0	1	1	Gazipur	E&C
	Madagascar plum	*Flacourtia ramontchi* (Burm. f.) Merr.	1	1	1	Gazipur	E&C
	Mango	*Mangifera indica* L.	0	1	1	Gazipur	E&C
	Monkey jack	*Artocarpus lakoocha* Roxb.	0	1	1	Gazipur	E&C
	Orange (Multa)	*Citrus sinensis* (L.) Osbeck	0	1	1	Comilla	E&C
	Orange	*Citrus sinensis* (L.) Osbeck	0	1	1	Sylhet	E&C
	Passion fruit	*Passiflora edulis* Sims	0	1	1	Chittagong	E&C
	Pomegranate	*Punica granatum* L.	0	1	1	Gazipur	E&C
	Rambutan	*Nephelium lappaceum* L.	0	1	1	Philippines	Introduction
	River ebony	*Diospyros peregrina* Gupke.	0	1	1	Gazipur	E&C
	Rose apple	*Syzygium jambos L.*	0	1	1	Gazipur	E&C
	Star goose berry	*Phyllanthus acidus* (L.) Skeels	0	1	1	Gazipur	E&C
	Tamarind	*Tamarindus indica* L.	0	1	1	Thailand	Introduction
	Tisa	*Sapotaceae* sp.	0	1	1	Gazipur	E&C
	Wild Blackberry	*Antidesma ghaesembilla*	0	1	1	Gazipur	E&C
	Velvet apple	*Diospyros blancoi* A. DC.	0	1	1	Gazipur	E&C
	Wax jambu	*Syzygium samarangense* (Blume) Merr. & Perry	1	1	1	Gazipur	E&C
	Elephant apple	*Dillenia indica L.*	0	1	1	Gazipur	E&C
	Grape	*Vitis vinifera* L.	0	1	1	Gazipur	E&C
	Guava	*Psidium guajava* L.	0	1	1	Gazipur	E&C
	Litchi	*Litchi chinensis* Sonn.	0	1	1	Gazipur	E&C
	Olive	*Olea sp.*	0	1	1	Gazipur	E&C
	Pummelo	*Citrus maxima* (Burn) Merr.	0	1	1	Gazipur	E&C

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Wild Teasle gourd	*Momordica cochinchinensis*	1	1	1	Thakurgoan	E&C
	Wild Brinjal	*Solanum indicum*	0	1	1	Locally collected	E&C
		Solanum sysymbrifollium	1	1	1	Locally collected	E&C
		Solanum nigrum	1	1	1	Locally collected	E&C
	Wild Lemon	*Citrus sp.*	0	1	1	Khagrachhari	E&C
	Total	-	**61**	**136**	**197**	-	
BRRI	Rice	*Oryza sativa L.*	-			-	-
		Local varieties (Indica type)	4402	553	4955	All over Bangladesh	E&C
		Pure lines (Indica type)	52	0	52	All over Bangladesh	E&C, selection and purification
		Exotic (Indica type)	157	79	236	IRRI, China, Africa, Vietnam, Nepal etc.	Collection
		Breeding lines (Indica type)	168	682	850	Local and exotic	Collecgtion from breeding programmes
		Japonica type	72	0	72	Overseas	Introduction
		Wild rice	75	19	94	Overseas and local collection	Introduction and E&C
	Total	-	4926	1333	6259	-	-
BSRI	Sugarcane Wild Relatives	*Saccharum spontaneum*	26	10	36	Chittagong, Habiganj, Feni, Bandarban	E&C
	Local collection	*Sachharum sp.*	281	82	363	All over Banglaqdesh	E&C -
	Exotic collection	*Sachharum sp.*	437	102	539	India, USA, Indonesia, Malaysia, Thailand, Philippines, Brazil, Mauritius, *Au*stralia, Cuba, Oman, Egypt, Sri Lanka, France, Swaziland	Introduction
	Germplasm developed at the Institute	*Sachharum sp.*	255	169	426	Developed germplasm	Crop Breeding Division
	Total	-	999	363	362 Collec-tion	Actual held 902	
BINA	Rice	*Oryza sativa*	0	400	400	IRRI, BRRI, IAEA	GEP
	Mustard	*Brassica campestris*	2000	100	2100	Sweden, Canada, Denmark, Turkey, India	PC
	Mungbean	*Vigna radiata*	0	100	100	AVRDC	GEP
	Chickpea	*Cicer arietinum*	0	50	50	ICRISAT, ICARDA	GEP
	Lentil	*Lens culinaris*	0	300	300	ICRISAT, ICARDA	GEP
	Total	-	2000	950	2950 (Collec-tion)		-
CDB	Cotton	*Gossypium spp.*	386	104	490	Bangladesh, India, Zimbabwe, Pakistan, USA, Sudan, Egypt.	Germplasm exchange programme, Survey (local), Introduction
	Total		386	104	490		

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
BJRI	Jute	*Corchorus capsularis*	2361	7	23676	Nepal, Ivory Coast, Vietnam, Taiwan (AVRDC), Philippines, India, Kenya, Tanzania, IJO (IJSG), Biovarsity.	Survey, Personal visits and germplasm exchange
		C. olitorius	1429	36	1465	~	~
		Wild Corchorus	278	0	278	~	~
	Kenaf	*Hibiscus cannabinus*	681	17	698	~	~
	Mesta	*Hibiscus sabdariffa*	453	0	453	~	~
		Wild Hibiscus, allied genera	337	1	338	~	~
	Total		5539	54	5593		
BTRI	Tea	*Camellia sinensis* (L.) Kuntz				Sylhet, Chittagong in Bangladesh, India, Sri Lanka, Kenya, Korea, etc.	Survey, visits and germplasm exchange
		Local	274	84	358	"	E&C
		Exotic	45	68	113	Overseas	Introduction
	Wild Tea	*Camellia japonica*	1	0	1	South India	Introduction
		C. Chaerajong	0	1	1	Korea	-
		C. sasanqua	0			Seeds from Germany	-
		C. Yasang	0	1	1	~	-
	Total	_	320	155	475	_	_
BSMRAU	Rice	*Oryza sativa L.*	52	95	147	Netrokona, BRRI, Khulna, Rajshahi	Field collection
	Pea	*Pisum sativum L.*	50	88	138	BARI, Nothern Districts of Bangladesh	Institutional and Field collection
	Radish	*Raphanus sativus*	15	5	20		Personal contact
	Mungbean	*Vigna radiata*	25	100	125	AVRDC	Personal contact
	Pigeon pea	*Cajanus cajan*	0	40	40	ICRISAT	Personal contact
	Chickpea	*Cicer arietinum*	10	25	35	ICRISAT	Personal contact
	Snake Gourd	*Trichosanthes anguina*	0	22	22	Different Districts of Bangladesh	Field collection
	Rapeseed	*Brassica napus*	0	22	22	BARI	Personal contact
	Pumpkin	*Cucurbita moschata /maxima*	0	28	28	Japan and BARI	Personal contact
	Ginger	*Zingiber officinale*	0	19	19	Japan, Sierra Leon	Personal contact
	Onion	*Allium cepa*	0	38	38	Local market	Personal contact
	Brinjal	*Solanum melongena*	0	84	84	BARI and Local market	Personal contact
	Ash Gourd	*Benincasa Hispida*	0	46	46	BARI	Personal contact
	Total	-	152	612	764	-	-
E WS (Bd) Ltd.	Bitter gourd	*Momordica charantia*	28	800	828	Phillipine, Thailand, India, Vietnam, Indonesia and all over Bangladesh	Personal , Field collection
	Bottle Bottle gourd	*Lagenaria vulgaris*	14	730	744	Phillipine, Thailand, India and all over Bangladesh	Personal and Field collection
	Ridge gourd	*Luffa acutangula*	12	150	162	India, all over Bangladesh	Personal, Field collection
	Water melon	*Citrullus lanatus*	2	34	36	Japan, China, kora and Bangladesh	Personal contact

Stake-holder	Crop name	Species	No. of accession held upto			Location of collection	Methods of collection
			1996	1996-2006	Total		
	Pumpkin	*Cucurbita moschata*	8	842	850	India, Thailand, Phillipine, Bangladesh	Personal and Field collection
	Snake gourd	*Trichosanthes anguina*	6	112	118	Thailand, India, Bangladesh	Personal contact
	Cucumber	*Cucumis sativus*	8	200	208	Thailand, India, China, Bangladesh	Field collection
	Wax gourd	*Benincasa hispida*	12	631	643	India, Bangladesh, Malayasia	Personal contact
	Tomato	*Lycopersicon esculentum*	35	1200	1235	AVRDC, India, China, Thailand, Bangladesh	Personal contact
	Egg plant	*Solanum melongena*	26	800	826	India, China, Bangladesh, Phillipine	Personal contact
	Onion	*Allium cepa*	4	112	116	India, Pakistan, Burma, Bangladesh	Personal contact and field collection
	Chilli	*Capsicum annum*	12	200	212	India, Korea, Indonesia Bangladesh	Personal contact and field collection
	Radish	*Raphanus sativus*	12	120	132	India, China, Japan, NZ, Bangladesh	Personal contact and field collection
	Cauliflower	*Brassica oleracea var. capitata*	3	60	63	Japan, China, Thailand, Bangladesh	Personal contact and field collection
	Yard long bean	*Vigna unguiculata*	2	26	28	Thailand, India, Bangladesh	Personal contact and field collection
	Country bean	*Lablab purpureus*	3	16	19	India, Bangladesh	Personal contact and field collection
	Okra	*Abelmoschus esculentus*	7	123	130	India, Phillipine, Bangladesh	Personal contact and field collection
	Papaya	*Carica papaya*	3	29	32	India, Taiwan, Thailand Bangladesh	Personal contact and field collection
	Coriander	*Coriandrum sativum*	2	12	14	Bangladesh, New Zealand, India	Personal contact and field collection
	Kangkong	*Ipomoea sp.*	1	6	7	Thailand, Bangladesh, Philippines	Personal contact and field collection
	Stem amaranth	*Amaranthus gangeticus*	2	6	8	Bhutan, Bangladesh, India	Personal and field collection
	Leaf amaranth	*Amaranthus tricolor*	2	8	10	Bangladesh	Personal and field collection
	Sponge gourd	*Luffa cylindrica*	0	14	14	Nepal, Bangladesh	Personal and field collection
	Total		**204**	**6231**	**6435**		

Collection of wild relatives of crop plants

Some of the stakeholder organizations made attempts to collect wild relatives of crop plants. These are summarized in Table III.8(c).

Table III.8 (c). Wild relatives of crop plants collected by different stakeholder organizations

Stake-holder	Crop	Taxon collected	No. of collection up to1996	No. of collection after 1996	Location of collection	Prevalence status	Time of collection
BARI	Brinjal	*Solanum sisymbrifolium*	1	-	-	Abundant	March-April
	Brinjal	*Solanum nigrum*	1	-	-	Abundant	March-April
	Teasle Gourd	*Momordica cochinchinensis*		-	Thakurgaon	Threatened	March-April
	Amaranth	*Amaranthus* sp.	-	1	Jessore	Threatened	March-April
	Lemon	*Citrus* sp.	-	1	Khagrachari	Threatened	July-September
BTRI	Tea	*Camellia japonica*	1	-	South India	Not available in Bangladesh	-

Stake-holder	Crop	Taxon collected	No. of collection up to1996	No. of collection after 1996	Location of collection	Prevalence status	Time of collection
		Chaeraejong (Wild Tea)	-	1	Korea	Not available in Bangladesh	-
		Camellia sisanqua	-	1	Germany	Not available in Bangladesh	-
		Yasang (Wild Tea)	-	1	Germany	Not available in Bangladesh	-
BRRI	Rice	*Oryza rufipogon*	75	-	All over Bangladesh	Few	March-September
		Oryza officinalis	4	-	All over Bangladesh	Threatened	March-September
		Oryza nivara	1	1	Hilly areas of Bangladesh	Endangered	March-September
		Oryza sativa f. spontania	1	1	All over Bangladesh	Abundant	March-September
		Oryza alta	-	4	Exotic	-	-
		Oryza latifolia	-	2	Exotic	-	-
		Oryza granulata	-	2	Exotic	-	-
		Oryza longistamina	-	2	Exotic	-	-
		Oryza minuta	-	2	Exotic	-	-
		Oryza punctata	-	2	Exotic	-	-
		Oryza glaberrima	-	5	Exotic	-	-
		Oryza barthii	-	2	Exotic	-	-
BJRI	Jute	*Corchorus* spp	278	-	Bangladesh, Kenya, Tanzania, Maldives, USA	Few endangered	June-July
	Hibiscus	*Hibiscus* spp.	369	-	Thailand, China, Niger, Mali	Few	September-October
	Allied genera	-	346	-	Many other countries including Namibia	Threatened	September-October
BSRI	Sugarcane Wild Relatives	*Saccharum spontaneum*	26	10	Chittagong, Habiganj, Feni and Baqndarban	-	-
	Total		26	10			
CDB	Cotton	*Gossypium arboreum*	-	30	Chittagong Hill Tracts	Few and, endangered	-
EWS (Bd) Ltd.	Ridge Gourd	*Luffa acutangula*	-	2	Lalmonirhat	-	-
	Watermelon	*Citrullus vulgaris.*	-	1	Himchhari, Cittagong	-	-
	Cucumber	*Cucumis sativus*	-	2	Pirojpur	-	-
	Brinjal	*Solanum melongena*	-	1	Thakurgaon	-	-
	Okra	*Abelmoschus esculentus*	-	1	Gazipur	-	-
	Sponge Gourd	*Luffa cylindrica*	-	8	Munshiganj	-	-

It appears that collection efforts have intensified after 1996. This suggests that there is an increased awareness among professionals of different stakeholder organizations about the importance of germplasm collection. This needs to be continued and supported.

***Conditions of Storage*:** The storage conditions for germplasm of different stakeholders are given in Table III.9.

Table III.9. Germplasm storage conditions under different stakeholder organisations

Stake-holders	Type of storage	Temperature (^{0}C)		Humidity (%)		Moisture content		Total area (sq. meter)	Total volume (cubic meter)	Space available
		Max.	Min	Max	Min.	Max	Min			
BARI	Medium term seed store	6	4	50	35	8	6	23	60	Yes
	Long term seed store	-12	-15	-		8	6	15	40	Yes
BRAC	Short term seed store	23	17	55	40	11	9	20	80	Yes
CDB	Short term seed store	20	16	60	50	7	6	12	12	No
EWS (Bd) Ltd.	Short term seed store	25	18	40	35	12	8	12	40	Yes
BAU	Short term Seed store	35	10	90	25	10	8	-	-	No
BINA	Short term seed store	20	15	90	10	12	10	12	-	Yes
BJRI	Long term seed store	-20	-20	30	30	10	5	19	53	Yes
	Medium term seed store	4	4	30	30	10	5	19	53	Yes
BRRI	Medium term seed store	4	0	40	30	8	6	17	46	Yes
	Long term seed store	-18	-20	-	-	8	6	20	54	Yes
	Short termseed store	22	18	60	50	10	8	12	34	Yes
BSMRAU	Medium term seed store	5	2	30	15	12	8	20	10	Yes

Ex situ Collections

III.10. *Ex situ* collections by taxon/crop by different stakeholder organisations and their number of accessions, under different storage conditions with their inventories and monitoring activities

Stake-Holder	Ex situ Collections	*Taxon*	Stock			Stock Inventories	Monitoring Of viability	Monitoring Of genetic integrity
			Mid term Seed storage	Long term Seed storage	Field Gene Bank			
BARI	Active collection	*Triticum aestivum*	563	450	-	Performed regularly	Performed regularly	Not performed
		Setaria italica	515	506	-	Performed regularly	Performed regularly	Not performed
		Panicum miliaceum	198	198	-	Performed regularly	Performed regularly	Not performed
		Sorghum bicolor	162	162	-	Performed regularly	Performed regularly	Not performed
		Hordeum vulgare	30	20	-	Performed regularly	Performed regularly	Not performed
		Fagopyrum esculentum	5	5	-	Performed regularly	Performed regularly	Not performed
		Triticale cereale	5	5	-	Performed regularly	Performed regularly	Not performed
		Panicum miliaceum	2	2	-	Performed regularly	Performed regularly	Not performed
		Ergrostis abyssinica	2	2	-	Performed regularly	Performed regularly	Not performed
		Avena sp.	1	1	-	Performed regularly	Performed regularly	Not performed
		Zea mays	69	69	-	Performed regularly	Performed regularly	Not performed
BARI		Cereals (11 spp.)	1577	1577				
		Pulses (12 spp.)	3322	3000				
		Oilseeds (7 spp.)	599	450				
		Vegetables (37 spp.)	3517	3350				
		Spices (6 spp.)	156	156				
		Fruits (2 spp.)	150	150				
		Tobacco (3 spp.)	64	64				
		Yam bean (1 spp.)	3	3				
		Sunnhemp (1 spp.)	5	5				
		Field genebank (53 spp.)			196			
		Potato (1 spp.)	4					
		Spices	156	156				
		Fruits	150	150				
		Tuber crops	5	5				
		Total	9301	9169				
CDP	Rice diversity and production in southwest Bangladesh	*Oryza sp.*	Farrm stored	-	Performed regularly	Performed regularly	Not performed	
CDB	• Cotton Research, Seed Production and Extension Programme	*Gossypium hirsutum*	460	-	-	Performed regularly	Performed regularly	Performed regularly

Stake-Holder	Ex situ Collections	*Taxon*	Stock			Stock Inventories	Monitoring Of viability	Monitoring Of genetic integrity
			Mid term Seed storage	Long term Seed storage	Field Gene Bank			
	• Chittagong Hill Tracts Integrated Development and Rehabilit-ation Program	*Gossypium arboreum*	30	-	-	Performed regularly	Performed regularly	Performed regularly
EWS (Bd) Ltd	Collection, Evaluation and Conservation of Indigenous Germplasm	*Momordica charantia, Lagenaria vulgaris, Luffa acutangula, Citrullus lanatus, Cucurbita moschata, Trichosanthes anguina, Cucumis sativus, Benincasa hispida, Lycopersicon esculentum, Capsicum annuum, Solanum melongena, Allium cepa, Raphanus sativus, Vigna unguiculata, Lablab purpureans, Abelmoschus esculentus, Carica papaya, Amaranthus gangeticus, A. tricolor, Spinacea oleracea, Basella alba, Ipomoea sp., Coriandrum sativus.*	3,000	1,000	-	Performed regularly	Performed regularly	Performed regularly
BJRI	Collection, ConserationCh aracterization, Evaluation and Deocumentatio n of Jute, Kenaf and Mesta Germplasm	*Corchorus capsularis, C. olitorius, Hibiscus cannabinus, H. sabdariffa and allied genera*	4,500	5,969	-	-	Performed Regularly	Performed Regularly
BRRI	Collection, Evaluation, Utiliation of Rice (Oryza satifa L.) germplasm	*Oryza sativa Oryza rufipogon, Oryza officinalis, , Oryza nivara Oryza sativa, Oryza alta, Oryza latifolia, Oryza punctata, Oryza* glaberrima, *Oryza barthii*	6,000	250	-	-	Performed Regularly	Performed regularly
BSRI	Collection and Conservation of Indigenous & exotic germplasm of sugarcane	Saccharum spp.	-	-	902	-	Performed regularly	Performed regularly

Stake-Holder	Ex situ Collections	*Taxon*	Stock			Stock Inventories	Monitoring Of viability	Monitoring Of genetic integrity
			Mid term Seed storage	Long term Seed storage	Field Gene Bank			
BSMRAU	Collection, Evaluation and Utilizarion	*Oryza sativa, Pisum sativum, Raphanus sativus, Vigna radiata, Vigna mungo, Brassica napus,*	612	-	-	-	Performed but irregularly	Performed but irregularly
BINA	-	-	-	-	-	-	Performed but irregularly	Performed but irregularly
BTRI	-	*Camellia sinensis*			475		Performed but irregularly	Performed but irregularly

Publication and Information Systems Related to Ex situ Collections

Publications and information systems related to *ex situ* collections, as reported by different stakeholder organisations, are given in Table III.11 below.

Table III.11. Publications and information systems related to *ex situ* collections, the media used and regional/international cooperation

Stake-holder	*Ex situ* collection	Title of publication	Publication media	Publication coverage	Data type	Information system	No. of accessions covered	Cooperation/ Agreement with regional crop networks /international organization
BARI	Active collection (Medium term conservation)	Catalogue	Hard copy (printed / Facsimile)	Passport data, Evaluation/ characteriza-tion data	Analyzed data	Documentation of germplasm in Excel Programme	9342	AVRDC Project on Collection, Conservation and Utilization of Indigenous Vegetables (RETA 3639).
	Base collection (Long term conservation	Annual Report	Hard copy (printed / Facsimile)	Passport data, Evaluation/ Character-ization data, Regeneration Data	Analyzed data	Documentation of Germplasm in Excel Programme	7000	
	Active collection (Medium term conservation)	Crop catalogue	Hard copy (printed / Facsimile)	-	Analyzed data	-	147	
	Active collection (Medium term conservation)	Annual Research Report	-	-	-	-	1406	
CDB	Collection, documenta-tion & characterizati on of *Gossypium arboreum*, Gossypium hirsutum and Gossypium barbadense	Annual Research Report	Hard copy (printed Facsimile)	Evaluation/ Character-ization data, Regeneration Data	Raw data	Cotton Research, Seed Production, and Extension	490	-
BAU	-	-	-	-	-	-	-	
BRRI	Collection. Evaluation and Utilization Rice (Oryza sativa L.) Germplasm	Annual Research Report/ Journal	Hard copy (printed / Facsimile)	Passport data, Evaluation/ Characteriza-tion data, Regeneration Data	Raw data	Bangladesh Rice Information System	5,600	Exchange of germplasm with IRRI, JICA, USDA, WARDA

Stake-holder	*Ex situ* collection	Title of publication	Publication media	Publication coverage	Data type	Information system	No. of accessions covered	Cooperation/ Agreement with regional crop networks /international organization
	Collection of traditional/ Local and Wild Rice Varieties	*Deshi Dhaner Jat (*Book) (Indigenous Rice Cultivars - in Bangla)	Hard copy (printed /Facsimile)	Passport data, Evaluation/ Characteriza-tion data, Regeneration Data	Raw data	Bangladesh Rice Information System	5,600	
	Active collection	Physico-chemical characteriza -tion	Book /Hard copy	Evaluation and characteriza-tion	Accession data	Printed material	2500	
	Active collection	Passport data and physico-chemical characteri-za tion	Report/ Hard copy	Evaluation and characteriza-tion	New collection from AEZ # 13	Printed material	116	
	Active collection	Participator y variety selection in rice	Booklet/ Hard copy	Evaluation and characteriza-tion	Selection	Printed material	11	
BJRI	Collection, Conservation, Characteri-zation, Evaluation and Documenta-tion of Jute, Kenaf and Mesta Germplasm	Accession/ CGRegister	Hard copy, soft copy (computer based)	Passport data	Analysed data	Printed and computer based	3475	Maintenance of base collection of germplasm of jute, kenaf and other allied fibres collected by IJO
BSMRAU	Collection, evaluation and utilization of vegetable germplasm	Annual report, PhD andMS Thesis	Hard copy (printed /facsimile)	Evaluation/ Character-ization data,	Analyzed data	Printed materials	123	-
BTRI	Field genebank	Updating and enrichment of tea germplasm in Bangladesh	Hard copy	Evaluation / Characteriza-tion	-	Printed material	104	
BSRI	Field Genebank	Annual Reports and Project Reports	Hard Copy	Evaluation, Characteriza-tion and Agronomic Traits	Analyzed data	Printted materials	902	Exchange of sugarcane germplasm through the programme under Varietal Exchange in Southeast Asia and the Pacific
BINA	Collection and evaluation of rice and lentil germplasm	Annual Report, PhD, and MS Thesis,	Hard copy	Morphological and molecular characteriza-tion	Raw data	Printed materials	170	Collection of germplasm from IRRI and ICARDA
EWS (Bd) Ltd	Collection, evaluation and utilization of vegetable germplasm	Annual research report	Hard copy	Evaluation data	Analysed data	Printed materials	3000	-

Constraints

Major constraints in sustaining *ex situ* collections mentioned by stakeholders were:

- Limited fund.
- Limited number of advanced trained personnel.

- Insufficient training.
- Irregular power/electricity supply.
- Disaster-prone environment (mainly floods and tidal surges in the coastal regions, and riverbank erosion in hinterland areas).
- Lack of focused approach on conservation.
- Occurrence of pests and diseases.
- Insufficient long-term storage facilities and lack of field genebanks at BRRI.
- Red rot disease for sugarcane germplasm.

Needs and Priorities

Needs and priorities can be summarised as follows:

- Support to existing genebanks should be strengthened, with particular reference to their modernization as identified above.
- The proposal for establishing the National Plant Genetic Resources Institute should be revived and implemented for coordinated and coherent activities on PGR, especially for *ex situ* collection, evaluation, characterization, and management.
- Regeneration activities should be improved for maintaining the germplasm collected and safeguarding against their losses and degeneration.
- Arrangements should be made for strengthening for staff training in stakeholder organizations and retaining them so that the PGR system becomes stronger in the future. It is rather weak at present.
- Continuous support should be ensured in terms of trained staff and finance, particularly for active collections, to prevent their losses.
- Participatory *ex situ* conservation system should be developed with the involvement of local farmers/peoples so that collection of indigenous germplasm can be strengthened, information on local knowledge and practices, as well as uses of indigenous PGR can be gathered and documented and preserved. For this establishment of Community Genebanks and their networks would be an opportune approach.
- Contingency plans for and buffer stock of indigenous PGR should be developed to support farming systems following disasters.
- Regional/international collaboration should be strengthened. Bangladesh has fallen behind in attracting regional/international collaboration in comparison to neighbouring countries. A regional SAARC programme on PGR vis-à-vis genebank may be developed in order to strengthen regional PGR activities.
- Arrangements should be made for maintenance of duplicate germplasm samples with other national genebanks as well as with regional/international genebanks (i.e. IRRI, CIMMYT, AVRDC, etc.)
- Botanical gardens/National Parks should be brought under the purview of PGR Conservation.
- Fairs of biodiversity may be arraged to stimulate public interest in PGR.
- International collaboration and cooperation specially with FAO and Bioversity needs to be strengthened.

It may be noted that a Farmers' Group in Maheswar Chanda village of Jhenaidah district collected, on their own initiatives, about 60 indigenous rice germplasm, with emphasis on aromatic and fine grain rice. But due to lack of financial support and preservation facilities these varieties could not be maintained[56]. This indicates that there is interest among farmers to collect and conserve PGR. A proper approach, for example, establishment of Community Genebank can make PGR conservation much easier and effective.

Another example is UBINIG, a local NGO, who have collected germplasm and are maintaining them in their 'community genebank'. Similarly, Coastal Development Program (CDP), another NGO, is also undertaking similar activities. Such activities should be promoted and supported.

Activity Area 6: Regenerating Threatened Ex situ Accessions

Regeneration of *ex situ* accessions is weak in Bangladesh. Table III.12 below gives the summary of regeneration activities for *ex situ* collections undertaken by different stakeholders.

Loss of genetic integrity

The c*Aus*es of the loss of genetic integrity identified by stakeholder organizations are shown in Appendix Table III.8. The causes include: low viability of regeneration from sample, regeneration sample too small, mechanical mixture/contamination, selection pressure from unsuitable environment, improper handling in general and insufficient isolation and unbalanced seed production between individuals (in cross pollinated species).

[56] Personal communication with the Centre for Agriculture and Rural Development (CARD), a village based farmers' organisation in Maheswar Chanda Village of Jhenaidah District.

Table III.12. Projects/activities related to regeneration of *Ex situ* collections

Stake-holder	*Ex situ* collection	Regeneration project	Taxon	Name of crop/crop group	Priority areas
BARI	Active, Base and Field Genebank	Seed increase and germplasm evaluation of plant genetic resources	Various	Cereals, Pulses, Oilseeds, Vegetables, Fruits, spices, Root & Tuber Crops	Vegetables and cereals germplasm
CDP	Rice Diversity and Production in the Southwest of Bangladesh	Rice diversity evaluation and maintenance in Southwest Bangladesh	*Oryza*	Rice	Priorities not yet set
CDB	Cotton Research, Seed Production and Extension	-	*Gossypium hirsutum*	Cotton	Priorities set and activities underway. Hill cotton seed multiplication .
	Chittagong Hill Tracts Integrated Development and Rehabilitation (CDB part)	-	*Gossypium arboreum*	Cotton	Priorities set and activities underway
EWS (Bd.) Ltd	Utilization and conservation of vegetable germplasm	Characterization and evaluation of germplasm	*Various*	Vegetables: Solanaceous, Crucifers, Cucurbits, Allium, Legumes, Amaranths, including spices	Priorities set and activities underway in collection, conservation and evaluation.
BJRI	Collection, Conservation, Characterization, Evaluation and Documentation of Jute, Kenaf and Mesta Germplasm	Regeneration of *Corchorus* and *Hibiscus* germplasm for conservation, breeder seed production	*Corchorus capsularis, C. olitorius, Hibiscus cannabinus, H. sabdariffa*	Jute, Kenaf and Mesta	Priorities set and activities underway
BRRI	Active and base collections	Collection, evaluation and utilization of Rice (*Oryza sativa L.*) Germplasm	*Oryza*	Rice	Priorities set and activities underway
BINA	Characterization, evaluation and utilization of germplasm	Evaluation of IRRI and ICARDA accessions/lines	*Oryza sativa and Lens culinaris*	Rice and Lentil	Priorities set and activities underway
BSRI	Regeneration of degerating varieites of sugarcane through mutation breeding and tissue culture technique	Development of sugarcane varieties	*Saccharum spp.*	Sugarcane	Priorities set and programme has been undertaken. Red rot diseases screening.
BSMRAU	Collection and conservation of aromatic rice, grain legumes, vegetable crops	Field evaluation of germplasm	*Oryza sativa, Pisum sativum, Vigna radiate, Vigna mungo, Raphanus sativus, Cucurbita spp.*	Aromatic Rice, Mungbean, Blackgram, Pea and Radish	Priorities not yet set

Published regeneration guidelines

Regeneration guidelines found useful by stakeholder organizations are shown in Table III.13 below.

Table III.13. Published regeneration guidelines found useful by stakeholders are as follows:

Stakeholder	Published regeneration guidelines found useful
Bangladesh Agricultural Research Institute	• IPGRI Crop Descriptor(Bioversity) • AVRDC Data Recording Sheet • Crop Descriptors on Cereals, Legumes and Vegetables
Bangladesh Rice Research Institute	• Descriptor for Rice (*Oryza sativa*)
Bangabandhu Sheikh Mujibur Rahman Agricultural University	• Crop Descriptors on Cereals, Legumes and Vegetables

Capability and trend in performing regeneration

Stakeholders' capability and trend in performing regeneration are given in the Table III.14 below.

Table III.14. Capability and trend in performing regeneration by stakeholder organizations

Stake-holder	Crop type	Regeneration capability level	Regeneration capability trend	Regeneration capability for accessions from other organizations
BARI	Self pollinated	On-going	Increasing	Good
	Cross pollinated	On-going	Increasing	Good
	Vegetatively propagated	On-going	Stable	Poor
CDB	Self pollinated, often cross pollinated	Backlog being reserved	Stable	Poor
EWS (Bd.) Ltd	Self and Cross pollinated	On-going	Stable	Poor
BJRI	Self pollinated	On-going	Increasing	Fair
BRRI	Self pollinated	On-going	Increasing	Fair
BSRI	Vegetatively propagated	On-going	Decreasing	Poor
BSMRAU	Self and Cross pollinated	On-going	Decreasing	Fair
BINA	Self pollinated	On-going	Stable	Fair

Constraints, Needs and Priorities

Constraints, needs and priorities in *ex situ* conservation are summarized in Table III.15 below.

Table III.15. Constraints, needs and priorities related to *Ex situ* conservation

Stakeholder	Constraints	Needs	Priorities
BARI	• Lack of modern seed processing facilities • Limited number of trained staff and laboratory equipments	• Technical cooperation improving regeneration facilities • Staff training • Regional and international collaboration	• Technical cooperation staff training • Improving facilities for PGR conservation
CDP	• Lack of dialogue between CDP and BRRI for free flow of information. • Lack of technical assistance	• Continuous dialogue and free flow of information between CDP and BRRI • Technical assistance	• Technical assistance • Free flow of information
CDB	• Weak research infrastructure • Insufficient fund • Lack of technical expertise for research on regeneration	• Strengthening research facilities for molecular characterization • Developing documentation facilities • Facilities for long term conservation • Collection from remote areas	• Research strengthening • Documentation • Molecular characterization • Facilities for long term conservation
EWS (Bd.) Ltd	• Insufficient staff • Insufficient modern equipment facilities • Lack of genetic finger printing	• Developing genetic finger printing facilities • Staff training	• Genetic finger printing facilities • Staff training
BAU	• Inadequacy of fund	• Cryo-preservation facilities	• Conservation
BJRI	• Jute is a threatened but environment-friendly crop • Insufficient trained staff	• Conservation of germplasm • Fund • Staff training	• International collaboration
BRRI	• Insufficient lab and screening facilities • Insufficient fund • Lack of staff training	• Fund • Staff training • Infrastructure development for regeneration of germplasm • Technical cooperation	• Fund • Staff training • Infrastructure development for regeneration
BINA	• Inadequacy of fund for regeneration • Limited number of trained staff	• Fund • Staff training • Infrastructure development for regeneration of germplasm	• Fund • Staff training
BSMRAU	• Insufficient trained personnel for regeneration activities • Inadequacy of fund	• Human resource development in PGR with emphasis on germplasm conservation • Fund	• Human resource development • Fund
BSRI	• Insufficient trained staff training • Inadequacy of fund	• Fund • Staff training	• Fund • Staff training
BTRI	• Insufficient fund • Limited number off trained manpower	• Fund • Staff training	• Fund • Staff training

In addition, work on identification of threatened species should be strengthened; site-specific facilities for regeneration of threatened species/accessions should be developed with farmers' participation; exchange of germplasm between countries of the region should be promoted; and storage facilities (short, medium and long-term) should be improved.

Activity Area 7: Supporting Planned and Targeted Collecting of Plant Genetic Resources

Collecting missions undertaken by stakeholder organizations

Collecting missions undertaken by stakeholder organizations covered only a limited number of species. These are given in Table III.16(a) below.

Table III. 16(a). Collecting missions undertaken by different stakeholders in Bangladesh

Stake-holder	Collecting mission	Collection area	Collected taxon	Crop	No. of collected accessions	No. of collected accessions in long term conservation
BARI	BARI-IBPGR Joint Collection of Brinjal and Okra Germplasm	Almost all districts of Bangladesh	*Solanum spp. and Hibiscus spp.*	Brinjal and Okra	250	200
	BARI-IBPGR Joint Collection on Sesame	Northern districts of Bangladesh	*Sesame indicum, Colocasia and Dioscorea spp.*	Sesame, Taro and Yam	62	50
	BARI-IDRC Joint Collection on Major Pulses	Almost all over Bangladesh	*Cicer, Lens, Lathyrus, Vigna* spp.	Major pulses	1,200	800
	BARI-AVRDC Joint Collection Programme on Vegetable Germplasm	Some districts of Bangladesh	Cucurbits, Amaranths, Lablab, *Solanaceous, Brassica spp.,*	Major vegetables	300	200
CDB	Collection of Traditional/Local and Wild Cotton varieties	Bangladesh	*Gossypium arboreum*	Cotton	30	-
EWS (Bd) Ltd	Collection and Evaluation of Germplasm	Bangladesh and abroad	Solanaceous, Cucurbits, Alliaceae, Crucifers, Legumes	Vegetables	3,000	-
BJRI	Characterization and Evaluation of Jute, Kenaf and Mesta Germplasm	All over Bangladesh and abroad	*Corchorus capsularis, C. olitorius, Hibiscus cannabinus and H. sabdariffa*	Jute and allied fibre	5968	5968
BRRI	Collection of Traditional/Indigenous and wild rices	All over Bangladesh	*Oryza sativa,* and wild and weedy races	Traditional and Wild rice	6,259	250
BSMRAU	JICA-IPSA Joint Collection of Aromatic Rice AVRDC and BSMRAU Joint Collection of Mungbean Germplasm	Northern districts of Bangladesh	*Oryza sativa, Pisum sativum, Vigna radiata, Raphanus sativus, Cucurbita moschata*	Local varieties of Aromatic Rice, Pea, Radish, Pumkin and Mungbean	300	
BINA	Collection and Evaluation of Germplasm	Bangladesh and abroad	*Oryza sativa, Vigna radiata, Lens culinaris, Cicer arietinum, Brassica spp., Arachis hypogaea Lycopersicon esculentum*	Rice, pulses, oilseeds, tomato	2950	-

Exploration programmes undertaken after 1996

Plant exploration missions undertaken in recent times (i.e.since the First Report on PGR, 1996) by different stakeholder organizations and future collection areas are summarized in Table Table III. 16(b).

Table III.16(b). Plant exploration missions in recent times by different stakeholder organizations

Stake-holder	Name of exploration	Name of taxon	Year	No. of accessions collected	Futures collection areas
BARI	Exploration and Collection of Vegetable Germplasm	20 taxon mentioned in Table III.8(b)	1997-1998	2993	Rajshahi, Dhaka, Khulna, Sylhet, and Barisal Divisions
	Collection of Pigeon Pea	*Cajanus cajan*	1999	62	Rajshahi, Dhaka, Khulna, Sylhet, and Barisal Divisions
	Exploration and Collection of Vegetable Germplasm	30 taxon mentioned in Table III.16(b)	2001-2002	1500	Rajshahi, Dhaka, Khulna, Sylhet, and Barisal Divisions
BRRI	Exploration and Identification of Wild Rice Habitats/ *In Situ* spots	*Aman* rice	1997 1998	3 12	Exploration and collection of cultivated and wild rice from hills, coastal and *Haor* areas
	Survey on Rice Diversity and Identification of areas for On-farm Conservation in Southwest Bangladesh	*Aman* rice *Aus* rice	2002 2003	116 53	Exploration and collection of cultivated and wild rice from hills, coastal and *Haor* areas
	Exploration and Identification of Wild Rice Habitats/*In Situ* spots	*Aus, Aman and Boro* rice	2004-05	242	All over Bangladesh specially in hills, coastal and *Haor* areas
	Survey on Rice Diversity and Identification of areas for On-farm Conservation in Southwest Bangladesh	*Aman* rice	2005-06	173	All over Bangladesh specially in hills, coastal and *Haor* areas
BJRI	None	None	None	None	Northern and Southeast Hilly areas of Bangladesh
BINA	Collection and evaluation of germplasm	*Oryza sativa, Vigna radiata, Lens culinaris, Cicer arietinum, Brassica spp., Arachis hypogea Lycopersicon esculentum*	1997-2006	2950	Collection of germplasm from home and abroad
BSRI	Collection of Sugarcane Germplasm from Different Parts of Bangladesh	*Saccharum officinarum*	1996 2000 2002 2003	50 30 25 35	Northern and Southern part of Bangladesh
		Saccharum spontaneum	2000	3	
BSMRAU	Collection of local *Aman* rice Germplasm from Netrokona District	*Oryza sativa*	2002	50	Germplasm collection from other parts of Bangladesh
EWS (Bd.) Ltd.	Collection of Local Vegetable Germplasm, Collected from Chittagong Area	Cucurbits, Solanaceous, Crucifers, Legumes, etc.	1997, 2000, 2002	1002	Collection of vegetable germplasm from Rangamati, Khagrachchari, Chittagong
	Collection of Local Vegetable Germplasm, Collected from Sylhet Area	Cucurbits, Solanaceous, Legumes, etc.	1998, 2002	250	Collection of vegetable germplasm from Moulavibazaar, Sunamganj and Habiganj Districts
	Collection of Local Vegetable Germplasm Collection from Jessore Area	Cucurbits, Solanaceous Legumes, etc.	1999, 2002	350	Collection of vegetable germplasm from Khulna, Satkhira and Narail
	Collection of Vegetable Germplasm from Thailand, Vietnem, India, Philippines	Cucurbits, Solanaceous Legumes, etc.	1999-2005	4320	Abroad
CDB	Collection, Conservation, Evaluation, Documentation and Utilization of Cotton Germplasm	*Gossypium hirsutum, G. barbadense, G. arboreum*	1996-2004	104	Collection of germplasm from home and abroad
BTRI	Updating and Enrichment of Tea Germplasm in Bangladesh	*Camellia sinensis*	1998-2001	104	Old tea areas and seed orchards

Collecting rare and endangered species for ex situ conservation

The stakeholder organizations having provision for rare and endangered species are Bangladesh Agricultural Research Institute, Bangladesh Rice Research Institute and Bangladesh Sugarcane Research Institute (Appendix Table III.9).

Gaps in collection

The gaps in collection, information system and method used to identify gaps by different stakeholder organizations are summarized also in Appendix Table III.10. Gaps detected were: incomplete coverage of targeted taxa, incomplete geographical coverage, missing historical/known cultivars/landraces (AppendixTable III.10).

Needs and Priorities

Constraints, needs and priorities in *ex situ* collections are given in Table III.17 below.

Overall, mission oriented collection exploration needs to be strengthened in all stakeholder organizations; periodic surveys of germplasm should be undertaken to assess changes with time; and virtually all stakeholder organizations need support in skill development, in characterization and evaluation as well as in identification of gaps in collections. The establishment of the proposed National Plant Genetic Resources Institute with specific mandate to look into the needs in PGR collection, conservation and their management, and promotion of community genebanks, would help overcoming most of these technical constraints.

Table III.17. Constraints, needs and priorities in collecting plant genetic resources by different stakeholder organization

Stake-holder	Constraints	Needs	Priorities
BARI	• Transport facilities • Insufficient remuneration for PGR collection • Insufficient trained staff	• Transport facilities • Modest remuneration for PGR collection • Staff training • Undertaking collection exploration with special emphasis on endangered crops, crop wild relatives, wild food plants • Regional/International collaboration	• Transport • Daily remuneration for collection • Regional/International collaboration
CDP	• Lack of own conservation and regeneration facilities • Insufficient trained staff • Gaps in collection of germplasm	• Staff training	• Staff training • Further collection exploration
CDB	• Lack of lab facilities • Limited number of trained staff • Inadequacy of fund • Insufficient evaluation of collected germplasm • Gaps in collection of germplasm	• Staff training • Infrastructure development for PGR activities • Fund • Regional/International collaboration	• Staff training • Infrastructure development for PGR activities • Fund
EWS (Bd) Ltd	• Lack of skilled staff • Gaps in collection of germplasm	• Staff training on PGR collection and conservation • Regional/International collaboration	• Staff training on PGR collection and conservation • Collection exploration
BJRI	• Jute is a threatened (but environmentally friendly) crop	• Collection and conservation of jute germplasm • Regional/International collaboration	• Collection exploration for collection of germplasm of jute and allied fibre

Stake-holder	Constraints	Needs	Priorities
	• Gaps in collection of germplasm • Constraints in seed production		• Regional/International collaboration to strengthened
BRRI	• Logistic support • Limited number of skilled staff • Insufficient fund	• Undertaking exploration especially in remote areas • Staff training • Regional/International collaboration	• Staff training • Collection exploration, especially in remote areas like Chittagong Hill Tracts, coastal areas • Regional/International collaboration
BSRI	• Lack of skilled staff • Lack of fund	• Staff training • Fund	• Staff training • Fund
BSMRAU	• Lack of skilled manpower • Lack of facilities for PGR activities	• Human resources development in PGR activities • Improving facilities for PGR research	• Human resources development
BINA	• Limited number of skilled staff • Lack of fund	• Staff training • Financial support	• Staff training
BTRI	• Inadequacy of fund • Limited number of skilled manpower • Lack of transport facilities	• Staff training	• Staff training • Fund

Activity Area 8: Expanding Ex situ Conservation Activities

Expanding *ex situ* conservation activities, covering vegetatively propagated materials and recalcitrant seeds, needs special attention in Bangladesh. This is more so for the large number of fruit trees grown in the country that are vegetatively propagated and/or have recalcitrant seeds. Their wild relatives are threatened due to habitat destruction, forest clearance and especially due to disappearance of backyard forests that existed in homesteads in the past.

Research on management of PGR, for that matter on conservation methodology, is extremely weak and need strengthening. Stakeholder organization-wise constraints, needs and priorities for expanding *ex situ* conservation activities are summarized in Table III.18.

Table III.18. Constraints, needs and priorities for expanding *ex situ* conservation activities as reported by different stakeholder organizations

Stake-hilder	Constraints	Research capacity for expanding ex situ conservation		Priorities
		Need	Capacity	
BARI	• Insufficient number of trained manpower	High	High	• Training in cryo-preservation. • Developing/strengthening facilities for cryo-preservation and vegetatively propagated plants • Promotion of community genebank • Training of farmers involved in community genebanks on conservation of germplasm
BNH	• Lack of attachment of botanic garden to BNH.	Medium	Medium	• Transfer of botanic gardens to BNH or establishing a strong institutional linkage between botanical gardens and BNH.

Stake-hilder	Constraints	Research capacity for expanding ex situ conservation		Priorities
		Need	Capacity	
CDP	• Lack of skilled man power • Fund	High	Low	• Recruitment of skilled staff and/or staff training for *ex situ* conservation and management • Establishment of community genebank
CDB	• Lack of lab facilities • Lack of research capabilities • Inadequacy of fund	High	Low	• Lab facilities need to be improved • Research staff should be recruited and trained • Necessary financial support should be provided
EWS (Bd) Ltd	• Lack of trained manpower for research on PGR	High	Medium	• Staff training on PGR conservation and management • Development of cryo-preservation facilities
BAU	• Lack of expertise • Lack of fund	High	High	• Human resources development in PGR conservation • Ex situ conservation facilities including cryo-preservation technology
BJRI	• Jute is a threatened crop in spite of its high importance as an environmentally friendly fibre crop.	High	Medium	• Regional/International collaboration • Promotion of community genebank for conservation of germplasm
BRRI	• Sustainable management of genebank • Limited facilities for molecular characterization and documentation • Insufficient skilled staff	Medium	Medium	• Management of genebank • Facilities for molecular characterization of germplasm • Regional/International collaboration
BINA	• Lack of facilities for long term preservation • Inadequacy of fund • Lack of trained staff	High	High	• Staff training on PGR conservation and management • *Ex situ* conservation facilities including cryo-preservation
BSRI	• Limited number of trained staff in PGR activities • Lack of cryo-preservation facilities	Medium	Medium	• Staff training on ex situ conservation • Developing cryo-preservation facilities
BSMRAU	• Lack of trained manpower in *ex situ* conservation • Lack of cryo-preservation facilities	High	Medium	• Human resources development in ex situ conservation • Developing cryo-preservation facilities
BTRI	• Inadequacy of fund • Limited number of skilled manpower	High	Low	• Staff training on PGR conservation. • Long term preservation facilities.

Promotion of community genebanks and linking them up with the activities of the proposed National Plant Genetic Resources Institute has a high potential for expanding both *in situ* and *ex situ* conservation of germplasm. For this, not only the establishment of the proposed National Plant Genetic Resources Institute is a priority, so also is the promotion of community genebanks. This would also warrant not only training of staff but also training of farmers involved in community genebank and entrepreneurship development. In general, there is the need for capacity building for *ex situ* conservation in most of the stakeholder organizations and a focused national attention on *ex situ* conservation of PGR.

Summary

Activity Area 5: Sustaining Ex situ Collections

Ex situ programmes/projects/activities have been undertaken by some stakeholder organizations. Some the important species covered include *Triticum aestivum, Hordeum vulgare, Sorghum bicolour, Lathyrus sativus, Lens culinaris, Brassica campestris, Brassica oleracea, Lablab purpureus, Luffa cylindrica, Musa sp., Aegle marmelos, Mangifera indica, Zea mays, Oryza sativa, Gossypium arboreum, Gossypium hirsutum, Corchorus capsularis, C. olitorius, Camellia spp.*etc (Table III.8A). But the capacity and storage conditions of stakeholders vary.

Table III. 18(a). Germplasm collections of some important crops by different stakeholder organizations

Stakeholder	Crop	No. of accessios held up to		Total
		1996	1996-2006	
Bangladesh Agricultural Research Institute	Cereals other than rice	1191	386	1577
	Pulses	3174	159	3333
	Oilseeds	182	599	781
	Vegetables	768	2748	3516
	Spices	50	106	156
	Fruits	5	84	89
	Field Genebak			
	Fruits and Vegetables	61	136	197
	Sub-Total	5431	4218	9649
Bangladesh Rice Research institute	Rice (Cultivated and Wild)	4926	1333	6259
Bangladesh Sugarcane Research Institute	Sigarcane (Wild and Cultivated)	999	363	1362
Cotton Development Board	Cotton	386	104	490
Bangladesh Jute Research institute	Jute (Cultivated and Wild)	5539	54	5593
Bangladesh Tea Research institute	Tea (Cultivated and Wild)	320	155	475
Banglabandhu Sheikh Mujibur Rahman Agricultural university	Various Crops	152	612	764
East West Seed (Bd) Ltd.	Vegetables	204	6239	6443
	Total	17957	13018	31035

Different stakeholder organizations use different information systems on collections of germplasm. Major constraints in sustaining *ex situ* collections mentioned by stakeholders were:

- Inadequacy of fund.
- Insufficient training.
- Lack of focused approach on conservation.
- Limited space for long-term storage facilities and lack of field genebanks at BRRI.

Needs and Priorities: Regional/international collaboration should be strengthened. A regional SAARC programme on PGR *vis-à-vis* genebank may be developed in order to strengthen regional PGR activities.

Activity Area 6: Regenerating Threatened Ex situ Accessions

Regeneration of *ex situ* accessions is weak, even though some stakeholder organizations have had regeneration projects. Constraints include:

- Inadequacy of fund for regeneration.
- Limited number of trained staff.
- Insufficient equipment facilities.

Needs and priorities include:

- Improving regeneration facilities, especially with fund and training of staff.
- Developing documentation facilities.
- Improving facilities for long term conservation.
- Collection from remote areas.
- Developing genetic finger printing facilities.
- Human resource development in PGR with emphasis on germplasm conservation and internship training Bioversity on descriptor for charaterization of germplasm.
- International collaboration.

In addition, work on identification of threatened species should be strengthened; site-specific facilities for regeneration of threatened species/accessions should be developed with farmers' participation; exchange of germplasm between countries of the region should be promoted; and modern storage facilities (short-, medium- and long-term) should be improved.

Activity Area 7: Supporting Planned and Targeted Collecting of Plant Genetic Resources

Collecting missions undertaken by stakeholder organizations

Collecting missions have been undertaken by different stakeholder organizations but these are mainly adhoc attempts and there are many gaps in collection. Gaps detected were: incomplete coverage of targeted taxa, incomplete geographical coverage, missing historical/known cultivars/landraces

Needs and Priorities: Collection exploration needs to be strengthened in all stakeholder organizations; periodic surveys of germplasm should be undertaken to assess changes with time; and virtually all stakeholder organizations need support in skill development, in characterization and evaluation as well as in identification of gaps in collections. The establishment of the proposed National Plant Genetic Resources Institute with specific mandate to look into the needs in PGR collection, conservation

and their management, and promotion of community genebanks, would help overcoming most of these technical constraints.

Activity Area 8: Expanding Ex situ Conservation Activities

Expanding *ex situ* conservation activities, covering vegetatively propagated materials and recalcitrant seeds, needs special attention in Bangladesh. Promotion of community genebanks and linking them up with the proposed National Plant Genetic Resources Institute has a high potential for expanding both *in situ* and *ex situ* conservation of germplasm. In general, there is the need for capacity building for *ex situ* conservation in most of the stakeholder organizations and a focused national attention on *ex situ* conservation of PGR.

Needs and Priorities

- Improvement in long-term modern storage facilities.
- Staff training and training of nursery personnel in conservation.
- Regional/international collaboration should be strengthened.

Chapter 4: The State of Use

The Use of Plant Genetic Resources

The the status of the use of plant genetic resources by different stakeholder organizations is given inTable III.19 (a) below;

Table III.19. Status of the use of plant genetic resources by different stakeholder organizations

Stake-holder	Name of crop	Total no. of accessions	Type of use			No. of accessions used
			Breeding	Seed enhancement	Supply to others	
BARI	Foxtail Millet	200	√	-	-	200
	Proso Millet	185	√	-	-	185
	Chickpea	100	√	-	√	100
	Okra	31	√	-	-	31
	Sweet Gourd	7	√	-	√	7
	Ash Gourd	5	-	-	√	5
	Bitter Gourd	5	-	-	√	5
	Bottle Gourd	5	√	-		5
	Snake Gourd	5	-	-	√	5
	Sweet Gourd	5	-	-	√	5
	Hyacinth Bean	5	-	-	√	5
	Wheat	2	√	-	-	2
	Stem Amaranth	11	√	-	-	11
	Leaf Amaranth	10	√	-	-	10
	Brinjal	9	√	-	-	9
	Chilli	5	√	-	-	5
	Total	590				590
BRRI	Rice	6259	√	√	√	Around 20,000 samples
BTRI	Tea	475	√	-	-	30
CDB	Cotton	490	√	√	√	130
BSRI	Sugarcane	902	√	√	√	229
BJRI	Jute *(Corchorus capsularis)*	2368	√	√	√	2915 accessions are reported to have been used
	Jute *(C. olitorius)*	1465	√	√	√	
	Wild *Corchorus*	278	-	√	√	
	Kenaf	698	-	√	√	
	Mesta	453	-	√	√	
	Wild *Hibiscus*	369	-	√	√	
	Allied genera	346	-	√	√	
BINA	Rice	300	√	-	-	-
	Mung bean	100	√	√	√	-
	Mustard	35	√	√	√	-
	Groundut	42	√	√	√	-
	Lentil	150	√	√	√	-
EWS (Bd) Ltd	Bitter Gourd	800	√	√	-	720
	Bottle Gourd	730	√	√	-	450
	Ridge Gourd	150	√	√	-	120
	Watermelon	34	√	√	-	34
	Pumpkin	842	√	√	-	612
	Snake Gourd	112	√	√	-	110
	Cucumber	200	√	√	-	200
	Ash Gourd	631	√	√	-	600
	Tomato	1200	√	√	-	1200
	Chilli	200	√	√	-	120
	Brinjal	800	√	√	-	600
	Onion	112	√	√	-	80

Stake-holder	Name of crop	Total no. of accessions	Type of use			No. of accessions used
			Breeding	Seed enhancement	Supply to others	
	Radish	120	√	√	-	120
	Cauliflower	60	√	√	-	53
	Yard Long Bean	26	√	√	-	25
	Okra	123	√	√	-	120
	Hyacinth Bean	16	√	√	-	16
	Stem Amaranth	6	√	√	-	6
	Papaya	29	√	√	-	29
	Leaf Amaranth	8	√	√	-	8
	Spinach	14	√	√	-	14
	Indian Spinach	8	√	√	-	8
	Kangkong	6	√	√	-	6
	Coriander	12	√	√	-	12
	Total	6239				5263
BSMRAU	Rice	95	√	√	-	95
	Total	6239				5263
	Pea	88	√	√	-	88
	Radish	20	√	√	-	20
	Mung bean	100	√	√	-	100
	Black gram	50	√	√	-	50
	Chick pea	25	√	√	-	25
	Snake Gourd	27	√	√	-	27
	Rapeseed	22	√	√	-	22
	Pumpkin	28	√	√	-	28
	Ginger	19	√	√	-	19
	Onion	38	√	√	-	38
	Brinjal	84	√	√	-	84
	Ash Gourd	46	√	√	-	46
	Total	547				547

Plant genetic resources are the sources of food, fibre, fuel, timber as well as medicines. What is a wild plant today may turn out useful tomorrow as sources of useful genes for our cultivated crops or through our new knowledge of their use. How plant genetic resources can be useful depends on our familiarity with their properties and characteristics. As such, it is not only their collection and conservation that is important, their characterization and evaluation are equally important for their current as well as future utilization.

On the other hand, how much one can handle collections of plant genetic resources economically without any risk of genetic erosion, depends on the core collections, i.e. the limited subset of accessions "which represents, with a minimum repetitiveness, the genetic diversity" of a crop species and/or their wild relatives.

A core collection, therefore, represents a larger collection and provides an entry point to the larger collections. The concept is of importance in undertaking characterization and evaluation activities as it (core collection) provides the safest minimum collections that need to be handled without the risk of genetic loss as well as for channelling germplasm from conservation into breeding programmes, using conventional or advanced methods of breeding including genetic engineering. This also relates, directly or indirectly, to the use of germplasm in bioprospecting of, access to and benefit sharing of plant genetic resources.

Activity Area 9: Expanding the Characterization, Evaluation and Number of Core Collections to Facilitate Use

Characterization and evaluation work is still in preliminary phases in Bangladesh. Studies on core collections are yet to take off. Characterization and evaluation work is still in preliminary phases in Bangladesh. Studies on core collections are yet to take off. However, the number of germplasm used for breeding, seed enhancement and supply by BARI was 590 accessions, BRRI about 20,000 accessions, BTRI about 30, CDB 130, BSRI 229, BJRI 2,915, East West Seed (Bd) Ltd 5263 and Bangabandhu Sheikh Mujubur Rahman Agricultural University used 547.

The information supplied by stakeholder organizations throws little light on the status of characterization and evaluation of *ex situ* collections (Appendix Table III.11). This is apparently because characterization and evaluation activities have not been geared up yet.

Status of Core Collection

The understanding about core collection is extremely poor in Bangladesh and methodologies are yet to be developed or introduced for use. This is reflected from the answers given by stakeholders (Appendix Table III.12)

Obstacles to establishing core collections

- Widespread lacking in the understanding of the concept of core collection.
- Dearth of trained personnel.
- The need for core collection is yet to be recognized.
- Methodology not known/available.

Constraints, Needs and Priorities in expanding characterization, evaluation and core collection

Table III.19(a) below summarizes the constraints, needs and priorities in expanding characterization, evaluation and core collection.

In addition to the above needs and priorities, research on establishment of methodologies for core collection should be initiated with backstopping support from regional and international organizations. Also networking projects to share knowledge, experience, and facilitation in the exchange of expertise should be developed and implemented.

Table III.19(a). Constraints, needs and priorities in expanding characterization, evaluation and core collection of different stakeholder organizations

Stake-holder	Constraints	Needs	Priorities
BARI	• Insufficient number of trained and skilled staff for characterization and, evaluation and core collection • Inadequate financial support • Lack of availability of methodology and trained manpower for core collection	• Staff training on characterization, evaluation and core collection • Fund availability • Methodologies for core collection	• Training on core collection • International collaboration
CDP	• Lack of trained and skilled staff for characterization, evaluation and core collection • Lack of understanding of the concept of core collection • Need for core collection not recognized • Lack of availability of methodology for core collection	• Staff training on characterization, evaluation and core collection • Awareness creation on core collection • Methodologies for core collection	-
CDB	• Dearth of trained and skilled staff for characterization, evaluation and core collection • Inadequate financial support • Lack of understanding of the concept of core collection • Lack of availability of methodology for core collection	• Staff training on characterization, evaluation and core collection • Awareness creation on core collection • Methodologies for core collection • Fund availability	• Creation of awareness on core collection • Training on core collectionStaff training on characerization, evaluation and core collection
EWS (Bd) Ltd	• Lack of trained and skilled staff for characterization, evaluation and core collection • Lack of understanding of the concept of core collection • Lack of availability of methodology for core collection	• Staff training on characterization, evaluation and core collection • Awareness creation on core collection • Methodologies for core collection	• Awareness creation on core collection • Staff training on characterization, evaluation and core collection • Methodologies for core collection
BJRI	• Dearth of trained and skilled staff for characterization, evaluation and core collection • Lack of understanding of the concept of core collection • Lack of availability of methodology for core collection	• Staff training on characterization, evaluation and core collection • Awareness creation on core collection • Methodologies for core collection	• Awareness creation on core collection • Staff training on characterization, evaluation and core collection • Methodologies for core collection • International collaboration
BRRI	• Insufficient number of trained and skilled staff for characterization, evaluation and core collection • Lack of understanding of the concept of core collection • Lack of availability of methodology for core collection • Inadequate financial support	• Staff training on characterization, evaluation and core collection • Awareness creation on core collection • Methodologies for core collection • Fund availability	• Awareness creation on core collection • Staff training on characterization, evaluation and core collection • Methodologies for core collection • International collaboration
BINA	• Lack of trained staff for characterization, evaluation and core collection • Inadequate financial support	• Staff training on characterization, evaluation and core collection • Fund availability • Awareness creation on core collection	• Staff training on characterization, evaluation and core collection • Awareness creation on core collection

Stake-holder	Constraints	Needs	Priorities
		• Methodologies for core collection	• International collaboration
BINA	• Insufficient number of trained and skilled staff for characterization, evaluation and core collection • Lack of understanding of the concept of core collection • Lack of availability of methodology for core collection • Lack of financial support	• Staff training on characterization, evaluation and core collection • Awareness creation on core collection • Methodologies for core collection • Fund availability	• Awareness creation on core collection • Staff training on characterization, evaluation and core collection • Methodologies for core collection • International collaboration
BSMRAU	• Lack of trained and skilled staff for characterization, evaluation and core collection • Lack of understanding of the concept of core collection • Lack of availability of methodology for core collection	• Staff training on characterization, evaluation and core collection • Awareness creation on core collection • Methodologies for core collection	• Awareness creation on core collection • Staff training on characterization, evaluation and core collection • Methodologies for core collection

Obstacles to establishing core collections

- Widespread lacking in the understanding of the concept of core collection.
- Lack of trained personnel.
- The need for core collection is yet to be recognized.
- Methodology not known/available.

Needs and Priorities

Research on establishment of methodologies for core collection should be initiated with backstopping support from regional and international organizations. Also networking projects to share knowledge, experience, and facilitation in the exchange of expertise should be developed and implemented.

Activity Area 10: Increasing Genetic Enhancement and Base-broadening Efforts

Genetic enhancement or Pre-breeding refers to activities of transferring genes, gene combinations and/or genetic variability from unadapted sources into more usable breeding materials that can be used as parents in breeding programmes. Two approaches can be recognized: (a) **Introgression**, the most common approach that can be achieved by repeated backcrossing or by using biotechnological techniques, and (b) **Base-broadening** that involves large-scale development of locally adapted population from unimproved germplasm stocks, through a long-term, population-oriented approach. Breeding capability of different stakeholder organizations with the above two approaches are summarized in Table III.20 below.

Table III.20. Breeding capability involving the above approaches in different stakeholder organizations.

Stake-holder	Program/ Project/ Activities	Taxon/ Crop Group	Traits/ Characte ristics	Germplasm sources	No. of profe-ssionals	Output	
						Produced	Year of output
BARI	Wheat Improvement Programme	Wheat	High yield	Regional/ International network, CGIAR genebank	20	Improved -variety	**1986-2006**
	Potato Improvement Programme	Potato	High yield	Regional/ International network, CGIAR genebanks, other countries	15	Improved variety-	**-1986-2006**
	Pulse Improvement Programme	Grass pea, Chickpea, Lentil, Mungbean, Black gram, Pigeon pea, etc.	High yield, Short duration, Disease resistance	Local genebabk, National genebank, CGIAR genebank, Other countries	10	Improved variety-	**1986-2006**
	Oilseed Improvement Programme	Mustard, Sesame, Groundnut, Soybean, Linseed, Niger, etc.	High oil content	National genebank, CGIAR genebank, Other countries	12	Improved variety-	**1986-2006**
	Vegetable Improvement Programme	Eggplant, Pumpkin, Bottle gourd, Okra, Amaranth, Hyacinth bean, etc.	High yield	National genebank, CGIAR genebank, Other countries	40	Improved variety-	**1986-2006**
	Spices Improvement Programme	Major spices	High yield	National genebank, CGIAR genebank, Other countries	40	Improved variety-	**1986-2006**
	Fruits Improvement Programme	Mango, Jackfruit, Litchi, Orange, Guava, Papaya, etc.	High yield, taste and flavour	National genebank, CGIAR genebank, Other countries	15	Improved variety-	**1986-2006**
	Maize Improvement Programme	*Zea mays*	High yield	National genebank, CGIAR genebank, Other countries	15	Improved variety-	**1986-2006**
CDB	Strengthening of Cotton Research, Seed Production and Extension Services	*Gossypium hirsutum, G. arboreum*	Physiologic al traits	National genebank, CGIAR genebank, Other countries	6	-	-
EWS (Bd) Ltd	Collection and evaluation of germplasm	Solanaceae, Cucurbitaceoe, Alliaceae, Crucifereae	Yield	Local (private sector) genebank	10	-	-
	Development of hybrid/HYV varieties of vegetables and legumes	*Vegetable crops including legumes*	High yield	Local (private sector) genebank	10	New varieties with desirable traits	**2003**
BJRI	Varietal Development of Jute, Kebaf and Mesta	*Corchorus capsularis, C. olitorius, Hibiscus cannabinus, H. sabdariffa*	High yield (Tolerance to Biotin and abiotic) stresses and quality parameters,	Local genebank, Regional/Internationa l network, CGIAR genebanks, Private sectorGenebank	25	New variety with desirable traits	-
BRRI	Rice-Wheat Consortium Protoplast fusion	Rice, Wheat Rice-Rice (indica-japonica)	Salinity tolerance, Drought tolerance Protoplast	National genebank CGIAR	20 2	Crossing material and crossing pattern Protoplast fusion	**2007** **1996**
BINA	Varietal development of rice, oilseeds, pulses, jute and tomato through mutation breeding and biotechnological approach	Rice, Mustard, Rapeseed, Sesame, Groundnut, Mungbean,, Lentil, Jute and Tomato	High yield, short duration, biotic and abiotic stress tolerance	Local genebank, regional/international network, CGIAR genebanks	15	39 varieties of different crops developed	**1996-2005**
BSRI	Development of Sugarcane Varieties through Hybridization and Selection	*Saccharun officinarum*	All agronomica l traits	Local genebank, Regional/Internationa l; network, CGIAR genebanks, Private sector	20	37 varieties developed by 2002	**1996-2006**
BSMRAU	Development of hybrid varieties in Aromatic Rice and Vegetable Crops and Varietal Development of Grain Legumes	Aromatic Rice and Vegetable crops and grain legumes	Seed aroma of rice, bold seed of pea and mug - bean	Local collections	-20	15 varieties developed	**1985-2005**

Answers received from stakeholder organizations with respect to genetic enhancement/ base-broadening are summarized in Table III.21 below.

Table III.21. Genetic enhancement and base-broadening efforts by different stakeholder organizations

Stake-holder	Programme/ Project/Activity	Taxon/ Crop group	Type of activity	Method of assess-ment of genetic diversity	Starting material	Farmers' involvement in:
BARI	Develop ment of high yielding variety	Cereals, Pulses, Oilseeds, vegetables, Spices, Fruits, Roots & Tuber crops	Introgression for specific traits, Population improvement through incorporation or base broadening, wide hybridization	No assess-ment made for Characterization	Improved variety in use, Exotic varieties, Local varieties/ Landraces and wild relatives	Farmers involvement is insignificant
CDB	Strengthening Cotton Research, Production, and Extension	*Gossypium hirsutum*	Introgression	Pedigree studies	Local varieties/ Landraces	Setting priorities; implementing programme
E W S (Bd) Ltd	Collection and Evaluation of GermplasmDevelo pment of hybrid variety in vegetable crops	Abelmoschis esculentus Vegetables	Introgression, hybridization	Pedigree studies	Exotic varieties, Local varieties/ Landraces	Setting priorities
BINA	Varietal development of rice, oilseeds, pulses, jute and tomato through mutation breeding and biotechnological approach	Rice, Oilseeds, Pulses, Jute and Tomato	Intrrogression for specific traits, population improvement through incorporation or base broadening	Pedigree studies	Improved varieties in use in the country, exotic varieties, local varieties and landraces	Setting priorities
BJRI	Varietal Development of Jute, Kenaf and Mesta	*Corchorus capsularis, C. olitorius, Hibiscus cannabinus, H. sabdariffa* and interspecific hybridization	Introgression for specific traits through hybridization	Pedigree studies	Wild relativesDifferent accessions of BJRI genebank	Setting priorities, insufficient farmers' participation
BRRI	Rice Diversity, Evaluation and Maintenance in the Southwest of Bangladesh	*Oryza sativa*	Population improvement through incorporation or base broadening, Participatory variety selection	-	Improved varieties in use in the country, Local varieties/ Landraces	Setting priorities
BSRI	Development of Parent Materials through Inbreeding and Crossbreeding	*Saccharum officinarum*	Introgression for specific traits, Population improvement through incorporation or base-broadening, Mutation breeding, Parent material development	Pedigree studies	Improved varieties in use, Exotic varieties, Wild relatives, Local varieties/ Landraces	Setting priorities
BSMRAU	Development of O.P. varieties of Radish Development of interspecific hybrid in cucurbita spp.	*Raphanus sativus* Cucurbita spp.	Population improvement Interspecific hybrid development	-Mutivariate analysis	Exotic hybrid varieties and germplasm	-

Constraints, Needs and Priorities in genetic enhancement and base-broadening

Constraints, needs and priorities in genetic enhancement and base-broadening are given in Table III.22 below.

It is a common knowledge in Bangladesh that breeding programmes, for that matter agricultural research in general, in stakeholder organizations have weakened in recent times due to inadequate fund and exodus of trained and experienced staff without their proper replacement.

Table III.22. Constraints, needs and priorities in genetic enhancement and base-broadening

Constraints	Needs	Priorities
• Inadequate trained and skilled staff and lack of knowledge of appropriate germplasm • Inadequqacy of fund • Lack of incentives for good work • Lack of organized programmes	• Strong staff training programme • Strengthening breeding programmes, with special reference to enhancing genetic base • Strengthening germplasm collection, characterization, evaluation and documentation for easy flow of information • Germplasm exchange with regional/international organizations • Fund for improving research and facilities for research • Creating facilities for research with special reference to genetic enhancement and base-broadening including molecular techniques. • Inter-institutional linkages should be strengthened. • Introduction of incentive systems for high professional performances.	• Creation of professionalism, enabling environment • Staff training • Strengthening breeding programmes in stakeholder organizations • Development of regional projects with special reference to genetic enhancement and base-broadening of crops/species. Till the time the National Institute of Plant Genetic Resources comes into operation, BARC should undertake to develop and lead national programmes on genetic enhancement and base-broadening • Improvement of service conditions for scientists and/or introduction of incentives for good work • Inter-institutional linkages • Reward for excellence and good work • Increase in operational fund for research

Activity Area 11: Promoting Sustainable Agriculture through Diversification of Crop Production and Broader Diversity in Crops

Since the introduction of green revolution technologies, monoculture of modern crop varieties, mainly HYV rice, with narrow genetic bases has intensified. This has posed threats of genetic vulnerability vis-à-vis reduced diversity. Therefore, an assessment and improvement of genetic diversity has become an impending need. Table III.23 summarizes Programme/Project/Activity in stakeholder organizations with respect to assessment/improvement of diversity within and among crops or crop production.

Constraints in diversifying crop production and broadening diversity

- The Seed Policy (1993) has earmarked five major crops: Rice, Wheat, Jute, Sugarcane and Potato as notified crops meaning that introduction, cultivation and use of varieties of these crops cannot be made available to farmers without rigorous tests approved by the National Seed Board (NSB).

- Again, varieties released are, in principle, based on the DUS system that does not permit heterogenic material to be released officially. Farmers' varieties are often heterogeneous and do not qualify for release against NSB rules.
- There is no incentive programme for diversified crop production, processing or marketing.
- Breeding programmes are, in general, weak especially for diversification of crop production and broadening diversification in crops. For examples, the number of varieties in use is fewer than what used to be in the past (because of the use of modern high yielding varieties with narrow genetic base), and hybridization programmes involving germplasm from widely different genetic background is practically absent.
- It becomes apparent from Table III.23 that crop species covered for improvement are limited and reporting references are, in general, poor. There is the need for strengthening the activities on diversification of crop production and broadening diversity of crops as well as their assessment.

The other constraints include:

- Exchange of germplasm retarded after CBD.
- Minor crops are not getting importance in research agenda.
- Value addition for local diversity is low.

Table III.23. Programmes/Projects/Activities related to assessment and improvement of diversity within crop and among crops or crop production in stakeholder organizations.

Stake-holder	Programme/ Project/ Activity	Taxon	Crop	Topics covered	Reference
BARI	•Improvement/ development of crop varieties	*Triticum aestivum, Solanum tuberosum, Lablab purpureus, Zea mays, Cucurbits, Cicer arietenum, Lens culinaris Vigna radiata, Pisum sativum, Brassica spp., Raphanus sativus, Amaranthus spp, etc.*	Wheat, Potato, Eggplant, Hyacinth Bean, Maize, Cucurbits, Pulses, Cole crops, and stem leaf and grain amaranths, etc.	Increasing intra-specific diversity; Assessing/monitoring diversity in agricultural systems	Annual Reports of Wheat Research Centre, Tuber Crops Research Centres/Divisions, Horticultural Research Centre, Pulses Research Centre of BARI.
CDP	Rice Diversity and Production in the Southwest of Bangladesh	*Oryza sativa*	Indigenous varieties of rice	Assessing/monitoring intraspecific diversity of crops; Increasing intraspecific diversity of crops; Assessing/monitoring diversity of agricultural systems; Increasing diversity in agricultural system; Participatory diversity method applied.	Brackish Water Rice, Environmental Disasters in Southwest Region and Problems in Agriculture and Rice Farming, Problems in Rice Farming, Problems in Rice Cultivation in Southwest Region of Bangladesh and Possible Solutions, Report on Socio-economic Data Sheet Analysis, Rice Diversity and Production in Southwest of Bangladesh, Rice Varieties Facing Extinction.

Stake-holder	Programme/ Project/ Activity	Taxon	Crop	Topics covered	Reference
CDB	Strengthening Cotton Research, Seed Production and Extension Programme	*Gossypium hirsutum, G. arboreum*	Cotton	Assessing/monitoring intraspecific diversity in crops; Increasing intraspecific diversity in crops; Assessing/monitoring diversity in agricultural systems; Increasing diversity in agricultural systems	Annual Research Report
EWS Bd. Ltd	• Collection and Evaluation of Germplasm • Development of hybrid/HYV varieties	Various vegetable crops, Cucurbits, Solanum, Lablab etc.	Vegetable crops	Increasing diversity in agricultural systems	Technical report
BINA	Selection for greater agronomic water-use efficiency in rice under favourable and salt affected conditions, Selection for blight and rust resistant for lentil	*Oryza sativa* *Lens culinaris*	Rice Lentil	Increasing diversity in agricultural systems	Annual Report
BRRI	Rice Diversity evaluation and Maintenance production in Southwest Bangladesh	*Oryza sativa*	Rice	Assessing/monitoring diversity in agricultural systems; Increasing diversity in agricultural systems; Participatory diversity method applied	PVS Field Day Reports Proceedings
BSRI	Development of Sugarcane Varieties through Hybridization and Selection	*Saccharum officinarum*	Sugarcane	Assessing/ monitoring, intraspecific diversity in crops increasing intraspecific diversity; Increasing diversity in agricultural systems	Sugarcane varietal improvement programme for Southeast Asia and the Pacific
BSMRAU	Aromatic Rice and Vegetable Crop Improvement	*Oryza sativa, Pisum sativum, Raphanus sativus and Vigna radiata*	Aromatic Rice, Pea, Radish and Mungbean	Assessing/monitoring intraspecific diversity in crops	-Annual Report, Post Graduate Thesis
BJRI	Collection of germplasm, Screening, Hybridization	*Corchorus capsularis, C. olitorius, Hibiscus cannabinus, H. sabdariffa*	Jute Kenaf and Mesta	Increasing both intra and interspecific diversity	Annual Report

Table III.24 summarizes the constraints identified by stakeholder organizations in diversifying production and broadening diversity in crops.

Table III.24. Constraints identified by stakeholder organizations in diversifying crop production and broadening diversity in crops

Stakeholder	Constraints identified in diversifying crop production and broadening diversity
Bangladesh Agricultural Research Institute	• Marketing/commercial obstacles • Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties
Bangladesh Agricultural Development Corporation	• Marketing/commercial obstacles • Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties
Coastal Development Partnership	• Marketing/commercial obstacles • Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties
Cotton Development Board	• Marketing/commercial obstacles • Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties
East West Seed Ltd	• Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties
Bangladesh Agricultural University	• Policy/legal restrictions especially for notified crops • Marketing/commercial obstacles • Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties
Bangladesh Institute of Nuclear Agriculture	• Marketing/commercial obstacles • Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties
Bangladesh Jute Research Institute	• Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties
Bangladesh Rice Research Institute	• Marketing/commercial obstacles • Paucity of ecosystem based planning for crop production • Lack of production support for traditional varieties • Seed supply
Bangladesh Sugarcane Research Institute	• Marketing/commercial obstacles • Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties
Bangabandhu Sheikh Mujibur Rahman Agricultural University	• Lack of ecosystem based planning for crop production • Lack of production support for traditional varieties

Needs and Priorities

Table III.25 below summarizes the needs and priorities for crop diversification.

Table III.25. Needs and priorities in crop diversification

Needs	Priorities
• Breeding programmes with the objectives of crop diversification should be initiated. • Incentives for researchers, producers and processors of diversified crops should be introduced. • Market niches for diversified crops should be created and promotional activities undertaken. • Marketing incentives should be introduced for diversified crops. • Regional /international programmes for food security should be undertaken through crop diversification. Under such programmes, innovative breeding programmes should be encouraged and trials of breeding lines, fixed lines and finished varieties may be undertaken through exchange programmes. • IARCs (ICRISAT, IRRI, CIMMYT, ICARDA, IJSG, ACUC/ICUC) should be encouraged to support national programmes on crop diversification. • Promotion of technologies for value addition • Molecular lab facilities for research and development of diversified crops should be created. • Post harvest technology and value addition for traditional crop varieties	• Regional/international programmes for food security through crop diversification • Incentives for researchers, producers, processors of diversified crops • Development of market niches and promotional activities for diversified crops. • MoUs with IARCs on programmes of crop diversification. • Development of molecular lab facilities • Ecosystem based production planning for crop diversification

Activity Area 12: Promoting Development and Commercialization of Under-utilized Crops and Species

Under-utilized crops of Bangladesh with their relative importance, regional differences, and progress achieved in their development and commercialization so far are given in Table III. 26 below.

Table III.26. Under-utilized crops of Bangladesh with their relative importance, regional differences, and progress achieved in their development and commercialization

Crop	Scientific Name	Uses/Products	Relative importance	Regional difference in importance	Progress achieved
Cereals					
Barley	*Hordeum vulgare*	Widely used food grain	Food security	All over the country, especially in marginal land	-
Fox Tail Millet	*Setaria italica*	Widely used food grain	Food security	All over the country, especially in marginal land	One variety released (BARI)*
Maize	*Zea mays*	Widely used fish feed and food grain	Food security	All over the country	Four varieties released (BARI*
Pearl Millet	*Panicum milliaceum*	Widely used food grain	Food security	All over the country, especially in marginal land	One variety released (BARI)*
Pulses (Grain legumes)					
Black gram	*Vigna mungo*	Widely used protein crop	Food security, Nutrition	All over the country	Two varieties released, one each by BARI and BINA
Pigeon pea	*Cajanus cajan*	Widely used protein crop	Food security	All over the country	-
Oilseeds					
Linseed	*Linum usitatissimum*	Widely used oilseed	Food security	All over the country	Two varieties released, one each by BARI and BINA
Niger	*Guizotia abyssinica*	Widely used oilseed	Food security	All over the country	-
Safflower	*Carthamus tinctorius*	Widely used oil seed	Food security	All over the country	-
Sesame	*Sesamum indicum*	Widely used oil seed	Food security	All over the country	One variety released (BARI)*
Soybean	*Glycine max*	Widely used oil seed, as a pulse crop and as a poultry feed.	Food security	All over Bangladesh	One variety released (BARI)*
Vegetables					
Amaranth	*Amaranthus spp/ gangeticus*	Widely used vegetable	Food security	All over the country	One variety released (BARI)**
Bathua	*Chenopodium album*	Widely used vegetable	Food security, Nutrition	All over the country	-
Carrot	*Daucus carota*	Widely used vegetable	Food security, NutritionFood security	All over the country	-
Cheena sak	*Brassica spp*	Widely used vegetable	Food security, Nutrition Food security	All over the country	One variety released (BARI)**
Drumstick	*Moringa oleifera*	Widely used vegetable	Food security, NutritionFood security	All over the country	-
French bean	*Phaseolus vulgaris*	Widely used vegetable	Food security, Nutrition Food security	All over the country	-
Indian spinach	*Basella alba*	Widely used vegetable	Food security	All over the country	-
Kalmi sak	*Ipomoea aquatica/ reptans)*	Widely used vegetable	Food security, NutritionFood security	All over the country	One variety released (BARI)**
Lima bean	*Phaseolus lunatus*	Widely used vegetable	Food security	All over the country	-
Marfa, Phuti	*Cucumis melo*	Widely used vegetable	Food security	All over the country	-
Spinach	*Spinacia oleracea*	Widely used vegetable	Food security	All over the country	-
Sponge gourd	*Luffa cylindrica*	Widely used vegetable	Food security	All over the country	-
Squash	*Cucurbita moschata /pepo*	Widely used vegetable	Food security	All over the country	-
Teasle gourd	*Momordica dioica*	Widely used vegetable	Food security	All over the country	-
Winged bean	*Psophocarpus tetragonolobus*	Widely used vegetable	Food security, NutritionFood security	All over the country	-
Yam	*Dioscorea spp.*	Widely used vegetable	Food security	All over the country, especially in hilly areas	-
Yam bean (Shak alu)	*Pachyrhizus tuberosus*	Widely used vegetable	Food security	All over the country	-

Crop	Scientific Name	Uses/Products	Relative importance	Regional difference in importance	Progress achieved
Yard Long Bean	*Vigna unguiculata*	Widely used vegetable	Food security	All over the country	One variety released (BARI)**
Spices					
Black cumin	*Nigella sativa*	Widely used spice	Food security, medicinal value	All over the country	-
Black pepper	*Piper nigrum*	Widely used spice	Food security, medicinal valueFood security	All over the country	One variety released (BARI)**
Coriander	*Coriandrum sativum*	Widely used spice	Food security, Nutrition	All over the country	-
Cumin seed (Jeera)	*Cuminum cyminum*	Widely used spice	Food security	All over the country	-
Fenugreek (Methi)	*Trigonella foenum-graceum*	Widely used spice	Food security, medicinal valueFood security	All over the country	-
Join	*Carum capticum*	Widely used spice	Food security, medicinal valueFood security	All over the country	-
Fruits					
Amloki	*Phyllanthus emblica*	Widely used fruit	Food security, medicinal valueFood security	All over the country	-
Amra	*Spondias dulcis*	Widely used fruit	Food security	Grown in southern districts, especially in Barisal Division	-
Arboroi	*Cicca acida*	Widely used fruit	Food security	All over the country	-
Bel	*Aegle marmelos*	Widely used fruit	Food security	All over the country	-
Carambola (Kamranga)	*Averrhoa carambola*	Widely used fruit	Food security, medicinal valueFood security	All over the country	-
Cashew nut	*Anacardium occidentale*	Widely used fruit	Food security, medicinal valueFood security	All over the country	-
Chalta	*Dillenia indica*	Widely used fruit	Food security, medicinal valueFood security	All over the country	-
Custard Apple (Sharifa)	*Annona squamosa*	Widely used fruit	Food security	All over the country	-
Dewa	*Artocarpus lacucha*	Widely used fruit	Food security	All over the country	-
Jalpai	*Elaecarpus floribundus*	Widely used fruit	Food security	All over the country	-
Jamrul	*Syzygium samarengense*	Widely used fruit	Food security	All over the country	-
Kalajam	*Syzygium cumini*	Widely used fruit	Food security	All over the country	-
Kath badam	*Terminalia catappa*	Widely used fruit	Food security	All over the country	-
Kothbel	*Feronia limonia*	Widely used fruit	Food security	All over the country	-
Kul	*Zizyphus jujuba*	Widely used fruit	Food security	All over the country	-
Latkan	*Bixa orellana*	Widely used fruit	Food security	All over the country	
Lemon	*Citrus limon*	Widely used fruit	Food security/ medicinal	All over the country, especially in Sylhet Division	-
Lime	*Citrus aurantifolia*	Widely used fruit	Food security /medicinal	All over the country, especially in Sylhet Division	-
Mandarin	*Citrus reticulata*	Widely used fruit	Food security	All over the country, especially in Sylhet Division	-
Nona	*Annona reticulata*	Widely used fruit	Food security	All over the country	-
Pomegranate	*Punica granatum*	Widely used fruit	Food security	All over the country	-
Pummelo	*Citrus grandis*	Widely used fruit	Food security	All over the country	
Rose apple (Golapjam)	*Syzygium jambos*	Widely used fruit	Food security	All over the country	-
Safeda	*Achras zapota*	Widely used fruit	Food security	All over the country	-
Sweet orange (Malta)	*Citrus sinensis*	Widely used fruit	Food security	All over the country	-
Tamarind	*Tamarindus indica*	Widely used fruit	Food security	All over the country	-
Fibre crops					
Cotton	*Gossypium spp.*	Fibre	Economic	All over the country, especially in Hilly areas and northern districts	Two varieties released (BARI)* and 12 varieties released by CDB.
Mesta and Kenaf	*Hibiscus sabdariffa spp.*	FibreLeaf, calyx and bark	EconomicVegetables, sauces jelly and fibre	All over the country, especially in marginal landHigh land and hilly areas of Bangladesh	-
Sunnhemp	*Crotalaria juncea*	Fibre	Economic	All over the country	-

Crop	Scientific Name	Uses/Products	Relative importance	Regional difference in importance	Progress achieved
Sugar crops					
Date palm	*Phoenix sylvestris*	Widely used sugar/for gur making	Food security	All over the country, especially south western districts	-
Palmyra Ppalm	*Borassus flabellifer*	Widely used for gur makingSugar/gur and fruits	Food security	All over the country	-
Narcotics					
Tobacco	*Nicotiana tabacum/ N. rustica*	Narcotic	Economic	All over the country, especially in northern districts	One variety released (BARI)*
Betel nut	*Areca catechu*	Narcotic	Economic	All over the country, especially in southern districts	-
Green-manuring crops					
Sunn hemp (Shun pat)	*Crotalaria juncea*	Soil amelioration	Economic	All over the country, especially in marginal land	-
Sesbania (Dhaincha)	*Sesbania aculeate*	Soil amelioration	Economic	All over the country, especially in marginal land	-

Modified after Mondal, M. H. 1990. Plant Genetic Resources Activities in Bangladesh. Proc. South Asia National Coordinators Meeting, March 21 - 24, 1990.
*Source: Characteristics of Crop Varieties Released by the National Seed Board (No.2), 1992.
**Source: AVRDC-USAID-BARI-BARC Project Consultancy Report 'Technology Transfer of Vegetable Crops in Bangladesh', 1999.
*** Source: Cotton Development Board.

Development efforts for these crops are scanty as revealed from Table III.26 above. As such programme/project/activity related to commercialization of under-utilized crops is practically non-existent. Policy/legal framework needs to be developed to promote development of under-utilized crops and their commercialisation in view of the large number of under-utilized crops available in the country and their market potentials, their value in nutrition.

Needs and Priorities

Development of national programmes on under-utilized crops should be promoted, with especial emphasis on their identification for large-scale consumption/industrial use, through market development. Improving the seed supply, processing/storage need to be given attention to. Regional/international programmes should be developed for development and commercialization of under-utilized crops and species. Such regional/international programmes would help promote national activities on under-utilised crops. IARCs like ACUC, ICUC, AVRDC, ICRISAT may take initiatives in developing regional/international programmes. Incentives to researchers, producers, processors should be created. Marketing of under-utilized crops/species needs to be promoted too.

Activity Area 13: Supporting Seed Production and Distribution

Production and distribution of seed/planting material are vital for crop production. Activities in these areas facilitate collaboration among governmental, commercial and small-scale seed producers. Major programmes/projects/activities related to seed production and distributions undertaken in Bangladesh are summarized in Table III.27(a).

Table III.27(a). **Programme/project/activity related to seed production and distribution undertaken by different stakeholder organizations**

Stake-holder	Programme/project	Taxon/Crop Group	Topics covered	Reference
BARI	Breeder Seed Production	Potato, Wheat, Maize, Oilseeds, Pulses, Vegetables, Fruits and Spices	Seed production, Seed storage, Seed processing, Seed quality control, Seed distribution	-Regional and On-farm variety trial, Technology Village Reports, BARI
BADC	Production, Distribution and (organization of both public and private sector seed production and distribution)	Cereals, Tubers, Jute, Vegetables, Fruits, Pulses and Oilseeds	Seed production, Seed storage, Seed processing, Seed quality control, Seed distribution, Linkage between formal and informal sectors.	-
BRAC	Hybrid Maize Seed Production	Maize	Seed production, Seed storage, Seed processing, Seed quality control, Seed distribution	-
CDP	Rice Diversity and Production in Southwest Bangladesh	Indigenous and BRRI developed varieties of rice		Evaluation of Rice Diversity in Southwest Coastal Region of Bangladesh; Identification of farmers' needs for Transplant *Aman* Rice for Participatory Variety Selection (PVS); Problems in Rice Cultivation in southwest Coastal Region of Bangladesh and Possible Solutions; Rice Varieties Facing Extinction
CDB	Breeder Seed and Foundation Seed Production and Distribution	Cotton	Seed cotton production, Seed processing, Storage, Seed quality control, Seed distribution, Participatory community based activities,	Tula Utpadan Karmashuchi (Cotton Production Programme)
SCA	DUS test, Seed testing and Field inspection for certification and quality control of seeds	Rice, Wheat, Jute, Potato	Quality control, Linkage between formal and informal seed sectors	Seed Ordinance 1977, Seed (Amendment) Act 1997, Seed Rules 1998, Seed (Amendment) Act 2005
EWS (Bd) Ltd	Seed Production	Vegetables	Seed production, Seed storage, Seed Processing, Seed Quality control, Seed distribution	Technical report
BJRI	Production and supply of Breeder Seed	White Jute, Kenaf, Mestand Tossa Jute	Seed production, Seed Storage, Seed processing, Seed quality control, Seed distribution, Linkage between formal and informal sectors.	Annual Report, BJRI
BRRI	Rice breeder seed production and distribution programme	Aromatic Rice, Pea, Radish and Mung bean	Seed production, Seed Storage, Seed processing, Seed quality control, Seed distribution, Linkage between formal and informal sectors.	Technical Report GOB (MOA), Management Information System Report
BSMRAU	Breeder seed production of Pea, Radish and Mung bean	Aromatic Rice, Pea, Radish and Mung bean	Seed production, Seed Storage, Seed processing, Seed quality control, Seed distribution, Linkage between formal and informal sectors.	
BINA	Production and supply of breeder and clean seed	Sugarcane	Seed production, Seed quality control, Seed distribution, Linkage between formal and informal sectors.	Sugarcane varietal improvement for South-East Asia and the Pacific. Different Projects under GOB and Development Funds

Seeds supplied by different stakeholder organizations in recent years (after 1996)

Table III.27 (b) shows the seeds of different crops supplied by different stakeholder organizations.

Table III.27(b). Seeds of crop groups supplied by different stakeholder organizations

Stake-holder	Crop	Name of varieties	Quantity of seed supplied up to 1996 (kg)	Quantity of seed supplied after 1996 (kg)	Future programme
BARI	Maize (Breeder Seed)	Barnali, Shuvra, Khoibhutta, Mohor, BARI Maize-5, BARI Maize-6, BARI Maize-7, BARI Maize Hybrid-1, BARI Maize Hybrid-2, BARI Maize Hybrid-3	-	3640	Breeder Seed production will be increased based on the demand of BADC, NGOs and others
	Barley (Breeder Seed)	BAI Barley-1, 2, 3, 4, 5 & 6		980	
	Mustard (Breeder Seed)	Tori-7, BARI Sorisha-6, 7, 8, 9, 10, 11, 12		14,466	
	Soybean (Breeder Seed)	Bangladesh Soybean – 4 BARI Soybean - 5		9,850	
	Groundnut	Dhaka-1, DG-2, BARI Badam-5, 6, & 7		8,156	
	Sesame	BARI Til-2 and 3		7,850	
	Sunflower	Kironi, BARI Sunflower-2		4,182	
	Mungbean	BRAI Moog-2, 3 & 4		7,200	
	Blackgram	BARI Mash-1		640	
	Chickpea	BARI Sola-1, 2, 3, 4, 5 & 6		1,836	
	Lentil	BARI Lentil-1, 2 and 3		809	
	Tomato	Manik, Ratan, BARI Tomato-3,,4, 5, 6, 7, 8, 9, 10, 11, 12 & 13			
	Brinjal	Uttara, Kazla, Nayan tara,			
	Cabbage	BARI Bandha Kopi-1 (Provati), BARI Bandha Kopi-2 (Agradut)			
	Cauliflower	BARI Phulkopi-1			
	Batishak	BARI Batishak-1			
	Chinese cabbage	BARI China Kopi-1			
	Radish	BARI Mula-1 (Tasaki), BARI Mula-2 (Pinki), BARI MUla-3 (Druti)		67	
	Bottle Gourd	BARI Lau-1		6	
	Hyacinthbean	BARI Sim-1, and 2		7.5	
	Green pea	BARI Motor Shuti-1, 2 and 3 (Aguri)			
	French bean	BARI Jhar Sim-1 and 2			
	Okra	BARI Dherosh-1			
	Kangkong	BARI Gimakolmi		15	
	Indian Spinach	BARI Puishak-1 (Chitra)			
	Amaranth	BARI Lalshak-1, BARI Danta-1 (Laboni)		25	
	Guava	Kazi Peara	-	20,000 seedlings	
		BARI Peara-1		15,000 seedlings	
	Papaya	BARI Papaya-2 (Shahi Papaya)			
	Mango	BARI Aam-1, 2 & 3			
	Litchi	BAR Litchu-1, 2 & 3			
	Sapota	BARI Safeda-1			
	Orange	BARI Kamal-1			
	Pommelo	BARI Batabi Lebu-1, 2 & 3			
	Toikar	BARI Toikar-1			
	Coconut	BARI Narikel-1, 2 & 3			
	Lemon	BARI Lebu 1, 2 & 3			
	Rose Apple	BARI Jamrul-1			
	Longan	BARI Ashphal			
	Banana	BARI Kala-1 & 2			
	Potato	Cardinal, Diamant, Patronese, Multa, Heera, Ailsha, Dheera		Ton	
	Sweet Potato	BARI Sweet Potato-1 (Tripti), 2 (Kamala Sundari), 3 (Daulatpuri), 4 , 5,			
BRRI	Rice	BR1 (Chandina), BR2 (Mala), BR3 (Biplob), BR4 (BRRI sail),	11.65 tons from 51 varieties	78.25 tons from 35	• Sustainability of Rice Seed

Stake-holder	Crop	Name of varieties	Quantity of seed supplied up to 1996 (kg)	Quantity of seed supplied after 1996 (kg)	Future programme
		BR 5 (Dulhabhog), BR6 (IR28), BR7 (Brribalam), BR8 (Asha), BR9 (Sufala), BR10 (Progoti), BR11 (Mukta), BR12 (Moyna), BR14 (Gazi), BR15 (Mohini), BR16 (Shahibalam), BR17 (Hashi), BR18 (Shahjalal), BR19 (Mangal), BR20 (Nizami), BR21 (Niamat), BR22 (Kiron), BR23 (Diswhari), BR24 (Rahmat), BR25(Naya pajam), BR26 (Sraboni), BRRI dhan 27, BRRI dhan 28), BRRI dhan 29), BRRI dhan 30, BRRI dhan 31, BRRI dhan 32, BRRI dhan 33, BRRI dhan 34, BRRI dhan 35, BRRI dhan 36, BRRI dhan 37, BRRI dhan 38, BRRI dhan 39, BRRI dhan 40, BRRI dhan 41, BRRI dhan 42, BRRI dhan 43, BRRI dhan 44, Hobiganj *Boro* II, Hoboganj *Boro* IV, Hobiganj *Boro* VI, Hobiganj *Boro* VIII, Nizersail, Kalijira, Khaskani, Basmoti (D)		varieties	Network • Establishment of Breeder Seed Unit at BRRI regional stations • Development of human resources for quality seed production • Training for seed entrepreneurs
BJRI	White jute Tossa jute	Variety D-154, CVI-1, CVE-3, CC-45, BJC-83 and BJC-7370 O-9897, OM-1-4, O-72and O-9897	3 tons	4.175 tons	• Breeder seed production according to the demand of BADC and others (NGOs and private seed companies)
BINA	Rice	Iratom-24, Binasail, Binadhan-4, Binadhan-5, Binadhan-6	2200 kg	4800 kg	**Long term** • Esatblishment of a genebank • *In situ* / On-farm conservation • Human resources development in PGR, especially for higher studies • Strengthening collaboration with other • Enhancement of genetic resources **Medium term** • Molecular characterizatio n of crop germplasm • Seed production **Short term** • Visit to modern conservation facilities / laboratory
	Mustard	Safal, Agrani, Binasharisha-3, 4, 5, & 6	700 kg	2300 kg	
	Sesame	Bina Til-1	-	400 kg	
	Groundnut	Binachinabadam-1, 2 & 3	-	1200	
	Mungbean	Binamoog-1, 2, 3, 4, 5, 6 & 7	900 kg	2400 kg	
	Chickpea	Hyprosola, Binasola-2, 3, & 4	600 kg	1600 kg	
	Lentil	Binamasur-1, 2 & 3	-	400 kg	
	Blackgram	Binamas-1	-	300	
	Grasspea	Binakhesari-1	-	200 kg	
	Jute	Atompat-38, Binadeshipat-2, Binapatshak-1	200 kg	550 kg	
	Tomato	Bahar, Binatomato-2, 3, 4 & 5	-	8 kg	
BSRI	Sugarcane	Isd 2/53, LJC, Isd 15, Isd 16, Isd 17, Isd 18, Isd 19, Isd 20, Isd 21, Isd 22, Isd 24, Isd 25, Isd 26, Isd 27, Isd 28, Isd 29, Isd 30, Isd 31,	345 tons	190 tons	• Production of breeder seed • Hybrid development

Stake-holder	Crop	Name of varieties	Quantity of seed supplied up to 1996 (kg)	Quantity of seed supplied after 1996 (kg)	Future programme
		Isd 32, Isd 33, Isd 34, Isd 35, Isd 36 and Isd 37			• Clean seed production through tissue culture
EWS (Bd) Ltd	Bitter Gourd	Teea F1, Taj, Parrot F1	-	800 g each year	Maintaining the lines
	Bottle Gourd	Martina F1, Dalisy F1-	-	500 g each year	
	Ridge Gourd	Hero F1, Hercules F1	-	750 g each year	
	Pumpkin	Supreme F1, Sweety F1, Dream Gold F1	-	250 g each year	
	Cucumber	Green King, Naogaon Green, Sheila	-	250 g each year	
	Wax Gourd	Duranta, Durbar, PoleStar F1	-	20 g each year	
	Tomato	Delta F1, Mintoo F1	-	200 g each year	
	Brinjal	Banani F1, Laboni F1	-	6 g each year	
	Onion	Taherpuri EW 20, Jumbo Ew 40	-	1000 g each year	
	Chilli	Sonic F1, Premium F1, Major	-	50 g each year	
	Radish	Rocky-45	-	200 g each year	
	Cauliflowr	Balaka	-	25 g each year	
	Okra	Silvia F1, Lucky 7 F1	-	450 g each year	
	Corinader	Sugandha, LB-60	-	120 g each year	
	Kangkong	Bamboo Leaf	-	260 g each year	
	Stem Amaranth	Panna, Red Tower	-	200 g each year	
	Leaf Amaranth	Raktaranga	-	10g each year	
	Beet Spinach	Sathi	-	200 g each year	
	Indian Spinach	Madhuri	-	250 g each year	
BTRI	Tea	BTRI -1 seed (Bioclonal Seed) of different varieties	1532 kg	1840 kg	Establishment of improved seed source in tea estates (63 such estates have already been established)
BSMRAU	Country bean, pea, radish, mung bean	-IPSA Baromashi seem-1, IPSA Baromashi seem-2, IPSA Motorshuti-1, IPSA Motorshuti-2, IPSA Motroshuti-3, , BU Mula-1, BU Mula-2, BU Mug-1, BU Mug-2	2 tons	23 tons	-Production of breeder seed
CDB	Cotton	CB-1 CB-3 CB-5 CB-8 CB-9 CB-10 Pahari Tula-1 (Hill Cotton-1) Pahari Tula-2 (Hill Cotton-2)	- - - - - - - -	300 kg 1505 kg 230 kg 466 kg 1968 kg 850 kg 15 kg 12 kg	Production of Breeder Seed and Foundation Seed

Variety Registration and Agencies

Table III.28. Agencies responsible for variety registration of crops and procedure followed

Crop/Crop group	Responsible agency	Procedure	Other procedure	Reference
Notified crops (Rice, Wheat, Jute, Sugarcane, Potato)	• Seed Wing, Ministry of Agriculture • The National Seed Board • The Technical Committee of National seed Board on variety release	• Distinctiveness, Uniformity and Stability (DUS) • Value for Cultivation and Use (VCU) • Special regulation for local varieties	Certified Seed (CS) Truthfully Labelled Seed (TLS)	Proceedings of the NSB Meetings
Non-notified crops – all other crops except the notified crops	Seed Wing, Ministry of Agriculture	Both public and private agencies can apply for variety registration to the Seed Wing, Ministry of Agriculture	Truthfully Labelled Seed (TLS)	-

Publications Listing the Registered and Recommended Cultivars

Publication(s) listing the registered and recommended cultivars specifying the geographical area

Organisation	Crop or Crop Group/Taxon	Title of publication	Area (geographical)
Seed Wing, Ministry of Agriculture			
Seed Certification Agency			
Bangladesh Agricultural Research Institute	Different crops	Technology hand book 2006	
Bangladesh Rice Research Institute	Rice	Adhunik Dhaner Chash (Modern cultivation of rice)	
Bangladesh Jute Research Institute	Jute, Kenaf and Mesta	Adhunic Pat, Kenaf and Mmesta Chash (Cultivation of Modern Jute, Kenaf and Mesta) Pat Beej Utpadan Patdhati	All over Bangladesh
Bangladesh Sugarcane Research Institute			
Bangladesh Institute of Nuclear Agriculture	Different crops	BINA Udbhabito Unnata Krishi Prajukti (Improved Technologies Developed by BINA)	All over Bangladesh
Bangladesh Agricultural Research Council			
Bangladesh Agricultural Development Corporation			

Seed quality standard

Quality standard followed for five notified crops is presented in table III.29(a-e)

Table III.29 (a). Seed standard of paddy

Factor	Standard		
	Breeder	Foundation	Certified
1. Pure Seed (Min.% by wt.)	99.0	97.0	96.0
2. Inert matter (Max.% by wt).	1.0	2.0	3.0
3. Other Seed (Max. % by wt) a. Other crop seed (Max No. in Total; whole sample will be tested) b. Total weed seed (Max. No.; whole sample will be tested)	Trace 2/kg 2/kg	1.0 5/kg 8/kg	1.0 10/kg 10/kg
4. Germination (Min. %)	80.0	80.0	80.0
5. Moisture Content (Max. %)	12.0	12.0	12.0

Table III.29(b). Seed standard of wheat

Factor	Standard		
	Breeder Seed	Foundation Seed	Certified Seed
1. Pure seed (Min.% by wt.)	99.0	97.0	96.0
2. Inert matter (Max.% by wt.)	1.0	2.0	3.0
3. Other crop seed (max. No. in total)	Trace	1.0	1.0
(a) Other crop seed (Max. No. in total) Whole sample will be tested.	0/kg	5/kg	10/kg
(b) Total weed seed (Max. No; Whole sample will be tested)	2/kg	8/kg	10/kg
4. Germination (Min. %)	85.0	80.0	80.0
5. Moisture content (Max.%)	12.0	12.0	12.0

Table III.29(c). Seed standard of Jute

Factor	Standard		
	Breeder Seed	Foundation Seed	Certified Seed
1. Pure seed (Min.% by wt.)	99.0	98.0	96.0
2. Inert matter (Max.% by wt.)	1.0	1.0	3.0
3. Other crop seed (max. No. in total)	Trace	1.0	1.0
(a) Other crop seed (Max. No. in total)	0/kg	5/kg	10/kg
(b) Total weed seed (Max. No; Whole sample will be tested)	0/kg	5/kg	10/kg
4. Germination (a) Fresh seed (min %) (b) Carry over seed (Min. %)	 80.0 70.0	 80.0 70.0	 80.0 70.0
5. Moisture content (Max.%) (a) *Chorchorus capsularis* (b)) *Chorchorus olitorius*	 10 8.0	 10.0 8.0	 10.0 8.0

Table III.29(d). Seed standard of potato

Factor	Standard		
	Breeder	Foundation	Certified
1. Potatoes with any kind of damage or secondary growth are not acceptable	0.00	0.00	0.00
2. Mixture of other varieties (Max. %)	0.2	0.2	0.2
3. Grades of seed potato: a) 28mm – 35mm diameter b) 36mm – 45mm diameter c) 46mm – 55mm diameter			
5. The above mentioned grades will not be applicable for tuberlets produced from true potato seed (TPS)			

Table-III.29(e): Field standard of sugarcane

Factor	Standard		
	Breeder	Foundation	Certified
1. Isolation (No. of guard rows)	2	2	2
2. Other Varieties (Max. % by No.)	0.00	0.00	0.00
3. Other Crop (Max % by No.)	0.00	0.00	0.00
4. Obnoxious weeds (Max. %)	0.00	0.00	0.00
5. Diseases (infection by seed borne pathogen: Max % of infected plants)			
a. Red rot (Colletotrichum falcatum)	0.00	0.00	0.00
b. Mosaic (SCMV) (stool basis)	0.00	1.00	3.00
c. Wilt (*Cephalosporium sacchari*) (stool basis)	0.00	1.00	0.50
d. Smut (*Ustilago scitaminea*) (stool basis)	0.00	0.10	0.30

Factor	Standard		
	Breeder	Foundation	Certified
e. RSD/GSD (MLO) (stool basis)	0.00	0.10	0.50
f. White leaf (MLO) (stool basis)	0.00	0.10	0.50
g. Striga (Striga densiflora)	0.00	0.00	0.00

Quality Standards

Table III.29(b) below gives the quality standards applicable to seeds of different crops/crop groups

Table III.29(f). Seed quality standards applicable to crop(s)/crop groups in Bangladesh

Crop(s)/Crop group(s)/ Taxon	Physical purity, Germinability, etc. based on	Genetic purity standards based on
Rice, Wheat, Jute, Potato and Sugarcane,	ISTA Rules	Nationally defined scheme

Constraints in making seed of new varieties available in the market

Table III. 30 summarises the constraints, as perceived by different stakeholder organizations, in making seeds of new varieties available in the market.

Table III.30. Major constraints identified by different stakeholder organizations in making seed of new varieties available in the market

Stakeholder	Crop/ Crops group	Constraints	Other Constraints
BARI	Potato	Insufficient availability of basic/foundation seed; Insufficient availability of commercial seeds; Poor seed storage facilities, poor seed production system	Lack of availability of disease free material
	Wheat	Insufficient availability of commercial seed; Adulteration and high cost of inputs; Inadequate seed distribution system; Weak seed production system	Lack of seed processing and storage facilities, especially in the private sector
	Vegetables	Insufficient availability of registered/certified seed; Insufficient availability of commercial seeds; Poor seed storage facilities; Poor germination;, Inadequate seed distribution system	Lack of seed processing and storage facilities especially in the private sector
BADC	Cereals, Tubers, Jute, Vegetables, Fruits, Pulses and Oilseeds	Varieties poorly adapted to local conditions; Insufficient availability of basic/foundation seed; Insufficient availability of commercial seed; Insufficient availability of disease free planting material; Low physical purity of seed; Poor seed storage facilities; Poor germination; Adulteration and high cost ; Inadequate availability of inputs; High seed price compared to commodity price; Inadequate seed distribution system; long distance to seed supplier.	Lack of awareness in the private sector about seed production and processing
BRAC	Hybrid maize	Varieties poorly adapted to local conditions; Adulteration, high cost and inadequate availability of inputs; Seed price is too high compared to commodity price	Parent materials not available for local seed production
CDP	Indigenous and BRRI developed varieties of Rice	Varieties poorly adapted to local conditions; Insufficient availability of basic/foundation seed; Insufficient availability of commercial seed; Insufficient availability of disease free planting material; Low physical purity of seed; Poor seed storage facilities; Poor germination; Adulteration and high cost and Inadequate availability of inputs; Inadequate seed distribution system; Inadequate seed distribution system; Long distance to seed supplier; Inadequate seed production system	• Lack of local seed storage system • Lack of integration between centralized seed development and farmers • Farmers' ignorance about protection, about means of protecting seed stock from natural calamities like floods, droughts

Stakeholder	Crop/ Crops group	Constraints	Other Constraints
			• Lack of encouragement of production, preservation and storage of seed to farm women who are traditionally engaged in such responsibilities; they need both training and encouragement
CDB	Cotton	Poor seed storage facilities; Adulteration and high cost of inputs; Weak seed production system	• Inadequate financial support to produce breeder seed
EWS (Bd) Ltd	Vegetables	Insufficient availability of basic/foundation seed; Insufficient availability of commercial seed; Poor seed storage facilities; Inadequate seed distribution system; Distance to seed supplier; Inadequate seed production system and promotional activities	• Lack of sufficient fund to produce breeder seed • Market opportunity for Breeder Seed is low
BINA	Rice, Oilseeds, Pulses, Jute and Tomato	Insufficient availability of registered/certified seed; Poor seed storage facilities; Availability and cost of required production inputs; Distance to seed supplier; Inadequate seed production system	• Inadequate financial support to produce Breeder Seed-
BJRI	Jute, Kenaf, Mesta	Varieties poorly adapted to local conditions; Insufficient availability of basic/foundation seed; Insufficient availability of certified seed; Insufficient availability of commercial seed; Insufficient availability of disease free planting material; Poor seed storage facilities; Poor seed germination; Low seed physical purity; Availability and cost of required production inputs; Inadequate seed distribution system; Inadequate seed production system	• Seed production system developed by BJRI has not been well adopted by farmers. • Insufficient supply of Public sector seed • Uunknown source of seed.
BRRI	Rice	Insufficient availability of basic/foundation seed; Insufficient availability of certified seed; Insufficient availability of commercial seed; Poor seed storage facilities; Poor seed germination; Seed price too high compared to commodity price; Inadequate seed distribution system; Inadequate seed production system	• Lack of sufficient fund and project to produce breeder seed
BSRI	Sugarcane	Varieties poorly adapted to local conditions; Insufficient availability of certified seed; Insufficient availability of commercial seed; Insufficient availability of disease free planting material; Poor seed germination; Low seed physical purity; Inadequate seed distribution system; Inadequate seed production system	• Inadequate fund for production of Breeder Seed
BSMRAU	Aromatic Rice, Vegetables and Grain Legumes	Varieties poorly adapted to local conditions; Insufficient availability of commercial seed; Poor seed storage facilities poor seed germination; Low seed physical purity	-

Proportions sown to modern varieties

Table III.31. Estimates of the proportion sown to modern/improved varieties

Crop	Estimated percentage of area sown to modern varieties	Source of estimate	Other source
Rice: *Boro* Transplanted *Aman*	 90% 70%	 Expert estimate Expert estimate	
Wheat	100%	Expert estimate	
Jute	60%	Expert estimate	
Cotton	100%	Expert estimate	
Sugarcane: Mill zone Non-mill zone	 90% 30%	 Expert estimate Expert estimate	
Pulses	40%	Expert estimate	
Oilseeds	20%	Expert estimate	
Potato	70%	Expert estimate	
Vegetables: Winter Summer	 80% 30%	 Expert estimate Expert estimate	

Cultivated varieties

Cultivated varieties are numerous. Appendix Table III.13 gives information on some recommended cultivars of selected crops. Table III.32 below gives the number of cultivated varieties released by different stakeholder organizations prior to and after the First Report on Plant Genetic Resources (i.e.1996).

Table III.32. Number of cultivated varieties released by different stakeholder organizartions prior to and after the First report on Plant Genetic Resources of 1996

Stakeholder	Name of crop	Scientific name	No. of varieties released prior to 1996	No. of Varieties released after 1996
BARI	Wheat	*Triticum aestivum*	15	6
	Maize	*Zea mays*	4	5
	Proso Millet	*Panicum miliaceum*	1	0
	Foxtail Millet	*Setaria italica*	1	2
	Barley	*Hordeum vulgare*	1	4
	Mustard	*Brassica campestris*	11	2
	Sesame	*Sesamum indicum*	1	3
	Groundnut	*Arachis hypogaea*	4	2
	Sunflower	*Helianthus annuus*	1	0
	Niger	*Guizotia abyssinica*	2	1
	Mung Bean	*Vigna radiata*	1	3
	Chickpea	*Cicer arietinum*	3	3
	Blackgram	*Vigna mungo*	1	2
	Lentil	*Lens culinaris*	0	4
	Grasspea	*Lathyrus sativus*	1	1
	Onion	*Allium cepa*	0	3
	Methi	*Trigonella foenumgraceum*	0	1
	Turmeric	*Curcuma domestica*	2	1
	Garlic	*Allium sativum*	0	1
	Chilli	*Capsicum frutescens*	0	1
	Tomato	*Lycopersicon esculentum*	4	11
	Potato	*Solanum tuberosum*	13	12
	Sweet Potato	*Ipomoea batatas*	13	2
	Taro	*Colocasia esculenta*	2	0
	Brinjal	*Solanum melongena*	3	5
	Cabbage	*Brassica oleracea var. capitata*	4	1
	Cauliflower	*Brassica oleracea var botrytis*	0	3
	Radish	*Raphanus sativus*	0	3
	Bottle Gourd	*Lagenaria siceraria*	0	2
	Bitter Gourd	*Momordica charantia*	0	1
	Ash Gourd	*Benincasa hispida*	0	1
	Pointed Gourd	*Trichosanthes anguina*	0	2
	Hyacinth Bean	*Lablab purpureus*	0	3
	Garden Pea	*Pisum sativum*	0	3
	Yard Long Bean	*Vigna sinensis*	0	1
	French Bean	*Phaseolus vulgaris*	0	2
	Okra	*Hibiscus esculentus*	0	2
	Kangkong	*Ipomoea raptans*	1	0
	Indian spinach	*Basella alba*	0	2
	Amaranth	*Amaranthus spp.*	0	4
	Guava	*Psidium guajava*	1	1
	Papaya	*Carica papaya*	1	0
	Mango	*Mangifera indica*	0	4
	Litchi	*Litchi sinensis*	0	4
	Sapota	*Achras sapota*	0	1
	Orange	*Citrus sinensis*	0	1
	Pommelo	*Citrus maxima*	0	1
	Taikar	-	0	1
	Coconut	*Cocos nucifera*	0	3
	Lemon	*Citrus spp.*	0	3
	Jamrul	*Syzygium samarangense*	0	1
	Longan	*Dimocarpus longan*	0	1
	Banana	*Musa spp.*	0	2
	Kul (Jujuba)	*Zizyphus mauritiana*	0	1
	Total	**-**	**91**	**128**

Stakeholder	Name of crop	Scientific name	No. of varieties released prior to 1996	No. of Varieties released after 1996
BRRI	Rice	*Oryza sativa*	31	16
	Total	-	**31**	**16**
BSRI	Sugarcane	*Saccharum officinarum*	28	9
	Total		**28**	**9**
CDB	Cotton	*Gossypium hirsutum*	6	6
		Gossypium arboreum	0	2
	Total		**6**	**8**
BINA	Rice	*Oryza sativa*	2	3
	Mustard	*Brassica campestris*	2	1
		Brassica napus	0	3
	Sesame	*Sesamum indicum*	0	1
	Groundnut	*Arachis hypogaea*	0	3
	Mungbean	*Vigna radiata*	2	5
	Chickpea	*Cicer arietinum*	2	2
	Lentil	*Lens culinaris*	0	3
	Grasspea	*Lathyrus sativus*	1	1
	Jute	*Corchorus capsularis*	0	2
		Corchorus spp.	0	1
	Tomato	*Lycopersicon esculentum*	1	4
	Total		**10**	**29**
BJRI	White Jute	*Corchorus capsularis*	20	0
	Tossa jute	*Corchorus olitorius*	12	1
	Kenaf	*Hibiscus cannabinus*	2	0
	Mesta	*Hibiscus subdariffa*	1	0
	Total		**35**	**1**
BTRI	Tea	*Camellia sinensis*	12	9
	Total		**12**	**9**
EWS (Bd.) Ltd	Bitter Gourd	*Momordica charantia*	0	1
	Bottle Gourd	*Lagenaria siceraria*	0	2
	Ridge Gourd	*Luffa acutangula*	0	3
	Pumpkin	*Cucurbita moschata*	0	3
	Cucumber	*Cucumis sativus*	0	3
	Ash Gourd	*Benincasa hispida*	0	3
	Tomato	*Lycopersicon esculentum*	0	1
	Brinjal	*Solanum melongena*	0	1
	Onion	*Allium cepa*	0	2
	Chilli	*Capsicum annuum*	0	3
	Radish	*Raphanus sativus*	0	1
	Cauliflower	*Brassica oleracea var. capittata*	0	1
	Okra	*Abelmoschus esculentus*	0	2
	Coroander	*Coriandrum sativum*	0	2
	Kangkong	*Ipomoea reptans*	0	1
	Stem Amaranth	*Amaranthus gangeticus*	0	2
	Stem Amaranth	*Amaranthus tricolor*	0	1
	Beet Spinach	*Spinacea oleracea*	0	1
	Indian Spinach	*Basella alba*	0	1
	Total	-	0	34
BSMRAU	Pea Radish Mungbean Cabbage	*Pisum sativum* *Raphanus sativus* *Vigna radiata* *Brassica oleracea*	6 0 0 0	0 3 3 1
	Total	-	6	7

Policy and Regulatory Framework to Develop and Expand Local Seed Systems

There is no regulatory framework for developing and expanding local seed systems for crops and crop varieties important to small-scale farmers. However, in times of emergency, for example following natural disasters, local crops/crop varieties are often

called for. But seeds of such varieties are usually in short supply. However, some private seed entrepreneurs have started producing seeds of local varieties (especially of vegetables) through contract growers and their marketing.

Incentive for quality seed production of local varieties and/or under-utilized crops

The information provided by different stakeholders reveals that no realistic programme has so far been undertaken in the country for quality seed production, let alone for local varieties and/or under-utilized crops (Table III.33).

Table III.33. Incentive for quality seed production of local varieties as experienced by different stakeholder organizations

Stakeholder	Status of incentive experienced by the stakeholder
Bangladesh Agricultural Research Institute	No incentive given
Bangladesh Agricultural Development Corporation	No incentive given
Coastal Development Partnership	Time bound donor aided projects do not help develop sustainable programme (any incentive should be given through rolling programmes)
Cotton Development Board	No incentive for quality seed production of local cotton varieties
Department of Agricultural Extension	No incentive
East West Seed (Bd.)	Some monetary incentive for quality seed production for local varieties
Bangladesh Institute of Nuclear Agriculture	No incentive
Bangladesh Jute Research Institute	There is some cash incentive given for quality seed production of local varieties. Training programmes for quality seed production.
Bangladesh Rice Research Institute	No incentive
Bangladesh Sugarcane Research Institute	No incentive
Bangabandhu Sheikh Mujibur Rahman Agricultural University	No incentive

Seed growers' organization

There is no legal barrier in organizing local seed growers' association, but no formal mechanism exists. However, with donor project support, one seed growers' association of small-scale seed growers, the Bangladesh Golden Agri Seed Associates (BGASA), have come into existence in a formal way. The association is thriving. Apart from this, there are no organized seed growers' association. There is, however, an association of seed traders, the Bangladesh Seed Growers, Dealers amd Merchants Association (BSGDMA), with the main fcocus on seed trading. Recently they have started seed production locally but the amount of seed production is very low. Contract growing system is being followed for the production of TLS/Certified Seed both by the public and the private sector.

Constraints, Needs and Opportunities

Constraints, mentioned by different stakeholder organizations in seed production and distribution, are summarized in Table III.34 below.

Table III.34. Constraints/needs in seed production and distribution mentioned by different stakeholder organizations

Stakeholder	Constraints	Needs
BARI	Production and market linkage is weak	Regional/international support needed to develop and expand local seed production systems.
BADC	Facilities do not allow producing enough to meet the demand.	Contract farming system should be expanded with processing facilities, processing and distribution of quality seeds.
CDP	• Two thirds of the 12,000 rice varieties that existed in this region disappeared during the last five decades.	• Master plan may be developed (for seed production and distribution) based on national needs under supervision of FAO. • Farmwomen who undertake work on seed need to be trained and facilitated.
CDB	• High crop competition and low price for seed cotton • Major areas covered by vegetables • Long duration cotton varieties	• Research on breeding, • support in improved seed production, • support in storage, processing and distribution • subsidy for cotton growers
SCA	• The major constraint is very low production and availability of quality seeds.	-
EWS (Bd.) Ltd	• Availability of quality seeds and planting materials to farmers is constrained by poor seed distribution system.	• Needs: Collaboration among commercial and small-scale seed production and distribution agencies.
BJRI	• Jute, an environment-friendly crop, is threatened. • Insufficient quality seed • Public sector seed supply is inadequate • Strong competition with other food crops	• Bangladesh Jute Research Institute has the role to promote jute as not only an important natural fibre but also as an environment-friendly crop. The institute needs support from international organizations in playing its role. Public sector seed supply should be increased • Cash incentives to be given to the seed producer specially farmers • Financial support
BRRI	• Local varieties are still grown in many parts of the country but quality seeds are scarce. Quality seed can improve the yield	• . Emphasis should be given to breeder seed and foundation seed production.
BINA	• Availability of quality seeds to farmers is constrained by poor seed distribution system	• Support in improved seed production, storage, processing and distribution • Emphasis should be given to breeder and foundation seed production
BSRI	• Very low seed production • Availability of quality seeds	• A national programme for production of clean sugarcane seeds should be undertaken using Moist Hot Air Treatment (MHAT) plant.
BSMRAU	• Paucity of fund • Collaboration	Collaboration

In general, the constraints, needs and opportunities shown in Table III. 35 should be considered for improving seed production and distribution systems in the country:

Table III.35. Constraints, needs and opportunities in improving seed production and distribution

Constraints	Needs	Opportunities
• Lack of awareness of the importance and potentials of local varieties. • Decreasing availability of seeds of local varieties. • Lack of incentive for seed production of local varieties. • Lack of market promotion efforts of local varieties. • Absence of policy/regulatory framework and programmes for traditional/local varieties.	• Awareness creation of the loss of traditional/ local varieties. • Development of national programmes for purification, seed production and supply of traditional/local varieties. • Creation of incentives for production of traditional/local varieties. • Market promotion of traditional/local varieties. • Promotion of Seed Growers' Association. • Identification of crops/varieties that have large-scale consumption and industrial use. • Regional/international programmes for seed production of traditional varieties should be undertaken. • Contingency stock of seeds of traditional varieties by the public sector to meet demands in emergencies (e.g. crop failures following floods or droughts, disease epidemics, etc) should be developed.	• A significant percentage of crops grown still belong to traditional/local varieties • Some seed growers are coming up in the private sector that produce local popular varieties • Some seed growers' association(s), with small-scale seed enterprises at the local level, has of late come into existence (e.g. BGASA) that deserves support. • The private sector is now thriving with seed production of improved as well as traditional varieties. • Tissue cultured materials for potato and banana are gaining popularity • Nursery owners are now investing in the production and supply of sesds and saplings.

Activity Area 14: Developing New Markets for Local Varieties and "Diversity-Rich" Products

Numerous locally adapted traditional varieties of crop plants have been replaced by modern varieties as a response to intensive agriculture. Consequently, informal exchange and formal commodity markets are dominated by improved varieties (fewer in number than traditional varieties) and farmers are losing interest in maintaining genetically diverse traditional varieties and landraces. This trend can be slowed and reversed by promoting the demand for genetically diverse traditional varieties and diversity-rich materials in the market place. Support in production of traditional varieties with the supply of seeds and other inputs, and their market promotion would facilitate the production of local varieties and diversity rich products. This would need special efforts and would encourage farmers to maintain locally adapted diversity on-farm as 'living collections' of PGRFA.

Legal policy/framework to support new markets development and "diversity-rich" products

Policy or legal frameworks to support new market development for diverse traditional varieties or diversity-rich material need to be developed in order to maintain diversity on-farm. Regional/international programmes for traditional varieties/diversity rich materials involving IARCs would encourage stakeholders to undertake such programmes.

Market situations

Responses by stakeholder organizations on market situations of local crop varieties with economic potential for developing new markets are given in Table III.36 below.

Table III.36. Market situation of local crop varieties with economic potential for developing new markets as identified by stakeholder organizations

Stake-holder	Taxon/Crop	Current market situation	No. of local varieties in the market	No. of varieties with economic potential for new markets development
BARI	Wheat	Markets well established and expanded	-	Not estimated
	Potato	Markets well established and expanded	4 - 5	Not estimated
	Brassica juncea (Mustard)	Markets well established and expanded	2	Not estimated
	Vegetables	Markets well established and expanded	Numerous	Not estimated
CDP	Rice (indigenous varieties)	Markets well established and expanded. A limited number of new markets developed.	Numerous. Aromatic rice varieties about 50-60 grown in *Aman* season	Not estimated
CDB	Cotton	Markets well established and expanded. A limited number of new markets developed. No attempts are presently being made to develop new markets	-	Not estimted.

Stake-holder	Taxon/Crop	Current market situation	No. of local varieties in the market	No. of varieties with economic potential for new markets development
EWS (Bd) Ltd	Vegetables (Solanaceae, Cucurbitaceae, Alliaceae, Cruciferae, Malvaceae)	Markets well established and expanded	Numerous	Not estimted.
BINA	Rice, Oilseeds, Pulses, Jute and Tomato	A limited number of new markets developed. No attempts are presently being made to develop new markets	-	Not estimated
BJRI	Jute, Kenaf and Mesta	Established market is expending. No real attempts for developing new markets.	50 – 60	Not estimated.
BRRI	Rice	Attempts are underway to develop new markets	3-4	Several (Kalijira, Kataribhog, Nigershail, Latishail, Jhingashail, etc.)Not estimated
BSRI	Sugarcane	No attempts are presently being made to develop new markets	10-12	Not estimated
BSMRAU	Aromatic rice, Vegetables and Grain Legumeas	A limited number of new markets have been developed. Attempts are underway to develop new markets.	Numerous	Not estimated

Efforts towards developing value-added processing of "diversity-rich" products for commercial purposes and the state of their incentives

Rice made cakes and rice packets are nowadays available for sale in supermarkets. Aromatic rice is processed as value added products. Apart from this, there does not appear to be any effort for developing value added processing of "diversity-rich" products for commercial purposes. No incentive is known to be given by any agency for value-added processing of "diversity-rich" products (see AppendixTable III.14).

Critical Constraints to increasing markets for local varieties and 'diversity-rich' products

The critical constraints to increasing markets for local varieties and "diversity-rich" products, identified by stakeholder organizations, are summarized in Table III.37 below.

Table III.37. **Critical constraints to increasing markets for local varieties and "diversity-rich" products identified by stakeholder organizations**

Stake-holder	Critical constraints	Other constraints
BARI	Emphasis on modern cultivars of staple crops; Lack of financial support; Lack of trained personnel in production and marketing; Insufficient seed or planting material; Lack of consumer demand; Lack of market potential	Food habit of the people; Lack of awareness; Lack of value addition and processing facilities. Problems in seed production and distribution.
BADC	Emphasis on modern cultivars of staple crops; development / establishment of market for local variety is not a national priority; Lack of financial support; Lack of trained personnel; Insufficient seed or planting material, Lack of consumer demand.	Lack of communications and transport facilities
CDP	Emphasis on modern cultivars of staple crops; Development/estalishment of markets for local varieties is not a priority; Lack of financial support; Lack of trained personnel; Insufficient seed or planting material	-
CDB	Emphasis on modern cultivars of staple crops; Lack of financial support; Lack of trained personnel; Insufficient seed or planting material	Low yield of local cotton variety and lack of subsidies.
DAE	Emphasis on modern cultivars. Development/establishment of markets for local varieties is a national priority; Lack of financial support; Lack of trained personnel; Industrial processing limitations	
SCA	Emphasis on modern cultivars of jute; Development/establishment of markets	

Stake-holder	Critical constraints	Other constraints
	for local varieties is not a national priority; Lack of financial support; Lack of trained personnel; Industrial processing limitations; Insufficient seed or planting material; Legal restrictions; Lack of consumer demand	
EWS (Bd) Ltd	Emphasis on modern cultivars of staple crops; Lack of financial support; Lack of trained personnel; Industrial processing limitations; Insufficient seed or planting material	Low yield of local varieties
BINA	Emphasis on modern cultivars of staple crops; Lack of financial support; Lack of trained personnel; Insufficient seed or planting material; Lack of consumer demand.	Low yield of local varieties
BJRI	Emphasis on modern cultivars of staple crops; Development/establishment of markets for local varieties is a national priority; Lack of financial support; Lack of trained personnel; Industrial processing limitations; Insufficient seed or planting material	Low yield of local varieties Competition with *Rabi* crops
BRRI	Emphasis on modern cultivars of staple crops; Development/establishment of markets for local varieties is a national priority; Lack of financial support; Lack of trained personnel; Industrial processing limitations; Insufficient seed or planting material	Low yield of local variety and lack of subsidy or incentives
BSRI	Development/establishment of markets for local varieties is not a national priority; Industrial processing limitations; Insufficient seed or planting material	Local varieties are low in production both in cane as well as in sugar and 'gur' against the improved varieties
BSMRAU	Development/establishment of markets for local varieties is not a national priority; Lack of financial support; Lack of trained personnel; Industrial processing limitations	-

Constraints, Needs and Priorities for *Developing New Markets for Local Varieties and "Diversity-Rich" Products*

Table III.38 Constraints, needs and priorities for developing new markets for local varieties and 'diversity-rich` products as perceived by stakeholder organizations.

Table III.38. Constraints, needs and priorities for developing new markets for local varieties and diversity-rich products

Stake-holder	Constraints	Needs	Priorities	Opportunities
BARI	• Seed dealers are not interested to market local varieties. • No price incentive for local varieties and diversity rich products.	A national programme should be undertaken for value addition, processing and creating awareness about nutritional value of 'diversity-rich' products and for exporting in overseas markets	• A national programme for value addition and processing • Creating awareness on nutritional value of diversity rich products • Exploring overseas markets • Promoting organic agriculture with traditional (local) varieties	• Ethnic and nich market exists
BADC	The seed sale centres at the Upazila level will be phased out and replaced with network of seed dealers.	The distribution points of seeds should be within the reach of seed dealers for quick availability of seeds	Decentralization	-
CDP	• Training programmes are usually targeted to males while housewives are responsible for post harvest activities (threshing, drying, selecting and preserving seeds, storage, etc. • Seed supply of indigenous varieties is scarce. • Farmers have turned away from traditional varieties bec*Aus*e of low productivity	• Farm women need training in modern methods of post harvest processing, preservation and storage of seeds • Enhancement of productivity of indigenous varieties that are disease resistant, flood-drought-salinity tolerant and cam be grpwm 'organically' • Training of farmers and farmwomen in modern methods of cultivation.	• Extension approach should include small and marginal farmers also. • Training of farmers and farmwomen in modern methods of cultivation • Training of farmwomen in modern methods of post harvest processing, preservation and storage of seeds	There is a good demand for indigenous varieties

Stake-holder	Constraints	Needs	Priorities	Opportunities
			• Enhancement of productivity of indigenous varieties that are disease resistant, flood-drought-salinity tolerant	
CDB	Programm for diversity-rich products is yet to be undertaken in CDB	• Undertake studies for developing new markets for local varieties / diversity- rich' products • Policy and legal framework for promoting cultivation of local varieties 'diversaity-rich' products should be developed and implemented • Research on gossypol-free cotton seed production sould be initiated and/or strengthened • Promotion of rural based small industries of 'diversity-rich products should be underetaken	• Policy and legal framework towards promoting cultivation of local varieties 'diversity-rich' products should be developed and implemented • Studies to be undertaken or developing new markets for local varieties / 'diversity-rich' products • Research on gossypol free cotton seed products	• Value-added products of cotton seed (oil, oilcake, etc.) are well known and should be encouraged in the country
SCA	Informal exchanges and formal commodity markets are dominated by fewer advanced varieties replacing traditional local varieties. As a result, farmers are losing interest in maintaining genetically diverse traditional varieties and landraces.	The trend of replacing traditional varieties by modern varieties needs to be reversed	Market development and Incentive system	Rainfed and saline areas where traditional/local varieties can be promoted.
EWS (Bd) Ltd	Farmers are losing interest in maintaining genetically diverse traditional varieties and landraces.	• The trend of replacing traditional varieties by modern varieties needs to be reversed	• Strengthening lab facilities • Strengthening manpower through training in research on developing diversity-rich products	Locally adapted improved varieties have good market potential
BJRI	Low market price; Seeds not readily available; Poor yield Lack of quality seed	Jute crop needs national priority • Jute Research Institute needs financial support to increase seed production • Mobilization program through manpower development	• Incentives; Improvement of the seed supply system • Improvement of quality seed production system • Manepower development through training	Highly adaptable. Having genes of breeder's interest. Well adjusted in local conditions
BRRI	• Farmers lack financial support for pest management • Lack of quality seed	• Developing new markets for local varieties and diversity-rich products are important • Research needs strengthening • Strengthening laboratory facilities • Financial support	• Developing new markets for local varieties and diversity-rich products are important • Strengthening research in improving local varieties and diversity rich products • Financial support • Strengthening lab facilities	Farmers in unfavourable areas want to produce local varieties with tolerance to stress conditions
BINA	• Farmers are losing interest in maintaining genetically diverse traditional varieties and landraces. • Low market price • Lack of quality seed	• National programme should be undertaken for creating awareness of diversityrich product • Developing new markets for local varieties and diversity-rich products	• Incentives for improvement of seed supply • Identification of economic potentials	Good demand for indigenous varieties

Stake-holder	Constraints	Needs	Priorities	Opportunities
		• Characterization and evaluation of local varieties		
BSRI	• Low quality seed • Low market price • Poor yield	• Nobilization (if flowering) programme through manpower development • Financial support for quality seed production	• Improvement of seed supply system • Training for skill development • Financial support	Early maturing; Good for 'gur' making
BSMRAU	Lack of seed storage; Lack of documentation and characterization	Characterization and evaluation of local varieties	Identification of economic potentials	Local fruits and vegetables have good market potential

R&D activities on post harvest processing, preservation and storage technologies suitable for rural areas/households should be emphasize. Nutritional awareness on diversified products should be created. Organic farming should be promoted. Packaging of products and marketing channels should be developed for local varieties and 'diversity-rich' products.

Summary

Activity Area 9: Expanding the Characterization, Evaluation and Number of Core Collections to Facilitate Use

Characterization and evaluation work is still in preliminary phases in Bangladesh. Studies on core collections are yet to take off.

Use of PGR

The number of germplasm used for breeding, seed enhancement and supply by BARI was 590 accessions, BRRI about 20,000 accessions, BTRI about 30, CDB 130, BSRI 229, BJRI 2,915, East West Seed Co. 5263 and Bangabandhu Sheikh Mujubur Rahman Agricultural University used 547.

Obstacles to establishing core collections

- Widespread lacking in the understanding of the concept of core collection.
- Insufficient number of trained personnel.
- The need for core collection is yet to be recognized.
- Methodology not known/available.

Needs and Priorities

Research on establishment of methodologies for core collection should be initiated with backstopping support from regional and international organizations. Also networking projects to share knowledge, experience, and facilitation in the exchange of expertise should be developed and implemented.

Activity Area 10: Increasing Genetic Enhancement and Base-broadening Efforts

Of the two broad approaches for genetic enhancement or pre-breeding, 'Introgression' and 'Base-broadening', some introgression programmes have been undertaken by each stakeholder organizations but for base-broadening there is hardly any attempt as yet.

Constraints

- Insufficient trained and skilled staff and lack of knowledge of appropriate germplasm.
- Inadequacy of fund.
- Lack of incentives for good work.

Needs

- Strong staff training programme.
- Strengthening breeding programmes, with special reference to enhancing genetic base including molecular techniques.
- Strengthening germplasm collection, characterization, evaluation and documentation for easy flow of information.
- Germplasm exchange with regional/international organizations.
- Fund for improving research and facilities for research.
- Inter-institutional linkages should be strengthened.

Activity Area 11: Promoting Sustainable Agriculture through Diversification of Crop Production and Broader Diversity in Crops

There is no incentive programme for diversified crop production, processing or marketing.

Needs

- Marketing incentives should be introduced for diversified crops.
- Breeding programmes with the objectives of crop diversification should be promoted.
- Regional/international programmes for food security through crop diversification should be emphasized.
- Development of market niches and promotional activities for diversified crops would promote diversification.
- MoUs with IARCs on programmes of crop diversification can promote diversity in crop production and borader diversity of crops in the country.

Activity Area 12: Promoting Development and Commercialization of Under-utilized Crops and Species

There are nearly 100 under-utilized crops grown in Bangladesh**.** Programmes/ projects/activities related to commercialization of under-utilized crops are practically non-existent. Policy/legal framework needs to be developed to promote the

development of under-utilized crops and their commercialisation in view of their large number, their market potentials and their value in nutrition and food security.

Needs and Priorities

Development of national programmes on under-utilized crops should be promoted, with special emphasis on their identification for large-scale consumption/industrial use, through market development. Improving the seed/sapling supply, processing/storage needs to be given attention to. Regional/international programmes should be developed for development and commercialization of under-utilized crops and species. Such regional/international programmes would help promote national activities on under-urtilized crops. Incentives to researchers, producers, processors should be created. Marketing of under-utilized crops/species needs to be promoted too.

Activity Area 13: Supporting Seed Production and Distribution

Bangladesh Agricultural Development Corporation is responsible for production and distribution of foundation and certified seeds in the public sector. However, currently the private sector is playing an increasing role in seed distribution but quality of such seeds is not always up to the mark.

Variety Registration and Agencies

The agency responsible for variety registration is the Seed Wing of the Ministry of Agriculture with assistance from the National Seed Board (NSB) where ARIs, Department of Agricultural Extension and the Seed Certification Agency are members of NSB.

Constraints in making seed of new varieties available in the market

- Varieties imported are often poorly adapted to local conditions;
- Insufficient availability of basic/foundation seed;
- Insufficient availability of commercial seeds;
- Poor seed storage facilities, poor seed production system;
- Inadequate seed distribution system;
- Low physical purity of seed;
- Long distance to seed supplier.

Cultivated varieties

A list of recommended varieties released has been provided in the Appendix (Appendix Table III. 13). Proportions have sown to modern varieties ranges from 20% (in oilseed crops) to 100% (in maize) with rice about 80% in the case of *Boro* rice and about 90% in the case of transplanted *Aman* rice.

Seed growers' organization

With donor project support, one seed growers' association of small-scale seed producers, the Bangladesh Golden Agri Seed Associates (BGASA), have come into existence in a formal way. The association is thriving. Apart from this, there are no organized or recognized seed growers' associations.

Needs

- Awareness creation of the loss of traditional/local varieties.
- Development of national programmes for purification, seed production and supply of traditional/local varieties.
- Creation of incentives for production of traditional/local varieties.
- Market promotion of traditional/local varieties.
- Promotion of Seed Growers' Association.
- Identification of crops/varieties that have large-scale consumption and industrial use.
- Regional/international programmes for seed production of traditional varieties should be undertaken.
- Contingency stock of seeds of traditional varieties by the public sector to meet demands in emergencies (e.g. crop failures following floods or droughts, disease epidemics, etc) should be developed.

Opportunities

- A significant percentage of crops grown still belong to traditional/local varieties.
- Some seed growers are coming up in the private sector that produces local popular varieties.
- Some seed growers' association(s), with small-scale seed enterprises at the local level, has of late come into existence (e.g. BGASA) that deserves support.
- The private sector is now thriving with seed production of improved as well as traditional varieties. Some of the organizations are promoting aromatic rice in the marketing.
- Tissue cultured materials for potato and banana are gaining popularity.
- Export potential for aromatic rice and banana exists.
- Nursery owners are now investing in the production and supply of seeds and saplings.

Activity Area 14: Developing New Markets for Local Varieties and "Diversity-Rich" Products

Numerous locally adapted traditional varieties of crop plants have been replaced by modern varieties. Regional/international programmes for traditional varieties/diversity-rich materials involving IARCs would encourage stakeholders to undertake such programmes.

Market situations

Markets well established and expanded for modern varieties.
A limited number of new markets developed for traditional varieties.

Critical Constraints to increasing markets for local varieties and 'diversity-rich' products

- Lack of awareness about the intrinsic value of local varieties and diversity rich products;
- Problems in seed production and distribution of local varieties and diversity rich products;
- Low yield of local/traditional varieties;
- Lack of incentives for local varieties and "diversity-rich" products in the country;
- Insufficient seed or planting material;
- Industrial processing limitations for diversity rich products.

Needs and priorities

- Studies to be undertaken or developing new markets for local varieties / 'diversity-rich' products.
- Research on gossypol free cotton seed products.
- Characterization and evaluation of local varieties.
- Exploring overseas markets for local varieties and diversity rich products.
- Market development and incentive system for production of local varieties and diversity rich products.
- Improvement in the seed supply system.
- Strengthening manpower through training, research in improving local varieties and diversity rich products.
- Identification of economic potentials of local varieties and diversity rich products.
- Packaging of products and marketing channels should be developed for local varieties and 'diversity-rich' products.

Chapter 5: The State of National Programmes, Training Needs And Legislation

Activity Area 15: Building Strong National Programmes

National programmes on PGR provide the basis for developing a rational PGR strategy, balancing activities in *in situ*, *ex situ* conservation and use, conditions of access, safe movement of PGR, benefit sharing, and technology transfer, etc. Such programmes should include representatives from agencies/committees, etc. that are involved in PGR activities in the country.

Bangladesh established the National Committee on Plant Genetic Resources (NCPGR) soon after the FAO Technical Meeting on PGR held in Leipzig, Germany in 1996. The Committee, among other things, mobilized the national network on PGR, held a National Workshop on PGR in 1997 and prepared draft Acts related to PGR in 1998. A network formed under FAO programme in 2004 on PGRFA is promoting plant genetic resources activities in Bangladesh. Bagladesh Agricaultural Research Council is coordinating the activities. So far 4 training workshops organized under the programme with 20 stakeholder including NARS institutions and development organizations.

The national entities responsible for coordinating and facilitating PGR activities are given in Table III.39 below.

Table III.39. National entities responsible for coordinating and/or facilitating PGRFA activities

Name of entity	Year of establis h- ment	Year of latest restruc- turing	Additional mandate	Objectives	Frequency of meeting	Date of last meeting	Partners	Other partners
National Committee on Plant Genetic Resources	1996	-	Forest Genetic Resources	• To advise/assist the government on issues related to CBD and GATT/WTO negotiations on PGR diversity and prioritise conservation activities based on surveys • To plan documentation and data management of PGR • To strengthen and coordinate the national network on PGR based on the GATT Agreement • To plan PGR programmes/ activities in harmony with activities for improvement of crop varieties, forest resources, medicinal and ornamental plants • To make recommendations on PGR.	Twice a year or as and when necessary	1998	Professionals of NARS institutes, Universities, NGOs, Universities, National Genebanks, Ministry of Agriculture and Ministry of Environment and Forest.	-
Bangladesh Agricultural Research Council	1973	1996		• Planning, monitoring, review and evaluation of agricultural research including PGR. • Assisting the Government in preparing/revising policies related to agriculture and PGR • Act as a focal point of PGRFA	At least three meetings in a year.	June 2006	NARS Institutes, Universities, NGOs, Seed Companies	IARC, FAO

National programmes for the conservation and sustainable use of PGRFA

- With the assistance of Bioversity International, the NCPGR, in cooperation with Bangladesh Agricultural Research Council organized a National Workshop on RGR in 1997. The workshop recommendations included, *inter alia*, the development of national policy framework/legislation in pursuance of the principles of CBD.
- Based on this recommendation, two draft acts related to PGR were prepared:
  - Biodiversity and Community Knowledge Protection Act of Bangladesh; and
  - Plant Variety and Farmers ' Rights Protection Act of Bangladesh

The Ministry of Agriculture has revised the draft of the Plant Varierty and Faremer's Rights Protection Act in 2006. The Bangla version of the draft has already been prepared. These are in process at the Government level. Meanwhile, two documents:

- a report on Plant Genetic Resources of Bangladesh (by Bangladesh Agricultural Research Council/Bangladesh Academy of Agriculture, 2001); and
- a Red Data Book of Vascular Plants of Bangladesh (by Bangladesh National Herbarium, 2001) have been published, based on survey of literature, studies on herbarium specimens, other local herbaria as well as field work. These are summarized in Appendix Table III.15

PGR Conservation facilities developed in stakeholder organizations after 1996

New facilities for PGR conservation developed in different stakeholder organizations after 1996 are given in Table III.40.

Table III.40. New conservation facilities developed in stakeholder organizations after 1996.

Stake-holder	Name of facility	Space		Temperature	Relative Humidity	Moisture content	Nature of work performing	No. of accessions stored
		Up to 1996	After 1996					
BARI	Clonal Genebank	3 acres	30 acres	Not applicable	Not applicable	Not applicable	Clonal crop conservation, maintenance and propagation	507
	Seed Genebank							
	Short-term	330 sq .ft	500 sq. ft.	20^0-25^0C	No control system	12%	Seed proce-ssing and packaging	1,000-2,000
	Medium-term	249 sq. ft	700 sq. ft	4^0-6^0C	30%	6%-10%	Preserving seed as active collection	60,000
	Long-term	163 sq. ft	650 sq. ft	-12^0C to -15^0C	Not applicable	6%-10%	Preserving seed as base or security collection	40,000
	Seed Processing Space	-	300 sq. ft	20^0-25^0C	No control system	No control system	Seed cleaning, drying, packaging, etc.	-
	Facilities under development							
	Germination testing facilities	-	400 sq. ft	-	-	-	Testing of seed germination	-
	DNA Lab						Biotech and DNA finger printing	-

Stake-holder	Name of facility	Space		Temperature	Relative Humidity	Moisture content	Nature of work performing	No. of accessions stored
		Up to 1996	After 1996					
	In vitro and Cryo-Preservation Lab						*In vitro* and cryo-preservation of germplasm	-
BRRI	**Seed Genebank:**							
	Short-term	-	-	18^0-20^0C	-	-	• Seed threshing, cleaning, drying, packaging • Routine monitoring of germplasm for germination and viability	6188
	Medium-term	21 units	15.5'ft x 11.5 ft x 9 ft	4^0C	-	-	Routine monitoring of germplasm	6188
	Long-term	-	15.5'ft x 11.5 ft x 9 ft	-20^0C	-	-	Long-term preservation and safe keeping of accessions	-
	Seed Store / Processing Space	-	-	18^0-20^0C	-	-	Breeder seed threshing, cleaning, drying, grading, packaging etc.	40-50 tons of Breeder Seed
	Lab Facilities	-	-	18^0-25^0C	-	-	Testing of seed purity, germination and moisture content	-
BJRI	**Seed Genebank:**							
	Short-term							
	Medium-term	5.5m x 3.4 m x 2.8m	-	4^0C	-	-	Medium term seed preservation	5172
	Long-term	5.5m x 3.4 m x 2.8m	-	-20^0C	-	-	Long-term seed preservation	5172
	Seed Store and Processing Space:							
	At head-quarters		-	Around 20^0C	-	-	-	-
	Short-term storage at Manikganj Station	15 ft x 10 ft	-	-	-	-	-	-
	Seed threshing floor at Manikganj	105 ft x 100 ft	-	-	-	-	-	-
	Seed threshing floor at Rangpur	40 ft x 15 ft	-	-	-	-	-	-
	New Seed Multiplication Farm Nashipur, Dinajpur	18.2 ha	-	-	-	-	-	-
BINA	Short-term facilities	200 sft.	-	15^0C -20^0C	No control	No control	Seed processing, and packaging	2,950

Since the time of the First Report on PGR (1995) the following new PGR facilities have been developed:

- **At the Bangladesh Agricultural Research Institute (BARI)** (i) clonal gene bank in 30 acres of land have been established for conservation, maintenance and propagation of germplasm, (ii) a space of 500 sq. ft. have been added to the seed

genebank for short-term storage of germplasm at 20^0 to 25^0C; 700 sq.ft. to the medium term storage for conservation at 4^0 to 6^0C and 650 sq.ft. to the long term storage for conservation at -12^0 to -16^0C.(iii) a seed processing space of 300 sq.ft. under controlled temperature of 20^0 to 25^0C. Also facilities for germination testing, *in vitro* cryo-preservation and a DNA Lab are under development (Table III.40).

- **At the Bangladesh Rice Research Institute** short-term storage at 18^0 to 20^0C, medium term storage at 4^0C, and long-term storage at -20^0C have been established. Also a seed processing space and lab facilities both at 18^0 to 20^0C have been added to the gene bank (Table III.40).

- Similarly **at the Bangladesh Jute Research Institute** medium term storage at 4^0C, long term storage at -20^0C, and seed processing spaces/short term storage at around 20^0C at the headquarters genebank and Manikganj and Rangpur Stations have been added and/or established. In addition, at the Nashipur (Dinajpur), a new Seed Multiplication Farm has been established (Table III.40).

Future PGR programmes/projects/activities in stakeholder organizations

Table III.41 below summarizes the future programmes/projects/activities in different stakeholder organizations.

Table III.41. Future programmes/projects/activities in different stakeholder organizations

Stake-holder	Programmes/Projects/Activities		
	Short term	**Medium term**	**Long term**
BARI	• Exploration, collection of germplasm and documentation. • Development of IT facilities • *In situ*/On-farm conservation • Characterization and regeneration of germplasm collected	• Molecular characterization of germplasm • Strengthening collaboration with institutes/organizations at home and abroad on PGR activities	• Development of expertise in core collection • Development of community genebank
BRRI	• Completion of exploration and collection of wild rice from hills, coastal and haor areas • Development of IT facilities • Development of audio, video and printed materials for creating awareness on PGR • *In situ*/On-farm conservation	• Strengthening collaboration with other institutes/ organizations (home and abroad) on PGR activities • Molecular characterization of rice germplasm	• Core collection
BJRI	• Regeneration of germplasm collected • Seed processing with germination tests of regenerated materials • Monitoring of viability of stored materials in the genebank • Development of IT facilities	• Cataloguing of stored materials of the genebank • Molecular characterization of collection of jute, kenaf and mesta germplasm • Selection of salt tolerant germplasm • Collection of new germplasm	• Molecular marker identification of jute, kenaf and mesta varieties released by BJRI • Gene targeting transformation in jute, kenaf and mesta • Development of protocols for DNA finger printing for evaluation and utilization of jute and allied fibre germplasm stored in the genebank • Core collection
BINA	• Visit to modern conservation facilities/laboratories	• Molecular characterization of germplasm	

Stake-holder	Programmes/Projects/Activities		
	Short term	Medium term	Long term
	• Establishment of genetic resources conservation facilities • Development of seed production and processing facilities • *In situ*/ On-farm conservation of germplasm	• Strengthening collaboration with institutes/organizations at home and abroad on PGR activities • Human resources development on PGR activities	
BSRI	• Micro propagationn of newly developed varieties of sugarcane • Collection, documentation and conservation of sugarcane germplasm • *In-situ* conservation of germplasm	• Molecular characterization of sugarcane germplasm • Artificial induction of flowering in non-flowering germplasm of sugarcane	• Transgenic variety development of sugarcane
BTRI	• Human resources development on PGR • Awareness creation on conservation of tea germplasm among tea workers at different levels	• Exploration, collection, documentation and conservation of tea and allied germplasm • Regional and international collaboration on collection and conservation of tea germplasm	• Molecular characterization of germplasm
CDB	• Human resources development on PGR • Exploration, collection, documentation and conservation of cotton germplasm • *In situ* a conservation of cotton germplasm • Production of Breeder Seed	• Development of conservation facilities • Molecular characterization of cotton germplasm	• Training on core collection • Molecular characterization of germplasm
EWS (Bd.) Ltd	• Human resources development for PGR with special reference to documentation and genebank management • Development of micro propagation facilities	• Development of facilities for molecular characterization of germplasm /genetic finger printing	• Developing facilities for long-term conservation
BSMRAU	• Human resources development on PGR	• Development of facilities for molecular characterization of aromatic rice, legumes and vegetable crops	• Development of facilities for long term conservation
BLRI	• Triticale as fodder/ feed for dairy /beef fattening	• Napier seed production	• Conservation of fodder germplasm • Fodder development for flood plain areas

National focal point

The current national focal point for PGR:
Dr. Md. Abdur Razzaque
Member Director (Crops)
Bangladesh Agricultural Research Council (BARC)
Farmgate, Dhaka 1215
Bangladesh
Tel: 880-2-8118275, Fax: 880-2-8113032
E-mail: marazzaque@barcbgd.org

Legal framework regulating the establishment of the national strategy of PGRFA

There have been attempts in the past to develop legal framework regulating the establishment of the national strategy, plan and programme on conservation and sustainable use of PGRFA. As mentioned above, the draft Acts relating to PGRFA were prepared. The Table III.42 summarizes the proposed legal framework of the Acts.

Table III.42. Proposed legal framework of the draft Acts on PGR

Reference to legal framework	Description	National programme mandate status
Draft Act : Biodiversity and Community Knowledge Protection Act of Bangladesh	• To ensure the conservation and sustainable use biological resources and related knowledge. culture and practice and to maintain and improve their diversity. • To protect biological resources and related knowledge, culture and practice from destruction, erosion and pollution.. • To protect and support the rights, knowledge, innovations and practices of local and indigenous communities and national scientific research institutions with respect to conservation, use and management of biological resources. • To provide an appropriate system of access to biological resources and related knowledge based on prior informed consent of the state and the concerned local or indigenous communities. • To promote appropriate mechanism of a fair and equitable sharing of benefits arising from the use biological resources and related knowledge and technologies. • To ensure participation and agreement of concerned communities in making decisions. regarding the distribution of benefits which may derive from the use of biological resources. • To promote and encourage the building of national scientific and technological capacity relevant to conservation and sustainable utilization of biological resources. • To promote new innovations and discoveries to reproduce, manage and enhance biodiversity. • To ensure that the transfer and movement of biological resources and the knowledge of the community takes place in transparent manner and in accordance with this Act. • To protect biological and ecological environment of the country from all pollution, particularly from potential hazards of biological pollution c*Au*sed by genetic engineering technology and the release of genetically modified organism in the environment.	-
Draft Act:: Plant Variety and Farmers' Rights Protection Act of Bangladesh	• Plant Variety Protection Authority will govern the Plant Variety and Farmers' Rights Protection Act. The Authority shall grant Plant Variety Protection Certificates, providing the plant breeder's rights, and de-register such varieties as and when needed. • There shall be a permanent Register of Protected Plant Varieties which will be available for consultation and check by anyone interested, except for certain materials for which breeders have given some limits as justifiably approved by the Authority. • The Plant Variety Certificate shall be granted only where the variety is (a) New (b) Distinct (c) Uniform (d) Stable, and (e) the subject of a denomination pursuant to the provision of this Act. • The Authority shall receive applications for variety protection. For each application, the Authority will designate an examiner to test the application against the criteria of Section 8. • The holder of the New Plant Variety Certificate shall have an exclusive right to exploit the protected variety commercially for the following purposes: (i) Production or reproduction (multiplication); (ii) conditioning of the purpose of propagation; (iii) offering for sale; (iv) selling or otherwise marketing; (v) exporting, importing, and (vi) stocking for any of the purposes mentioned in (i) to (v), above; • The Plant Variety and Farmers' Rights Protection Authority of Bangladesh shall restrict the use of the Breeder's Rights for reasons of public interest in the following cases: ➢ when the necessity arises for the prevention of human diseases, the preservation and conservation of the environment and biological diversity and for the maintenance of public welfare. ➢ the prevention of misuse of trade monopoly; • The Authority shall declare a Breeder's Rights null and void when it is established - (i) that the variety was not new or distinct at the issuing of the New Plant Variety Certificate, or (ii) that the certificate has been granted to a person who is not entitled to it, unless it is transferred to the person who is so entitled.	

Reference to legal framework	Description	National programme mandate status
	• The Authority shall cancel a Breeder's Rights when it is established that the variety is no longer uniform and stable. • The period of protection shall be: (i) 25 years for fruit trees, other tree species and vines of perennial habit; and (iii) 20 years for all other plant species. • The Plant Variety and Farmers' Rights Protection Authority shall protect and promote Farmers' Rights, which constitute the following: (i) The rights of farmers and their communities to protect their traditional knowledge relevant to plant genetic resources for food and agriculture. (ii) The right to equitably participate in the sharing of benefits arising from the utilisation of plant genetic resources. (iii) The right to participate in making decisions on matters related to the conservation and sustainable use of plant genetic resources. (iv) The right of farmers to seek cancellation and/or retribution, as the case may be, for appropriation by formal sector breeders of denominations traditionally in use for their varieties. (v) The right that farmers have to grow, save, use, exchange, and sell farm-saved seed of any variety except selling of seed of a protected variety for the purpose of reproduction under commercial marketing arrangements. (vi) The right to have access to all information relevant to the exercise of their rights with respect to plant varieties. • A Citation of Recognition can be awarded by the Authority in the form of a certificate to encourage and recognise the contribution of individuals, communities, or agencies in the development of a New Plant Variety. • The Authority shall constitute a "Gene Fund"	
Biosafety Guidelines of Bangladesh	The objective of the Guidelines is to contribute to ensuring an adequate level of protection in laboratory, field trial, safe transfer, handling, use and transboundary movement of GMOs as part of biotecnology that may have adverse effects on the conservation and sustainable use of biological diversity taking also into account risk to human and animal health. The guidelines focus on the institutional arrangements. It provides that the Ministry of Environment and Forest (MOEF) being the competent national authority and national focal point to implement the protocol shall establish a National Committee on Biosafety (NCB) in order to ensure environmentally safe management of modern biotechnological development. A Biosafety Core Committee (BCC) will be working to assist and accelerate the function of NCB. The Guidelines elaborates on the risk assessment and risk management procedures. Depending on how and where GMOs will be used specific criteria for risk assessment in five major areas have been augmented. These areas are; laboratory use, field use, direct use of foreign GMOs into the environment, industrial use and product intended to release into the market. Procedures and guidelines for obtaining permission for various dealings with GMOs, such as, laboratory use, field release, and release into the market have also been provided. The Guidelines provides the procedural details for physio-chemical and biological containment in order to avert the adverse impacts of modern biotechnological research works. It categorises the laboratory work into four different biosafety level such as work bearing minimum risk, work bearing low risk, work bearing considerable risk and work bearing high risk and describe the precautionary measures that should be taken to avert such risks.	

PGRFA relevant international agreements signed/ratified by Bangladesh

PGRFA relevant international agreement signed/ratified by Bangladesh, with names of the institute(s) responsible for its implementation, the national focal point for the agreement/ convention, implementation reports and the GPA priority areas in which the country benefits most, are tabulated below (Table III.43)

Table III.43. **PGRFA relevant international agreement signed/ratified by Bangladesh with reference to the institute(s) responsible for its implementation, the national focal point for the agreement/convention, implementation reports and the GPA priority areas in which the country benefits most**

Agreement/ convention	Agreement reference	Implementing organization	National focal point	Implementation reports	GPA Area that benefit the country most
The Convention of Biological Diversity (CBD)	-	• Ministry of Environment and Forest (responsible for biodiversity in general) • Ministry of Agriculture /Bangladesh Agricultural Research Council (responsible for PGRFA,	Ministry of Environment and Forest	-	• Surveying and inventorying PGRFA • Supporting on-farm management of PGRFA • Assisting farmers in disaster situations • Sustaining existing *ex situ* collections • Supporting planned and targeted collecting of PGRFA • Expanding ex situ conservation activities • Promoting development and commercialization of under-utilized crops and species • Supporting seed production and distribution • Building strong national programmes • Promoting network for PGRFA • Expanding and improving education and training
TRIPS					• TRIPS Agreement 27.3 (b) Development of *Sui generis* System of Plant Variety Protection
Cartagena Protocol	Ministry of Environment and Forest	Ministry of Environment and Forest			• Adoption of good laboratory practices • Building National Programmes • Genetic finger printing of germplasm
International Treaty on Plant Genetic Resources for Food and Agriculture	Bangladesh Agricultural Research Council	Ministry of Agriculture			• Assisting in the development of national programmes on Plant Genetic Resources for Food and Agriculture (PGRFA)

Trends in terms of the number of experts in national programmes

Table III.44. Current trend within the National Programme in terms of number of experts

Experts	Trend
Technical experts	Stable
Legal experts	No legal experts
Managerial/Policy experts	Stable

Workshops and meetings of concerned persons and organizations

No workshop/meetings involving the stakeholders (of concerned NARS institutes, concerned Ministries, Universities, National Genebanks, NGOs) have been held to review national activities on conservation and use of PGRFA since 1997. However, BARC organized four training workshops with network members on PGRFA in the recent past with support from FAO. The PGR network activities formed under FAO support is continuing for the promotion of PGRFA activities in Bangladesh.

Constraints, needs and priorities

Table III.45 below gives the main constraints and priorities in building national programmes.

Table III.45. Main constraints and needs/priorities in building national programmes

Constraints	Needs and Priorities
• Lack of follow up activities of international agreements • Lack of clear organizational responsibilities to follow up international agreements • Lack of national coordination on matters related to PGR • Focal points are not always clearly identified with clear responsibilities and accountability • Lack of fund	• Revitalize the national coordination body, the National Plant Genetic Resources Committee (NCPGR) to follow up international agreements vis-à-vis all other activities related to PGR. BARC may take initiatives in this regard. • Clear identification of focal points with defined responsibilities and accountability • Fund to PGR activities • Advanced training on PGR (short and long term) • External/international support needed for capacity building in increasing public awareness

Activity Area 16: Promoting Networks for PGRFA

Viable and functional networks promote sharing knowledge and experiences as well as wide use of germplasm. For this reason, establishing network(s) of organizations within the country as well as setting national, regional and global priorities in germplasm conservation, genetic enhancement and enrichment are all critical for the progress in PGR activities.

Unfortunately, the awareness within Bangladesh on matters related to PGRFA is still very low. This also has had an impact on active participation of the country in regional and international networks. However, Bangladesh is a member of some regional/ international networks shown in Table III.46.

Table III.46. Name and acronym of international PGRFA networks that Bangladesh is participating

Name	Acronym	Network activity description	Network national focal point
Bioversity (former International Plant Genetic Resources Institute (South Asian Region)	Bioversity	Sharing information and technical cooperation in PGR	Bangladesh Agricultural Research Institute (BARI)
International Network for Genetic Evaluation of Rice	INGER	International germplasm trials	Bangladesh Rice research Institute
Coconut Genetic Resources Network	COGEN	Coconut germplasm collection and training	Bangladesh Agricultural Research Institute
International Centre for Maize and Wheat Improvement	CIMMYT	International trials with breeding lines of wheat and maize and technical cooperation.	Wheat Research Centre, BARI
Asian Vegetable Research and Development Centre	AVRDC	Trials and exchange of vegetable germplasm / breeding lines.	Horticultural Research Centre, BARI
International Potato Centre	CIP	International trials and germplasm exchange of potato.	Tuber Crops Research Centre, BARI
International Crops Research Institute for the Semi-Arid Tropics	ICRISAT	International trials and sharing of breeding lines of pulse crops	Pulses Research Centre, BARI
International Rice Research Institute	IRRI	International trials, exchange of germplasm and technical cooperation involving rice.	Bangladesh Rice Research Institute (BRRI)
Rice Wheat Consortium	RWC	Development of rice-wheat cropping systems	BARI and BRRI
International Jute Study Group Organization	IJSG	Sharing of germplasm and technical cooperation	Bangladesh Jute Research Institute (BJRI)
Tropical Asia Maize Network	TAMNET	Germplasm evaluation of hybrid	Bangladesh Agricultural

Name	Acronym	Network activity description	Network national focal point
		maize.	Research Institute.
Common Fund for Commodity	CFC	Sugarcane germplasm exchange	Bangladesh Sugarcane Research Institute.
International Network for Banana And Plantain	INIBAP	Collection and conservation of banana germplasm	Bangladesh Agricultural Research Institute.

In addition, the NARS institutes have signed Memorandum of Understanding (MoU) with a number of PGR related organizations operating within and outside the country. Table III.47 shows the NARS institutes having MoUs with their collaborating organizations.

Table III.47. NARS institutes with MoUs with other national PGR related organizations

NARS institutes	Organizations within the country having MoUs	Purpose	Status of collaboration
Bangladesh Agricultural Research Institute	• East West Seed (Bd) Ltd, • Supreme Seed Co., • Omni Group, • PRAN Group, • GETC Agro Vision	•PGR utilization, Seed production & marketing •PGR utilization, Seed production & marketing •PGR utilization, Seed production & marketing • PGR utilization, Seed production & marketing •PGR utilization, Seed production & marketing	• On-going • On-going • On-going • On-going • On-going
Bangladesh Rice Research Institute	• BRAC (NGO) • GKF (NGO) • Syngenta (multinational company) • Padakhep (NGO) • 7 (Seven) national universities • 15 (Fifteen) Private Co../NGOs	•Seed production •Seed Production •Seed production •Seed Production •Germplasm exchange •Seed Production	• On-going • On-going • On-going • On-going • On-going • Under process
Bangladesh Jute Research Institute	• East West Seed (Bd) Ltd	•Seed production	• On-going
Bangladesh Sugarcane Research Institute	• BINA • BARI • BRRI • BJRI • BAU • BSMRAU	• Collaboration on seed production and collaborative research	•On going - -
Bangabandhu Sheikh Mujibur Rahman Agricultural University	• Bangladesh Agricultural Research Institute • Bangladesh Rice Research Institute • ACI • Kyushu University, Japan • Asian Vegetable Research and Development Centre • International Crops Research Institute for the Semi-Arid Tropics	• Germplasm exchange • Germplasm exchange • Under process • Germplasm exchange • Germplasm exchange • Germplasm exchange	
Bangladesh Livestock research Institute	• Milk Vita	• Napier cutting supply	On-going
	• CIMMYT	• Triticale as fodder and feedproduction	On-going
	• BRAC	• Seed/cutting supply of fodder crops	On-going
	• Youth Training Centre	• Seed/cutting supply of fodder crops	On-going
	• MCC	• Seed/cutting supply of fodder crops	On-going

The nature of support the Bangladesh Government has provided to support network activities:

- Technical expertise in joint activities.
- Organization and hosting of network meetings.
- Institutional infrastructure to participate in joint activities.
- Information support.
- Other (specify): Organizing training.

Major benefits gained by the country through PGRFA networks

- Transfer of technology and germpalsm/breeding lines.
- Backup safety duplication of germplasm.

- Exchange of germlplasm.
- Increased stakeholder participation in international trials crop improvement programmes.
- Access to financial resources through participation.
- Increased research facilities.
- Sharing of responsibilities of network activities.
- Exchange of technical expertise.
- Training for national programme scientists.
- Exchange of information.
- Access to advanced research results.
- Joint characterization and evaluation of germplasm.
- Increased awareness of PGRFA.
- Avoiding duplication efforts.

Major constraints to effective participation of the country in regional and/or international PGRFA networks

- Material flow is not uniform.
- Dearth of trained manpower to work in teams in international PGRFA networks.
- Limited visits of scientists within participating countries.

Programmes/projects/activities carried out by different stakeholder organizations in collaboration with any PGRFA network

Table III.48 below gives the programmes/projects/activities carried out by different stakeholder organization in collaboration with PGRFA networks

Table III.48. Programm/project/activity carried out by different stakeholder organization in collaboration with PGRFA networks

Stakeholder	Programm/project/activity carried out
BARI	• BARI-AVRDC Collection of germplasm and development of varieties of vegetables and soybean varieties • Conservation and utilization of indigenous vegetables • Breeding lines from CIMMTY for evaluation of wheat and maize breeding lines • Collaboration with ICRISAT for evaluation of breeding lines of chickpea and other pulses • Collaboration through Rice-Wheat Consortium for development of rice-wheat cropping systems
CDP	MoUs with BARI, BJRI, Khulna University, Cornell University (USA), High-Tech (China) and AVRDC
BJRI	Collection,Characterization and evaluation of Jute, Kenaf and Mesta - collaboration with IJSG and Bioversity (former IPGRI)
BINA	Breeding lines from IRRI, ICRISAT and ICARDA
BSRI	• Sugarcane varietal improvement programme for South East Asia and the Pacific (collaborative programme among Bangladesh, Philippines, Thailand, Indonesia and Malaysia)
BSMRAU	Collaborative programmes with ICRISAT and AVRDC

Publications the stakeholder organization contributed to in the context of network activities

Stakeholder	Title of publication	Name of network
Coastal Development Partnership	Rice varieties facing extinction	Coastal Development Partnership
Bangladesh Agricultural Research Institute	BARI-AVRDC Collaboration Annual Reports	SAVERNET

Comments by stakeholders on promoting networks for PGRFA

Stakeholder	Comments
Bangladesh Agricultural Development Corporation	Linkage with research organizations (within and outside the country) should be strengthened
Coastal Development Partnership	CDP has no network with any regional/international PGRFA bodies but has a network of its own, *Sustainable Agricultural Forum*, where grassroots level organizations/groups (in Bagerhat, Khulna, Satkhira and Jessore districts) are members.
Bangladesh Jute Research Institute	Link with national and international genebank should be strengthened-
Bangladesh Rice Research Institute	Sharing of experiences between public and private organizations should be strengthened.
Bangladesh Institute of Nuclear Agriculture	Linkage with national and international genebanks should be strengthened
Bangladesh Sugarcane Research Institute	Linkage with different reseaerch organizations (inside and outside the country) should be strengthened
Bangabandhu Sheikh Mujibur Rahman Agricultural University	Information sharing among network members should be strengthened.

In addition,

- A South Asian Network on PGR under SAARC umbrella may be created.
- IPGRI/Bioversity may take more vigorous network activities.

Activity Area 17: Constructing Comprehensive Information Systems for PGRFA

Data management and information systems have not been standardized between stakeholder organizations participating in activities of national programmes on PGR. However,

- Many GPA stakeholders (43-66%) are equipped with computers.
- *Dial-up* internet connectivity is available in all stakeholder organizations.

Data development and information management system

Project/programme/activity in which different stakeholder organizations participate to develop data and information management system for PGRFA are given in Table III.49 below.

Table III. 49. Projects/programmes/activities in which different stakeholder organizations participate to develop data and information management system for PGRFA

Stakeholder	Project/programme/activity
Bangladesh Agricultural Research Institute	Software (BDGRIN) is being developed
Costal Development Partnership	Rice Diversity and Production in Southwest Bangladesh
Cotton Development Board	Strengthening Cotton Research, Seed Production and Extension Services
Seed Certification Agency	DUS & VCU Tests, Seed Testing and Field Inspection for Seed Certification
Bangladesh Jute Research Institute	Preparation of descriptor list and jute breeding through IJSG Information Sharing Mechanism on GPA Implementation
Bangabandhu Sheikh Mujibur Rahman Agricultural University	Inventory of plant genetic reasources

International PGR information system consulted by stakeholder organizations

None of the stakeholder organizations has so far consulted International PGR Information Systems.

Information system currently used by stakeholder organizations for PGRFA and/or Seed Stock data management with and their level of utilization

Table III.50.Information systems used by stakeholder organizations for PGRFA and/or seed stock data management

Stakeholder	Name of system	Level of use	Frequency of data quality control
BARI	MS Word & Excel	Medium	Occasionally
CDB	Hard copy (printed/ official)	Low	Never
BJRI	MS Word, Excel	Low to Medium	Occasionally
BRRI	Bangladesh Rice Information System	Medium	Regularly
BINA	MS Word and Excel	Medium	Occasionally
BSMRAU	MS Word and Excel	Medium	Occasionally

Constraints, Needs and Opportunities

Table III.51. Constraints, needs and opportunities for constructing information system for PGRFA

Stakeholder	Constraints	Needs	Opportunities
BARI	• Lack of adequate awareness • Dearth of trained staff • Lack of standard documentation system (Software) • Inadequacy of fund	• Awareness creation • Staff training • Appropriate software • Sustainable financial support	• Interested staff available
BADC	• Lack of awareness at policy level • Lack of facilities • Dearth of trained staff	• Awareness creation • Staff training • Appropriate software • Sustainable financial support	-
CDP	• Lack of trained staff • Lack of standard documentation system (Software) • Lack of fund	• Staff training • Appropriate software • Sustainable Financial support	Keen to acquire expertise
CDB	• No internet connectivity • Lack of fund • Lack of facilities • Lack of trained staff	• Development of facilities including internet connectivity • Staff training • Sustainable financial support	Awareness is there within the organization
SCA	• Lack of adequate awareness • Lack of trained staff • Paucity of fund	• Awareness creation at the policy level • Staff training	Organizational mandate is favourable

Stakeholder	Constraints	Needs	Opportunities
		• Sustainable Ffinancial support	
EWS (BD) Ltd.	• Lack of trained staff • Lack of standard documentation system (Software) • Lack of fund	• Training • Appropriate software Financial support	Interested human resources available-
BJRI	• Lack of trained staff • Lack of standard documentation system (Software) • Inadequacy of fund	• Staff training • Appropriate software • Sustainable financial support	Awareness is there within the organization
BRRI	• No internet connectivity • Lack of skilled manpower • Inadequacy of fund	• Internet connectivity • Staff training • Sustainable financial support	Information system for local use available
BINA	• Lack of awareness • Lack of trained staff • Lack of facilities • Inadequacy of fund	• Awareness creation • Staff training • Sustainable financial support	Interested staff available
BSRI	• Lack of adequate awareness • Lack of trained staff • Inadequacy of fund	• Awareness creation at the policy level • Staff training • Sustainable financial support	Information system can be established both in mill and non-mill zones.
BSMRAU	• Lack of trained staff • Lack of standard documentation system (Software) • Inadequacy of fund	• Training • Appropriate software • Sustainable financial support	Interested human resources available.
DAE	• Lack of adequate awareness	• Training • Appropriate software • Financial support	• Adequate physical facilities available. • Committed staff available

Activity Area 18: Developing Monitoring and Early Warning System for PGRFA

Recognizable threat to genetic erosion

There are a number of recognizable threats of genetic erosion and genetic vulnerability in the country. These include:

- The number of crop varieties in farmers' fields has reduced drastically since the introduction of green revolution technologies. For example, it was reported that some 12,000 rice cultivars existed in this region[57]. At present farmers grow mostly the improved varieties released from research institutes and their number does not exceed more than a few dozens of rice varieties.
- An estimated 73,000 hectares of forest has been lost through encroachment for aquaculture and agriculture during 1970s and 1980s. About 8,000 hectares of forest are lost annually to homestead establishment, urbanisation and deforestation[58]. With these disappeared numerous plant genetic resources for food and agriculture, both in use currently and with potential use in the future.
- The first volume of the Red Data Book published in 2001 identified 106 species of vascular plants that are threatened at various degrees and many of these are no longer tracable in the country.[59]

[57] Ahmad, Q.K. and S. M. H. Z*Aman*. 1998. Agricultural Growth and Environment. In Faruquee, R. 1998. Bangladesh Agriculture in the 21st Century. University Press Limited, Dhaka.
[58] See Hossain, M. G. 2005. Bangladesh Agriculture: A Critique on Performances and the Challenges of Tomorrow. Jatiya Shahitya Prakashoni, Dhaka 1000. pp. 34.
[59] Khan, M. S. et al. (Eds.). 2001. Red Data Book of Vascular Plants of Bangladesh. Bangladesh Agricultural Research Council/Bangladesh National Herbariumm Dhaka,

Apparently, the losses of genetic materials have not been reported to the FAO Global System on PGRFA authorities in any formal way.

Assessing genetic erosion

There is no formal mechanism in the country for assessing genetic erosion. The only exception, however, is the publication of the first volume of the *Red Data Book* in 2001 by the Bangladesh National Herbarium. The need for assessing genetic erosion is strongly felt in the country.

The mechanisms used so far for assessing genetic erosion in the country were land surveys and inventories of germplasm maintained in genebanks and the herbarium specimens.

Constraints to monitoring genetic erosion

The major constraints the country faces to monitoring genetic erosion are:

- Lack of a coherent national programme,
- Dearth of skilled personnel, and
- Lack of financial resources.

Participation of stakeholder organizations in assessing genetic erosion

The status of participation of stakeholder organizations in projects relating to the assessment of magnitude and the rate of genetic erosion is summarized in Table III.52.

Table III.52. Status of participation of stakeholder organizations in assessment of genetic erosion

Stakeholder	Status of participation in projects on assessment of genetic erosion
Bangladesh Agricultural Research Institute	None
Bangladesh National Herbarium	Inventory of threatened plants and publication of Red Data Book of Vascular Plants of Bangladesh
Coastal Development Partnership	Rice Diversity and Production in Southwest Bangladesh
Seed Certification Agency	None
Bangabandhu Sheikh Mujibur Rahman Agricultural University	None
Bangladesh Jute Research Institute	None

Constraints to, needs and opportunities for developing and sustaining early warning systems for loss of PGRFA

Table III.53. Constraints, needs and opportunities identified by stakeholder organizations on developing and sustaining early warning systems for loss of PGRFA

Stakeholder	Constraints	Needs	Opportunities
CDB	• No project undertaken yet on monitoring and early warning systems for PGRFA • Lack of manpower • Lack of facilities	• Manpower development • Training • Financial support	Demand for sustaining varieties
DAE	• No project • Lack of manpower • Inadequacy of fund • Mehtodology not known	• Manpower development • Training • Financial support	There are demands for traditional/local varieties after natural disasters

Stakeholder	Constraints	Needs	Opportunities
SCA	• PGR erosion in *ex situ* collections	• Supporting planned and targeted collection	-
EWS (Bd) Ltd	• PGR erosion in ex situ collections	• Surveying and inventorying • Supporting planned and targeted collection	Has a good number of *ex situ* collection
BINA	• No project • Lack of manpower • Inadequacy of fund	• Local and wild germplasm should be collected and preserved	Demand for local varieties in unfavourable environments
BJRI	• Lack of trained staff • Inadequacy of fund	• Awareness building among scientists to maintain genetic resources	Has a good collection of germplasm of jute and allied fibre species.
BRRI	• No project/programme for developing, monitoring and early warning systems. • Lack of trained staff • Lack of facilities • Inadequacy of fund • Methodology not available	• Early warning system should be developed • Training on methodology • Financial support	Has a good collection of rice germplasm
BSRI	• No project undertaken for monitoring and sustaining for loss of PGRFA	• Early warning system should be developed	Has a good collection of sugarcane germplasm
BSMRAU	No project undertaken	• Monitoring and early warning system should be established	A good number of *ex situ* collection

Activity Area 19: Expanding and Improving Education and Training

Training programmes implemented by different stakeholder organizaions

Training progrqammes implemented by different stakeholder organizations after the First Report on Plant Genetic Reasources (1996) are given in Table III.53.

Table III.53(a). Training programmes implemented by different stakeholder organizations after the First Report on Plant Genetic Resources, 1996

Stakeholder	Name of training programme	Year of implementation	No. of participants	Duration	Issues and subjects covered
BARI	National Training Course on Genebank Management System (GMS) Software	1996	14	6 days	Passport information, characterization, and evaluation, conservation and documentation
	Exploration and Collection of PGR	1997	1	21 days	Survey, data management of germplasm conservation
	Practical Tainting on Plant Genetic Resources Documentation	1998	2	18 days	Plant Genetic Resources Centre (PGRC) documentation
	Vegetable Germplasm Conservation and Management	2000	20	4 days	Germless collection, conservation and documentation of vegetables
	Practical Course on Novel Genetic Marker of Crop Improvement	2002	16	10 days	Training on RAPD, SSR, MAS, etc.
	The Third Country Training Programme on Plant Genetic Resources Conservation and Management	2002	2	One month	PGR conservation and management

Stakeholder	Name of training programme	Year of implementation	No. of participants	Duration	Issues and subjects covered
	Participatory Approach in the Selection of Indigenous Vegetables	2006	204	1 day	Improvement of awareness on indigenous vegetables and nutrition
BRRI	Field Collection and Conservation of Rice Germplasm	1996	Scientists, NGO and Extension personnel	One week	Rice morphology and habitats, rice germplasm collection, identification of wild rice and conservation
	Training on Documentation and Data Management	1997	BRRI scientists	2 weeks	Data base preparation, documentation and management of data
	Germplasm Collection, Passport Data Preparation and Socio-economic Data Collection in Southwest Bangladesh	2001	NGO personnel	3 days	Rice morphology identification of local/traditional varieties
	Participatory Variety Selection and Seed Production in Southwest Bangladesh	2003	Local NGO personnel	One day	PVS and seed production of local and traditional varieties
	Indigenous Knowledge and Sustainable Rice Livelihood in Southwest Bangladesh	2003	BRRI scientists	One day	Indigenous knowledge and sustainability of rice livelihood regarding *Aman* varieties of SW Bangladesh
	Cultivation practices and adaptability of Rice Germplasm under Waterlogged Situation in Southwest Bangladesh	2004	BRRI scientists	2 days	Production and adaptability of deep water rice germplasm
	Production, Evaluation and Data Analysis of Deep Water Rice Germplasm in Southwest Bangladesh	2004	Research Assistants	3 days	Production, evaluation and data analysis of deep water rice germplasm
	Preparation of database and Management with GIS	2006	BRRI scientists	5 days	Preparation and database management with geo reference
	GIS Database	2006	BRRI scientists	5 days	Database required with GIS
BJRI	Jute and Kenaf breedingGenebank Management	1996	21	1015 days	Breeding/Gene bank management
	Gene bank Management System Software	1996	1	6 days	Gene bank management software
	PGR Documentation	1998	1	18 days	PGR documentation
	Conservation and Utilization of PGR of Food Crops	2001	1	Three weeks	PGR of food crops
BSRI	Present status of Sugarcane Germplasm and Variety Development in Thailand	2001	-	-	-
	Disease indexing of Sugarcane using PCR	2002	-	-	-
	Characterization and Documentation of Sugarcane	2005	-	-	-
BLRI	Demonstration of Improved Fodder Species of BLRI	2006	20	1 day	Production and conservation
	Production and Utilization of Triticale	2005	20	4 days	Production and Utilization
	Whole Family Training on Triticale Production and Utilization	May 2005	20	12 days	Production and Utilization
	Whole Family Training on Triticale Production and Utilization	October 2005	20	12 days	Production and Utilization
	Training of Trainers (Fodder Production)	May 2006	80	4 days	Production and Utilization
	Training of Trainers (Fodder Production)	May 2006	80	3 days	Production and Utilization

Stakeholder	Name of training programme	Year of implementation	No. of participants	Duration	Issues and subjects covered
	Training of Trainers (Fodder Production)	November 2006	120	4 days	Production and Utilization
	Whole Family Training on Triticale Proudction and Utilization	November 2006	120	3 days	Production and Utilization

Training received by staff of different stakeholder organizations

Course curricula to address PGR issues, in general, are weak in our education system. There are no courses/programme worth the name on population biology, ecology, ethno botany, *in situ* management in our universities. Experts on Taxonomy have become increasingly scarce. However, training courses covering the 20 GPA priority areas received by staff of stakeholder organizations are summarized in Table III.54.

Table III.54. Training received by staff of stakeholder organizations on the GPA priority areas

Stakeholder	Training course	GPA priority areas addressed
BARI	Characterization and Evaluation of Germplasm Collections	8. Expanding *ex situ* conservation activities; 8.1. *Ex situ* conservation of vegetatively propagated and recalcitrant seeded plants; 9.1. Germplasm characterization and/ or evaluation
	Collection, Conservation and Utilization of Indigenous Vegetables	1.5 Indigenous knowledge; 8. Expanding *ex situ* conservation activities; 9.1 Germplasm characterization and/or evaluation
CDP	Rice Diversity and Production in Southwest Bangladesh	9.1 Germplasm characerization and evaluation 9.2 On-farm conservation
CDB	National Information Sharing Mechanism on Implementation and Monitoring of GPA	15. Building Strong National Programmes; 16. Promoting Networks of PGRFA;
BJRI	Conservation, Utilization and documentation of PGRNational Information Sharing Mechanism on Implementation and Monitoring of GPA	1.Surveying and Inventorying PGRA 5. Sustaining Existing *Ex Situ* Collections 6. Regenerating Threatened *Ex Situ* Accessions 8. Expanding *Ex Situ* Conservation Activities 9.1 Germplasm Characterization and/or Evaluation 9.2 On-farm Evaluation 10.1 Plant Breeding 14. Developing New Markets for Local Varieties and 'Diversity-Rich' Products 15. Building Strong National Programmes 16. Promoting Networks for PGRFA 17. Constructing Comprehensive Information Systems for PGRFA 18. Developing Monitoring and Early Warning Systems for Loss of PGRFA 19. Expanding and Improving Education and Training
BRRI	National Information Sharing Mechanism on the Implementation and Monitoring of the GPA for Conservation and Sustainable Utilization of PGRFA	15. Building Strong National Programmes 16. Promoting Networks of PGRFA 19. Expanding and Improving Education and Training
BSRI	Characterization and Evaluation of Germplasm Accessions	1. Surveying and Inventorying PGRFA 1.1Taxonomy 9. Expanding the Characterization, Evaluation

Stakeholder	Training course	GPA priority areas addressed
		and Number of Core Collections to Facilitate Use 9.1 Germplasm Characterization and/or Evaluation 9.2 On-farm Evaluation 10. Increasing Genetic Enhancement and Base Broadening Efforts 10.1Plant Breeding
BSMRAU	National Information Sharing M echanisms and monitoring of GPA	Building national crop improvement programs
EWS (Bd.) Ltd.	National Information Sharing M echanisms and mMonitoring of GPA	9.1. Germplasm characterization and evaluation 10.1 Plant Breeding

Training areas considered as priority for staff by stakeholder organizations

Table III.55. Topic(s) considered as training priority for staff by stakeholder organizations and not covered in the country

Stakeholder	Training areas	Availability at national/regional level
BARI	Molecular characterization of germplasm	Not available at national level
	Cryo- preservation of germplasm	Not available at national level
	Germplasm documentation	Not available at national level
	Geographical information system	Not available at national level
	Core collection	Not available at national level
	Global issues related to PGRFA	Not available at regional level
CDP	Regeneration of species conserved *ex situ*	Not available at regional level
CDB	Institution and capacity building	Not available at regional level
	In situ conservation and methodologies for *in situ* conservation.	Not available at national level
	Developing monitoring and early warning system for loss of PGRFA	Not available at national level
DAE	*In situ* and *ex situ* conservation	Not available at national level
SCA	Taxonomy, Phenotypic characterization	Not available at national level
BAU	Cryo-preservation, Marker aided characterization	Not available at regional level
BINA	GIS, In-situ Conservation,Plant Genetic Resources	National level at national level.
BINA	Management of Genebank; Quality seed production; Collection, conservation / Geographical information system and utilization genetic resources, Molecular characterization and cryo-preservation	Not available at national level
BRRI	Information technology (IT) systems for management of rice diversity	Not available at national level
BSRI	All areas of GPA except Activity Area 9 (i.e. Germplasm characterization/evaluation)	Not available at national level
BSMRAU	Germplasm collection, Characterization and evaluation of germplasm; Use of GIS in the state of PGRFA diversity and on *In situ* conservation and utilizatrion	Not available at national level
EWS (Bd) Ltd.	Germplasm documentation;, GIS;, Molecular characterization of germplasm; , cryo-preservation of germplasm, Management of Genebank; and *In situ* conservation	Not available at national level

Statements that best describe education and training for PGRFA in the country

- There is no national strategy for education and training on PGRFA.
- University-level education is offered to interested students.

Level of training and educational facilities in PGRFA conservation and utilization

- Training and education opportunities are rare and inadequate in the country.

Availability of university training opportunities in the region on topics related to PGRFA conservation and use

- Some university level training opportunities exist, but these are not sufficient to meet the country's needs.

Availability of short course training opportunities in the region on priority topics related to PGRFA conservation and use

Sufficient short course training opportunities exist in the region (India and Bioversity International).

Greatest obstacles to training in PGRFA in the country

- Lack of awareness of the training needs within the country.
- Lack of financial resources.
- Paucity of resource materials to improve existing training programme.
- Paucity of human resources to provide quality training.

Establishing, improving and expanding training facilities on conservation and sustainable use of PGRFA

- Coordinated programme by FAO and/or other international/regional Organizations.
- International/regional support for lab facilities and training materials.
- Higher training (Master's and PhD level) in the form of scholarships.
- Internship training programmes (e.g. at IARCs).

Activity Area 20: Promoting Public Awareness of the Value of PGRFA Conservation and Use

Bangladesh is a country with rapid and large-scale genetic erosion. But the awarenss of the impacts of PGRFA on the economy and the environment is rather low. Therefore, creating public awareness is conservation imperative.

Public awareness of the value of PGRFA conservation in the country

- The public is generally unaware of the value of PGRFA conservation.

Development of public awareness programme

- No public awareness programme on PGRFA has been undertaken except some sporadic television clips by the Ministry of Environment and Forest on conservation of tree species.

Public awareness activity coordinator in the country

The Bangladesh Agricultural Research Council is coordinating the activities of NARS. NARS institutes can be involved in awareness creation through organizing training and workshop.

Integration of the awareness of the value of PGRFA into pre-secondary and/or secondary educational curricula

- The awareness of the value of PGRFA into pre-secondary and/or secondary educational curricula has not been integrated.

Greatest constraints to developing and using public awareness materials

Table III.56. Constraints identified by different stakeholder organizations in developing and using public awareness materials

Stakeholder	Constraints	Other constraints
BARI	• Insufficient number of staff • Staff does not have sufficient skill • Insufficient financial support	Incentive systems are not in place
BADC	• Insufficient number of staff • National priorities have not been established • Staff does not have sufficient skill and knowledge • It is not clear which organizations is responsible for this activity • Insufficient financial support	No policy on PGR
BLRI	• Insufficient number of staff • National priorities have not been established • It is not clear which organizations is responsible for this activity • Insufficient financial support	-
BNH	• Insufficient number of staff • National priorities have not been established • Staff does not have sufficient skill and knowledge • It is not clear which organizations is responsible for this activity • Insufficient financial support	-
CDP	• Insufficient number of staff • National priorities have not been established • Staff does not have sufficient skill and knowledge • It is not clear which organizations is responsible for this activity • Insufficient financial support	• Lack of educational and communication aids and equipment • Lack of documentation skills, training and information systems • National priorities is yet to be established
CDB	• Insufficient number of staff • Staff does not have sufficient skill and knowledge • Insufficient financial support	-
DAE	• National priorities have not been established • Staff does not have sufficient skill and knowledge • It is not clear which organizations is responsible for this activity • Insufficient financial support	-
EWS (Bd.) Ltd	• Staff does not have sufficient skill and knowledge • It is not clear which organizations is responsible for this activity • Insufficient financial support	-

Stakeholder	Constraints	Other constraints
BAU	• Insufficient number of staff • National priorities have not been established • Staff does not have sufficient skill and knowledge • It is not clear which organizations is responsible for this activity • Insufficient financial support	-
BINA	• National priorities have not been established • It is not clear which organizations is responsible for this activity • Insufficient financial support	-
BJRI	• Insufficient number of staff • National priorities have not been established • Staff does not have sufficient skill and knowledge • Insufficient financial support	There should be a unit for developing public awareness(within the organization.
BRRI	• National priorities have not been established	-
BSRI	• Insufficient number of staff • National priorities have not been established • Staff does not have sufficient skill and knowledge • Insufficient financial support • Lack of a unit for developing public awareness within the organization	-
BSMRAU	• Insufficient number of staff • National priorities have not been established • Staff does not have sufficient skill and knowledge • It is not clear which organizations is responsible for this activity • Insufficient financial support	Access to electronic media is limited.

Products developed, media used, audience targeted and topics covered by different stakeholder organizations in creating awareness on the value of PGRFA

Table III.57. Products developed, media used, audience targeted and topics covered by different stakeholder organizations in creating awareness on the value of PGRFA (as reported)

Stakeholder	Products developed	Media used	Audiences targeted	Topics covered	Reference
BARI	Audio-visual products; Display panels & posters; Newsletters; Reports; magazines;	Press; Television; Radio, Diversity fairs; Conferences; Educational events	Policy makers; Scientists; Extension agents; Farmers; School children	Importance of PGRFA as part of biodiversity; National policy	-
BADC	Audio-visual products; Display panels & posters; Fact sheets; Newsletters; Reports; magazines; WWW pages; Accessories	Press; Television; Radio, Internet; Diversity fairs; Conferences; Educational events	Policymakers; Scientists; Extension agents; Farmers; School children, General public	Importance of PGRFA as part of diversity; Farmers' Role; National Policy; Environmental education	-
CDP	Display panels & posters; Fact sheets; Newsletters; Reports; magazines; WWW pages; Accessories	Press; Diversity fairs; Conferences; Educational events	Policymakers; Scientists; Extension agents; School children, General public	Importance of PGRFA as part of diversity; Farmers' Role; National Policy; Environmental education	Environmental Disaster in Southeast Region and Problems in agriculture and Rice Farming; Evaluation of Rice Diversity on Southwest Coastal Region of Bangladesh; Problems in Rice Cultivation in Southwest Coastal Region of Bangladesh and

Stakeholder	Products developed	Media used	Audiences targeted	Topics covered	Reference
					Possible Solutions; Rice varieties facing Extinction
CDB	Display panels and posters	Television; Radio; Diversity fairs; Conferences	Policymakers; Scientists; Extension agents; Farmers	Farmers' role	Tula Utpadan Karmashuchi (Cotton Production Programme)
SCA	Display panels and Posters; Fact Sheet	Radio; Conferences	Policymakers; Scientists; Extension agents; Farmers	-	-
EWS Seed (Bd) Ltd	Newsletters; Reports; Magazines; Accessories (T-shirts, caps, bags, etc)/ Gadgets	Press; Radio; Internet; Conferences	Policymakers; Scientists; Extension agents; Farmers	Importance of PGRFA as part of biodiversity	Technical Report
BINA	Reports	-	Policymakers; Scientists; Extension agents; Farmers	Farmers' role; National policy	-
BRRI	Fact sheets; Reports	Diversity fairs	Policymakers; Scientists; Extension agents; Farmers	Importance of PGRFA as part of biodiversity; Environmental education	Rice biodiversity and Genetic Wealth of Flood prone Environments of Bangladesh; Completion Report on Identification of Rice Varieties for Waterlogged situation in Southwest Bangladesh
BSRI	Audio-visual products; Reports ; Newsletters: Journal	Press, Television,Radio, Conference, Workshop	Policymakers; Sugar and 'gur' producers; Farmers; Extension workers, NGOs	National policy; Farmers' role	Reports
BSMRAU	Audio-visual products; Newsletters: Reports Magazines	Press; Television; Radio; Diversity fairs; Conferences; Educational events	Policymakers; Scientists; Extension agents; Farmers	Farmers role; National Policy; Environmental education	-
BJRI	Audio-visual products, Reports, Leaflets, Newsletter	Newspaper, Radio and Television	Policymakers, Extension workers and Farmers	PGR importance and production of seed	Annual Reports and Office Records

NGOs and well-known personalities, identified by stakeholder organizations, involved in public awareness activities in the country

Stakeholder	Name of organization involved in public awareness
Bangladesh Agricultural Research Institute	UBINIG
Bangladesh Agricultural Development Corporation	NGOs: BRAC, CARE, PROSHIKA
Bangladesh National Herbarium	IUCN
Coastal Development Partnership	Coastal Development Partnership
Seed Certification Agency	-
East West Seed Ltd	-
Bangladesh Rice Research Institute	Coastal Development Partnership
Bangabandhu Sheikh Mujibur Rahman Agricultural University	-
Bangladesh Jute Research Institute	UBINIG, East-West Seed (Bd) Ltd.

Regional or international organizations that provide the country with support for public awareness activities on PGRFA: None

Constraints, challenges, opportunities identified by stakeholder organizations in promoting public awareness

Stakeholder	Constraints	Needs	Opportunities
BARI	• Lack of fund for organizing workshop at farm level. • National priority has not been established • Lack of training of scientist on the value of PGRFA.	Training; Publication; Telecasting	Institutional set up is available in different AEZs
BLRI	• No awareness activity related to PGRFA and fodder genetic resources • No national priority for creating public awareness	• Increasing public awareness for PGRFA and fodder genetic resources • Audio-visual presentation, communications and consultations to increase public awareness	Institutional set up is available in different AEZs
CDP	• Lack of trained staff • National priorities have not been established • Staff does not have sufficient skill and knowledge • It is not clear which organizations is responsible for this activity • Insufficient financial support	• Staff training • Setting national priorities • Clear identification of an organization responsible for PGRFA conservation, use and awareness building • Financial support	Institutional set up is available in different AEZs
CDB	• Public awareness is low • No National strategy for education and training • Lack of training on conservation of PGRFA • Lack of fund	• Institution and capacity building for conservation and use of PGRFA • Public awareness building • Education and training on PGRFA conservation and use • Technical assistance from regional and international, organizations • Financial support from regional and international organization for conservation, use and awareness building • Telecasting	Institutional set up is available in different AEZs
DAE	• No support for PGRFA conservation and use	• Support, especially for *in situ* conservation	
SCA	• No support for PGRFA conservation and use.	• Awareness building on conservation and use of PGRFA should be promoted	Institutional set up is available in different AEZs
EWS (Bd) Ltd	• Lack of trained staff • Lack of fund	• Awareness building on conservation and use of PGRFA for scientists, plant breeders and farmers should be promoted	-
BINA	• No financial support for PGRFA conservation and use	• Expert assistance in PGRFA conservation, use and awareness building • Financial support	
BJRI	• Lack of fund for organizing workshop/training • Lack of training formulated at farm level • Priority at national level not yet established • Limited manpower	• Public awareness of the value of PGRFA • A separate unit /division for, PGRFA • Training for developing manpower	
BRRI	• Little effort for public awareness of the importance of PGRFA • Increasing density of population warrant s producing more from less area and makes in situ conservation difficult • There is no national strategy for education and training on PGRFA • Lack of fund	• Training facilities and infrastructure development • Financial support from regional and international organizations	-
BSRI	• No national strategy • Lack of training • Lack of fund	• Training of staff • Sustainable financial support	-
BSMRAU	• Lack of fund-	• External support needed for capacity building in increasing public awareness.	-

Summary

Activity Area 15: Building Strong National Programmes

Bangladesh established the National Committee on Plant Genetic Resources (NCPGR) after the FAO Technical Meeting on PGR held in Leipzig, Germany in 1996. The Committee mobilized the national network on PGR and prepared draft Acts related to PGR in 1998. It is important to revitalise the NCPGR in order to bring in a new momentum of PGR activities in the country. A network established in 2004 with the support of FAO is working for the promotion of PGRFA activities in Bangladesh. So far 4 training-workshop organized under the network with 20 stakeholders.

National programmes for the conservation and sustainable use of PGRFA

With the initiative from NCPGR, a National Workshop on RGR was held 1997. The workshop recommendations included the development of national policy framework/ legislation in pursuance of the principles of CBD. Based on this recommendation, the NCPGR drafted two complementary Acts related to PGR:

- Biodiversity and Community Knowledge Protection Act of Bangladesh; and
- Plant Variety and Farmers' Rights Protection Act of Bangladesh

The Ministrey of Agriculture prepared the final draft of the Plant Variety Protection Act. The Bangla version of the draft Act has also been prepared. The Darft Act is under process at the Government level. Meanwhile, the following two documents on PGR have been published:

- a report on Plant Genetic Resources of Bangladesh (by Bangladesh Agricultural Research Council/Bangladesh Academy of Agriculture, 2001); and
- a Red Data Book of Vascular Plants of Bangladesh (by Bangladesh National Herbarium, 2001).

  Bangladesh Agricutlural Research Council organized 4 training-workshop on PGRFA during 2004-2007 with 20 stakeholder organizations.

Legal framework regulating establishment of the national strategy of PGRFA

The proposed Biodiversity and Community Knowledge Protection Act, among other things, aims:

- To protect and support the rights, knowledge, innovations and practices of local and indigenous communities and national scientific and research institutions with respect to conservation, use and management of biological resources.
- To promote and encourage the building of national scientific and technological capacity relevant to conservation and sustainable utilization of biological resources.

The Draft Plant Variety and Farmers' Rights Protection Act stipulates that:

- To be eligible for protection, a variety must be new, have consistent specific traits, be stable and have distinction specific traits.
- Breeding alone is not sufficient to justify commercial previleges. The variety must have immediate direct and substantial benefit to the people of Bangladesh.
- The country of origin of the material used to develop the variety shall be disclosed.
- Period of protection are 25 years for fruit trees, other tree species and vines of perennial habits and 20 years for all other plant species.
- There is a citation of recognition system to award innovators who wish to register their innovations without claiming commercial privilege.
- Farmers' Right is provided to grow, save, use exchange and sell farm saved seed of any variety except selling of seed of a protected variety for the purpose of reproduction under commercial marketing arrangement.
- The Gene Fund shall be established for support.

PGRFA relevant international agreement signed/ratified by Bangladesh

- International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).
- The Convention of Biological Diversity (CBD).
- World Trade Organization (WTO).
- TRIPS Agreement.
- Cartagena Protocol.

Constraints

- Weak follow up activities of international agreements.
- Lack of clear organizational responsibilities to follow up international agreements.
- Weak national coordination on matters related to PGR.
- Focal points are not always clearly identified with clear responsibilities and accountability.
- Inadequacy of fund for PGRFA.

Needs and Priorities

- Establishment of a national coordination body to follow up international agreements vis-à-vis all other activities related to PGR.
- Clear identification of focal points with defined responsibilities and accountability
- Fund to PGR activities.

Activity Area 16: Promoting Networks for PGRFA

Establishing network(s) of organizations within the country as well as setting national, regional and global priorities in germplasm conservation, genetic enhancement and enrichment are all deemed critical for the progress in PGR activities.

Major benefits gained by the country through PGRFA networks

- Increased stakeholder participation.
- Training for national programme scientists.
- Increased awareness of PGRFA.
- NISM-GPA database of Bangladesh.

Major constraints to effective participation of the country in regional and/or international PGRFA networks

- Material flow is not uniform.
- Dearth of trained manpower.
- Limited visits of scientists within participating countries.

Programme/project/activity carried out in collaboration with any PGRFA network

- BARI-AVRDC Collection of germplasm, conservation and utilization of indigenous vegetables.
- Collection of breeding lines from CIMMTY.
- Collaboration with ICRISAT.
- Collaboration through Rice-Wheat Consortium.
- Characterization and evaluation of Jute, Kenaf amd Mesta in collaboration with IJSG.
- Exchange of sugarcane varieties through Common Fund for Commodity (CFC).

Comments by stakeholders on promoting networks for PGRFA

Stakeholders feel that the linkage between research organizations working in the field of PGRFA, within and outside the country, should be strengthened. The South Asian Network for PGRFA under the South Asian Association for Regional Cooperation (SAARC) may be created and IPGRI/Bioversity may play an important role in such a network.

Activity Area 17: Constructing Comprehensive Information Systems for PGRFA

Up till now, the stakeholder organizations have not consulted international PGR Information Systems.

Constraints

- Lack of adequate awareness.
- Dearth of trained staff.

Needs

- Awareness creation.
- Staff training.
- Financial support.

Activity Area 18: Developing Monitoring and Early Warning System for PGRFA

Assessing genetic erosion

Some assessment of the loss of genetic erosion has been made. The losses of genetic materials have not been reported to the FAO Global System on PGRFA authorities in any formal way.

Constraints to monitoring genetic erosion

- Lack of a coherent national programme.
- Inadequacy of financial resources.

Developing and sustaining early warning systems for loss of PGRFA

Constraints

- Projects on monitoring and early warning systems for PGRFA are yet to be undertaken.
- Limited number of trained manpower.r
- Lack of financial support.
- PGR erosion in *ex situ* collections.
- Lack of methodology.

Needs

- Early warning system should be developed.
- Manpower development.
- Supporting planned and targeted collection.
- Surveying and inventorying and collection of local and wild germplasm.
- Monitoring of PGR erosion.
- Infrastructure development.

Activity Area 19: Expanding and Improving Education and Training on PGR

Course curricula to address PGR issues, in general, are weak in the education system.

Training areas considered as priority for staff by stakeholder organizations

- Molecular characterization of germplasm.
- Cryo-preservation of germplasm.
- Germplasm documentation.
- Geographical information system.
- Regeneration of species conserved *ex situ.*
- Developing monitoring and early warning system for loss of PGRFA.
- *In situ* and *ex situ* conservation including core collection and methodologies for *in situ* conservation.
- Marker aided selection.
- Management of Genebank.
- Information technology (IT) systems for PGR with special reference to information sharing mechanism on implementation of GPA for conservation and sustainable utilization of PGRFA.

Statement that best describes education and training for PGRFA in the country*:* There is no national strategy yet for education and training on PGRFA.

Greatest obstacles to training in PGRFA in the country

- Lack of awareness of the training needs within the country.
- Paucity of resource materials to improve existing training programme.
- Dearth of resource persons.

Activity Area 20: Promoting Public Awareness of the Value of PGRFA Conservation and Use

Bangladesh is a country with rapid and large-scale genetic erosion. There is no regional or international organization that provide the country with support for public awareness activities on PGRFA

Constraints

- Little effort for public awareness of the importance of PGRFA.
- Staff does not have sufficient skill and knowledge.
- It is not clear which organizations is responsible for promoting public awareness of PGRFA.
- No National strategy for education and training on PGRFA.
- Lack of support for PGRFA conservation and use.
- Increasing density of population warrants producing more from less area and makes in situ conservation difficult.

Needs

- Training, publication and telecasting on PGRFA.
- Audio-visual presentation, communications and consultations to promote public awareness.
- Setting national priorities.
- Clear identification of an organization responsible for PGRFA conservation, use and awareness building.
- Financial support.
- Institution and capacity building for conservation and use of PGRFA.
- Public awareness building.
- Education and training on PGRFA conservation and use.
- Technical assistance from regional and international, organizations.
- Financial support from regional and international organization for conservation, use and awareness building.
- Support, especially for *in situ* conservation.
- Awareness building on conservation and use of PGRFA for scientists, plant breeders and farmers should be promoted.
- A separate unit/division for PGRFA.
- Training facilities and infrastructure development.
- External support needed for capacity building in increasing public awareness.

Priority Activity Areas for Bangladesh

National Centre for PGRFA

- Establishment of a National Genebank for conservation, use and enhancement of biodiversity with appropriate infrastructure for conservation of orthodox and recalcitrant seeds, vegetatively propagated materials, including facilities for a Cryo bank and a DNA bank.

Assessment of PGR

- An assessment of genetic diversity, the rate and extent of PGR erosion and prioritization of PGRFA activities.

Development of national framework for PGRFA

The national framework or PGRFA needs to be formulated. The framework, among other things, should include the following:

- a *sui generis* system of plant variety protection;
- access to and exchange of plant genetic resources;
- recognition of farming communities, their conservation and use of PGR, and their indigenous knowledge (Farmers' Rights) and benefit sharing;
- adopting means to curb biopiracy;
- arrest genetic erosion and threat to conservation of biodiversity;

- protection of habitats rich in native diversity;
- biosafety regulation;
- seed policies and other such concerns;
- *in situ* and *ex situ* conservation including long term seed bank, *in vitro* bank, field repositories for tree species, root and rhizome crops, National Herbarium for cultivated plants;
- cryo preservation of germplasm;
- documentation of germplasm;
- geographical information system.

Coordination

- A strong coordination among different stakeholders involving research, the public and the private sector, NGOs, farmers organizations, etc. should be strengthened. Bangladesh Agricultural Research Council should lead the activities related to PGRFA for strengthening national programmes and international collaboration.

Capacity building

- Human resources development and capacity building in PGR in various fields that needs to be prioritized both for professional staff and technicians. (FAO and Bioversity International can be of assistance).

PGR plan of Activities

- Development perspective plan: vision 2025.
- A national plan: (a) to priorities PGR activities in germplasm collection, characterization, evaluation, documentation and conservation, (b) to prepare inventories of such resources for their better utilization; and (c) to develop a national database (including a sharing mechanism with NISM-GPA database).
- Strengthening and integration of national PGR network including field genebanks.
- Strengthening of national varietal improvement progrmmes and an integration of such programmes with PGR activities.
- Biochemical and molecular characterization of germplasm and its facility development.
  (FAO may provide technical and financial assistance in the above activities).

Awareness building

- To promote dissemination of information and national concern on biodiversity conservation through increased public awareness (including introduction of course curricula in PGR/biodiversity in educational institutions at different levels), with participation of farming communities, NGOs and other partners.

Regulatory issues

- Development of a well-structured national plant quarantine system/policy for import and export of materials (seeds, plant propagules, *in vitro* cultures) Strengthening of short-and medium-term storage facilities at existing genebanks at other institutes will be required.
- Drafting of policy and legal document (eg. MTA, policy on PGR, Biodiversity Act, Plant Variety and Farmers' Rights Protection Act, Development of conceptual paper etc.).

Training and Monitoring

- Methodologies of *in situ* conservation and on-farm management.
- Regeneration of species conserved *ex situ*.
- Developing monitoring and early warning system for PGRFA.
- Marker aided selection.
- Information Technology system (data base management) with special reference to information sharing on conservation and sustainable utilization of PGR.
- Management of gene bank.
- Negotiating skill development.
- Back-up research on conservation regime and protocols.
- Eco-tourism activities to be promoted.

Appendices

Apppendix Table II.1: Area (million hectares) and production (million tons) of some major agricultural crops (for jute production shown in bales)

Year	Rice		Wheat		Pulses		Oilseeds		Jute		Sugarcane		Vegetables	
	ha	ton	ha	ton	ha	Ton	ha	ton	ha	bales	ha	ton	ha	ton
1985-86	10.40	15.04	0.54	1.06	0.74	0.50	0.49	0.47	1.06	8.66	0.16	6.64	0.14	0.90
1987-88	10.32	15.41	0.60	1.05	0.74	0.54	0.55	0.45	0.51	4.70	0.17	7.21	0.15	0.95
1989-90	10.41	17.71	0.60	0.89	0.74	0.49	0.56	0.43	0.54	4.64	0.19	6.71	0.16	1.06
1991-92	10.24	18.26	0.57	1.07	0.72	0.51	0.56	0.46	0.59	5.27	0.19	7.68	0.17	1.10
1993-94	10.07	18.04	0.62	1.13	0.71	0.52	0.55	0.48	0.49	4.44	0.18	7.51	0.18	1.16
1995-96	9.94	17.69	0.70	1.37	0.70	0.53	0.55	0.47	0.59	4.04	0.19	7.52	0.19	1.25
1997-98	10.27	18.86	0.81	1.80	0.67	0.52	0.56	0.48	0.58	5.82	0.18	7.38	0.20	1.31
1999-00	10.71	23.07	0.83	1.84	0.50	0.39	0.44	0.41	0.41	3.92	0.17	6.91.	0.24	1.53
2001-02	10.66	24.30	0.74	1.61	0.45	0.36	0.43	0.39	0.46	4.73	0.16	6.50	0.24	1.60
2003-04	10.03	26.80	0.57	-	-	-	-	-	0.40	-	0.07	-	-	-

Source: MoA. 2004. Handbook of Agricultural Statistics. Ministry of Agriculture (Sector Monitoring Unit).

Appendix Table II.2. Profitability in some selected crops (2003-04)

Crop	Yield (ton/ha)			Total Cost (Tk/ha)	Net Return (Taka/ha)			Benefit/Cost Ratio		
	Bogra	Parbotipur	Experiment Station (HYV)	Bogra	Parbotipur	Bogra	Parbotipur	Bogra	Parbotipur	Experiment Station (HYV)
Aus (HYV)	3.33		3.70	16450	-	3530	-	1.21	-	-
Aus		1.73	3.70		7904		746		1.16	
Aman (HYV)	3.952	-	5.00	14598	-	13066	-	1.89	-	-
Aman (local)	2.470	2.470	5.00	11016	9880	7509	7410	1.68	1.75	-
Boro	5.31	4.94	5.97	24885	21489	9630	13091	1.28	1.61	-
Wheat	2.964	1.976	3.3	18426	11115	8250	8645	1.45	1.78	1.81
Pulses- Mash	1.235	-	-	12128	-	6397	-	1.53	-	-
Pulses- Masur	0.865			12721		8904		1.70		
Pulses	-	0.494	-	-	7410	-	9880	-	1.75	-
Mustard	1.111	-	1.46	13709	-	6289	-	1.46	-	2.74
Potato (HYV)	16.06	-	16.50	47128	-	17112	-	1.36	-	-
Potato	-	7.41	-	-	4407	-	29393	-	1.66	1.69
Maize	6.916	4.00	7.00	33730	21489	14682	18511	3.30	1.86	1.93
Aromatic rice	1.383	0.939	2.89	11209	9880	4004	5144	1.31	1.52	1.89
Onion	9.88	4.45	10.58	31898	25441	86662	63559	3.72	3.50	3.10
Chilli	1.383	-	11.16	33533	-	63277	-	2.89	-	1.90
Garlic	6.916	4.45	3.54	43262	30381	95058	103119	3.20	4.39	1.5
Ginger	11.856	9.88	10.56	109330	45448	127790	102752	2.17	3.26	-
Turmeric	13.585	17.785	15.25	66796	25318	41884	63602	1.63	3.51	2.24
Brinjal	21.74	14.82	32.53	25886	62985	82814	122314	4.20	5.73	2.52
Okra	11.84	4.20	-	26824	25688	44336	41512	2.65	2.62	-
Country Bean	13.59	4.94	14.39	44954	24453	90946	24947	3.02	2.02	2.06
Cauliflower	22.23	37.05	29.24	37593	59280	73557	88920	2.96	2.50	2.74
Tomato	19.76	19.76	-	37482	34580	120598	163020	4.22	5.71	-
Cabbage	25.94	37.05	43.37	48654	59280	29166	88920	1.60	2.50	2.2
Banana	19.76	-	16.05	56716	-	81604	-	2.44	-	2.10
Papaya	29.64	22.23	24.95	60288	21242	28632	89906	1.47	5.23	2.10
Watermelon	29.64	22.23	-	22057	13338	96503	75582	5.38	6.67	-
Pumpkin	18.525	22.23	-	18130	13338	55970	97812	4.09	8.33	-
Pointed Gourd	14.82	22.23	18.75	28800	13338	74940	97812	3.60	8.33	2.67
Bitter Gourd	11.12	22.23		22563	13338	33037	97812	2.46	8.33	
Bottle Gourd	17.29	-	-	16796	-	52364	-	4.12	-	-
Garden pea	1.68	-	-	15388	-	11492	-	1.75	-	-
Carrot	11.86	24.70		26577	14573	32723	59527	2.23	5.08	
Sunflower	1.61	-	1.88	23712	-	5268	-	1.22	-	1.46
Spinach	19.76	4.94	-	23613	28899	15907	20501	1.67	1.71	-

Source: MoA. 2004. Actionable Policy Brief. Agriculture Sector Review MoA/FAO/WB/Danida

Appendix Table II.3. Official farm size classification

Category	Farm size	Per cent of total households	Per cent of operated land area
Landless	<0.02 ha	20	1
Marginal	0.02 – 0.2 ha	19	3
Small	0.2 – 1.0 ha	37	26
Medium	1.0 – 3.0 ha	20	44
Large	>3.0 ha	4	26
Total	-	100	100

Source: Agricultural Extension Manual, Ministry of Agriculture, Government of Bangladesh. January 1999 Revision.

Appendix Table II.4. Distribution of Certified and Foundation Seeds 1997-1998 to 2001-2002 (tons)

Name of Seed	1997-1998		1998-1999		1999-2000		2000-2001		2001-2002
	Founda-tion	Certified	Founda-tion	Certified	Founda-tion	Certified	Founda-tion	Certified	Founda-tion
Aus	32	1,002	23	425	53	330	34	221	39
Aman	147	5,306	131	4,599	760	6,340	496	4,510	1,042
Boro	77	3,824	145	5,080	784	7,474	886	7,618	1,181
Total Paddy	***256***	***10,132***	***299***	***10,104***	***1,597***	***14,144***	***1,416***	***12,346***	***2,262***
Wheat	670	12,051	1,400	23,966	1,417	9,793	1,348	21,356	2,565
Maize		149	9	815	2	214	1	163	
Vegetable	12	17	5	21	7	11	9	12	12
Potato	1,486	7,357	1,338	6,540	1,396	6,175	1,659	6,313	1,400
Jute	23	274	23	308	31	209	31	335	51
Pulses	19	65	19	182	24	142	28	226	-
Oilseeds	36	301	23	275	26	219	39	386	-
Total	***2,502***	***30,346***	***1,686***	***42,211***	***4,500***	***30,907***	***4,531***	***41,140***	***6,290***

Source: Adapted from Actionable Policy Brief. Agriculture Sector Review (ASR), MoA/FAO/WB/Danida, 2004.

Appendix Table III.1A: Major crops[60] of Bangladesh within the list of crops under the Multilateral System and their use, relative importance and regional difference

Crop	Scientific name	Uses/Products	Relative importance	Regional difference in importance
Cereals				
Rice	*Oryza sativa*	The staple food grain	Food security and economic	Important all over the country
Wheat	*Triticum aestivum*	Food grain	Food security	Important all over the country
Pulses (Grain legumes)				
Chickpea	*Cicer arietinum*	Extensively used protein crop, but production area has declined mainly due to competition from *Boro* rice	Food security	Important all over the country. High production potential exists in southwest region of the country.
Grass pea	*Lathyrus sativus*	Extensively used protein crop, but production area has declined mainly due to competition from *Boro* rice	Food security	Important all over the country
Lentil	*Lens culinaris*	Extensively used protein crop, but production area has declined mainly due to competition from *Boro* rice	Food security	Important all over the country
Mung bean	*Vigna radiata*	Extensively used protein crop, but production area has declined mainly due to competition from *Boro* rice	Food security	Important all over the country
Oilseeds				

[60] Major crops adapted from Mondal, M. H. 1990. Plant Genetic Resources Activities in Bangladesh. Proc. South Asia National Coordinators Meeting, March 21 - 24, 1990. Held at IBPGR Regional Office for South Asia. NBPGR Campus, Pusa, New Delhi 1 110, India.

Crop	Scientific name	Uses/Products	Relative importance	Regional difference in importance
Coconut	*Cocos nucifera*	Extensively used oil crop with other food uses	Food security and economic	Important all over the country, though grown mostly in the southern districts including the coastal belt
Groundnut	*Arachis hypogaea*	An oil crop and also eaten as nuts	Food security and economic	Important all over the country
Mustard	*Brassica spp.*	Extensively used traditional oil crop, but production area has declined mainly due to competition from *Boro* rice	Food security and economic	Important all over the country
Vegetables				
Arum	*Colocasia esculenta*	Extensively used root crop, also leaf and stem used as vegetables	Food security and economic	Important all over the country, traditionally grown in hilly areas
Brinjal (Eggplant)	*Solanum melongena*	Extensively used vegetable crop	Food security and economic	Important all over the country
Potato	*Solanum tuberosum*	Extensively used tuber crop	Food security	Important all over the country
Sweet potato	*Ipomoea batatus*	Popular root crop, grown especially on marginal (*char*) lands	Food security	Important all over the country, grown especially in marginal lands
Fruits				
Banana	*Musa* spp.	Extensively used fruit crop	Food security and economic	Important all over the country

Appendix Table III.1B. Some major crops[61] of Bangladesh beyond the list of crops under the Multilateral System, their uses and relative importance and regional difference

Crop	Scientific name	Uses/products	Relative importance	Regional difference in importance
Fibre crops				
Jute	*Corchorus spp.*	The major fibre crop of Bangladesh	Economic (export crop)	Important all over the country
Vegetables				
Ash gourd	*Benincasa hispida*	Extensively used vegetable crop	Food security	Important all over the country
Bitter gourd	*Momordica charantia*	Extensively used vegetable crop	Food security	Important all over the country
Bottle gourd	*Lagenaria siceraria*	Extensively used vegetable crop	Food security	Important all over the country
Hyacinth bean	*Lablab purpureus*	Extensively used vegetable crop	Food security	Important all over the country
Cucumber	*Cucumis sativus*	Extensively used vegetable crop	Food security	Important all over the country
Okra	*Abelmoschus esculentus*	Extensively used vegetable crop	Food security	Important all over the country
Papaya	*Carica papaya*	Extensively used vegetable crop	Food security	Important all over the country
Pumpkin	*Cucurbita moschata*	Extensively used vegetable crop	Food security	Important all over the country
Radish	*Raphanus sativus*	Extensively used vegetable crop	Food security	Important all over the country
Ribbed gourd	*Luffa acutangula*	Extensively used vegetable crop	Food security	Important all over the country
Snake gourd	*Trichosanthes anguina*	Extensively used vegetable crop	Food security	Important all over the country
Tomato	*Lycopersicon esculentum*	Extensively used vegetable crop	Food security	Important all over the country
Spices				
Chilli	*Capsicum annum C. frutescens*	Extensively used spice crop	High value crop	Important all over the country
Garlic	*Allium sativum*	Extensively used spice crop	High value crop	Important all over the country

[61] *Ibid.*

Crop	Scientific name	Uses/products	Relative importance	Regional difference in importance
Ginger	*Zingiber officinale*	Extensively used spice crop	High value crop	Important all over the country but grown especially in hilly / forest areas
Onion	*Allium cepa*	Extensively used spice crop	High value crop	Important all over the country
Turmeric	*Curcuma longa*	Extensively used spice crop	High value crop	Important all over the country, but especially in hilly / forest areas
Fruits				
Guava	*Psidium guajava*	Widely grown fruit tree	Food security	Important all over the country
Jackfruit	*Artocarpus heterophyllus*	Widely grown fruit tree	Food security	Important all over the country, but grown especially in central districts
Litchi	*Litchi chinensis*	Widely grown fruit tree	Food security	Important all over the country, but grown especially in northern districts (Rajshahi, Dinajpur, Natore, Naogaon, etc.)
Mango	*Mangifera indica*	Widely grown fruit tree	Food security and economic (cash crop)	Important all over the country but grown especially in northern districts.
Papaya	*Carica papaya*	Widely grown fruit tree	Food security	Important all over the country
Watermelon	*Citrullus lanatus*	Widely grown fruit crop	Food security	Important all over the country
Sugar crops				
Sugarcane	*Saccharum officinarum*	Widely grown sugar crop	Food security and economic (cash crop)	Important all over the country, but grown especially in northern districts
Beverage				
Tea	*Camellia sinensis*	A major export crop	Economic (export crop)	A major export crop grown especially in hilly areas of Sylhet and Chittagong districts

Appendix Table III.2A: Minor and Under-utilized crops of Bangladesh with their relative importance and regional difference

Crop	Scientific name	Uses/Products	Relative importance	Regional difference in importance
Cereals				
Barley	*Hordeum vulgare*	Widely used food grain	Food security	All over the country, especially in marginal land
Foxtail Millet	*Setaria italica*	Widely used food grain	Food security	All over the country, especially in marginal land
Maize	*Zea mays*	Widely used food grain	Food security	All over the country
Pearl Millet	*Panicum miliaceum*	Widely used food grain	Food security	All over the country, especially in marginal land
Pulses (Grain legumes)				
Black gram	*Vigna mungo*	Widely used protein crop	Food security	All over the country
Pigeon pea	*Cajanus cajan*	Widely used protein crop	Food security	All over the country
Oilseeds				
Linseed	*Linum usitatissimum*	Widely used oilseed	Food security	All over the country
Niger	*Guizotia abyssinica*	Widely used oilseed	Food security	All over the country
Safflower	*Carthamus tinctorius*	Widely used oil seed	Food security	All over the country
Sesame	*Sesamum indicum*	Oil seed	Food security	All over the country
Vegetables				
Amaranth	*Amaranthus gangeticus*	Widely used vegetable	Food security	All over the country
Bathua	*Chenopodium album*	Widely used vegetable	Food security	All over the country
Carrot	*Daucas carota*	Widely used vegetable	Food security	All over the country
China shak	*Brassica spp.*	Widely used vegetable	Food security	All over the country
Drumstick	*Moringa oleifera*	Widely used vegetable	Food security	All over the country
French bean	*Phaseolus vulgaris*	Widely used vegetable	Food security	All over the country

Crop	Scientific name	Uses/Products	Relative importance	Regional difference in importance
Indian spinach	*Basella rubra*	Widely used vegetable	Food security	All over the country
Kalmi shak	*Ipomoea aquatica*	Widely used vegetable	Food security	All over the country
Lima bean	*Phaseolus lunatus*	Widely used vegetable	Food security	All over the country
Marfa, Phuti	*Cucumis melo*	Widely used vegetable	Food security	All over the country
Spinach	*Spinacea oleracea*	Widely used vegetable	Food security	All over the country
Sponge gourd	*Luffa cylindrica*	Widely used vegetable	Food security	All over the country
Squash	*Cucurbita moschata C. pepo*	Widely used vegetable	Food security	All over the country
Teasle gourd	*Momordica dioica*	Widely used vegetable	Food security	All over the country
Winged bean	*Psophocarpus tetragonolobus*	Widely used vegetable	Food security	All over the country
Yam	*Dioscorea spp.*	Widely used vegetable	Food security	All over the country, especially in hilly areas
Yam bean (Shak alu)	*Pachyrrhizus tuberosus*	Widely used vegetable	Food security	All over the country
Yard Long Bean	*Vigna unguiculata*	Widely used vegetable	Food security	All over the country
Spices				
Black cumin	*Nigella sativa*	Widely used spice	Food security	All over the country
Black pepper	*Piper nigrum*	Widely used spice	Food security	All over the country
Coriander	*Coriandrum sativum*	Widely used spice	Food security	All over the country
Cumin seed (Jeera)	*Cuminum cyminum*	Widely used spice	Food security	All over the country
Fenugreek (Methi)	*Trigonella foenum-graceum*	Widely used spice	Food security	All over the country
Join	*Carum copticum*	Widely used spice	Food security	All over the country
Fruits				
Amloki (Aonla)	*Phyllanthus emblica*	Widely used fruit	Food security	All over the country
Amra (Golden apple)	*Spondias dulcis*	Widely used fruit	Food security	Grown in southern districts, especially in Barisal Division
Arboroi (Star gooseberry)	*Phyllanthus acidus*	Widely used fruit	Food security	All over the country
Bael (Wood apple)	*Aegle marmelos*	Widely used fruit	Food security	All over the country
Carambola (Kamranga)	*Averrhoa carambola*	Widely used fruit	Food security	All over the country
Cashew nut	*Anacardium occidentale*	Widely used fruit	Food security	All over the country
Chalta (Indian dellenia)	*Dillenia indica*	Widely used fruit	Food security	All over the country
Custard Apple (Sharifa)	*Annona squamosa*	Widely used fruit	Food security	All over the country
Dewa (Monkey jack)	*Artocarpus lacucha*	Widely used fruit	Food security	All over the country
Jalpai (Indian olive)	*Elaeocarpus robustus*	Widely used fruit	Food security	All over the country
Jamrul (Wax apple)	*Syzygium samarengense*	Widely used fruit	Food security	All over the country
Kalajam (Jamun)	*Syzygium cumini*	Widely used fruit	Food security	All over the country
Kath badam	*Terminalia catappa*	Widely used fruit	Food security	All over the country
Kothbel (Elephant's foot apple)	*Feronia limonia*	Widely used fruit	Food security	All over the country
Kul (Jujube)	*Zizyphus mauritiana Z. jujuba*	Widely used fruit	Food security	All over the country
Latkan (Burmese grape)	*Baccaurea ramiflora*	Widely used fruit	Food security	All over the country
Lemon	*Citrus limon*	Widely used fruit	Food security	All over the country, especially in Sylhet Division
Lime	*Citrus aurantifolia*	Widely used fruit	Food security	All over the country, especially in Sylhet Division

Crop	Scientific name	Uses/Products	Relative importance	Regional difference in importance
Mandarin	*Citrus reticulata*	Widely used fruit	Food security	All over the country, especially in Sylhet Division
Nona (Bullock's heart)	*Annona reticulata*	Widely used fruit	Food security	All over the country
Pomegranate	*Punica granatum*	Widely used fruit	Food security	All over the country
Pummelo	*Citrus grandis*	Widely used fruit	Food security	All over the country
Rose apple (Golapjam)	*Syzygium jambos*	Widely used fruit	Food security	All over the country
Safeda (Sapota)	*Manilkara achras*	Widely used fruit	Food security	All over the country
Sweet orange (Malta)	*Citrus sinensis*	Widely used fruit	Food security	All over the country
Tamarind	*Tamarindus indica*	Widely used fruit	Food security	All over the country
Fibre crops				
Cotton	*Gossypium spp.*	Fibre	Economic	All over the country, especially in Hilly areas and northern districts
Mesta and Kenaf	*Hibiscus spp.*	Fibre, Liams, Calyx	Economic and food security	All over the country, especially in marginal landNorthrn high land and hilly areas
Sunn hemp	*Crotalaria juncea*	Fibre	Economic	All over the country
Sugar crops				
Date palm	*Phoenix sylvestris*	Widely used sugar	Food security	All over the country, especially south western districts
Palm	*Borassus flabellifer*	Sugar	Food security	All over the country
Narcotics				
Tobacco	*Nicotiana tabacum N. rustica*	Narcotic	Economic	All over the country, especially in northern districts
Betel nut	*Areca catechu*	Narcotic	Economic	All over the country, especially in southern districts
Green maturing crops				
Sunnhemp (Shon pat)	*Crotalaria juncea*	Soil amelioration	Economic	All over the country, especially in marginal land
Sesbania (Dhaincha)	*Sesbania canabina*	Soil amelioration	Economic	All over the country, especially in marginal land

Modified after Mondal, M. H. 1990. Plant Genetic Resources Activities in Bangladesh. Proc. South Asia National Coordinators Meeting, March 21 - 24, 1990.

Appendix Table III.2B. Minor and underutilized crops of Bangladesh and their state of diversity

Crop	Scientific Name	Diversity	
		Present state of diversity	Diversity trend
Cereals			
Barley	*Hordeum vulgare*	Some 30 geermplans in BARI genebank	Decreasing
Foxtail Millet	*Setaria italica*	More than 500 germplasm in BARI genebank	Decreasing
Maize	*Zea mays*	More than 100 germplasm are reported to be maintained at BAU, 69 in gene bank at BARI	Increasing with introduction of new varieties
Pearl Millet	*Panicum miliaceum*	Only two germplasm in BARI genebank	Not known
Triticale	*Triticosecale*	Five germplasm in BARI gene bank	Remaining the same
Pulses (Grain legumes)			
Black gram	*Vigna mungo*	89 accessions in BARI genebank	Not known
Pigeon pea	*Cajanus cajan*	84 accessions in BARI genebank	Not known
Oilseeds			
Linseed	*Linum usitatissimum*	Not known	Not known
Niger	*Guizotia abyssinica*	2 accessions in BARI genebank	Not known
Safflower	*Carthamus tinctorius*	Not known	Not known
Sesame	*Sesamum indicum*	83 accessions in BARI genebank	Not known

Crop	Scientific Name	Diversity	
		Present state of diversity	Diversity trend
Vegetables			
Amaranth	*Amaranthus spp.*	Data on diversity not available. However, 620 accessions in BARI genebank.[62]	Not known
Bathua	*Chenopodium album*	One accessions in BARI genebank	Not known
Carrot	*Daucas carota*	Data on diversity not available. However, two varieties were mentioned.[63]	Not known
Cheena shak	*Brassica spp.*	10 accessions in BARI genebank	Not known
Drumstick	*Moringa oleifera*	10 accessions in BARI genebank	Not known
French bean	*Phaseolus vulgaris*	10 accessions in BARI genebank	Not known
Indian spinach	*Basella rubra*	34 accessions in BARI genebank	Not known
Kalmi shak	*Ipomoea aquatica*	Data on diversity not available. However, five varieties were mentioned.[64]	Not known
Lima bean	*Phaseolus lunatus*	Not known	Not known
Marfa, Phuti	*Cucumis melo*	Not known	Not known
Spinach	*Spinacea oleracea*	Data on diversity not available. However, three varieties were mentioned.[65]	Not known
Sponge gourd	*Luffa cylindrica*	Not known	Not known
Squash	*Cucurbita moschata C. pepo*	Not known	Not known
Teasle gourd	*Momordica dioica M. cochinchinesis*	Data on diversity not available. However, two varieties were mentioned.[66]	Not known
Winged bean	*Psophocarpus tetragonolobus*	One accession in BARI genebank	Not known
Yam	*Dioscorea spp.*	62 accessions in BARI genebank	Not known
Yam bean (Shak alu)	*Pachyrrhizus tuberosus*	3 accessions in BARI genebank	Not known
Yard Long Bean	*Vigna unguiculata*	147 accessions in BARI genebank	Not known
Spices			
Black cumin	*Nigella sativa*	6 accessions in BARI genebank	Not known
Black pepper	*Piper nigrum*	Not known	Not known
Coriander	*Coriandrum sativum*	18 accessions in BARI genebank	Not known
Cumin seed (Jeera)	*Cuminum cyminum*	Not known	Not known
Fenugreek (Methi)	*Trigonella foenum-graceum*	Four accessions in BARI genebank	Not known
Join	*Carum copticum*	One accessions in BARI genebank	Not known
Fruits			
Amloki (Aonla)	*Phyllanthus emblica*	10 accessions mentioned	Not known
Amra (Hog plum)	*Spondias dulcis*	10 accessions mentioned	Not known
Ar*Boroi* (Star goseberry)	*Phyllanthus acidus*	10 accessions mentioned	Not known
Bael (Wood apple)	*Aegle marmelos*	Data on diversity not available. However, 15 varieties were mentioned.[67]	Not known
Carambola (Kamranga)	*Averrhoa carambola*	Not known	Not known
Cashew nut	*Anacardium occidentale*	Not known	Not known
Chalta (Indian dellenia)	*Dillenia indica*	Not known	Not known
Custard apple (Sharifa)	*Annona lacucha*	Not known	Not known
Dewa (Monkey jack)	*Artocarpus lacucha*	Not known	Not known
Jalpai (Olea eropaea)	*Elaeocarpus robustus*	Not known	Not known
Jamrul (Wax apple)	*Syzygium samarangense*	Not known	Not known
Kalajam (Jamun)	*Syzygium cumini*	Not known	Not known
Kath badam	*Terminalia catappa*	Not known	Not known

[62] Source: Khan, M. S. & F. Ahmed. A Tentative List of Plant Genetic Resources (Wild and Cultivated). Mimeo.
[63] *Ibid.*
[64] *Ibid.*
[65] *Ibid.*
[66] *Ibid.*
[67] *Ibid*

Crop	Scientific Name	Diversity	
		Present state of diversity	Diversity trend
Kothbel (Elephent's foot apple)	*Feronia limonia*	Not known	Not known
Kul (Jujube)	*Zizyphus mauritiana* *Z. jujuba*	Data on diversity not available, However, five varieties were mentioned.	Not known
Latkan (Burmese grape)	*Baccaurea ramiflora*	Not known	Not known
Lemon	*Citrus limon*	Not known	Not known
Lime	*Citrus aurantifolia*	Not known	Not known
Mandarin	*Citrus reticulata*	Not known	Not known
Nona (Bullocks heart)	*Annona reticulata*	Not known	Not known
Pomegranate	*Punica granatum*	Not known	Not known
Pummelo	*Citrus grandis*	25 varieties were mentioned.[68]	Not known
Rose apple (Golapjam)	*Syzygium jambos*	Not known	Not known
Safeda (Sapota)	*Manilkara achras (Syn. Achras sapota)*	Not known	Not known
Sweet orange (Malta)	*Citrus sinensis*	Not known	Not known
Tamarind	*Tamarindus indica*	Not known	Not known
Fibre crops			
Cotton	*Gossypium spp.*	Not known	Not known
Mesta and Kenaf	*Hibiscus spp.*	Data not available	Not known
Sunnhemp	*Crotalaria juncea*	Not known	Not known
Sugar crops			
Date palm	*Phoenix sylvestris*	Not known	Not known
Palm	*Borassus flabellifer*		Not known
Narcotics			
Tobacco	*Nicotiana tabacum* *N. rustica*	Not known	Not known
Betel nut	*Areca catechu*	Not known	Not known
Green-maturing crops			
Sunnhemp (Shun pat)	*Crotalaria juncea*	Not known	Not known
Sesbania (Dhaincha)	*Sesbania canabina*	Not known	Not known

Modified after Mondal, M. H. 1990. Plant Genetic Resources Activities in Bangladesh. Proc. South Asia National Coordinators Meeting, March 21 - 24, 1990.

[68] *Ibid.*

Appendix Table III. 3. Crop plants and their wild relatives/allied species available in Bangladesh

Family	Crops and allied species		
	Common name	Scientific name	Local name
Agavaceae	Sisal	*Agave angustifolia*	Agave
	-	*Agave americana* L	Cantala, Belatipat, Konga, Belatianaras, Bakaspata, Ghaial
	Bow-string Hemp	*Sanseveria hyacinthoides* (L.) *Druce* (*S. zeylanica* (L) Willd.)	Murba, Sutahara, Sutimukhi
Amaranthaceae	Amaranth	*Amaranthus gangeticus* L.	Lalshak, Denga, Data
	-	*Amaranthus lividus* Roxb.	Kanta notey, Gobura notey
	-	*A. polygamus* L	Champa notey, Lamchamia notey, Swetmugra
	-	*A. spinosus* L	Kanta notey, Kantamiris
	-	*A. tenuifolius* L.	Genti notey, Delechukali
	-	*A. viridis* L. *Var fasciata*	Bon notey, Tuntuni notey
Anacardiaceae	Mango	*Mangifera indica* L.	Aam
	-	*Mangifera longipes* Griff.	Jangli aam, Uri aam
	-	*M. sylvatica* Roxb.	Jangli aam, Lakhi aam, Uri aam
	Cashewnut	*Anacardium occidentale* L.	Kaju, Kaju badam, Hujli badam
Annonaceae	-	*Annona reticulata* L.	Nona, Nona ata, Ram phal
	-	*A. squamosa* L.	Ata, Sharifa, Sita ata, Luna
Aquifoliaceae	Paraguay tea	*Ilex godajam* L.	Jangli gewa
Araceae	Taro	*Alocasia indica* (Roxb.) Schott.	Man kachu,
	-	*Colocasia esculenta* (L) Schott.	Mukaddam kachu
	-	*Colocasia antiquorum* Schott	Mukhi kachu, Shilkeli kachu, Bahumukhi kachu
	-	*Colocasia nymphaefolia* Kunth	Jangli kachu, Sar Kachu, Kali kachu
Asteraceae	Safflower	*Carthamus tinctorius* L.	Kusum phul, Kajira
	Chrysen-themum	*Chrysanthemum coronarium* L.	Chandra mallika, Gulchini, Guldani
	Niger seed	*Guizotia abyssinica* Cass.	Kali til, Ram til, Guji, Surgoza
	Chicory	*Cichorium intybus* L.	Kashni, Hinduba
	Lettuce	*Lactuca sativa* L.	Lettuce
	Sunfower	*Helianthus annuus* L.	Surjamukhi
Averrhoaceae	Starfruit	*Averrhoa carambola* L.	Kamranga
Basellaceae	Indian spinach	*Basella rubra* L. (B. rubra L.)	Puishak
Bombacaceae	Kapok	*Ceiba pentandra* (L.) Gaertn.	Shimul, Swet shimul, Kapok
Bromelliaceae	Pineapple	*Ananus sativus* Schult. f. *(A.. comosus* (L.) Merr.)	Anaras
Camelliaceae	Tea	*Camellia sinensis* (L.) Kuntz. *var. assamica*	Assam tea
	-	*C. sinensis* (L.) Kuntz. *var. sinensis*	China tea
	-	*C. sinensis* (L.) Kuntz. *var. camboidiensis*	Combodian tea
	-	*C. caudata*	
	-	*C. japonica*	
	-	*C. kissi*	
	-	*C. irrawardiensis*	
	-	*C. sesanquc*	
	-	*Thea wallichii*	
Cannaceae	Indian shoti	*Canna indica* L.	Sarbajaya
Caricaceae	Papaya	*Carica papaya* L.	Pepe
Chenopodiaceae	Beet	*Beta vulgaris* L.	Beet
	Spinach	*Spinacea oleracea* L.	Beet palong
	-	*Chenopodium album* L.	Betoshak, Betuashak
	-	*C. ambrosioides* L.	Chandan beto
Convolvulaceae	Sweet potato	*Ipomoea batatus* Lamk.	Misti alu
	-	*Ipomoea alba* L. (*I. bonanox* L.*)*	Halkalmi, Didh kalmi
	-	*I. aquatica* Forsk. *(I. reptans* Poir.*)*	Kalmishak, Kalmi
	-	*I. pescaprae (*L.*)* R.Br. *(I. biloba* Forsk.*)*	Chhagalkhuri, Dupatilata
	-	*I. cairica* (L.) Sweet	Rail lata
	-	*I. fistulosa* Mart. ex Choisy *(I. crassicaulis* (Benth) Roxb.	Dholkalmi, Darukalmi

Family	Crops and allied species		
	Common name	**Scientific name**	**Local name**
	-	*I. hederacea* Jacq. *(I. nil)*	Nilkalmi
	-	*I. indica (*Burm. f.*)* Merr	Pravatrani
	-	*I. mauritiana* Jacq. *(I. paniculata* (L.) Br.)	Bhuikumra, Muralia lata
	-	*I. maxima (*L. f.) Don *(I. sepiaria* Koen. ex. Roxb.)	Bonkalmi
	-	*I. pestigridis* L.	Languli lata
	-	*I. quamolit* L.	Taru lata, Kunja lata
	-	*I. turpethum (L.)* R. Br.	Noa pata, Tori, Cheuri
	-	*I. vitifolia* Bl.	Karma lata, Kam lata
Crucifereae	Mustard	*Brassica campestris* L.var. *sarson* Prain	Sharisha
	-	*Brassica campestris* L. var. *toria* Duthie & Fuller	Tori sharisha
	White mustard	*B. alba* Hook.	Sada sharisha, Dhup rai
	-	*B. integrifolia* (West.*)* Schultz. *(B. juncea var. agrostis* Prain*)*	Keel rai
	Brown mustard	*B. juncea* L.	Rai sharisha, Bara rai, Jhuni, Chanchi
	Rape-seed	*B. napus* L.	Maghi Tori, Sharisha
	Black mustard	*B. nigra* L.	Kalo sharisha
	Cauliflower	*B. oleracea* L. *var. botrytis*	Phulkopi
	Brocoli	*B. oleracea* L. *var. Italica*	Brocoli
	Cabbage	*B. oleracea* L. *var. capitata*	Bandhakopi
	-	*B. oleracea L. var. gangyloides*	Olkopi
	-	*B. rapa* L.	Shalgam
	-	*Brassica rugosa* Prain. *var. cuneifolia*	Lahisag
	Garden cress	*Lepidium sativum* L.	Halimshak
	Radish	*Raphanus sativus* L.	Mula
Cucurbitaceae	Wax Gourd	*Benincasa hispida (*Thumb.) Cogn. *(B. Cerifera* Savi.*)*	Chalkumra
	-	*Citrullus colocynthis (L.) Schrad.*	Makal, *Indrayan*
	-	*Coccinea cordifolia (L.)* Cogn.	Telakucha
	Melon	*Cucumis melo* L.	Bangi, Kakri, Kharbuj, Khermia
	Cucumber	*Cucumis sativus* L.	Shasha, Khira, Mome
	Sweet Gourd	*Cucurbita maxima* Duch.	Misti Kumra, Kumra
	Squash	*Cucurbita* pepo D.C.	Dhada kadu
	Watermelon	*Citrullus lanatus* (Thumb.) Mans *(C. vulgaris* Schrad.*)*	Tarmuj
	-	*Hodgsonia macrocarpa* (Bl.) Cogn. *(H. heteroclita* Gk. f.*)*	Makal
	Bottle Gourd	*Lagenaria siceraria* (Mol.) Stan. *(L. vulgaris* Ser.*)*	Lau, Kadu, Pani lau
	-	*Luffa echinata* Roxb.	Bidal, Ghosa lata
	-	*Luffa amara* Roxb.	Tita Dhundul
	Ribbed Gourd	*Luffa acutangula* Roxb.	Jhinga, Ghosa lata
	Sponge Gourd	*Luffa cylindrica* (L.) Roem	Dhundul, Purul
	Bitter Gourd	*Momordica charantia* L.	Korola, Kerala, Uchhe
	Teasle Gourd	*Momordica cochinchinensis* Spreng.	Kakrol
	Teasle Gourd	*Momordica dioica* Roxb.	Kakrol
	Snake Gourd	*Trichosanthes anguina* L.	Chichinga
	-	*Trichosanthes bracteata* (Lam.) Vogt.	Makal
	-	*T. cordata* Roxb.	Bhui kakra

Family	Crops and allied species		
	Common name	**Scientific name**	**Local name**
	-	*T. cucumerina* L.	Bon patol
	Pointed Gourd	*T. dioica* Roxb.	Patol
	-	*T. lobata* Roxb.	Bon chchinga
	-	*T. palmata* Roxb.	Makal
Dioscoreaceae	Yam	*Dioscorea alata* L.	Mete alu, Kham alu, Chupri alu
	Yam	*D. belophylla* (Prain.) Haines	Shora alu
	Aerial Yam	*D. bulbifera* L. *(D. sativa* Thunb.*)*	Roth alu
	Lesser Yam	*D. esculenta (*Lour.*)* Burk.	Sushni alu, Mou alu
	-	*D. pentaphylla* L.	Jhum alu, Jhunihana Alu
	-	*D. wallichii* Hook.	Goantia alu
Euphorbiaceae	Tung	*Aleurites mollucana* Willd.	Akhrot, Japhal akhrot
	Cassava	*Manihot esculenta* Crantz.	Shimulalu, Kassava, Tapoica
	Castor	*Ricinus communis* L.	Bherenda, Reri, Venna
Gramineae	-	*Coix gigantea* Roxb.	Denga gurgur
	-	*C. lachryma-jobi* L.	Tasbi, Kalo kunch, Gurgur
	-	*Echinochloa colonam* (L.) Link	Shyama ghas
	-	*E. crussgalli* (L.) P. Beauv.	Bara shyama ghas
	-	*E. stagnina* (Retz.) P. Beauv.	Dul, Parua
	-	*Eleusine coracana* (L.) Gaertn.	Marna, Marua
	-	*E. indica* (L). Gaertn.	Malanga kuri, Mala kuri
	Teff	*Eragrostis tenella* (L.) P. Beauv	Koni
	Barley	*Hordeum vulgare* L.	Jab
	Rice	*Oryza sativa L*	Dhan
	-	*O. minuta*	Buno dhan
	-	*O. nivara*	Buno dhan
	-	*O. officinalis*	Buno dhan
	-	*O. rufipogon* (Griff.) *(O. fatua* Koen. ex Trin.)	Buno dhan
	-	*Portesia coarctata (Oryza coarctata* Roxb.*)*	Buno dhan
	-	*Oryza* hybrid swarms *(rufipogon-nivera)*	-
	Pearl Millet	*Panicum miliaceum* L.	Cheena
	Bulrush Millet	*Pennisetum typhoides* (Burm. f) Stapf. *(P. typhoidum)*	Bajra
	Sugarcane	*Saccharum officinarum* L.	Akh, Kushair, Kushail, Gandari
	Sugarcane allies	*Saccharum bengalense Retz.*	Munja ghash
	-	*S. spontaneum* L.	Kash, Khagra, Kaisha, Khag
	-	*Sclerostachya fusca* (Roxb.) Camus	Khuri
	-	*Setaria glauca* (L.) P. Bauv. *(Panicum flavescens* Sw.*)*	Kauni, Banaspati ghash
	Foxtail Millet	*Setaria italica* (L.) P. Bauv.	Kaon, Kangu, Kangui, Kora,Kaknidana
	-	S. pallidefusca (Schum.) Stapf	Pinginachi
	-	*S. verticillata* (L.) *) P. Bauv.*	Dor*abi*ari
	Sorghum	*Sorghum vulgare Pers.*	Joar
	-	*S. halepense* (L.) Pers.	Kanta much
	Triticale	*Triticosecale*	Triticale
	Wheat	*Triticum aestivum* L.	Gom
	Maize	*Zea mays L.*	Bhutta
	Other grasses	*Cynodon dactylon* Pers.	Durba, Dubla, Durba ghas
	-	*Panicum paludosum* Roxb.	Barti, Barati, Kalam

Family	Crops and allied species		
	Common name	Scientific name	Local name
	-	*P. punctatum* Burm.	Karing ghas
	-	*P. satigerum* Retz.	Bara jalgenti
	-	*Paspalidium flavidum* (Retz.) A. camus	Petinar
	Kodo Millet	*Paspalum scrobiculatum* Boj.	Goicha, Khoda dhan
Guttifereae	-	*Garcinia cowa* Roxb.	Kau, Kaglichu
	Mangosteen	*Garcinia mangostana* L.	Mangostin
	-	*G. morella* Desr.	Swarna Khiri
	-	*G. xanthochymus* Hook. F	Tamal, Dumbel
Leguminosae	Acacia	*Acacia auriculiformis* A. Cunn. ex. Benth	Akashmoni
	Kutch Tree	*A. catechu* (Lam.) Willd. *(A. arabica* Willd.)	Khair
	-	*A. catechuoides* Wall.	Khair
	-	*A. concinna* D.C.	Bonritha, Lal babul
	-	*A. farnesiana* (L.) Willd.	Gokul, Belatibabul
	-	*A. intisia* Willd.	Kuchai
	Black Babul	*A. nilotica* (L.) Del. *(A. arabica* (Lam.) Willd.)	Babla, Babul, Kikor
	-	*A. pennata* (L.) Willd.	Aila, Bisoal, Sembi
	-	*A. suma* Ham.	Swet Khoir, Sami, Sankanta, Laingach, Chaikanta, Saukanta
	-	*A. tomentosa* Willd.	Sisal babla
	Groundnut	*Arachis hypogaea* L.	Cheena badam
	Pigeon pea	*Cajanus cajan* (L.) Huth. (*C. indicus* Spreng.)	Arhar
	Chickpea	*Cicer arietinum* L.	Chhola. Chana, Boot
	Sunnhemp	*Crotalaria juncea* L.	Shonpat, Shon, Ghore shon
	-	*C. incana* L.	Chhota jhunjhuna
	-	*C. prostrata* Roxb.	Chhota jhunjhuna
	-	*C. retusa* L.	Atasi, Bil jhunjhuna
	-	*C. saltiana* Andr.	Chhota jhunjhuna, Jhanjani
	-	*C. spectabilis* Roth. (*C.sericea* Retz.*)*	Pipli jhanjhani
	-	*C. verrucosa* L.	Jhanjhania
	Derries	*Derris elliptica* Benth.	Tubamul
	-	*D. indica* (Lamk.) Benth	Makrigilla
	-	*D. robusta* Benth.	Korol,Jangaria, Jumurja, Miringa, Jamurja
	-	*D. scandens* Benth.	Noalata, Kamirialata, Maora gota, Noshoth
	-	*D. trifoliata* Lour.	Kalilata, Felialata,Panlata, Pan gota, Gilalata, Goali lata
Leguminosae	Soybean	*Glycine max.* (L.) Merr.	Soyabean,Gari kalai
	-	*Indigofera linifolia Retz.*	Bhangara
	Indigo	*I. tinctoria L.*	Nil
	Lentil	*Lens culinaris* Medik. (*L. esculenta* Moen.)	Musur, Musuri dal
	-	*Medicago denticularia Willd.*	Moyna
	Yam Bean	*Pachyrrhizus erosus* (L.) Urban	Shak alu
	Bean	*Phaseolus aconitifolius* Jacq.	Bon moog, Gaheri, Birimoog
	-	*P. adenanthus* Mey	Bon barbati
	-	*P. lunatus* L.	Bon barbati
	-	*P. mungo* L.	Mashkalai
	-	*P. sublobatus* Roxb.	Ghoramoog
	-	*P. radiatus* L.	Sonamoog
	-	*P. trilobatus*	Rakhal kalai, Magani, Mugani
	French bean	*P. vulgaris (* L.) Schr.	Farasshbean, Bakla, Kalobasak

Family	Crops and allied species		
	Common name	Scientific name	Local name
	-	*Pisum arvense* L.	Chhoto motor
	Pea	*Pisum sativum* L.	Motor, Motorshuti, Kabuli motor
	Winged bean	*Psophocarpus tetragonolobus D.C.*	Rakhal sim, Kumari sim, Karat sim
	Tamarind	*Tamarindus indica* L.	Tetul, Amli
	Field bean	*Vicia faba* L.	Bara sim, Bakla sim
	-	*V. hirsuta* Coch.	Masur chana
	-	*V. sativa* L.	Ankari
	Blackgram	*Vigna mungo* (L.) Hepper	Mashkalai, Tikha kalai
	-	*V. pilosa bak*	Jhikrai, Malkenia
	Mung	*V. radiata* (L.) Wilezck	Sona moog, Moog
	Yard Long Bean	*V. sinensis Endl.* ex Hassk.	Barbati, Lalsha
	Cowpea	*V. unguiculata* Endl. ex Hassk.	Barbati
Liliaceae	-	*Allium ampelopraseum* L.	Gandini
	Onion	*Allium cepa* L.	Piaz
	Garlic	*A. sativum* L.	Rasun
	-	*A. tuberosum* Roxb.	Banga gandini
	Asparagus	*Asparagus racemosus* L.	Shatamulu, Hilum
	-	*Urginea indica* Kunth	Jangli piaz
Linaceae	Fax/Linseed	*Linum usitatissimum* L.	Tishi, Chikna, Masina
Malvaceae	Okra/ Lady's Finger	*Abelmoschus esculentus* (L.) Moen.	Dherosh, Bhindi
Malvaceae	Tree Cotton	*Gossypium arboreum* var. *conansis L.*	Kapas, Karpas tula
	Comilla Cotton/Hill Cotton	*G. arboreum* *G. herbaceum* L.	Tula
	Khaki cotton	*G. arboreum*	Khaki tula
	-	*Hibiscus abelmoschus* L.	Mushakdana, Kalo kasturi
	Kenaf	*H. cannabinus* L.	Kenaf, mesta pat, Bimli
	-	*H. ficulneus* L.	Jangli Bhindi, Jangli dherosh, Bon dherosh
	-	*H. hirtus* L.	Lal surjamukhi
	-	*H. macrophyllus* Roxb.	Kashipata, Kashia udal, Chania
	-	*H. manihot* L.	Gajasudhi, Dumbula, Paresh, Palas pipul, Paresh pipul
Malvaceae	-	*H. mutabilis* L.	Sthalpadma
	China Rose	*H. rosa-sinensis* L.	Jaba, Jabaphul, Rakta jaba, Daru
	China rose	*H. schizopetalus* L.	Jhumko jaba, Latkan jaba
	Roselle	*H. sabdariffa* L. var. altissima	Mestapat, Kenaf, Mesta
	Roselle	*H. sabdariffa* L. var. sabdariffa	Chukair, Chukur
	-	*H. syriacus* L	Sada jaba, Nil jaba
	-	*H. tilliaceus* L.	Bolai, Bhola, Belapata, Chewla
	-	*H. vitifolius* L.	Bon kapas
Marantaceae	Arrowroot	*Maranta arundinacea* L.	Araroot, Takhur
Moraceae	Breadfruit	*Artoarpus altilis* (Park.) Fos.	Breadfruit
	Chaplash	*A. chaplasha Roxb.*	Chaplash, Chambal, Cham
	Jackfruit	*A. heterophyllus* Lamk.	Kanthal
	Jackfruit	A. *lacucha* Buch.-Ham.	Deua, Deophal, Dephal
	Ficus and allies	*Ficus altissima* Bl.	Bot, Prab
	Banyan Tree	*F. benghalensis* L. var. *krishnae* (C. DC) Corner (*F. krishnae* C. DC)	Krishna bot
	-	*F. comosa* Kurz.	Pakur, Jir, Kamrup

Family	Crops and allied species		
	Common name	Scientific name	Local name
	-	*F. carica* L.	Dumur
	-	*F. cunea* Buch.-Ham	Jagadumur, Sadimadi, Joyadumur
	-	*F. elastica* Roxb.	Bor, Atabor, Bharotio rubber
	-	*F. glaberrima* Bl.	Kakri
	-	*F. heterophylla* L. f. *var. heterophylla* L.	Ghati shaora, Baladumur, Bolalat
	-	*F. heterophylla* L. f. *var. repens*	Bhuidumur
	-	*F. hispida* L. f.	Kakdumur, Dumur, Thoska
	-	*F. hirta* Vahl.	Dangra, Khandadumur
	-	*F. lacor* Buch.-Ham. *(F. infectoria* Roxb.*)*	Pakur
	-	*F. lanceolata* Ham.	Butidumur, Erogachh
	-	*F. lepidosa* Wall.	Katgularia, Jir, Kamrup
	-	*F. microcarpa* L.f. *(F. retusa* Hook. f.*)*	Baltrella
	-	*F. recemosa* L. *(F. glomerata* Roxb.; *F. scandens* Roxb.*)*	Jagadumur, Gulangdumur
	Peepul Tree	*F. religiosa* L.	Asswath, Panbot, Pipal
	-	*F. rostrata* Lamk.	Paraboha
	-	*F. rumphii* Bl.	Hijuli, Gaya asswath
	-	*F. semicordata* Buch.-Ham ex Smith	Jagadumur, sadimadi
	Malberry	*Morus indica* L. *(M. alba* L.*)*	Tut, Tunt
Musaceae	Bananas	*Musa ornata Roxb.*	Ram kola,
	-	*M. paradisiaca* L. *var. paradisiaca*	Kachkola
	-	*M. paradisiaca* L. *var. sapientum*	Kola, kathalikola
	-	*M. sapientum* L.*var. sylvestris*	Aittakola, Aitekola
Myristicaceae	Nutmeg	*Myristica fragrans* Houtt	Jaiphal, Jayatri
	-	*M. longifolia* Wall.	Amboala
	-	*M. malabarica* Lamk.	Jayatri
Myrtaceae	Clove and allies	*Syzygium aqueum* (Burm. f) Alston	Jambo
	-	*Eugenia balsamea* Wt.*var. angustifolia*	Ekdarya
	-	*E. bracteata* Roxb.	Hijli menadi
Myrtaceae	Clove	*E. caryophyllaceus* (Spreng.) Bull.	Labanga, Lang
	-	*Syzygium claviflorum* (Roxb.) Wall	Nalijam, Lambanalijam
	-	*Syzygium syzygioides* (Miq.) Merr.	Khoirjam
	-	*Syzygium formosanum* Hayata Mor.	Panijam, Hanihak, Phulijam
	-	*Syzygium fruticosum* (Roxb.) DC	Bonjam, Khudijam
	Indian Black Berry	*Syzygium cumini* (L.) Skeels	Jam, Jamon, Kalojam
	-	*Syzygium grande* (Wt.) Wall.	Dhakijam
	Rose Apple	*Syzygium jambos* (L.) Alston	Golapjam
	-	*Syzygium malaccensis* (L.) Merr. & Perry	Amritaphal
	Wax Jambu	*Syzygium samarangense* (Bl.) Merr. & Perry	Jamrul
	-	*Eugenia lancaefolia* Roxb.	Parajam
	-	*E. macrocarpa* Roxb.	Chaltajam
Myrtaceae	-	*Syzygium operculatum* (Roxb.) Niedz.	Botijam, Thengajam, Patiajam, Dhepajam
	-	*Syzygium wallichii* Wall.	Kharkharajam

Family	Crops and allied species		
	Common name	Scientific name	Local name
	Guava	*Psidium guajava* (L.) Bat.	Payara, Sabri
Nymphaeaceae	Water Lily	*Nymphaea nouchalli* Burm. f.	Shapla, Raktabhanga, Kamol, Kumud. Kumudini, Shaluk, Sadashapla
	-	*Nymphaea stellata* Willd.	Nilshapla, Nilpadma, Nilshaluk, Sundishaluk
	-	*Nelumbo nucifera* Gaertn.	Padma, Raktapadma, Jalapadma
Oxalidaceae	Oxalis	*Oxalis corniculata* L.	Amrul, Amboli, Chukatriphal
Palmeae	Betelnut	*Areca catechu* L.	Supari, Gua
	-	*A. triandra* Roxb.	Bon gua, Bon supari
	Palmyra Palm	*Borassus flabellifer* L.	Tal
	Coconut	*Cocos nucifera L.*	Narikel, Dab
	Datepalm	*Phoenix sylvestris* (L.) Roxb.	Khajur, Khejur, Khagi Khejur
	-	*P. paludosa* Roxb.	Hintal, Hital, Hantal
Pedaliaceae	Sesame	*Sesamum indicum* L.	Til, Jangli til, Shanki til, Kalo til
Piperaceae	Piper	*Piper betel* L.	Pan, Tambuli
Piperaceae	-	*P. chaba* Hunter	Choi, Chab
	-	*P. cubeba* Vahl.	Kababchini
	-	*P. longum* L.	Peepul, Pipla
	Black Pepper	*P. nigrum* L.	Gol marich
	-	*P. peepuloides* Roxb.	Peepul
	-	*Peperomia pellucida* Kunth	Luchi pata
Polygonaceae	Buckwheat	*Polygonum fagopyrum*	Dhanchi
Puniaceae	Pomegranate	*Punica granatum* L.	Dalim, Anar
Rhamnaceae	Jujuba	*Zizyphus mauritiana* Lamk.	Kul, *Boro*i
	-	*Z. oenoplea* (L.) Mill.	Bon *Boro*i, Gram *Boro*i, Got *Boro*i
	-	*Z. rugosa* Lamk.	Anai, Jangli *Boro*i
Rosaceae	-	*Rosa centifolia* L.	Golap, Swetgolap,
	-	*Rosa damacena* Mill.	Golap, Knatagolap,
	-	*Rosa indica* L.	Knatagolap
	-	*Rosa involucrata* Roxb.	Bannyagolap, Bunogolap
	-	*Rubus hexagynus* Roxb.	Hira-charra, Hirachura
	-	*Pyrus communis* L.	Nashpati
	-	*Eriobotrya japonica* Lindl.	Loket, Loketphal
	-	*Prunus domestica* L. *(P. communis* Huds.*)*	Alu-Bokahra
Rubiaceae	Coffee	*Coffea arabica L.*	Kafi
	-	*Coffea benghalensis* Roxb.	Baynya kafi
	-	*Rubus tinctorium* L.	Manjistha
Rutaceae	Lime, Lemon	*Citrus aurantifolia* (Christ. & Panz.) Sw.	Kagzilebu, Nebum Nimbu, Lebu
	Shaddock	*C. grandis* (L.) Osbeck	Jambura, Batabilebu,
	Lime	*C. limettoides* Tanaka	Mithanebu
	Lemon	*C. limon* (L.) Burm. *f.*	Goralebu, Karnalebu
	Orange	*C. reticulata* Blanco	Kamla, Kamlalebu
	Orange	*Citrus sinensis* (Linn.) Osbeck	Malta, Moushandhi
Sapindaceae	Litchi	*Litchi chinensis* Sonn.	Lichu
	-	*Nephelium longana* Camb.	Ashphal
Sapotaceae	Sapodila	*Manilkara zapota* (L.) P. van Royen *(Achras sapota* L.*)*	Safeda, Chabeda
Solanaceae	Pepper	*Capsicum annum* L.	Morich, Lanka
	Pepper	*C. frutescens* L.	Morich, Lanka morich, Dhani anka, Dhani morich
Solanaceae	Tomato	*Lycopersicon esculentum* Mill.	Tomato, Bilati begun, Gur begun
	Tabocco	*Nicotiana rustica* L.	Deshi Tamak

Family	Crops and allied species		
	Common name	Scientific name	Local name
	Tobaccio	*N. tabacum* L.	Tamak
	-	*N. plumbaginifolia* Viv.	Bon tamak
	Egg plant allies	*Solanum melongena* Wall.	Begun, bagun
		S. melongena Wall *var. esculenta*	Kulibegun
	-	*S. filicifolium* Ort.*(S. tovrum* Sw.*)*	Tit begun, Goth begun, Hat begun
	-	*S. ferox* L.	Gota begun, Ram begun, Bagh gota
	-	*S. indicum* L.	Phutki begun, Baikur begun, Tit begun, Brithati begun
	-	*S. nigrum* L.	Gurkamal, Kakmachhi, Phuti begun
	-	*S. spirale* L.	Bagua
	-	*S. surattense* Burm. f. *(S. xanthocarpum* Schrad. Wendl.*)*	Kanti kari, Kanta kini
	Potato	*Solanum tuberosum* L.	*Alu, Gol alu, Bilati alu*
	-	*S. verbascifolium L.*	Urusa
Sterculiaceae	Cocao	*Theobroma cacao* L.	Koko, Chocolet
Tiliaceae	-	*Corchorus aestuans* L.	Titapat, Jangli pat
	Jute	*C. capsularis* L.	Desi pat,Tita pat, Bogi pat, Sada pat, Nalita pat,
	-	*C. fascicularis* Lam.	Jangli pat, Bil nailta
	-	*C. olitorius* L.	Tosha pat, Mitha pat, Bogi tosha
Umbelliferae	Celery	*Apium graveolens* L.	Chiruli
	Coriander	*Coriandrum sativum* L.	Dhania, Dhoney
	Fennel	*Foeniculum vulgare* Gaertn.	Pan mouri
	Ajowan	*Carum copticum* Benth. *(Trachyspermum ammi)*	Jowan
	Cuminseed	*Cuminum cyminum* L. *(Carum carvi* L*)*	Jira
	Carrot	*Daucas carota L.*	Gajor
	Dropwort	Oenanthe benghalensis *Benth. & Hk. f*	Panturasi
	-	*Seseli diffusum* Roxb. Ex Sm. Sent. & Wagh *(S. indicum* Wt. & Arn.*)*	Bon jawan
Urticaceae	Ramie	*Boehmeria nivea* (L.) Gaud.	Kankhura, Kankura
	-	*B. platiphylla* D. Don.	Ulichara
Vitaceae	Grapes & allies	*Cissus adnata* (Roxb.) Wall.	Alinga lata
	-	*C. assamica* Laws	Asham lata
	-	*C. glabrata* Heyne	Goda gauria
	-	*Tetrastigma leucostaphyllum*	Horinia lata
	-	*Ampelocissus latifolia*	Govila, Panibel
	-	*Cayratia pedata*	Goali lata
	-	*Cissus quadrangularis* Wall.	Har bhanga lata
	-	*C. setosa* Wall.	Goali lata
	-	*C. trifolia* (L.) Don	Anal lata, Amal lata, Sonekeshar
	Grape	*Vitis vinifera* L.	Angur, Kismis
Gingiberaceae	Turmeric	*Curcuma longa* L. *(C. domestica* Vahl*)*	Haldi, Halud
	Shoti	*C. zedoarea* Roscoe	Shathi, Ekangi, Phulga, Kachuri
	Cardamom	*Elettaria cardamomum* Maton	Elachi
	Ginger allies	*Zingiber purpureum* Roscoe	Bon ada, Baumugra gachh
	Ginger	*Zingiber officinale* Roscoe	Ada
	Ginger allies	*Zingiber rubens* Roxb.	Murga gachh
	-	*Zingiber zerumbet* Sm.	Mohabari gachh, Narkasur

Appendix Table III. 4. Number of accessions of wild rice germplasm available with BRRI

Scientific name	Number of accessions	Data source
Oryza alta	1	BRRI
O. Australiensis	3	BRRI
O. barthii	2	BRRI
O. granulata	3	BRRI
O. latifolia	1	BRRI
O. longistaminata	1	BRRI
O. minuta	2	BRRI
O. nivara	8	BRRI
O. officinalis	12	BRRI
O. punctata	1	BRRI
O. rufipogon	75	BRRI
O. subalata	1	BRRI
O. officinalis	5	BRRI
O. nivara	3	BRRI
O. punctata	2	BRRI
Oryza sativa f. spontenea	1	BRRI
Total	**121**	-

Appendix Table III.5. Threatened plant species in Bangladesh

Family	Species	Local name
Acanthaceae	*Andrographis paniculata* Burm. F. Wall. ex. Nees.	Kalomegh, Mahatita
	Gymnostachyum listeri Prain	-
	Justicia oreophylla C.B. Clarke	Chota Arusha
Anacardiaceae	*Holigarna longifolia* Roxb.	Jhawa, Barola
	Mangifera sylvatica Roxb.	Kash Aam, Jangli Aam, Uri Aam
	Nothopegia acuminata J. Sinclair	-
	Swintonia floribunda Griff.	Civit, Boilam, Boilsur, Am Barola
Annonaceae	*Desmos longiflorus* (Roxb) Safford	Kulla
	Sageraea listeri King var. listeri	Dh*Aman*
	Uvaria lurida Hoof. f. & Thoms. Var. Lurida	-
Apocynaceae	*Rauvolfia serpentina* Benth. ex Kurz.	Chandra
Araceae	*Aglaonema hookerianum* Schott	-
	Lagenandra gomezii (Schott) Bogner & Jacobson	-
	Steudnera colocasoides Hook. f.	Bish Kachu
	Typhonium listeri Prain	-
Asclepiadaceae	*Ceropegia longifolia* Wall. *subsp.longifolia*	-
	Cynanchum wallichii Wight	-
	Gymnema molle Wall. ex. Wight	-
	Hoya acuminata (Wight) Benth. ex. Hook. f.	-
	Hoya globulosa Hook. f.	-
	Hoya lanceolata Wall. *ex.* Don	-
	Marsdenia eriocarpa Hook. f.	-
Anacardiaceae	*Buchanania lancifolia* Roxb.	Chikki
	Pentabothra nana (F. Ham *ex* Wight*)* Hook. f.	-
Bombacaceae	*Bombax insigne* Wall *ex* Hook. F	-
Boraginaceae	*Tournefortia roxburghii* C. B. Clarke	-
Burseraceae	*Balsamodendron roxburghii* Arn.	-
	Canarium bengalense Roxb.	Borsam Phol (Garo)
	Canarium resiniferum Brace	Dhup
Combretaceae	*Terminalia citrina* (Gaertn.) Roxb. *ex* Fleming.	Haritaki
Compositae	*Vernonia thomsoni* Hook. f.	-
Cyatheaceae	*Cyathea gigantea* (Wall. *ex* Hook) Holtt.	-
Cycadaceae	*Cycas pectinata* Griff.	-
Dioscoreaceae	*Dioscorea prazeri* Prain & Burkill	
Dipterocarpaceae	*Aniosptera scaphula* (Roxb.) Pierre	Boilam
	Aldrovanda vesiculosa Linn.	Malacca Jhangi
Dryopteridaceae	*Tectaria chattagramica* (Clarke) Ching	-
Elaeoccarpaceae	*Elaeocarpus acuminatus* Wall *ex* Mast	-
Fragaceae	*Lithocarpus acuminata* (Roxb.) Rehder	Dooba Batna, Kantagola Batna
Flacourtiaceae	*Homalium schlichii* Kurz	-
	Hydnocarpus kurzii (King) Warb.	Chaulmugra, Dalmurgi
Gesneriaceae	*Aeschynanthus hookeri* C. B. Clarke	-
Gnetaceae	*Gnetum latifolium* Bl. var. *funiculare* (Bl) Mgf.	-
	Gnetum montanum Mgf.	-
	Gnetum oblongum Mgf.	-
Gramineae	*Cymbopogon osmastonii* R. N. Parker	Jay Ghash
Hypericaceae	*Triadenum breviflorum* (Wall *ex* Dyer) Kimura	-

Family	Species	Local name
Icacinaceae	*Iodes hookeriana* Baill	-
Lauraceae	*Litsea clarkei* Prain	-
Leeaceae	*Leea alata* Edgew.	-
Leguminosae	*Butea listeri* (Prain) Blatter	-
	Calliandra umbrosa (Wall) Benth.	-
Loranthaceae	*Taxillus thelocarpa* (Hook f.) *Alam*	-
Lythraceae	*Rotala simpliciuscula* (S. Kur) Koehne	-
Magnoliacea	*Magnolia pterocarpa* Roxb.	-
Malpighiaceae	*Adopterys rotundifolia* A. Juss	-
Malvaceae	*Abelmoschus hostilis* (Wall *ex* Mast.) Khan & Shakhawat	-
	Hibiscus scandens Roxb.	-
Marantaceae	*Phrynium inbricatum* Roxb.	Pituli Pata
Melastomaceae	*Osbeckia capitata* Benth *ex* Naud.	-
Meliaceae	*Desoxylum binectariferum* Hook. f. *ex* Bedd.	Rara. Rangi Rata
Menispermaceae	*Pycnarrhena pleniflora* (*"plainfora*) Hook. f. & Thoms	-
Myristicaceae	*Knema bengalensis* de Wilde	Khude Barala
Orchidaceae	*Acanthephippium sylhetense* Lindl.	-
	Bulbophyllum roxburghii (Lindl.) Reichb. f.	-
	Cymbidium aloifolium (Linn.) Sw.	-
	Dendrobium longicornu Wall. *ex* Lindl.	-
	Eulophia mackinnonii Duthie	-
	Gastrodia zeylanica Schlechteer	-
	Paphiopedilum insigne (Wall. *ex* Lindl.) Pfitz.	-
	Paphiopedilum venustum (Wall. *ex* Sims.) Pfitz.	-
	Vandopsis gigantea (Lindl.) Pfitz.	-
	Vanilla parishii Reichb. f.	-
Palmae	*Calamus erectus* Roxb.	Kadam Bet, Sitar Supari, Sungotta (Sylhet)
	Calamus guruba Buch. –Ham. *ex* Mart.	Jali Bet, Sundi Bet (Sylhet), Kejuni Bet (Ctg. & Cox's Bazar)
	Calamus latifolius Roxb.	Korak Bet, Budum Bet
	Calamus longisetus Griff.	Udom Bet
	Corypha taliera Roxb.	Tali
	Licuala peltata Roxb.	Chata Pat, Kurud, Kurkutti
	Pinanga gracilis Bl.	Ram Gua
	Wallichia caryotoides Roxb.	-
Psilotaceae	*Psilotum nudum* (Linn.) P. Beauv.	-
Rubiaceae	*Myrioneuron clarkei* Hook. f.	-
	Ophiorrhiza villosa Roxb.	-
Scrophulariaceae	*Lomnohila canna* Griff.	-
Sterculiaceae	*Pterospermum semisaggittatum* Buch. – Ham *ex* Roxb.	Asswar, Laona-asswar
Thymelaeaceae	*Aquilaria agallocha* Roxb.	Agar
Zingiberaceae	*Amomum aromaticum* Roxb.	Morung Elachi
	Amomum costatum (Roxb.) Benth.	-
	Caulokaemferia secunda (Wall. *ex* Roxb) Larsen.	-
	Curcuma ferruginea Roxb.	-
	Curcuma rubescens Roxb.	-
	Globba multiflora Wall *ex* Baker	
	Hedychium aureum Clarke & Mann *ex* Baker	-
	Hedychium coccineum Buch,-Ham *ex* Smith.	Bhui Ada
	Hedychium glaucum Rosc.	-
	Hedychium gracile Roxb.	-
	Hedychium speciosum Wall *ex* Roxb.	-
	Hedychium stenopetalum Lodd.	-
	Hedychium thyrsiforme Buch. - Ham ex Smith	
	Hitchenia careyana Benth.	-
	Mantisia radicalis (Roxb.) D. P. Dam & N. Dam.	-
	Mantisia spathulata (Roxb.) Schult.	-
	Zingiber capitatum Roxb.	Jangli Ada
	Zingiber roseum (Roxb.) Rosc.	-

Source: BNH. 2001. Red Data Book of Vascular Plants of Bangladesh, Bangladesh National Herbarium, Dhaka. PGR).

Appendix Table III.6. Surveys and inventories undertaken in Bangladesh

Stake-holder	Title of survey/ Inventory	Area surveyed/ Inven-toried	Area priority ranking for *in situ* conservation	Survey details	Surveying methods	Threatened species	Causes of threat	Major findings
BARI	Ethnobotanical survey on Taro and Yam	Different districts of Bangladesh	Medium	Indigenous knowledge used; identification of threatened /endangered species	-	-	Lack of knowledge on multiple use and value addition	-
BNH	Biosystemaic studies of Cucurbitaceae	Bangladesh	Not set/ known	Indigenous knowledge used	Field survey, literature survey and examination of herbarium specimens	*Tiochosanthes himalensis*	Habitat destruction	A total of 45 species were identified under the family Cucurbitaceae of which 15 species are vegetables.
	Exploration of the wild plant genetic resources of Kaptai National Park	Kaptai National Park, Rangamati	High	Indigenous knowledge used; identification of threatened /endangered species, threat to genetic diversity	Field survey, literature survey and herbarium specimens. Ethnobotanical data collected.	Of 423 species recorded threatened species recorded were 25.	Over exploitation and deforest-ation.	A total 423 species under 292 genera in 93 families recorded.
	Taxonomic studies of Araceae from Bangladesh	Bangladesh	Not set /known	Indigenous knowledge used; identification of threatened /endangered species, threat to genetic diversity	Field survey, literature survey and herbarium specimens. Data collected from 30 AEZ	At least 7 species have been identified as threatened	Habitat destruction, over exploitation	A total of 53 species under 20 genera in Bangladesh. Some 10 species used as vegetables and 16 species were endemic and endangered. Five species were recorded only once but not found during the study.
	Inventory of threatened plants to publish Red Data Book	Bangladesh	High	Indigenous knowledge used; identification of threatened /endangered species, threat to genetic diversity	Field survey, literature survey and herbarium specimens.	The names of 106 threatened vascular plants identified.	Habitat destruction, over-exploitation, climatic changes	A total of 106 species were listed in the first volume of the "Red Data Book of Vascular Plants of Bangladesh". Species categorised according to IUCN Red List Categories.
	Legume Flora of Bangladesh	Bangladesh	Not set / known	Indigenous knowledge used; identification of threatened /endangered species, threat to genetic diversity	Mainly based on literature survey and herbarium collections. Field studies done in a few cases.	About 50 species are threatened.	Habitat destruction and overexploitatio n	A total of 332 species under 98 genera identified. A total of 21 species recorded that were used as vegetables/puls es and 23 species recorded to be used as medicinal plants.

Stake-holder	Title of survey/ Inventory	Area surveyed/ Inven-toried	Area priority ranking for *in situ* conservation	Survey details	Surveying methods	Threatened species	Causes of threat	Major findings
	Survey of Plant Diversity of Bangladesh to publish the series of "Flora of Bangladesh" (Annonaceae, Solanaceae, Combretaceae, Cuscutaceae, Malvaceae and Menisperm-aceae	Bangladesh	Not set / known	Indigenous knowledge used; identification of threatened /endangered species, threat to genetic diversity	Field survey, literature survey and examination of herbarium specimens.	Some 23 species Annonaceae, 5 species of Solanaceae, 4 species of Cuscutaceae, 6 species of Menispermace ae and 2 species of Malvaceae have been identified as threatened.	Habitat destruction, climatic changes, over-exploitation	A total of 42 species under 15 genera of the Family Annonaceae identified. Of these 3 species were fruit yielding and widely cultivated. A total of 35 species under 13 genera of the Family Solanaceae identified, 5 species were vegetable yielding, two Nicotiana species, 4 species used as medicinal plants, and two species cultivated as ornamental plants. A total of 21 species under 6 genera of the family Combretaceae identified. Of these, 5 species are used as medicinal plants. A total of 6 species under the family Cucustaceae have been identified, of which one species is used a medicinal plant. A total of 19 species under the family Menispermace ae have been identified of which one is a fibre yielding plant and one is a poisonous plant. A total of 49 species under 19 genera of the family Malvaceae have been identified of which 3 species are used as vegetables, 21 are fibre yielding and 6 species are medicinal plants.

Stake-holder	Title of survey/ Inventory	Area surveyed/ Inven-toried	Area priority ranking for *in situ* conservation	Survey details	Surveying methods	Threatened species	Causes of threat	Major findings
	Survey of Pteridophytic Flora of Bangladesh	Bangladesh	Not set / known	Indigenous knowledge used; identification of threatened /endangered species	Field survey, literature survey and herbarium specimens.	About 25 species identified as threatened.	Habitat destruction and over-exploitation	A total of 165 species under 56 genera of 28 families identified. Of these 12 species were used as vegetables and 40 as medicinal plants.
CDP	Rice Diversity and Production in the Southwest of Bangladesh	Southwest Costal Region	High	Indigenous knowledge used; identification of threatened /endangered species, threat to genetic diversity.	Samples of indigenous rice varieties and anthropological information collected through FGD.	About 30 indigenous rice varieties were threatened.	Coastal Embankment Project, increased salinity and waterlogging and aggression of modern varieties.	Some 116 varieties were collected through resource poor farmers in 20 villages in 4 districts of the southwest region of Bangladesh.
CDB	Baseline Survey on Potentiality of Cotton Production in Bangladesh	63 Upazilas of the 19 cotton growing district (10 cotton growing zones)	Low	Indigenous knowledge used; identification of threatened /endangered species, data entered in GIS	To know farmers' capability through questionnaire, GIS system	Gossypium arboreum, indigenous species of cotton was threatened.	Monoculture of modern varieties	Middlemen purchase immature cotton, mixed varieties led to genetical deterioration.
BRRI	Collection and Registration of Rice Varieties	Bangladesh	Medium – High	Indigenous knowledge used; identification of threatened /endangered species, threat to genetic diversity.	Questionnaire, Passport Data, etc.	Wild rice (*Oryza rufipogon, O. officinalis, O. nivara) are* threatened.	Monoculture of modern rice, disturbances of natural habitats	About 12,000 local rice germplasm identified as new germplasm. Many local varieties have already been lost from farmers' fields
	Characteriza-tion of Rice Germplasm	BRRI HQ, Gazipur	Low - Medium	Indigenous knowledge used; identification of threatened /endangered species, threat to genetic diversity. Data entered into GIS	Data recording	Local rice cultivars	Monoculture of modern rice, disturbances of natural habitats	About 12,000 local rice germplasm identified as new germplasm. Many local varieties have already been lost from farmers' fields.
BSMRAU	Survey and Collection of Local Rice Germplasm	Netrokona and Kishoregan j District	Medium – High	Indigenous knowledge used; threat to genetic diversity.	-	-	Competition from modern high yielding varieties	-

Appendix Table III.7. Type and frequency of activities in the country to promote on-farm management and improvement of PGRFA

Type of on-farm management improvement	Frequency	Remarks
Community based research	Occasional	Deserves institutionalization of genebank activities
Participatory plant breeding	Occasional	
Participatory cultivar selection	Occasional	
Processing and packaging	Never	
Market development	Never	
Strengthening local supply	Occasional	
Diversity fairs and seed exchange	Occasional	
Increasing public awareness	Occasional	

Appendix Table III.8. Causes of the loss of genetic integrity identified by stakeholder organizations

Stake-holder	Name of collection	Taxon	Crop/crop group	Factors cAusing loss of genetic integrity	Other factors
BARI	Active collection (Medium term conservation)	Various	Cereals, Pulses, Oilseeds, Fruits, Roots & Tuber Crops, Spices	Low viability of regeneration sample, Insufficient Isolation of cross pollinated crops, Mechanical contamination, improper handling	-
CD B	Collection, Evaluation and Conservation of Cotton Germplasm	*Gossypium hirsutum*	Cotton	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation, Selection pressure from unsuitable environment	-
BAU	Collection, Evaluation, Conservation and Utilization of Landraces and Wild Relatives of Some Vegetables and Fruits of Bangladesh	*Cucurbita moschata*	Pumpkin	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation, Mechanical contamination, improper handling	-
		Benincasa hispida	Wax gourd	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation, Selection pressure from unsuitable environment, Mechanical contamination, improper handling	-
		Cucumis sativus	Cucumber	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation, Selection pressure from unsuitable environment, Mechanical contamination, improper handling	-
		Cucumis melo	Melon	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation, Selection pressure from unsuitable environment, Mechanical contamination, improper handling	
		Abelmoschus esculentus	Okra	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation, Selection pressure from unsuitable environment, Mechanical contamination, improper handling	-
		Lagenaria siceraria	Bottle gourd	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation.	-
		Luffa acutangula	Ribbed gourd	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation distance	-
		Luffa cylindrica	Sponge gourd	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation distance.	-
		Momordica charantia	Bitter gourd	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation distance.	-
		Solanum melongena	Eggplant	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-

Stake-holder	Name of collection	Taxon	Crop/crop group	Factors cAusing loss of genetic integrity	Other factors
		Trichosanthes anguina	Snake gourd	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Citrus aurantifolia	Lime	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Citrus assamensis	Adajamir	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Citrus grandis	Pommelo	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Citrus limon	Lemon	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Citrus macrocarpa	Satkora	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Citrus sinensis	Mandarin orange	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Citrus reticulata	Malta	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Artocarpus heterophyllus	Jackfruit	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Mangifera indica	Mango	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
		Mangifera longipes	Wild mango	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
	Conservation of Rice Germplasm	*Oryza sativa*	Rice	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation, improper post-harvest handling.	-
	Studies on the Development of Varieties, Production Technology, Food and Fish Feed Uses of Soybean in Bangladesh	*Glycine max*	Soybean	Regeneration sample size too small, Low viability of regeneration sample, Mechanical mixture, Insufficient isolation distance.	-
	Fruit Tree Development Programme, Germplasm Centre	*Mangifera indica*	Mango	Regeneration sample size too small, Low viability of regeneration sample, Insufficient isolation distance.	-

Stake-holder	Name of collection	Taxon	Crop/crop group	Factors c*Au*sing loss of genetic integrity	Other factors
		Artocarpus heterophyllus	Jackfruit	Regeneration sample size too small, Low viability of regeneration sample.	-
		Litchi chinensis	Litchi	Regeneration sample size too small, Low viability of regeneration sample.	-
		Manilkara achras	Sofeda	Regeneration sample size too small, Low viability of regeneration sample.	-
		Cocos nucifera	Coconut	Regeneration sample size too small, Low viability of regeneration sample.	-
BRRI	C*Au*ses of awn Development	*Oryza sativa*	Rice	Insufficient isolation, Unbalanced seed production between individuals.	-
BSRI	Collection and Conservation of Indigenous and Exotic Germplasm of Sugarcane	*Saccharum officinarum*	Sugarcane	Mechanical admixture and insufficienrt isolation distance	Inoculation tests showed that loss of genetic integrity was mainly due to red rot disease.
BSMRAU	Collection of Aromatic Rice, Vegetable Crops and Grain Legumes	*Oryza sativa, Raphanus sativus, Pisum sativum, Vigna radiata, Vigna mungo*	Aromatic Rice, Radish, Pea, Mung bean and Blackgram	Insufficient isolation distance, Mechanical contamination and Improper handling	-

Appendix Table III. 9. Provision for collecting rare and endangered species for *ex situ* conservation by different stakeholders and the gaps in existing collections

Stakeholder	Provision for *ex situ* conservation of rare/endangered species	Gaps in existing collections	Research conducted to identify gaps
BARI	Yes	Remote areas	No research conducted to identify gaps
CDP	No	Remote areas	No research conducted to identify gaps
CDB	No	Remote areas	No research conducted to identify gaps
BINA	No	Remote areas	No research conducted to identify gaps
BJRI	No	Remote areas	No research conducted to identify gaps
BRRI	Yes	Remote areas	No research conducted to identify gaps
BSRI	Yes	Remote areas	No research conducted to identify gaps
BSMRAU	No	Remote areas	No research conducted to identify gaps

Appendix Table III.10. Gaps in existing collections, information system and methods used to identify gaps by different stakeholders

Stakeholder	Name of collection	Name of information system	Gaps detected	Methods used to detect gaps
BARI	-	-	-	-
CDB	Collection of Traditional/ Local and Wild Cotton Varieties	-	Incomplete coverage of targeted taxa, Incomplete geographical coverage, Missing historical cultivars	Comparison of stored material against organization mandate
EWS (Bd.) Ltd	Collection and Evaluation of Germplasm	-	Incomplete coverage of targeted taxa	Comparison of stored material against organization mandate
BJRI	Characterization and Evaluation of Jute, Kenaf and Mesta Germplasm	MS Access, MS Stat	Missing known cultivars /landraces	Comparison of stored material against organization mandate
BRRI	Active and Base Collection	Bangladesh Rice Information System	Incomplete geographical coverage, Missing known cultivars/landraces, Missing historical cultivars. A book "Deshi Dhaner Jaat" listed about 12,000 rice germplasm but BRRI could collect and conserve only less than half of these in *ex situ* conditions.	Comparison stored materials against organization mandate, Comparison of stored material against historical references, Comparison of stored material against geographical references.
BSRI	Collection and Conservation of Indigenous & Exotic Germplasm of Sugarcane	Bangladesh Sugarcane Informatrion System	Incomplete coverage of targeted taxa, Missing known local cultivars.	Comparison of stored materials against organization mandate
BSMRAU	Collection of Pea	-	Incomplete geographical coverage.	-

Appendix Table III.11. Status of characterization and evaluation of *ex situ* collections by different stakholder organizations in Bangladesh

Stake Holder	*Ex situ* collection	Taxon/Crop group	% accesions characterized for						Capacity in charaterization /evaluation and Storing/ Analyzing system
			Morpho-logical traits	Molecular markers	Agrono-mic traits	Bio-chemical traits	Abiotic stresses	Biotic stresses	
BARI	Active Collection (Mid term conserva-tion)	*Lathyrus sativus*	34	-	34	-	-	-	•Morphological traits; Agronomic traits •MS Word & Excel
		Lablab purpureus	98	-	98	-	-	-	
		Cucurbita moschata	93	-	93	-	-	-	
		Cicer arietinum	51	-	51	-	-	-	
		Setaria italica	73	-	73	-	-	-	
		Amaranthus spp.	53	-	53	-	-	-	
		Benincasa hispida	98	-	98	-	-	-	
		Luffa cylindrica	97	-	97	-	-	-	
		Lagenaria siceraria	56	-	56	-	-	-	
		Vigna sesquipedalis	60	-	60	-	-	-	
		Solanum melongena	81	-	81	-	-	-	
		Triticum aestivum	40	-	40	-	-	-	
		Panicum miliaceum	85	-	85	-	-	-	
		Luffa acutangula	97	-	97	-	-	-	
		Pisum sativum	93	-	93	-	-	-	
		Lens culinaris	36	-	36	-	-	-	
		Brassica spp.	81	-	81	-	-	-	
		Trichosanthes anguina	96	-	96	-	-	-	
		Sorghum bicolor	40	-	40	-	-	-	
		Vigna mungo	-	-	-	-	-	-	
		Trichosanthes dioica	96	-	96	-	-	-	
		Momordica charantia	77	-	77	-	-	-	
		Sesamum indicum	89	-	89	-	-	-	
		Cajanus cajan	90	-	90	-	-	-	
		Capsicum frutescens	55	-	55	-	-	-	
		Vigna radiata	85	-	85	-	-	-	
		Cucumis sativus	83	-	83	-	-	-	
		Dioscorea spp.	99	-	99	-	-	-	
		Zea mays	78	-	78	-	-	-	
		Glycine max	90	-	90	-	-	-	
		Lycopersicon esculentum	90	-	90	-	-	-	
		Basella rubra	50	-	50	-	-	-	
		Vigna sinensis	-	-	-	-	-	-	
		Polygonum fagopyrum	100	-	100	-	-	-	
		Cucumis melo	-	-	-	-	-	-	
		Gossypium hirsutum	-	-	-	-	-	-	
CDB	Collection, Evaluation and Conserva-tion of Cotton Germplasm	*Gossypium hirsutum, Gossypium arboreum Gossypium barbadense*	-	-	-	-	-	-	•Morphological traits; Agronomic traits •Official document
EWS (Bd) Ltd	Collection and Evalua-tion of Germplasm	*Momordica charantia*	-	-	-	-	-	-	▪Morphological traits; ▪Agronomic traits ▪Official document
		Lagenaria siceraria	-	-	-	-	-	-	
		Luffa acutangula	-	-	-	-	-	-	
		Citrullus lanatus	-	-	-	-	-	-	
		Cucurbita moschata	-	-	-	-	-	-	
		Trichosanthes anguina	-	-	-	-	-	-	
		Cucumis sativus	-	-	-	-	-	-	
		Benincasa hispida	-	-	-	-	-	-	
		Lycopersicon esculentum	-	-	-	-	-	-	
		Capsicum annum	-	-	-	-	-	-	
		Solanum melongena	-	-	-	-	-	-	
		Allium cepa	-	-	-	-	-	-	
		Raphanus sativus	-	-	-	-	-	-	
		Brassica oleracea var. capitata	-	-	-	-	-	-	
		Brassica oleracea var. botrytis	-	-	-	-	-	-	
		Daucas carota	-	-	-	-	-	-	
		Brassica oleracea var. italica	-	-	-	-	-	-	
		Vigna unguiculata	-	-	-	-	-	-	
		Lablab purpureus	-	-	-	-	-	-	
		Abelmoschus esculentus	-	-	-	-	-	-	

Stake Holder	*Ex situ* collection	Taxon/Crop group	% accesions characterized for						Capacity in charaterization /evaluation and Storing/ Analyzing system
			Morpho-logical traits	Molecular markers	Agrono-mic traits	Bio-chemical traits	Abiotic stresses	Biotic stresses	
		Carica papaya	-	-	-	-	-	-	
		Amaranthus gangeticus	-	-	-	-	-	-	
		Amaranthus tricolor	-	-	-	-	-	-	
		Spinacea oleracea	-	-	-	-	-	-	
		Basella rubra	-	-	-	-	-	-	
		Ipomoea sp.	-	-	-	-	-	-	
		Coriandrum sativum	-	-	-	-	-	-	
BJRI	Characteri-zation and Evaluation of Jute, Kenaf and Mesta	*Corchorus capsularis,*	-	-	-	-	-	-	▪ Morphological traits; ▪ Agronomic traits ▪ MS Access
		Corchorus olitorius,	-	-	-	-	-	-	
		Hibiscus cannabinus,	-	-	-	-	-	-	
		Hibiscus sabdariffa	-	-	-	-	-	-	
BRRI	Collection of traditional/ Local and Wild Rice Varieties	*Oryza spp.*	-	-	-	-	-	-	▪ Morphological traits; ▪ Agronomic traits ▪ Bangladesh Rice Information System
BSRI	Collection and Conservation of indigenous & Exotic germplasm of Sigarcane	*Saccharum officinarum*	-	-	-	-	-	-	▪ Morphological traits; ▪ Agronomic traits Bangladesh Rice Information System
BSMRAU	Preserva-tion of Aromatic Rice and Vegetable Crops	Aromatic Rice, Pea, and Radish, Mungbean and Hyacinth Bean	-	-	-	-	-	-	▪ - Morphological traits; ▪ Agronomic traits Bangladesh Rice Information System
BINA	Characteriz ation and Evaluation of Rice Varieties			Molecular markers	Agro-nomic traits				▪ Morphological traits; ▪ Agronomic traits and DNA fingerprinting ▪ Annual report

Appendix Table III.12. Answers given against questions on core collection

Stakeholder	Answer against core collection
Bangladesh Agricultural Research Institute	Core collection is under consideration
East West Seed Bangladesh Ltd	Collection and evaluation of germplasm
Bangladesh Jute Research Institute	Characterization and evaluation of Jute, Kenaf and Mesta germplasm
Banglasdesh Rice Research Institute	Exchange of rice germplasm with international organizations
Bangladesh Sugarcane Reseaerch Institute	Collection and conservation of indigenous and exotic germplasm of sugarcane
Bangabandhu Sheikh Mujibur Rahman Agricultural University	None

Appendix Table III.13. Information related to improved varieties of some selected crops grown in Bangladesh

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
Rice	IR-6	Improved	Introduced from abroad	1966	All over Bangladesh	Plant height 90-100 cm; Leaf medium in size, thick and upright; Stem, sheath and leaf are all green; Panicle 25 cm in length with 110-130 grains; Life cycle 170-175 days in *Boro* season, 130-135 in *Aus* season. Yield 5.0-5.5 ton/ ha in *Boro* and 4.5-5.0 ton/ha in *Aus* season.
	Purbachi	Improved	Introduced from abroad	1968	All over Bangladesh	Plant height 85-95 cm; Leaves spread out, light green; No of tillers 15-16 with 110-120 grain per panicle; Grain is short but tasteful; Life cycle 110-115 in *Aus* and 140-150 in Boor season. Yield 4.0-4.5 t/ha in *Aus* and 4.5-5.0 t/ha in *Boro* season.
	IR-5	Improved	Introduced from abroad	1969	All over Bangladesh	Plant height 100-110 cm; Leaf upright and green; No. of tillers/plant 12-14 with about 10 panicles per plant. No. of grains per panicle 100-110. Grains short and tasteful; Resistant to blast and stem rot diseases; Life cycle 134-145 days; Optimum time for sowing June 1-30 and transplanting July 1-30; Slightly photosensitive; Yield 5.0-5.5 t/ha.
	IR-20	Improved	Intorduced from abroad	1969	All over Bangladesh	Transplant *Aman* variety; height 100-110 cm. stout and erect plant; Leaf deep green and upright; No. of tillers/plant 15-20 with 12-15 panicles per plant; No. of grains per panicle 115-130. Grain medium slender and tasteful; Resistant to blast and Bakani disease and moderately resistant to Tungru and sheath blast. Occurrence of rice hispa less. Life cycle 130-140 days and slightly photosensitive. Yield 4.5 –5.0 t/ha.
	Chandina (BR-1)	Improved	National	1970	Especially suitable in areas of early flood or after harvest of transplant *Aus*.	Height 75-90 cm; Leaf small and upright; All parts of the plant green; Average no. tillers 12 in *Aus* and 15 in *Boro* season; No. of grains per panicle 110 in *Aus* and 120 in *Boro* season; Grain is short and tasteful; Protein content about 9%. Life cycle 145-150 days; Yield 5.5-6.0 t/ha.
	Mala (BR-2)	Improved	National	1971	All over Bangladesh	Height 105-125 cm depending on season; Plant stout, erect and green all over; Tillers 12 in *Aus* and 15 in *Boro* season; No. of grains/panicle 150 in *Aus* and 180 in Boor season; Grain rize medium, white rice and tasteful; Susceptible to rice hispa but hardly attacked by gall-fly. Tolerant to Tungru, leaf blast and red streak disease in leaf but susceptible to sheath rot and sheath blast. Life cycle 120-125 days in *Aus* and 150-160 days in *Boro* season. Yield 5.0-5.5t in *Aus* and 4.0-4.5t/ha in *Boro*. Difficult in threshing and high percentage of empty grains.
	Biplab (BR-3)	Improved	National	1971	All over Bangladesh	Grown in *Boro*, *Aus* and T.*Aman* season;. Short statured plant. Leaf erect, rough and deep green. Height 90-100 cm depending on the season. Tillers 15-18 in *Boro*, 10-12 in *Aus* and 12-15 in T.*Aman* season. No. of grains per panicle 115-125 in *Boro*, and 90-100 in *Aus* and *Aman* season. Grain size medium and has 8.1 per cent protein. Infestation of Tungru, leaf blast usually not seen. Resistant to most pests, but may be infested by rice hispa. Life cycle 165-170 days in *Boro*, 125-130 days in *Aus* and 140-145 days in *Aman* season. Yield 5.0-5.5 t/ha.
	Brrishail (BR-4)	Improved	National	1975	All over Bangladesh	Height 125 cm; Leaf upright, rough and deep green; Stem stiff and green; Tillers 10-12 per plant, 20-25 cm long; No of grains per panicle 125. The seedling can grow up to 46 cm long and therefore can be transplanted in standing water of 15-20 cm; The grain remain green even when ripe; A photosensitive variety; Highly resistant to diseases, especially against Tungro, Bakani, and blast diseases but can be infested by thrips, dragon fly, Life cycle 145 days. Yield 5.0 t/ha

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
Rice	BR5 (Dulabhog)	Improved	National	1976	All over Bangladesh	Height up to 120 cm; Leaf upright; Stem stiff and does not Lodge easily; No. of tillers 9-10 per plant. The panicle 15-20 cm long; No. of grains/panicle 155-160; Fine grain and can be used for 'polao'. Highly resistant to rice blast, rice Tungro virus and leaf rot disease. Tolerant to insect pest; Life cycle 150 days; Yield 3.0 t/ha.
	BR6 (IR28)	Improved	IRRI	1976	All over Bangladesh	Height 100 cm in *Boro* and 113 cm in *Aus* season; Leaf up right and deep green; stem green and stiff; the stem and leaf remain green even when the grains ripe; Grain long, narrow and white in colour; Life cycle 140 in *Boro* and 110 days in *Aus* season; Yield 4.5 t/ha in *Boro* and 3.5 t/ha in *Aus* season.
	BR7 (Brri Balam)	Improved	National	1976	All over Bangladesh	Height 125 cm; Leaf narrow, long and green; Stem medium size; the stem and leaf remain green even when the grains ripe; No. of tillers per plant 12-15; Grain long, narrow and white in colour; Cooked rice is soft; Moderately tolerant to rice blast and Bakani disease, sheath rot and leaf streak disease not serious; usually not infested by pests; Life cycle 130 days in *Aus* and 155 days in *Boro* season; Yield 4.5 t/ha both in *Boro* and *Aus* season.
	BR8 (Asha)	Improved	National	1978	Especially suitable in areas of hail storms (grains tightly attached to the panicle)	Relatively taller than most modern varieties and can be transplanted in water of 10-15 cm depth. Height 125 cm; Stem and leaf upright and green. Can prevent leaf burning, red streak, sheath rot, and Bakani disease and is moderately resistant to blast disease. Can tolerate iron toxicity; grain medium size, coarse and white in colour; Life cycle 160 in *Boro* and 125 days in *Aus* season; Yield 6.0 t/ha in *Boro* and 5.0 t/ha in *Aus* season.
	BR9 (Shufala)	Improved	National	1978	All over Bangladesh	Height 125 cm; Stem stiff; Leaf long, upright and green; the stem and leaf remain green even when the grains ripe; Seedlings relatively tall and can be transplanted in standing water of 10-15 cm. Grain medium size with protein content 8.3 per cent.; Moderately resistant to leaf burn red streak in leaf blast and Bakani disease; Life cycle 155 days in *Boro* and 120 days in *Aus* season; Yield 6.0 t/ha in *Boro* and 5.0 t/ha in *Aus* season.
	BR10 (Pragati)	Improved	National	1980	All over Bangladesh	Leaf deep green and upright. Seedlings can grow to a height of about 40 cm and can be transplanted in standing water deeper than BR8. Seedlings can be transplanted up to mid September; Grain medium size, narrow and white in colour; Can prevent red leaf streak, blast and Bakani diseases; Moderately prevent brown leaf hopper; Life cycle 150 days and slightly photo sensitive. Yield 6.5 t/ha.
	BR 11 (Mukta)	Improved	National	1980	All over Bangladesh	Height 115 cm; Leaf deep green and upright; Seedlings can grow up to 38 cm in 30 days and can be transplanted in standing water of 20 cm depth; Grain medium size and coarse, cooked rice soft, tasty; Tolerant to leaf burning; red streak in leaf, balst, sheath rot and Bakani disease; moderately photo-sensitive; Life cycle 145 days; Yield 6.5 t/ha in *Aman* season.
	BR 12 (Moyna)	Improved	National	1983	All over Bangladesh	Height 105 cm; Leaf and stem upright; Leaf sheath violet and its border is reddish brown in colour; seedlings attain medium height and tillering medium; Grain medium white but tinged; grain contains 8.01 per cent protein and tasty; more resistant to diseases than other HYVs but can moderately be infested by rice hispa but not seriously; Life cycle 170 days in *Boro* and 130 days in *Aus* season; Yield 5.5 t/ha in *Boro* and 4.5 t/ha in *Aus* season.
	BR14 (Gazi)	Improved	National	1983	All over Bangladesh	Height 120 cm; Seedlings tall and tillering medium; leaf upright but broadens after pollination, leaf remain green until grain ripening stage; the clean grain white, medium coarse and has 8.3 per cent protein, cooked rice is tasty. The grain has medium size awn; resistance to leaf burning and Tungro disease but less resistant to to thrips and rice hispa; Life cycle 160 days in *Boro* and 120 days in *Aus* season. Yield 6.0 t/ha in *Boro* and 5.0 t/ha in *Aus* season.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	BR15 (Mohini)	Improved	National	1983	All over Bangladesh	Height 90 cm in *Boro* and 100 cm in *Aus* season; Leaf and stem upright and green; Seedling short like BR3 and moderate tillering. Plant green and ripened grain straw coloured;. Clean grain medium size, narrow and white in colour Protein content in grain is 8.3 per cent. Resistant to leaf burning and Tugro virus; Life cycle 125 days in *Aus* and 165 days in *Boro*; Yield 5.0.t/ha in *Aus* and 5.5 in *Boro* season.
Rice	BR16 (Shahi Balam)	Improved	National	1983	All over Bangladesh	Height 90 cm in *Boro* and 110 cm in *Aus* season; Leaf and stem upright and modertate tillering; Plant green and grain straw coloured when ripe. Cooked rice is very tasty, narrow and soft and has protein content of 7.8 per cent. Highly resistant to leaf burning and Tungro disease. Life cycle 130 days in *Aus* season and 165 days in *Boro*. Yield 6.0 t/ha in *Boro* and 5.0 t/ha in *Aus* season.
	BR17 (Hashi)	Improved	IRRI	1985	Haor area of Sunamganj and Habiganj	Height 125 cm; Leaf and stem upright; relatively early maturing compared to other HYVs. During anrthesis the panicle lies above the flag leaf; can escape early flood. Clean rice medium size and coarse. Moderately resistant to sheath rot, blast, leaf burning, tungro and stem rot diseases. Life cycle 150 days. Yield 6.0 t/ha.
	BR18 (Shah Jalal)	Improved	Indonesia	1984	Haor area of Sunamganj and Habiganj	Height 114 cm; moderate tillering; leaf broad and more or less upright; flag leaf small but broad and at about 90^0 angle to the stem, in terms of quality it is similar to variety Asha; Clean grain tasty, medium coarse and white in colour. Moderately resistant to rice blast, sheath rot, leaf burning, Tungro and stem rot diseases; Life cycle 170 days. Yield 6.0 t/ha.
	BR19 (Mongal)	Improved	National	1986	Hoaor area of Sunamganj and Habiganj	Height, about 110 cm. Plant upright till ripening; Leaf and stem deep green; Flag leaf short and perpendicular to the stem. At the time anthesis panicle lies above the flag leaf. Grain narrow, long and transparent; Moderately resistant to blast, sheath rot, leaf burning, tungro and stem rot diseases; Life cycle 170 days; Yield 6.0 t/ha.
	BR20 (Nizami)	Improved	National	1986	All over Bangladesh	Plant deep green, height 120 cm; Panicle length 26 cm, grain per panicle 125; Less tillering; Panicle upright at the beginning; Flag leaf 30^0-50^0 angle to the stem; ripe grain deep straw coloured: Clean rice white in colour; medium size, cooked rice is tasty and has 7.8 per cent protein; less susceptible to diseases and insect infestation compared to indigenous varieties but occasionally infested by rice bug and dragon fly; Life cycle 115 days; Yield 3.5 t/ha.
	BR21 (Niamat)	Improved	National	1986	Suitable in areas of heavy rainfall, especially Greater Sylhet, Chittagong, Comilla and Mymensingh districts	Height 100 cm; less tillering but spread from the main stem; Panicle 21 cm long, grains per panicle 110; 1000-grain weight 21.5 gm; grain straw colour; Clean rice medium size; white and with 8.3 per cent protein; Less infestation by insect and diseases; resistant to leaf rot disease; Life cycle 110 days; Yield 3.0 t/ha.
	BR22 (Kiron)	Improved	National	1988	All over Bangladesh	Plant height 120 cm; No. of tillers 8-10; Panicle 25-30 cm; Flag leaf 30- 50° angle with the panicle; Clean rice white in colour; grain medium size and narrow and slightly deeper than straw colour; can be planted from June to mid September. Grain contains 8.9 per cent protein; Moderately resistant to tungro and leaf burning diseases and less infested by pests and diseases as compared to indigenous varieties; Photo sensitive late variety; Life cycle 150 days; Yield 5.0 t/ha.
	BR23 (Dishari)	Improved	National	1988	Moderately tolerant to salinity and suitable for growing in tidal areas of Khulna and Bagerhat as late T. *Aman*	Plant green, height 120 cm; Leaf and stem upright stiff plant; Tillers no. per plant 8-10; Panicle 25-30 cm long; Flag leaf at 35–40ºcm angle with the panicle; Clean grain white in colour, long and slightly deep straw colour; Protein content of grain 8.9 per cent. Seeds tolerant to water submergence; Resistant to Tungro, stem rot, leaf burning and brown leaf hopper; Less disease and insect infestation

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
					crop	compared to indigenous varieties; Life cycle 150 days; Yield 5.5 t/ha.
Rice	BR24 (Rahmat)	Improved	National	1992	All over Bangladesh	All parts of the plant green; Height 105cm; Panicle 22-24 cm long; Grains No. per panicle 156; 1000-grain weight 21 gm; Ripe grain deep golden colour; Clean rice white in colour; More resistant to diseases and insects infestation compared to indigenous varieties; Life cycle 105 days; Yield 3.5 t/ha.
	BR25 (Naya pajam)	Improved	National	1992	All over Bangladesh	Seedling height attained 35-40 cm in one month; Plant height 138 cm; Length of panicle 25-28 cm; No. of grains per panicle 110-125; 1000-grain weight 21 g; No. tillers per plant 8-10; Ripe grain golden in colour but clean rice is white. Resistant to tungro disease; Life cycle 135 days; Yield 4.5 t/ha.
	BR26 (Sraboni)	Improved	National	1992	All over Bangladesh	Stiff stem; panicle remains above the flag leaf at anthesis; Height 115 cm; Clean rice white, long and narrow; slightly sticky; Life cycle 115 days; Yield 4 t/ha.
	BRRI dhan- 27	Improved	National	1994	All over Bangladesh	The leaf sheath towards the base of the plant is purplish; Stiff stem, does not lodge easily; Height 140 cm; grain medium size and coarse; Suitable for non-saline tidal areas both as transplant and broadcast *Aus*; Life cycle 115 days; Yield 4.0 t/ha.
	BRRI dhan- 28	Improved	National	1994	All over Bangladesh, especially as an early variety	Stem and leaf deep green and upright and does not lodge easily; Flag leaf hangs down and panicle stands above, Less infestation of insects and diseases; resistant to blast; plant remains green after grains are ripe; grain light golden in colour; 1000-grain weight 22 g; clean rice slender, transparent and white; cooked rice is non sticky and tasty; Protein content 8.6 and amylose 28 per cent. Life cycle 140 days; Yield 5.0 t/ha.
	BRRI dhan- 29	Improved	National	1994	Especially suitable for areas with a single *Boro* crop. Late *Boro* variety.	Stem and leaf deep green and upright; Height 95 cm, does not lodge bec*Aus*e of stiff stem; Hardly attacked by diseases and insects; moderately resistant to leaf burn and sheath rot diseases; Plant remains green after the grains ripe; Grain light golden in colour; 1000-grain weight 20 g; clean rice moderately slender; cooked rice non-sticky and tasty; Protein content 7 per cent and amylose 29.4 per cent; Life cycle 160 days; Yield 7.5 t/ha.
	BRRI dhan- 30	Improvd	National	1994	All over Bangladesh	Retains the characteristics of BR11 but has taller seedling and plant and more straw yield; Leaf and stem upright and deep green; height 120 cm; does not lodge; Hardly susceptible to diseases and insects; moderately resistant to tungro, stem rot and leaf burn diseases. Plant remains green after grains ripe; rice golden in colour; 1000-grain weight 22 g; grain long, moderately coarse, transparent and white in colour; cooked rice non-sticky, tasty; Protein content 8.7 per cent and amylose 26.7 per cent. Life cycle 145 days; Yield 5.0 t/ha.
	BRRI dhan- 31	Improved	National	1994	All over Bangladesh	In addition to the characteristics of BR 11, it is little early and more vigorous plant; with broader leaf; Stem and leaf deep green and upright; Seedlings attain a height of 30-35 cm in one month; plant height 115 cm; Stiff stem, does not lodge; Less susceptible to diseases and insects; resistant to leaf burn and sheath burn; plant remain green when the grains ripe; Long panicle with dense grains; Grains golden in colour; 1000-grain weight 25 g; clean rice medium in size, transparent and white in colour. Cooked rice non-sticky and tasty; Protein content 8.9 per cent amylose 26.5 per cent; Life cycle 140 days; Yield 5.0 t/ha.
	BRRI dhan- 32	Improved	National	1994	All over Bangladesh	Retains the characteristics of BR 11 but early and resistant to leaf burn. Seedlings and plants taller than BR 11 with higher straw yield; Stem and leaf light green; Flag leaf upright and remains green after grains are ripe; seedlings attain a height of 30-35 cm and plant height 120 cm; Less susceptible to diseases and insects; Resistant to leaf burn and moderately resistant to blast, sheath burn and Tungro virus. Leaf remains green after grains are ripe; Panicle long with dense grains; No. of grains

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
						per panicle 160; Ripe grain golden in colour; 1000-grain weight 22g; Clean rice moderately coarse, transparent and white in colour; Cooked rice non-sticky and tasty; Protein content 7.0 per cent and amylose 26.3 per cent; Life cycle 130 days; Yield 5.0 t/ha.
Rice	BRRI dhan-33	Improved	National	1997	All over Bangladesh	About 10 days earlier than Brridhan 32 and resistant to plant hopper; Leaf broad; the tip of the flag leaf twisted; stem and leaf deep green and upright; seedlings attain a height of 28 cm in one month; Plant height 100 cm; Stem stiff and does not lodge; Less susceptible to diseases and insects; Grain golden in colour; light brown tinge in husk, 1000-grain weight 25 g; clean rice white colour, short and coarse and has whitish tinge at the middle; cooked rice non-sticky and tasty; Protein content 8.7 per cent and amylose 26.7 per cent; Life cycle 118 days; Yield 4.5 t/ha.
	BRRI dhan- 34	Improved	National	1997	All over Bangladesh	An aromatic and photosensitive *Aman* rice variety. All parts of the plant green; Seedlings attain a height of 35 cm and plant height 117 cm; No. of tillers per plant 10; Fine grain with aroma similar to Kalizira variety; 1000-grain weight 10.7 g; Yields more than Kalizira; Moderately resistant to leaf burn and sheath burn diseases. Grain small, narrow, translucent and white; Protein content 8.6 per cent and amylose 23.5 per cent; Life cycle 135 days; Yield 3.5 t/ha.
	BRRI dhan- 35	Improved	National	1998	All over Bangladesh	Stem and leaf deep green and upright. Height 105 cm; stiff stem and does not lodge; Less susceptible to diseases and insects; resistant to brown plant hopper; moderately resistant to leaf burn, sheath rot; sheath scorch and blast diseases; Ripe grain light golden in colour, small and coarse; 1000-grain weight 20 g; grain small, transparent and white. Cooked rice non-sticky and tasty; Protein content 7.5 per cent and amylose 24.2 per cent; Life cycle 155 days; Yield 5.0 t/ha.
	BRRI dhan-36	Improved	National	1998	All over Bangladesh, especially as an early *Boro* variety	Stem and leaf deep green and upright; Plant height 90 cm but stiff and does not lodge; Less susceptible to diseases and insects, resistant to blast disease; Plants remain green after grains ripe; Grain light golden in colour; 1000-grain weight 20 g; rice long and narrow; Cooked rice non-sticky and tasty; Protein content 8.7 per cent and amylose 25.3 per cent; Life cycle 140 days: Yield 5.0 t/ha.
	BRRI dhan-37	Improved	National	1998	All over Bangladesh excluding flood prone areas, tidal and saline areas	An aromatic *Aman* rice variety, similar to Kataribhog but shorter by about 10-15 cm; more sturdy and 5-7 days late; Height 125 cm; stem moderately stiff and does not lodge; Panicle attractive to look at with dense grain; end of the grain slightly bent with awn; less susceptible to diseases and insects; resistant to blast;; grain light golden in colour; 1000-grain weight 16g; clean rice moderately slender, translucent and white; Cooked rice non-sticky and tasty; Protein content 8.5 per cent and amylose 24.0 per cent; Life cycle 140 days; Yield 4.0 t/ha.
	BRRI dhan-38	Improved	National	1998	All over Bangladesh excluding flood prone areas, tidal and saline areas.	An aromatic *Aman* rice variety, similar to Basmati variety but shorter than Basmati by 10-15 cm; sturdy; Height 125 cm; Grain less dense in panicle; tip of the grain slightly bent with awn; Less susceptible to diseases and insects; Resistance to blast disease; grain light golden in colour; 1000-grain weight 22g; Grain long and slender; translucent and white; Cooked rice non-sticky; Protein content 8 per cent and amylose 20.8 per cent; Life cycle 140 days; Yield 3.5 t/ha.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	BRRI dhan-39	Improved	National	1999	All over Bangladesh	Stiff stem, does not lodge; Stem and leaf green; Flag leaf upright, broader and remains green after grain ripe; Seedlings attain a height of 25-30 cm in one month; Plant height 106 cm; Moderately resistant to leaf burn and Tungro disease; Grain golden whitish; 1000-grain weight 22 g; Long and slender grain and translucent -white; Cooked rice non-sticky and tasty; Protein content 7.5 per cent and amylose 27.0 per cent; Life cycle 122 days; Yield 4.5 t/ha.
Rice	BRRI dhan- 40	Improved	National	2003	Especially suitable for coastal areas	Height 110 cm; Sturdy plant; Flag leaf broad; Life cycle similar to kazalshail and earlier than Patanai and Morichshail by 8-15 days; Photosensitive; tall seedlings of 30-50 days can be transplanted in knee deep water; grain medium coarse with a whitish tinge at the middle which disappears after cooking; Tolerant to salinity at 8 δs/meter; Awned; Life cycle 145 days; Yield 4.5 t/ha.
	BRRI dhan-41	Improved	National	2003	Especially suitable for coastal areas	Height 115 cm; Sturdy plant with broad flag leaf like traditional varieties; Late by about a week compared to BRRI dhan 40; Photosensitive; Tall seedlings of 30-50 days can be transplanted in knee deep water; grain medium coarse but longish, translucent-white; Tolerant to salinity of 8 dS/meter; Life cycle 148 days; Yield 4.5 t/ha.
	BRRI dhan 42	Improved	National	2004	All over Bangladesh	Early and drought tolerant *Aus* variety; Plant height 95 cm; 1000 grain weight 24g; The penultimate pubescent; About 20% chalkiness in the unparboiled kernel; Small awn may be present on a few spikelets at the apicle portion of the panicle; Life cycle 98 days; Yield 3.0 to 3.5 t/ha.
	BRRI dhan 43	Improved	National	2004	All over Bangladesh	Early drought tolerant *Aus* variety. Plant height 95 cm; 1000 grain weight 24g; The penultimate leaf pubescent; 20% chalkiness in the unparboiled kernel; Small awn may be present on few spikelets at the apical portion of panicle; Life cycle 101 days; Yield 3.0 to 3.5 t/ha.
	BRRI dhan 44	Improved	National	2005	Especially recommende d for tidal wetland.	Coarse grain; Stem strong enough to prevent lodging; Plant remains green even after maturity; Plant height 125 to 130 cm; 1000 grain weight 29.6 g; Clean rice medium bold and white in colour; Protein and amylose content of clean rice are 10.1% and 26.6% respectively; Modserately submergence tolerant; Life cycle 150-155 days; Yield 4.5 t/ha.
	BRRI dhan 45	Improved	National	2005	All over Bangladesh	Early, bold grain and high yielding *Boro* variety; Stem sturdy; Plant height 98 cm; 1000 grain weight 26.0 g; Flag leaf long and erect; Mature grain light golden in colour; Clean rice medium bold and white in colour; Unparboiled rice has 10% chalkiness; Small awn may be present on the apical grains of the panicle; Cooked rice non-sticky and tasty; Protein and amylose content of clean rice are 7.2% and 27.6% respectively; Life cycle 140 – 145 days; Yield 6.0 – 6.5 t/ha.
	BRRI dhan 46	Improved	Bangladesh	2007	All over Bangladesh	Photosensitive transplanted *Aman* variety, Plant height 105 cm, flag leaf wide erect and long, life duration 124 days, medium bold grain with white belly, 1000 grain weight 25.2g, average yield 4.7 ton/ha.
	BRRI dhan 47	Improved	Bangladesh	2007	Coastal saline area	In seedling stage salinity resistant 14 dS/meter and in growing period 6 dS/meter, plant height 105 cm, flag leaf wide erect and long, life duration 150 days, medium bold grain, having white belly but disappeared after parboiling, 1000 grain weight 27.1 g, yield 6.1 ton/ha.
	BRRI Hybrid dhan 1	Improved	National	2001	Recommende d for Jessore and Barisal regions	Height 100 cm; Stem and leaf deep green and upright; stem stiff and does not lodge; Grain medium in size, slender, translucent-white; cooked rice non-sticky and tasty; Protein content 8.9 per cent and amylose 27.0 per cent; Life cycle 155 days; Yield 8.5 t/ha.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	Iratom-24	Improved	National	1975	All over Bangladesh	Semi dwarf, height 80-85 cm: Strong culm, tillers per plant 10-12; Panicle 20-25 cm; Grains no. 100-110, medium in size, bright in colour; Amylose 25%; Life cycle 140-145 days in *Boro* and 120-125 days in *Aus* season; Yield 5-6 t/ha in *Boro* and 3-3.5 t/ha in *Aus* season. Max yields 8.0 t/ha. Requires low input, suitable for late planting'
	Binasail	Improved	National	1987	All over Bangladesh	Plant, height 135-145 cm; partially susceptible to lodging; Tiller No. per plant 9-11; Panicle 28-30 cm; Grains fine, grains no. per panicle 170-180, bright in colour; Life cycle 140-145 days; Amylose 20%, Yield 4.0-4.2 t/ha, yield 5.0 t/ha.
Rice	Binadhan-4	Improved	National	1998	All over Bangladesh	Plant, height 110-120 cm; No. of tillers 10-12; Panicle 24-26 cm; Grains long, fine, grains no. per panicle 115-125; Amylose 26%; Life cycle 125-135 days; Yield 5-6 t/ha; Max yield 8 t/ha.
	Binadhan-5	Improved	National	1998	All over Bangladesh	Tall plant, height 110-115 cm; No. of tillers 9-11; Panicle 24-26 cm; Grains medium fine, bright in colour; no. of grains per panicle 120-130 with small awn; Amylose 27%; Yield 5-6 t/ha. Max yield 8.0 t/ha.
	Binadhan-6	Improved	National	1998	All over Bangladesh	Tall plant, strong culm, height 115-120 cm; No. of tillers 9-11; Panicle 25-27 cm; Grain medium coarse, bright in colour, no grains per panicle 140-150; Amylose 26%; Yield 5.5-6.5 t/ha. Max yield 9 t/ha.
	BAU Rice-2	Improved	National		All over Bangladesh	Height 95-105 cm; Time to maturity 140-150 days, with late planting 130-140 days; Tolerant to drought; Gives relatively good yield with low doses of fertilizers; Empty grains very little (5-6%); Seed bright golden in colour, medium size.
Some recommen-ded traditional Rice Varieties	Kataktara	Traditional	National	1924	All over Bangladesh	Broadcast *Aus*, upland variety.
	Tilak Kachari	Traditional	National	1924	All over Bangladesh	Transplant *Aman* variety
	DA-31	Traditional	National	1932	All over Bangladesh	Transplant *Aman* variety
	Panbira	Traditional	National	1932	All over Bangladesh	Upland *Aus* variety
	Patnai-23	Traditional	National	1933	All over Bangladesh	Transplant *Aman* variety
	Latishail	Traditional	National	1934	All over Bangladesh	Transplant *Aman* variety
	Dharial	Traditional	National	1936	All over Bangladesh	Upland *Aus* variety
	Dular	Traditional	National	1940	All over Bangladesh	Upland *Aus* variety
	Marichbati	Traditional	National	1941	All over Bangladesh	Upland *Aus* Variety
	Tupa *Boro* (Habihanj *Boro*-II)	Traditional	National	1942	All over Bangladesh	Local *Boro* variety
	Khaiya *Boro* (Habiganj *Boro* IV)	Traditional	National	1944	All over Bangladesh	Local *Boro* variety
	Hashikalmi	Traditional	National	1944	All over Bangladesh	Upland *Aus* variety
	Nizershail	Traditional	National	1944	All over Bangladesh	Transplant *Aman* variety
	Katya-bagdar (Habiganj *Aman*-I)	Traditional	National	1944	All over Bangladesh	Broadcast *Aman* Variety
	DA-29	Traditional	National	1945	All over Bangladesh	Transplant *Aman* variety
	Rajashail	Traditional	National	1945	All over Bangladesh	Transplant *Aman* variety
	Goai (Habiganj *Aman* III)	Traditional	National	1946	All over Bangladesh	Broadcast Deep water *Aman* variety
	Dudhlaki (Habiganj *Aman* IV)	Traditional	National	1946	All over Bangladesh	Broadcast deep water *Aman* variety
	Dhola *Aman* (Habiganj *Aman* IV)	Traditional	National	1946	All over Bangladesh	Broadcast deep water *Aman* variety
	Godalaki (Habiganj Aman II)	Traditional	National	1946	All over Bangladesh	Broadcast *Aman* variety

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	Pashushail (Habiganj *Boro* V)	Traditional	National	1949	All over Bangladesh	Local *Boro* variety
	Lal *Aman* (Habiganj *Aman* VIII)	Traditional	National	1955	All over Bangladesh	Broadcast *Aman* variety
	Pajam	Traditional	Import-ed	1976	All over Bangladesh	Transplant *Aman* variety
Wheat	Inia-66	Improved	CIMMYT, Mexico	1972	All over Bangladesh	Plant height 80-85 cm; Stem stiff, straight upright; Spike length 9.5-10 cm; No. of spikelets/spike 30-35; 1000-grain weight 40-45 g; grain red in colour; moderately susceptible to leaf rust; Life cycle 105-107 days; Yield 3.5-3.7 t/ha. Protein content 13%.
	Nortona-67	Improved	CIMMYT, Mexico	1974	All over Bangladesh	Plant height 80-85 cm; Stem stiff, tall and thick; Spike length 10.0-10.5 cm; No. spikelets/spike 30-36; 1000-grain weight 40--46 g; Grain white colour; Life cycle 105-107 days; Protein content 12.5%.
	Sonalika	Improved	CIMMYT, Mexico	1973	North and northwest parts of Bangladesh	Plant height 85-90 cm; Stem stiff, tall and upright, moderately resistant to lodging; Length of spike 9.5- 10 cm; No. of spikelets/ spike 25-30; 1000-grain weight 48--52 g; Grain white colour; Susceptible to leaf rust; Life cycle 100-104 days; Protein content 12%.
	Nuri-70	Improved	CIMMYT, Mexico	1975	North and northwest parts of Bangladesh	Did not become popular and discontinued
	Tanori-71	Improved	CIMMYT, Mexico	1973	Can be cultivated only in eastern parts of Banglaxdesh	Plant height 80-85 cm; Stem stiff, medium tall and upright; Length of spike 8.5-9.0 cm; No.of spikelets/ spike 30-35; 1000-grain weight 38-42 g; Grain red colour; Life cycle 102-106 days; Protein content 12.2%.
	Jupatico-73	Improved	CIMMYT, Mexico	1973	Northwest and southwest parts of Bangladesh	Plant height 80-85 cm; Stem stiff, medium tall and upright ; Length of spike 10.0-11.0 cm; No. of spikelets/ spike 30-35; 1000-grain weight 38-42 g; Grain red colour; Life cycle 102-106 days; Protein content 12%.
	Balaka	Improved	CIMMYT, Mexico	1979	All over Bangladesh	Plant height 75-80 cm; Stem relatively short, stiff, upright; Length of spike 8.5-9.0 cm; No. of spikelets/ spike 30-35; 1000-grain weight 40-45 g; Grain white colour; Life cycle 105-110 days; Protein content 13.5%.
	Doel	Improved	CIMMYT, Mexico	1979	All over Bangladesh except the coastal region	Plant height 85-90 cm; Stem medium tall, stiff and upright; 1000-grain weight 40-47 g; Grain white colour; Life cycle 107-112 days; Protein content 13.2%.
	Pavon-76	Improved	CIMMYT, Mexico	1979	Northwest and southwest parts of Bangladesh	Plant height 90-95 cm; Stem stiff and upright; Leaf deep green; Length of spike 10.0-11.0 cm; 1000-grain weight 35-40 g; Grain white colour; Life cycle 107-112 days; Protein content 12.5%.
	Ananda (BAW-18)	Improved	CIMMYT, Mexico	1983	All over Bangladesh but not recommended for southern parts of Bangladesh	Plant height 95-100 cm; Stem stiff and upright; 1000-grain weight 35-38g; Grain white colour; Life cycle 103-108 days; Protein content 12.75%.
	Kanchan (BAW-28)	Improved	CIMMYT, Mexico	1983	All over Bangladesh	Plant height 95-100 cm; Stem stiff and upright, spread at the base ; Length of spike 9.0-10.5; No. of grains / spike 40-45; 1000-grain weight 48-52g; Grain white colour; Life cycle 103-108 days; Protein content 12.75%.
	Barkat (BAW-39)	Improved	CIMMYT, Mexico	1983	All over Bangladesh but not recommended for the southern parts of Bangladesh	Plant height 85-95 cm; Stem stiff and upright; Length of spike10.0-11.0; No. of grains / spike 40-42; 1000-grain weight 38-42g; Grain white colour; Life cycle 105-110 days; Protein content 12.5%.
	Akbar (BAW-43)	Improved	CIMMYT, Mexico	1983	All over Bangladesh but not recommended for the southern parts of Bangladesh.	Plant height 85-90 cm; Stem stiff, tall and upright; Length of spike10.0-11.0; No. grains / spike 40-44; 1000-grain weight 38-42 g; Grain white colour; Life cycle 103-108 days; Protein content 13%.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	Aghrani (BAW-38)	Improved	CIMMYT, Mexico	1987	All over Bangladesh but not recommended for the southern parts of Bangladesh.	Plant height 85-90 cm; Stem stiff, tall and upright; Length of spike10.5-11.0; No. of grains / spike 43-46; 1000-grain weight 38-42 g; Grain white colour; Life cycle 105-111 days; Protein content 12.75%.
Wheat	Prativa	Improved	CIMMYT, Mexico	1993	All over the Bangladesh	Plant height 85-95 cm; No. grains / spike 35-45; 1000-grain weight 42-48 g; Grain white colour; Life cycle 105-110 days; Leaf rust and leaf spot tolerant.
	BARI Gom-19 (Sourav)	Improved	CIMMYT, Mexico	1998	All over the Bangladesh	Plant height 90-100 cm; dark green and broad leaf; Stem thick and hard; No. of grains / spike 42-48; 1000-grain weight 40-45 g; Grain white colour; Life cycle 102-110 days;
	BARI Gom-20 (Gourab)	Improved	CIMMYT, Mexico	1998	All over the Bangladesh	Plant height 90-102 cm; No. grains / spike 45-50; 1000-grain weight 40-48 g; Grain white in colour; Life cycle 100-108 days;
	BARI Gom-21 (Shatabdi)	Improved	CIMMYT, Mexico	2000	All over the Bangladesh	Plant height 95-100 cm; Tiller/plant 5-6; Leaf colour light green; Flag leaf light green; Heading 65-68 days; No. of grain / spike 40-45; Grain colour white and bold; 1000 grain weight 46-48 gm; Life cycle 105-112 days
	BARI Gom-22 (Sufi)	Improved	Bangladesh	2005	All over the Bangladesh	Plant colour dark green with medium no. of hair in the upper cum ; Leaf are broad; Grain colour white, 1000 grain weight 36-46 gm; Life cycle 100-110 days; Protein 11%
	BARI Gom-23 (Bijoy)	Improved	Nepal	2005	All over the Bangladesh	Grain colour white, bold and large in size; 1000 grain weight 47-52 gm; Life cycle 103-112 days; Protein 11-12%; Resistant to leaf rust and tolerant to bipolaris leaf blight
	BARI Gom 24 (Prodip)	Improved	Nepal	2005	All over the Bangladesh	Heading 64-66 days; Grain colour white and large, 1000 grain weight 50-57 g; Life cycle 102-110 days; Protein 12.8%; Resistant to leaf rust and tolerant to bipolaris leaf blight
Maize	Khoi-Bhutta	Improved	Thailand	1986	All over Bangladesh	Plant medium tall with sparse canopy; Cob narrow and medium size; Grains small. !00-grain weight 14.4 g. The top of the cob usually do not have any grains. Life cycle 126-130 days
	Shuvra	Improved	CIMMYT, Mexico	1986	All over Bangladesh	Plant height is taller than common variety, 180 cm in *Rabi* and 200 cm in *Kharif* season. Grains white colour, large in size. ; The top of the cob bears grains; Leaves above the cob are smaller and narrower than below; Life cycle 126-130 days.
	Barnali	Improved	Pakistan	1986	All over Bangladesh	Plant height is taller than common variety, 201 cm in *Rabi* and 213 cm in *Kharif* season. Grains golden-yellow in colour; The top of the cob is narrow and cob size is large; Leaves are dark green and broad; Life cycle 125-145 days in *rabi* season and 95-105 days in *Kharif* season.
	Mohor	Improved	CIMMYT, Mexico	1990	All over Bangladesh	Plants height is 205 cm in *Rabi* and 220 cm in *Kharif* season. Grains dark-yellow in colour and large size; The cob is thick and long; Leaves are dark green and long; Life cycle 136-144 days in *rabi* season and 95-105 days in *Kharif* season.
	BARI Maize-5	Improved	Nigeria	1997	All over Ba ngladesh	Grain colour is yellow; 1000 grain weight 290-310 g; Life cycle 135-155
	BARI Maize-6	Improved	CIMMYT, Mexico	1998	All over Bangladesh	1000 grain weight 315-325 g; Life cycle 145-150 days in *rabi* season and 95-105 days in *Kharif* season
	BARI Maize-7	Improved	CIMMYT, Mexico	2002	All over Bangladesh	Time of tassel emergence- 82 (days), Anthocyanin in anthers-Weak, Time of silk emergence- 89 (days,) Seed color-Yellow
	BARI Hybrid Bhutta-1	Improved	Thailand	2002	All over Bangladesh	Plant height 190-210 cm; Grain colour is yellow and large; 1000 grain weight 570-580 g; Life cycle 135-145 days in *rabi* season and 95-105 days in *Kharif* season
	BARI Hybrid Bhutta-2	Improved	CIMMYT, Mexico	2004	All over Bangladesh	Plant height 225-235 cm in summer and 115-120 cm in winter; Grain colour is orange-yellow; 1000 grain weight 392 g; Life cycle 128-142 days in winter season.
	BARI Hybrid Bhutta-3	Improved	CIMMYT, Mexico	2002	All over Bangladesh	Plant height is medium tall, 70-75 cm. Grains white in colour; resistant to root rot disease; Life cycle is 85-100 days.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	BARI Hybrid Bhutta-5	Improved	CIMMYT, Mexico	2006	All over Bangladesh	Plant height is 195-200 cm in summer and 110-115 cm in winter; Grains are orange-yellow colour; 1000 grains weight 325-330 g; Life cycle is 148-153 days in winter and 95-105 days in summer.
	BARI Hybrid Bhutta-6	Improved	CIMMYT, Mexico	2006	All over Bangladesh	Average plant height 207 cm in winter; Grains are yellow, 1000-grain weight 372 g; Life cycle is 137 days in winter.
	BARI Hybrid Bhutta-7	Improved	CIMMYT, Mexico	2006	All over Bangladesh	Average plant height 216 cm in winter; Grains are orange-yellow, fint; 1000 grain weight 378 g; Life cycle is 144 days in winter.
Proso millet	Tushar	Improved	France	1989	All over Bangladesh	Plant height 120 cm; Seed colour is yellow and medium size; resistant to root rot disease; Life cycle is 105- 115 days in *rabi* season and 95-105 days in *Kharif* season.
Foxtail Millet	Titas	Improved	Bangladesh	1989	All over Bangladesh	Plant height is medium; 1000 seed weight 2.3-2.5 g; Life cycle is 105- 115 days in *rabi* season and 85-95 days in *Kharif* season.
	BARI Kaon-2	Improved	Bangladesh	2001	All over Bangladesh	Plant height is medium; 1000 seed weight 2.3-2.5 g; Life cycle is 120 days.Yield 3.0 t/ha
	BARI Kaon-3	Improved	Bangladesh	2001	All over Bangladesh	Plant height short; Mutant variety; Life cycle is 120 days.Yield 2.50 t/ha
Barley	BARI Barley-1	Improved	CIMMYT, Mexico	1994	All over Bangladesh	Plant height 85-90 cm; Seed colour is golden; 1000 grain weight 36-38 g; Life cycle is 108-112 days.
	BARI Barley-2	Improved	CIMMYT, Mexico	1994	All over Bangladesh	Plant height is medium; Seed colour is golden; 1000 grain weight 38-40 g; Protein content 12-14%.
	BARI Barley-3	Improved	CIMMYT, Mexico	2001	All over Bangladesh	Plant height is medium; Seed colour is golden; 1000 grain weight 34-36 g; Protein content 12-14%, hull-less.
	BARI Barley-4	Improved	CIMMYT, Mexico	2001	For saline area	Plant height is medium; Seed colour is golden; 1000 grain weight 35-38 g; Protein content 12-14%..
	BARI Barley-5	Improved	Bangladesh	2005	For less fertile& drought area	Plant height is medium; Seed colour is golden; 1000-grain weight 36-38 g; Protein content 12-14%.
	BARI Barley-6	Improved	Bangladesh	2005	For less fertile& drought area	Plant height is medium; Seed colour is golden; 1000 grain weight 35-38 g; Protein content 12-14% hull-less.
Mustard	Safal	Improved	National	1991	All over Bangladesh	Plant height 180 cm and Yellow seed coat. Crop duration 90 days. Seed yield 1.7 t/ha, Oil content 43%.
	Agrani	Improved	National	1991	All over Bangladesh	Height 160 cm, yellow seed coat; crop duration 85 days, seed yield 2.0 ton/ha; oil content 44%.
	BINA Shariisha 3	Improved	National	1997	All over Bangladesh	Height 97 cm; brown seed coat; crop duration 85 days; oil content 44%. Low erucic acid.
	BINA sharisha 4	Improved	National	1997	All over Bangladesh	Plant height 80 cm; brown seed coat; crop duration 90 days; seed yield 2.0 t/ha, oil content 44%. Low erucic asid.
	BINA sharisha 5	Improved	National	2002	Saline area	Height 85 cm; salt tolerant; crop duration 90 days; oil content 42%.
	BINA sharisha 6	Improved	National	2002	Saline area	Height 130 cm; salt tolerant; moderately crop duration 95 days; seed yield 1.40 t/ha.
	Shampad	Improved	National	-	All over Bangladesh	Yellow colour, seed yield 1.52 – 2.0 t/ha;
	Shambal	Improved	National	-	All over Bangladesh	Seed brown colour, yield 1.2-1.8 t/ha.
	Tori-7	Improved	Bangladesh	1976	All over Bangladesh	Plant height 60-75 cm; No. of siliquae/plant 100-150, Seed colour is brown; 1000 seeds weight 2.65 g, Oil content is 41% and protein 25.5%; Life cycle 70-80 days.
	Sonali (SS-75)	Improved	Bangladesh	1979	All over Bangladesh	Plant height 90-100 cm; No. of primary branche 4-5, No. of seed per fruit 35-40; 1000 seeds weight 3.75 g, Oil content is 44% and protein 26.6%; Life cycle 90-100 days.
	Kalyaniia (TS-72)	Improved	Bangladesh	1979	All over Bangladesh	Plant height is 75-90 cm; No. of siliquae/ plant 90-150, Seed colour is reddish brown; 1000 seed weight 1.8g, Oil content is 40% and protein 24.8%; Life cycle 95-105 days.
	Doulat (RS-81)	Improved	India	1998	All over Bangladesh	Plant height is 100-110 cm; No. of primary branches 4-8; No. of siliquae/plant 115-125; No. of seed per fruit 10-15; 1000 seed weight 2-2.5 g; seed colour is reddish brown; Oil content is 39-40% ; Life cycle 90-105 days; resistant from Alternaria blight disease.
	BARI Sarisha-6 (Dholi)	Improved	Bangladesh	1994	All over Bangladesh	Plant height is 100-117 cm; No. of primary branches 4-7; No. of siliquae/plant 95-130; No. of seed per fruit 22-25; 1000 seed weight 3-4 g; seed colour is yellow; Oil content is 44-45% ; Life cycle 90-100 days.

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	BAR I Sharisha- 7 (Napus 3142)	Improved	Bangladesh	1994	All over Bangladesh	Plant height is 80-100 cm; No. of primary branches 4-5; Flower colour is white; No. of siliquae/ plant 90-125; No. of seed per fruit 25-30; 1000 seeds weight 3.4-3.6 g; seed colour is purple black; Oil content is 42-45% ; Life cycle 90-100 days, resistant to Alternaria blight disease and moderately tolerant to water lodging.
	BAR I Sharisha- 8 (Napus 8509)	Improved	Bangladesh	1994	All over Bangladesh	Plant height is 90-110 cm; No. of primary branches 4-5; Flower colour is yellow; No. of siliquae/ plant 90-125; No. of seed per fruit 25-30; 1000 seed weight 3.4-3.6 g; seed colour is black; Oil content is 43-45% ; Life cycle 90-95 days, resistant to Alternaria blight disease and moderately tolerant to water lodging.
	Rai-5	Improved	Bangladesh	1976	All over Bangladesh	Plant height is 120-135 cm; No. of siliquae/ plant 90-150, Seed colour is reddish brown; 1000 seed weight 1.8g, Oil content is 40% and protein 24.8%; Life cycle 95-105 days.
Niger	Shova (Nig-1)	Improved	Bangladesh	2002	All over Bangladesh	Plant height is 80-85 cm; No. of primary branches 5-9; No. of siliquae/ plant 25-30; No. of seed per fruit -30-35; 1000 seed weight 3.27-3.37 g; seed colour is black; Oil content is 40% ; Protein content is 20-25%; Life cycle 95-105 days,
Sesame	T-6	Improved	Bangladesh	1976	All over Bangladesh	Plant height is 85-100 cm; 1000 seeds weight 2.5-2.7 g; seed colour is black; Life cycle 85-90 days,
	BARI Til-2	Improved	Bangladesh	2001	All over Bangladesh	Plant height is 100-120 cm;; seed colour is black; Life cycle 90-100 days, 60-70 seed per pod.
	BARI Til-3	Improved	Bangladesh	2001	All over Bangladesh	Plant height is 100-110 cm; 1000 seeds weight 2.5-2.7 g; seed colour is black; Life cycle 90-100 days, 50-55 seed per pod.
	BINA Til-1	Improved	National	2002	All over Bangladesh	Crop duration 85-90 days; yield 1.5-1.8 t/ha; capsule large size.
Groundnut	Dhaka-1	Improved	Bangladesh	1976	All over Bangladesh	Erect plant height 30-40 cm; No. primary branches 6-8; Seed size medium, round and light brown colour; Crop duration 140-150 days (*rabi*) and 120-130 days (*Kharif*).
	DG-2	Improved	*Au*stralia	1979	All over Bangladesh	Plant height 30-35 cm; No. primary branches 8-10; Seed size large, long and reddish brown colour; Crop duration 150-160 days; Resistant to root rot, stem rot and leaf spot .
	Zhinga Badam	Improved	Bangladesh	1988	All over Bangladesh	Plant height 35-50 cm and erect; No. of primary branches 5-8; Seed size medium, flat and light brown colour; Crop duration 145-155 days (*rabi*) and 130-140 days (*Kharif*). Tolerant to drought.
	Tridana Badam	Improved	India	1987	All over Bangladesh	Plant height 10-12 cm; No. of primary branches 6-7; Seed size medium, long and dark red colour; 100 seed weight 26-28 g; Crop duration 105-115 days
	BARI China-badam-5	Improved	Bangladesh	1998	All over Bangladesh	Plant height 10-12 cm; No. of primary branches 6-7; Seed size medium, long and dark red colour; 100 seed weight 26-28 g; Crop duration 105-115 days.
	BARI China-Badam-6	Improved	ICRISAT, India	1998	All over Bangladesh	Plant height 35-40 cm; Seed size large, 100 seed weight 50-55 g; Crop duration 140-150days (*rabi*) and 120-130 days (*Kharif*). Oil content 50-52% and protein 25-26%
	BINA Chinabadam-1	Improved	National	-	All over Bangladesh	Plant heigtht 50-55 cm; (*Rabi*); 20-25 cm (*Kharif*); pod per plant 20-30; 100 pod weight 60-80; crop duration 145-150 days (*Rabi*); 125-130 days (*Kharif*); yield 2.0-2.5 t/ha.
	BINA Chinabadam 2	Improved	National	2000	All over Bangladesh	Plant height 40-45 cm; pod per plant 20-30; 100 pod weight- 60-80 g; yield 2-2.5 t/ha (*Kharif*)
	BINA Chinabadam 3	Improved	National	2000	All over Bangladesh	Plant height 45-50 cm (*Rabi*); 20-25cm (*Kharif*); 100 pod weight 60-80 g; crop duration 150-160 days (*Rabi*); seed yield 2.0-2.5 t/ha (*Kharif*).
Sun-flower	Kironi (DS-1)	Improved	Poland	1982	All over Bangladesh	Plant height 90-110 cm; Seed size long and flat, 1000 seed weight 60-65 g; Crop duration 100-110 days. Oil content 42-44%.
Soybean	Bangladesh Soybean- 4	Improved	AVRDC, Taiwan	1994	All over Bangladesh	Medium height, 60-65 cm; Time to flowering 60-70 days; Time to maturity 120-220 days; Seed small, light green and creamy in colour; 100 seed weight 60-70 g.
	Shohag	Improved		1991	All over Bangladesh	Medium height, 50-60 cm; 100 seeds weight 11-12 g; seed colour is bright yellow colour; Time to maturity 100-110 days;

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Mung bean	Kanti (BARI Moog-2)	Improved	Philippines	1987	All over Bangladesh	Plant height 40-45 cm; Crop duration 60-65 days; smooth, green seed coat colour, Tolerant to CLS and MYMV. 1000 seed weight 30-40 g.
	Progot i (BARI Moog-3)	Improved	Bangladesh	1996	All over Bangladesh	Plant height 50-55 cm; Crop duration 60-65 days; smooth, brownish green seed coat colour, Tolerant to CLS and MYMV. 1000 seed weight 28-29 g.
	Rupsha (BARI Moog-4)	Improved	Bangladesh	1996	All over Bangladesh	Plant height 50-55 cm; Crop duration 60-65 days; smooth, green seed coat colour, 1000 seed weight 28-32 g.
Mung bean	Taiwani (BARI Moog-5)	Improved	AVRDC, Taiwan	1996	All over Bangladesh	Crop duration 60-65 days; dark green seed coat colour, 1000 seed weight 40-42 g.
	BINA moog-1	Improved	National	1992	All over Bangladesh	Plant height 30-50cm; crop duration 90-95 days; tolerant to YMV diseases; seed coat golden colour.
	BINA moog-2	Improved	National	1994	All over Bangladesh	Plant height 45-60 cm; crop duration 70-80 days; seed coat colour dull green; yield 1.4 t/ha.
	BINA moog-3	Improved	National	1997	All over Bangladesh	Plant height 30-35 cm; crop duration 80-85 days; pod cylindrical;
	BINA moog-4	Improved	National	1997	All over Bangaldesh	Plant height 28-30 cm; crop duration 75-80 days; pod colour dull green; yield 1.1 t/ha.
	BINA moog-5	Improved	National	2005	All over Bangladesh	Plant height 30-40 cm; early maturing 64-68 days. Green shiny seed coat. yield 1.1 t/ha.
	BINA moog-7	Improved	National	2005	All over Bangladesh	Plant height 48-52 cm; light green leaf colour; tolerant to CLS and MYMV; yield 1.8 t/ha.
Gram (Chick pea)	BARI Sola -1 (Nabin)	Improved	ICRISAT, India	1987	All over Bangladesh	Plant height 65-70 cm; 100 seed weight 11.8 g; Protein content 20%.
	BARI Sola-2 (Baral)	Improved	ICRISAT, India	1993	All over Bangladesh	Seed colour light brown; 1000 seed weight 140-150 g; Protein content 23-27% Life cycle 120-130 days
	BARI Sola-3 (Barendra)	Improved	ICRISAT, India	1993	All over Bangladesh	1000 seed weight 185-195 g; Protein content 23-26% Life cycle 115-125 days
	BARI Sola-4 (Jora phul))	Improved	ICRISAT, India	1996	All over Bangladesh	Plant height 50-60 cm; Seed colour light brown; 1000 seed weight 132-138 g; Protein content 18-21% Life cycle 120-125 days
	BARI Sola-5 (Pabnai)	Improved	Bangladesh	1996	All over Bangladesh	Plant height 45-50 cm; Seed colour grey brown; 1000 seed weight 110-120 g; Protein content 20-22% Life cycle 125-130 days
	BARI Sola-6 (Navarun)	Improved	ICRISAT, India	1996	All over Bangladesh	Plant height 55-60 cm; Seed colour brown-yellow; 1000 seed weight 155-165 g; Protein content 19-21% Life cycle 125-130 days
	Hyprosola	Improved	National	1981	All over Bangladesh	Height 59-55 cm; Deep green leaf; 100 seed weight 7.5 g; yield 1800 kg/ha.
	BINA sola 2	Improved	National	1994	All over Bangladesh	Plant height 70-85 cm; late maturity 100 seed weight 17 g; yield 1700 kg/ha;
	BINA sola 3	Improved	National	2001	All over Bangladesh	Plant height 60-65 cm; days to maturity 115; 100 seed weight 16.5 g; yield 2100 kg/ha.
	BINA sola 4	Improved	National	2001	All over Bangladesh	Plant height 55-65 cm; days to maturity 120-125; yield 2250 kg/ha.
Blackgram	BARI Mash-1 (Pantha)	Improved	India	1990	All over Bangladesh	Plant height 32-36 cm; Seed colour black-brown; 1000 seed weight 38-43 g; Protein content 21-23% Life cycle 65-70 days
	BARI Mash-2 (Sharot)	Improved	India	1996	All over Bangladesh	Plant height 33-35 cm; Seed colour black; 1000 seed weight 32-36 g; Protein content 21-24% Life cycle 65-70 days
	BARI Mash-3 (Hemanta)	Improved	India	1996	All over Bangladesh	Plant height 35-38 cm; Seed colour black; 1000 seed weight 40-45g; Protein content 21-24% Life cycle 65-70 days
	BINA Mash-1	Improved	National	1994	All over Bangladesh	Height 20-25 cm; crop duration 80-85 days; yield 1.6 t/ha.
Lentil	BARI Mashur-1	Improved	Bangladesh	2001	All over Bangladesh	Flower colour is white; Crop duration 105-110 days; 1000 seed weight 12-13 g; Protein content 27- 29%.
	BARI Mashur-2	Improved	ICARDA, Syria	1996	All over Bangladesh	Seed colour is black spotted; Crop duration 100-105 days; 1000 seed weight 22-25 g; Protein content 24- 26%.
	BARI Mashur-3	Improved	Bangladesh	1996	All over Bangladesh	Flower colour is violate; Crop duration 110-115 days; 1000 seed weight 18-20 g; Protein content 24- 26%.
	BARI Mashur-4	Improved	ICARDA, Syria	1996	All over Bangladesh	Leaf color Light green Flower color Purple Seed color red brown1000 seed weight 18-20 g.
	BINA Mashur-1	Improved	National	2001	All over Bangladesh	Crop duration 125-130 days; Black seed coat; yield 1.8 t/ha.
	BINA Mashur-2	Improved	National	2005	All over Bangladesh	Early maturing 98-101 days; yield 1.9 ton/ha.
	BINA Mashur-3	Improved	National	2005	All over Bangladesh	Deep green leaf; 1000 seed weight 20.5 g; yield 1.72-2.0 t/ha.
Grass pea	BARI Khesari-1	Improved	Bangladesh	1995	All over Bangladesh	Crop duration 125-130 days; Seeds contain low BOAA (0.22%); Seed coat with small black spots; 1000 seed weight 48- 52 g.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	BARI Khesari-2	Improved	Bangladesh	2001	All over Bangladesh	Flower colour is blue; Crop duration 125-130 days; Seeds contain low BOAA (0.22%); Seed coat light grey with small black spots; Protein content 24- 26%.
	BINA Kheshari 1	Improved	National	2001	All over Bangladesh	Crop duration 110-115 days; yield 1.9 t/ha.
Onion	BARI Peaz-1	Improved	Bangladesh	1996	Bangladesh	Plant height 50-55 cm with 10-12 leaves; Bulb weight 30-40 g; bulb diameter-4-5 cm; Bulb round and medium, reddish in colour and highly pungent.
	BARI Peaz-2	Improved	Bangladesh	2000	India	Plant height 25-30 cm; bulbs are round in shape and reddish in colour; Bulb weight: 22- 25g.
	BARI Peaz-3	Improved	Bangladesh	2000	India	Plant height-30-40 cm. Bulb weight-18-22 g, Bulb shape- round, Bulb color-reddish.
Fenugreek	BARI Methi-1	Improved	Bangladesh	2000	Bangladesh	Plant height- 55-60 cm, Pod/plant- 40-45, Pod length 7-9 cm, seed/pod- 10-12,
Turmeric	BARI Halud-1	Improved	Bangladesh	1988	Bangladesh	Plant height- 85-90 cm, number of leaf 7-8, Stump wt.- 125-130 gm, Color deep yellow.
	BARI Halud-2	Improved	Bangladesh	1988	Bangladesh	Plant height- 85-87 cm, Stump wt.- 85-90 g, Color deep yellow.
	BARI Halud-3	Improved	Bangladesh	2000	Bangladesh	Plant height- 110-125 cm, Stump wt.-150-180 g , Color deep yellow.
Garlic	BARI Rasun-1	Improved	Bangladesh	1998	Bangladesh	Plant height- 63 cm, Bulb weight (avg): 20 g, life cycle: 140-150 days,
Chilli	BARI Morich –1	Improved	Bangladesh	2001	AVRDC, TAIWAN	Plant height- 30-35 cm, Dwarf and bushy type, Flower- white in colour, Pod length- 5.5-6.5 cm, Pod diameter- 2.5-3.5 cm.
Black pepper	BARI Golmorich-1	Improved	Malaysia		Sylhet and Chittagong	Hot and pungent, main vine is 10-12 cm and regular bearer.
Tomato	BARI Tomato-1 (Manik)	Improved	AVRDC, Taiwan	1985	All over Bangladesh	Height 100-110 cm; Fruit oblong, Fruit weigh 85-95 g; Fruits/ plant 25- 30; Life cycle 105-110 days.
	BARI Tomato-2 (Ratan)	Improved	AVRDC, Taiwan	1985	All over Bangladesh	Height 75-85 cm; Crop duration 105-110 days; Fruit round shape, Fruit weight 85-90 g; Fruits/ plant 30-35; Life cycle 105- 110 days.
	BARI Tomato-3	Improved	Bangladesh	1996	All over Bangladesh	Height 100-110 cm; Fruit shape slightly flat, Average Fruit weight 80-90 g; Fruits/ plant 30-32; Life cycle 110- 115 days.
	BARI Tomato-4	Improved	AVRDC, Taiwan	1988	All over Bangladesh	Fruit shape round and red colour. Average Fruit weight 35-40 g; Fruits/ plant 20-25; Life cycle 90-95 days.
	BARI Tomato-5	Improved	AVRDC, Taiwan	1988	All over Bangladesh	Fruit heart shape, Fruit weight 40-50 g; Fruits/ plant 20-22; Life cycle 95-100 days.
	BARI Tomato-6 (Chaiti)	Improved	AVRDC, Taiwan	1998	All over Bangladesh	Height 120-130 cm; Fruit shape round and light reddish, Fruit weight 80-90 g; Average Fruits/ plant 30-32; Life cycle 100- 110 days.
	BARI Tomato-7 (Apurba)	Improved	AVRDC, Taiwan	1998	All over Bangladesh	Fruit colour is dark yellow and orange and slightly flat, Fruits/ plant 30-32; Life cycle 100-110 days.
	BARI Tomato-8 (Shila)	Improved	AVRDC, Taiwan	1998	All over Bangladesh	Fruit square to round shape; Fruit colour light red; Average Fruit weight 100-115 g; Fruits/ plant 25-30; Life cycle 100- 110 days.
	BARI Tomato-9 (Lalima)	Improved	AVRDC, Taiwan	1998	All over Bangladesh	Fruit egg shape; Fruits/ plant 32-35; Life cycle 95- 105 days.
	BARI Tomato-10 (Anupama)	Improved	Bangladesh	1998	All over Bangladesh	Fruit egg shape; Average Fruit weigh 25-30 g; Fruit/ plant 75-80; Life cycle 90- 100 days.
	BARI Tomato-11 (Jhumka)	Improved	AVRDC, Taiwan	1999	All over Bangladesh	Cherry type, Fruits are small; 8-10 g each; Plum shaped; Clustered (15-20 fruits/ cluster).
	BARI Tomato-12 (Sidur)	Improved	AVRDC, Taiwan	1999	All over Bangladesh	Fruits are medium flattened and turns to bright red on full ripping.
	BARI Tomato-13	Improved	Bangladesh	1999	All over Bangladesh	Heat tolerant and resistant to bacterial wilt; Fruits are oblong with an average weight 30 g;
	BARI Hybrid Tomato-3	Improved	Bangladesh	2006	All over Bangladesh	Number of fruits/plant 35- 40; Average Fruit weight 35- 40 g; Heat tolerant
	BARI Hybrid Tomato-4	Improved	Bangladesh	2006	All over Bangladesh	Number of fruits/plant 30-35; Average Fruit weight 50 g; Heat tolerant.
	BINA Tomato Bahar	Improved	National	1992	All over Bangladesh	Plant height 80-85 cm; crop duration 90-100 days; Vitamin content C 21.9 g/100 g. Fruit yield 65 t/ha.
	BINA Ttomato 2	Improved	National	1997	All over Bangladesh	Plant height 75-80 cm; crop duration 60-70 days; Average fruit weight 55 g; fruit yield 38 t/ha.
	BINA Tomato 3	Improved	National	1997	All over Bangladesh	Plant height 80-85 cm; crop duration 65-75 days; Vitamin C content 19.5 g/100 g; Average fruit weight 82 g.
	BINA tomato 4	Improved	National	2005	All over Bangladesh	Plant height 75 cm; Vitamin C 22.7 g/100 g; yield 81 t/ha.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	BINA Tomato 5	Improved	National	2005	All over Bangladesh	Oval fruit shape; Average fruit weight 56 g; yield 69 t/ha.
Flower						
Orchid	BARI Orchid-1	Improved	Bangladesh	2003	Bangladesh	Outer side of petal is creamy white and inner colour of petal is reddish brown white golden yellow; Flower stalk is up to 90- 100 cm long.
Gladiolus	BARI Gladiolus-1	Improved	Bangladesh	2003	All over Bangladesh	Fliwers are red colour with distinct yellow patches in petals; Flower stalk is up to 75-85 cm long; number of floret is 12- 15.
	BARI Gladiolus-2	Improved	Bangladesh	2003	All over Bangladesh	Fliwers are deep magenta colour with distinct cream colourpatches in petals; Flower stalk is up to 75-85 cm long; number of floret is 12-15.
Potato	BARI Alu-1 (Heera)	Improved	CIP, Peru	1990	All over Bangladesh	Tuber somewhat big flat round, light yellow colour, light yellow flesh, skin smooth, medium deep eye. Mature very early (80 days) but may be harvested after 60-65 days; yield range 25-40 t/ha.
	BARI Alu-2 (Morene)	Improved	Netherlands	1990	All over Bangladesh	Tuber: White oval shaped; Crop duration 80-85 days, yield 20-35 t/ha.
	BARI Alu-3 (Origo)	Improved	Netherlands	1990	All over Bangladesh	Tubers long oval, smooth, yellow skin, pale yellow to yellow flesh and Shallow eyes. Mature within 90-95 days, yield 20-30 t/ha.
	BARI Alu-4 (Ailsa)	Improved	UK	1993	All over Bangladesh	Tuber: Medium size, oblong shape, white colour, high keeping quality under natural condition (5-6 months) , mature within 90-95 days, yield 20-30 t/ha.
	BARI Alu-5 (Patronese)	Improved	Netherlands	1993	All over Bangladesh	Tuber: Big size, oval shape, skin pale yellow smooth and fairly shallow eye, flesh pale yellow colour, good keeping quality and early bulking, yield 20-35 t/ha.
	BARI Alu-6 (Multa)	Improved	Netherlands	1993	All over Bangladesh	Tuber: medium size, oval shape, skin pale yellow , flesh pale yellow , good keeping quality and early bulking(80-85 days), yield 20-35 t/ha.
	BARI Alu-7 (Di*Amant*)	Improved	Netherlands	1993	All over Bangladesh	Tuber: medium to large size, oval shape, skin yellow , flesh pale yellow , rough skin and fairly shallow eye, mature within 90-95 days, yield 25-40 t/ha.
	BARI Alu-8 (Cardinal)	Improved	Netherlands	1993	All over Bangladesh	Tuber medium size, Oblong shape, skin red, flesh pale yellow , smooth skin, shallow eyes, Mature within 90-95 days, yield 25-40 t/ha.
	BARI Alu-9 (Mondial)	Improved	Netherlands	1993	All over Bangladesh	Tuber big size, long oblong shape, skin yellow, flesh pale yellow , smooth skin, shallow eyes, Mature within 90-95 days, yield 25-40 t/ha.
	BARI Alu-10 (Kufri Sinduri)	Improved	India	1993	All over Bangladesh	Tuber medium size, round but irregular shape, skin red, flesh pale yellow, smooth skin, deep eyes, Mature within 90-95 days, yield 20-30 t/ha.
	BARI Alu-11 (Chamak)	Improved	CIP, Peru	1993	All over Bangladesh	Size; oval shape, skin light yellow, flesh pale yellow, smooth skin, Early mature within 80-85 days, yield 20-35 t/ ha.
	BARI Alu-12 (Dheera)	Improved	CIP, Peru	1993	All over Bangladesh	Tuber medium size, oval shape, skin light yellow, flesh pale yellow, smooth skin, shallow eyes, Mature within 90-95 days, yield 20-35 t/ha.
	BARI Alu-13 (Granola)	Improved	Netherlands	1994	All over Bangladesh	Tuber medium size, round oval shape, skin brownish yellow, slightly russet skin, shallow eyes, good keeping quality, Mature within 90-95 days, yield 20-30 t/ha.
	BARI Alu-14 (Cleopetra)	Improved	Netherlands	1994	All over Bangladesh	Medium to large size tuber, oval in shape, red in colour, shiny smooth skin, shallow eyes, mature within 90-95 days, yield 25-30 t/ha.
	BARI Alu-15 (Binella)	Improved	Netherlands	1994	All over Bangladesh	Medium size tuber, oval in shape, yellow in colour, shiny smooth skin, shallow eyes, mature within 90-95 days, yield 25-40 t/ha.
	BARI TPS-1	Improved	CIP, Peru	1997	All over Bangladesh	Medium size tuber, round-oval shape, Cream in colour, shiny smooth skin, Light yellow flesh, medium deep eyes, Flowers are mostly white colour, mature within 100-105 days, yield 45-80 t/ha (TPS to tuberlet); 25-40 t/ha (tuberlet to ware potato).
	BARI TPS-2	Improved	CIP, Peru	1997	All over Bangladesh	Medium size tuber, round-oval shape, Yellow shiny skin, Light yellow flesh, medium deep eyes, Flowers are mostly white colours, mature within 100-105 days, yield 45-90 t/ha (TPS to tuberlet); 25-40 t/ha (tuberlet to ware potato).
Potato	BARI Alu-16 (Arinda)	Improved	Netherlands	2000	All over Bangladesh	Tuber: White, oval, skin Smooth; Yield: 30-40 t/ha; Mature within 90-95 days.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	BARI Alu-17 (Raja)	Improved	Netherlands	2000	All over Bangladesh	Tuber: Attractive red skin, oval, yellow flesh, smooth skin, shallow eye; Yield: 25-30 t/ha; Mature within 90-95 days.
	BARI Alu-18 (Baraka)	Improved	Netherlands	2003	All over Bangladesh	Tuber: Oval to oblong, large size, smooth skin , pale yellow, flesh pale yellow; Yield; 20-25 t/ha ; Mature within 90-100 days.
	BARI Alu-19 (Bintje)	Improved	Netherlands	2003	All over Bangladesh	Tuber: Oval to long oval, medium to large size, smooth skin , pale yellow, flesh pale yellow, eye shallow; Yield; 20-25 t/ha ; Mature within 90-95 days.
	BARI Alu-20 (Jaerla)	Improved	Netherlands	2003	All over Bangladesh	Tuber: Oval to oblong oval, large size, smooth skin, skin and flesh pale yellow, eye shallow; Yield; 25-30 t/ha; Matue within 85-90 days.
	BARI Alu-21 (Provento)	Improved	Netherlands	2004	All over Bangladesh	White tuber, long dormancy in natural storage.
	BARI Alu-22 (CIP-88.163)	Improved	CIP, Peru	2004	All over Bangladesh	Red tuber, suitable for saline areas.
	BARI Alu-23 (Ultra)	Improved	Netherlands	2005	All over Bangladesh	White tuber, suitable for export
	BARI Alu-24 (Dura)	Improved	Netherlands	2005	All over Bangladesh	Red tuber, suitable for export.
	BARI Alu-25 (Asterix)	Improved	Netherlands	2005	All over Bangladesh	Red tuber, suitable for processing.
Sweet potato	BARI SP-1 (Tripti)	Improved	AVRDC, Taiwan	1985	All over Bangladesh	Flesh colour yellowish, Average tuber weight 200-250 g. Vitamin-A in fresh tuber is 450 IU/100g. Yield: 40-45 t/ha; Life cycle 135-140 days.
	BARI SP-2 (Kamlasundari)	Improved	AVRDC, Taiwan	1985	All over Bangladesh	Flesh colour orange and soft; Average tuber weight 200-250 g. Vitamin-A in fresh tuber is 7500 IU/100g. Yield: 40-45 t/ha; Life cycle 135-140 days.
	BARI SP-3 Daulatpuri	Improved	Bangladesh	1988	All over Bangladesh	Tuber and flesh colour white; Average tuber weight 180-190 g. Dry matter content in tuber 30-33%; Yield: 30-35 t/ha; Life cycle 135-140 days.
	BARI SP-4	Improved	Bangladesh	1994	All over Bangladesh	Tuber colour orange and flesh colour creamy; Average tuber weight 175-190 g. Dry matter content in tuber is 27.2%. Vitamin-A in fresh tuber is 1050 IU/100g; Yield: 35-40 t/ha. Life cycle 120-130 days.
	BARI SP-5	Improved	Bangladesh	1994	All over Bangladesh	Flesh colour yellowish; Average tuber weight 180-200 g. Dry matter content in tuber is 31.5%. Vitamin A in fresh tuber is 1000 IU/100g; Yield: 35-40 t/ha; Life cycle 120-130 days.
	BARI SP-6 (Lalkothi)	Improved	CIP, India	2004	All over Bangladesh	Tuber is medium to large size, skin pale red and flesh is Yellow; dry matter (%) of tuber is 35; contains 800 IU Vit-A per 100 g edible portion. Average tuber weight: 220 g; Yield: 30-35 t/ha; Life: 120-130 days.
	BARI SP-7 (Kalmegh)	Improved	CIP, India	2004	All over Bangladesh	Tuber is medium to large size, skin white and flesh is intermediate cream; dry matter (%)of tuber is 35%; contains 700 IU of β- carotene per 100 g edible portion; average tuber weight: 225 g; Yield: 30-35 t/ha; Life: 120-130 days.
Taro	Latiraj (Panikachu)	Improved	Bangladesh	1988	All over Bangladesh	Length of stolon is 90-100 cm. Stolon is free from acridity; crop duration 180-210 days; Yield: Stolon- 25-30 t/ha, Rhizome- 18-20 t/ha.
	Bilashi (Mukhikachu)	Improved	Bangladesh	1988	All over Bangladesh	Cormels are almost smooth and oval; boiled uniformly and free from acridity; crop duration 180-210 days; Yield: 25-30 t/ha.
Brinjal (Eggplant)	BARI Brinjal- 1 (Uttara)	Improved	Bangladesh	1985	All over Bangladesh	Plant height is short and prosted; Fruit length 18-20 cm; skin is thin and soft flesh; No. of fruits/ plant 100-150; Tolerant to bacterial wilt; resistant to stem and fruit borer; Life cycle 130-140 days.
	Suktara	Improved	Bangladesh	1992	All over Bangladesh	Plant height is short and prosted; Fruit colour is violet; Fruit length 18-20 cm; Fruit skin is thin and soft flesh; No. of fruits/plant 65-75; Tolerant to bacterial wilt; Life cycle130-140 days.
Brinjal (Eggplant)	BARI Brinjal-2 (Tarapuri)	Improved	Bangladesh	1992	All over Bangladesh	Fruit colour is black violet; Fruit skin is thin and soft flesh; No. of fruits/ plant 100-150; Tolerant to bacterial wilt; resistant to stem and fruit borer; Life cycle 110-140 days.
	BARI Brinjal- 4 (Kazla)	Improved	Bangladesh	1998	All over Bangladesh	Plant is slightly prosted; Fruit shape is medium long; Fruit colour is black violet; No. of fruits/ plant 70-80; Tolerant to bacterial wilt; Life cycle 95-190 days.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	BARI Brinjal- 5 (Nayan Tara)	Improved	India	1998	All over Bangladesh	Plant height erect; Fruit shape is round; Fruit colour is purple violet; No. of fruits/plant 25-30; Tolerant to bacterial wilt; Life cycle 80-100 days.
	BARI Brinjal-6	Improved	Bangladesh	2006	All over Bangladesh	Number of fruit/ plant 35- 40; Average Fruit weight 35- 40 g; Heat tolerant.
	BARI Brinjal-7	Improved	Bangladesh	2006	All over Bangladesh	Number of fruits/plant 30-35; Average Fruit weight 80-90 g; Fruits are deep purple long cylindrical.
	BARI Brinjal-8	Improved	Bangladesh	2006	All over Bangladesh	Number of fruits/plant 20-25; Fruit weight 70-80 g; Fruits are deep purple long cylindrical.
Cabbage	BARI Bandha Kopi-1 (Provati)	Improved	AVRDC, TAIWAN	1985	All over Bangladesh	Weight / cabbage 2-2.5 kg; Farmer produce seed from this variety; Life cycle 100-110 days for edible and 180 days for seed production.
	BARI Bandha Kopi-2 (Agradut)	Improved	Introduced	1998	All over Bangladesh	Shape is round and upper and lower part is flat, surface of the leaves covered by wax; weight / cabbage 2-2.5 kg; Farmer produce seed from this variety; Life cycle 100-110 days for edible;
	BARI Batishak-1	Improved	Japan	1984	All over Bangladesh	Green colour; edible harvestable time 50-55 days; non-heading type.
	BARI Chinashak	Improved	China	1984	All over Bangladesh	Short duration (40-45 days); Green colour; non -heading type.
	IPSA-Badha Kopi-1	Improved	Introduced	1998	All over Bangladesh	Open pollinated, early type, seed can be produced locally.
	BU China badha kopi-1	Improved	Introduced	2001	All over Bangladesh	Open pollinated, early type, seed can be produced locally.
	IPSA Pata Kopi-1	Improved	Introduced	1998	All over Bangladesh	Open pollinated, early type, seed can be produced locally.
	BARI China Kopi-1	Improved	China	1996	All over Bangladesh	Heading type; Leaves are light green and wrinkled.
Cauli-flower	BARI Phulkopi-1	Improved	Bangladesh	1998	All over Bangladesh	Weight/cauliflower 850-1000 g; Farmer produce seed from this variety; Life cycle 95-105 days .
	BARI Phulkopi-2	Improved	Bangladesh	2006	All over Bangladesh	Weight/cauliflower 800-900 g; Compact attractive creamy white colour.
Radish	BARI Mula-1 (Tasaki Mula)	Improved	Thailand	1996	All over Bangladesh	Length of radish 30-40 cm; White colour and long shape; Hair is absent on the leaf and use as a vegetable; More than ½ part grows on the soil; Seeds can be produced locally. Life cycle 65-75 days for edible and 145-155 days for seed production.
	BARI Mula-2 (Pinki)	Improved	Thailand	1996	All over Bangladesh	Length of radish 25-35 cm; Red colour and long shape; Hair is absent on the leaf and use as a vegetable; More than 50% grows above the soil; Seeds can be produced locally. Life cycle 70-80 days for edible and 145-155 days for seed production.
	BARI Mula-3 (Druti)	Improved	India	1998	All over Bangladesh	Length of radish 23-26 cm; White colour and long shape; Margin of the leaf is wavy; More than 50% grows above the soil; Seeds can be produced locally from this variety; Life cycle 55-60 days.
	BU Hybrid Mula-1	Improved	National	1998	All over Bangladesh	White root, no fibre and pith, non-pungent.
	BU Mula-2	Improved	Introduced	2004	All over Bangladesh	Open pollinated variety, quick growing, late flowering; seeds can be produced under local conditions.
	BU Mula-3	Improved	Introduced	2005	All over Bangladesh	Open pollinated variety, quick growing, late flowering; coloured root can produce seed under local conditions.
	Rocky-45 (EWS)	Improved	Introduced	1998	All over Bangladesh	Early, heat tolerant, leaf length 25-30 cm. It can be harvested within 40-50 days after sowing.
Bottle Gourd	BARI Lau-1	Improved	Bangladesh	1996	All over Bangladesh	Male and female flowers blooms from 40-45 days and 60-65 days; Fruit colour is light green and 40-50 cm length; No. of fruits/plant 10-12; Life cycle 120-140 days.
	BARI Lau-2	Improved	Bangladesh	2006	All over Bangladesh	Fruit colour is light green; No.of fruits/plant 15-20; Average fruit weight: 1.5 Kg, Fruit shape is like ash gourd.
	Martina F1	Improved	National	2003	All over Bangladesh	Attractive green fruit with while spots heat tolerant; fruit length 50-55 cm; Average fruit weight 2-3 kg.
	Dalisay F1	Improved	National	2003	All over Bangladesh	Attractive light green fruit colour, heat tolerant, fruit length 45-50 cm; fruit weight 2-3 kg.
Bitter Gourd	BARI Karola-1	Improved	Bangladesh	2006	All over Bangladesh	Deep green in colour, fruit weight 100 g, number of fruits per plant 30-35, Fruit length-17-18 cm.
Ash Gourd	BARI Chalkumra-1	Improved	Bangladesh	2006	All over Bangladesh	Light green colour, Average fruit weight-1-2 kg, number of fruits per plant 10-12, Fruit length-18-20 cm.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	Duranta (EWS)	Improved	National	2003	All over Bangladesh	Fruit green; fruit length 20-25 cm; Average fruit weight 1.5 kg; harvest; 40-45 days after transplanting. A high yielding variety; No. of fruits / plant 8-10.
	Durbar (EWS)	Improved	National	2003	All over Bangladesh	Fruit lengthn 20-25 cm; Average fruit weight 1.0-1.5 kg; harvest 40-45 days after transplanting. A high yielding variety; fruits no. / plant 8-10.
	Pole Star F_1 (EWS)	Improved	National	2003	All over Bangladesh	Fruit light green; Fruit length 20-25 cm; Average fruit weight 1.0-1.5 kg; harvesting starts at 40-45 days after transplanting; fruits no. / plant 10-12.
Pointed Gourd	BARI Potol-1	Improved	Bangladesh	2006	All over Bangladesh	Light green fruit with 10-11 white stripe, number of fruits per plant 240, Avg fruit weight 25 gm, fruit length 11-12 cm.
	BARI Potol-2	Improved	Bangladesh	2006	All over Bangladesh	Green fruit with 9-10 light green stripe, number of fruits per plant 350-380, Avg fruit weight 50 g, fruit length 9-10 cm.
Ridge Gourd	Prince (EWS)	Improved		2003	All over Bangladesh	Early variety; harvesting starts at 40-45 days after transplanting; fruit length 30-35 cm; fruits no. /plant 25
	Hero F_1(EWS)	Improved		2003	All over Bangladesh	Day neutral; harvesting starts at 40-45 days after transplanting; fruit length 40-45 cm; no. of fruits/ plant 25.
	Hercules F_1 (EWS)	Improved	National	2003	All over Bangladesh	Harvest started at 40-45 days after transplanting; fruit length 40-45 cm; fruit weight 250 g; no. of fruits/ plant 20-23.
Hyacinth Bean	BARI Seem-1	Improved	Bangladesh	1996	All over Bangladesh	Green colour pod and soft; Pod length 10-11 cm; Pod width 2.0-2.5 cm; Weight / pod 10-11 g and 4-5 seeded; Pod / plant 450-500; Life cycle 200-220 days; Resistant to virus disease.
	BARI Seem-2	Improved	Bangladesh	1996	All over Bangladesh	Narrow, long and green colour pod and soft; Pod length 10-13 cm; Pod width 1.5-2.0 cm; Weight/ pod 7-8 g and 4-5 seeded; Pod/plant 380-400; Life cycle 190-210 days; Resistant to virus disease;
	BARI Seem-3	Improved	Bangladesh	2006	All over Bangladesh	Number of fruits per plant 250-275, deep green flat wide pod.
Garden Pea	BARI Motor Shuti-1	Improved	Bangladesh	1996	All over Bangladesh	Flower colour white and pod colour green; No. of seed/pod 8-7 and green colour; No. of pod/plant 20-25; Life cycle 70-75 days as a vegetable, Sweet teste; resistant to downy mildew and powdery mildew.
	BARI Motor Shuti-2	Improved	AVRDC, Taiwan	1996	All over Bangladesh	Pod colour light green and flat type; Pod size 8x2 cm Life cycle 65-70 days as a vegetable, Pod is very soft; Resistant to downy mildew and powdery mildew.
	BARI Motor Shuti-3 (Aguri)	Improved	Bangladesh	1999	All over Bangladesh	Pods are light green; 5-7 green seeds/ pod; seeds are crispy and sweet; dry seeds are round, light green and slightly wrinkled.
Yard Long Bean	BARI Barbati-1	Improved	Bangladesh	2006	All over Bangladesh	Number of fruits per plant 60-70; pod length 45 cm, colour green deep.
French Bean	BARI Jhar Seem-1	Improved	Bangladesh	1996	All over Bangladesh	Plant short and bush type; Pod colour is green and curve; Pod length 10-13 cm long; Pod width 1.0-1.5 cm; Weight/pod 5-6 gm; Flower colour is white; Seed colour is white; Life cycle 40-45 days.
	BARI Jhar Seem-2	Improved	Bangladesh	2002	All over Bangladesh	Dwarf determinate type of plant with medium foliage coverage, pods are borne in cluster (2-6 pods per cluster), Number of pods is more (18.6 per plant), pods are cylindrical, very soft, medium long, straight, narrow.
Ladies Finger (Okra)	BARI Dherosh-1	Improved	Bangladesh	1996	All over Bangladesh	No. of fruit/plant 25-30; Days to flowering 45 days; Ride no. of fruit 5; Fruit length 14-18 cm green colour; Life cycle 5 months; Resistant to yellow vein virus.
	Silvia F_1 (EWS)	Improved	National	2003	All over Bangladesh	A hybrid variety; straight stem; tolerant to YMV; no. of fruit/plant 40-45.
	Lucky F_1 (EWS)	Improved	National	2003	All over Bangladesh	A hybrid variety; straight stem; tolerant to YMV; no. fruit /plant 45-50; thick fruitskin.
Kangkong	BARI Gimakalmi	Improved	Thailand	1983	All over Bangladesh	Leaf and stem colour are green and soft; Length of leaf 6-9 cm; Width of leaf 5-8 cm; Flower colour is white; seed coat colour is grey and hard; No. of seed / fruit 4.
Indian spinach	BARI Puishak-1 (Chitra)	Improved	Bangladesh	1999	All over Bangladesh	Entire plant is green at seedling stage; Stem and leaf vein gradually turn to light purple; Leaves are green, succulent and broad
	BARI Puishak-2	Improved	Bangladesh	2006	All over Bangladesh	Very soft, thick, fleshy vines with large green leave.

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Amaranth	BARI Lalshak-1	Improved	Bangladesh	1996	All over Bangladesh	Plant height 25-35 cm; Leaves/ plant 15-20; Weight / plant 10-15 g; Leaf and stem colour are bright red; Flower colour white; Seed round shaped; Seed coat colour black with red; Life cycle 25-30 days as a vegetable and 110-130 days for seed production.
	BARI Sabuj Danta Shak-1	Improved	Bangladesh	2006	All over Bangladesh	Light green leaf; attains harvestable size within 15-20 days after germination.
	BARI Danta-1 (Laboni)	Improved	Bangladesh	1999	All over Bangladesh	Stem is light purple, soft, less fibrous and erect; Dominant purple is at the ventral and dark green is at dorsal side of leaf.
	BARI Danta-2	Improved	Bangladesh	2006	All over Bangladesh	Lower two third of stem is light purple and the rest upper part is green; leaves are green.
Guava	Kazi peara	Improved	Thailand	1985	All over Bangladesh	Fruit shape is large, matured fruit is yellow-green and flesh is white. Fruit weight 445 g; TSS: 8.4%. Taste is light sour. Plant stature medium tall.
	BARI Peara-2	Improved	Thailand	1996	All over Bangladesh	Plant canopy is like umbrella, leaf tip is needle shaped, fruit is small, matured fruit is yellow-green and flesh colour is white, Fruit weight 240 g; TSS 10%, Plant stature dwarf.
	BARI Peara-3	Improved	Bangladesh	2003	All over Bangladesh	Fruits are medium, globular shape and pink fleshed.
Papaya	BARI Papaya-1 (Shahi papaya)	Improved	Bangladesh	1992	All over Bangladesh	Diocious plant, plant light green colour and leaf is deep green, fruit is oval shape. Fruit weight 900 g; TSS: 14% Plant stature medium tall; Flesh colour deep orange- red.
Mango	BARI Aam-1 (Mohananda)	Improved	Bangladesh	1997	All over Bangladesh	Inflorescence is pyramidal shaped, fruit is round, fruit colour is bright yellow, pulp colour is deep yellow and scented, fibreless; Fruit weight 200 g; TSS 19%; Edible portion 70%; Bearing habit regular.
	BARI Aam-2	Improved	Bangladesh	1997	All over Bangladesh	Fruit shape is spherical, fibreless and medium juicy. Fruit weight: 247 g; TSS 17.5%; Pulp colour Deep yellow; Edible portion 69%.
	BARI Aam-3 (Amropali)	Improved	India	1996	All over Bangladesh	Plant height is medium, Inflorescence is pyramidal shaped, Riped fruit is yellowish green, late variety, green fruit tastes sweet, Average Fruit weight: 315g; TSS: 23.4%; Pulp colour: Deep orange; Edible portion: 70.5%.
	BARI Aam-4 (Hybrid)	Hybrid	Bangladesh	2004	All over Bangladesh	Fruit weight 207g; TSS 14.9%; Pulp colour bright yellow; round shape, TSS 24.5%, Edible portion: 56.3%.
Litchi	BARI Litchu-1	Improved	Bangladesh	1996	All over Bangladesh	Fruit oval shape and red colour, Fruit weight 19.5 g; TSS 18.4%; Edible portion 65.3%
	BARI Litchu-2	Improved	Bangladesh	1996	All over Bangladesh	Plant height is medium, round fruit shape, fruit colour pinkish red, Fruit weight: 15.2 g; TSS 16.1%; Edible portion 68.4%.
	BARI Litchu-3	Improved	Bangladesh	1996	All over Bangladesh	Plant height is medium, fruit shape is elongated heart shaped, fruit colour greenish red, Fruit weight 18.4 g; TSS 18.9%; Edible portion: 75-77%.
Sapota	BARI Safeda-1	Improved	Bangladesh	1996	All over Bangladesh	Fruits are round-flat, large in size, oval shaped, Fruit weight 85.1 g; TSS: 18.9%; Edible portion 75-77%.
	BARI Safeda-2	Improved	Bangladesh	2003	All over Bangladesh	Fruits are round shape, 70g in weight and sweet, TSS 18- 19%.
Mandarin	BARI Kamala-1	Improved	Bangladesh	1996	Hilly area of Sylhet, Moulvibazar and chittagong hill tracts	Greenish yellow in colour, very juicy (55%), sweet, TSS 10.2% and TA 1.19%, Fruit weight 190 g; TSS 10.2%; Juice: 55.5%.
Orange	BARI Malta- 1	Improved	Bangladesh	2004	Hilly area of Sylhet, Moulvibazar and chittagong hill tracts	Fruit is round, medium in size (146g), very juicy (33.7%), attractive yellowish colour and sweet with TSS 7.8% and 0.36% TA.
Pummelo	BARI Batabi Lebu-1	Improved	Bangladesh	1997	All over Bangladesh	Leaf colour is dark green, round shaped fruit, TSS 9.20%, medium fruit shape, pulp colour is reddish and medium sweet, soft pulp, ripe fruit is yellow colour, Fruit weight 1.08 kg; TSS: 9.3%; Edible portion 45%.
	BARI Batabi Lebu-2	Improved	Bangladesh	1997	All over Bangladesh	Leaf colour is dark green with wing and round shaped, fruit shape is spherical and medium, fruit colour yellowish, pulp colour is reddish, Fruit weight 762g; TSS 11.35%; Edible portion: 40%.

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	BARI Batabi Lebu-3	Improved	Bangladesh	1997	All over Bangladesh	Leaf colour is dark green with wing and heart shape, fruit shape spherical; fruit yellowish in colour, pulp is bitterless and pinkish colour, Fruit weight 1.12 kg; TSS 8.4%; Edible portion 53%.
	BARI Batabi Lebu-4	Improved	Bangladesh	2004	All over Bangladesh	Fruit is round, white juice sac, medium juicy and soft, edible portion is 40%.
Toikar	BARI Toikar-1	Improved	Bangladesh	1996	All over Bangladesh	Fruit shape is round-flat, fruit colour yellowish, sour taste, Fruit weight 1.08 kg; TSS 9.3%.
Coconut	BARI Narikel-1	Improved	Bangladesh	1997	All over Bangladesh	Oval shaped fruit, tolerant to stem shattering, Fruit weight: 1287g; Kernel weight 379 g; Oil content 58%.
	BARI Narikel-2	Improved	Bangladesh	1997	All over Bangladesh	Oval shaped fruit, Fruit weight: 1698 g; Kernel weight 512 g; Oil content 53%.
Lemon	Alachi (BARI Lebu-1)	Improved	Bangladesh	1997	All over Bangladesh	Oval shaped fruit, seed colour is white, Fruit weight: 261 g; TSS 6.6%; Total acid 5.3 %.
	BARI Lebu-2	Improved	Bangladesh	1997	All over Bangladesh	Fruit round in shape, medium sour in taste, Fruit weight 80.8 g; TSS 7.3%; juice 32.6% .
	BARI Lebu-3	Improved	Bangladesh	1997	All over Bangladesh	Fruit round and medium in size, very fine skin, less sour, seed colour is light brown to whitish, Fruit weight 54.7 g; TSS 7.53% Juice 37.7%.
Wax Jambu	BARI Jamrul-1	Improved	Bangladesh	1997	All over Bangladesh	Fruit colour is purple, elongate shape, fruit skin is red purple in colour, pulp greenish white, Fruit weight: 42.73 g; TSS 6.5%; Fruit colour Maroon; Edible portion 97%
Longan	BARI Anshphal-1	Improved	Introduced	1982	All over Bangladesh	Fruit is small and round, seed is black and round, Fruit weight: 3.2 g; TSS 22.5%; Edible portion 60.5%
Banana	BARI Kola-1	Improved	Bangladesh	1998	All over Bangladesh	Fruit is large shaped (150g), yellow in colour, Fruit weight 620 g; TSS 24%;
	BARI Kola-2	Improved	Bangladesh	2004	All over Bangladesh	Fruit is medium (117 g), resistant to panama disease, Fruit weight 620 g; TSS 24%;
	BARI Kola-3	Improved	Bangladesh	2005	All over Bangladesh	Fruits are medium (144 g), yellow colour, seedless, having sticky and sweet pulp.
Kul	BARI Kul-1	Improved	Bangladesh	2003	All over Bangladesh	Fruit is medium, oblong and pointed at distal end, Fruit weight 23 g; TSS 24%; edible portion 92% .
	BARI Kul-2	Improved	Bangladesh	2003	All over Bangladesh	Fruits are medium (34 g), oval in shape and sweet, TSS 11.5%, edible portion is 91%.
Passion fruit	BARI Passion Phal-1	Improved	Bangladesh	2003	Hilly area of Sylhet, and Chittagong hill tracts	Fruits are medium-large, round and slightly yellow in colour with scented and tasty juice sac.
Pear	BARI Naspati- 1	Improved	Bangladesh	2003	Hilly area of Sylhet, and Chittagong hill tracts	Fruits are medium-large, brown colour, crispy and tasty.
Golden apple	BARI Amra- 1	Improved	Bangladesh	2003	All over Bangladesh	Dwarf plant, year round bearing habit, sour and sweet tasted, TSS 7%, edible portion 73%
Jute	C-6 (C-322)	Improved	National / Inroduced	1955*	All over Bangladesh	Stem coppery red greenish; Stipule ¾ pigmented; Petiole – upper surface prominently pigmented, lower surface has patches of red at joints; leaf lanceolate, broad, length-bradth ratio of lamina 2.6:1, Fruit light red; single or cluster of 2-4 fruits; Seed chocolate brown. Plant height 320 cm; average stalk (base) diameter 19 mm; Dry fibre yield 1662 kg/ha; Fibre recovery 5.71%; Flowering 90-100 days after sowing.
	CVL-1 (Sabuj Pat- BJRI Deshi 2)	Improved	National	1977*	All over Bangladesh	Stem green; Stipule green; Leaf ovate lanceolate, length-breadth ratio of lamina 2.1:1 Fruit green, single or cluster of 2-4; Seed chocolate brown; Plant height 325 cm; Average stalk (base) diameter 22 mm; Dry fibre yield 2528 kg/ha; Fibre recovery 6.51%; Flowering 120-130 days after sowing.
	CVE-3 (Ashu Pat – BJRI Deshi 3)	Improved	National	1977*	All over Bangladesh	Green stem, light coppery red on old branch; Stipule upper part bright coppery red; Petiole upper part bright coppery red; Leaf ovate lanceolate;, length-breadth ratio of lamina 2.1:1; Fruit bright red at maturity, single or cluster of 2-5; Seed chocolate brown; Plant height 300 cm; Average stalk (base) diameter 18 mm; Dry fibre yield 1769 kg/ha; Fibre recovery 5.91%; Flowering 90-105 days after sowing.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	CC-45 (Jo Pat – BJRI Deshi 4)	Improved	National	1979*	All over Bangladesh	Stem green, light coppery red on old branch; Stipule green, pigmented on tip; Petiole upper surface light coppery red, lower surface green; Leaf nearly ovate, comparatively smaller than D-154, length-bredth ratio of lamina 2:1; Fruit very light pink and greenish, single or cluster of 2-3; Seed small with light brown colour. Plant height 300 cm; Average stalk (base) diameter 22 mm; Dry fibre yield 2250 kg/ha; Fibre recoverey 6.62%; Flowering 135-180 days after sowing.
	BJC 7370 (BJRI Deshi 5)	Improved	National	1995*	All over Bangladesh	Green stem; Stipule tip pigmented; Petiole upper surface coppery red; Leaf ovate-lanceolate, length-breadth ratio of lamina 2.2:1; Fruit light coppery red, single or cluster of 2-3; Seed chocolate brown; Plant height 326 cm; Average stalk (base) diameter 26 mm; Dry fibre yield 244 kg/ha; Fibre recovery 6.75%; Flowering 105-115 days after sowing.
	BJC-83 (BJRI Deshi 6)	Improved	National	1995*	All over Bangladesh	Stem green; Stipule green; Leaf lanceolate but slightly broad, wavy margin, length-breadth ratio 2:1; Fruit green, single or cluster of 2-4; Seed chocolate brown; Plant height 318 cm; Average stalk (base diameter 21 mm; Dry fibre yield 2250 kg/ha; Fibre recovery 6.20%; Flowering 95-106 days after sowing.
	O-4 (BJRI Tossa 1)	Improved	National	1967*	All over Bangladesh	Stem green; Stipule green; Leaf green oblong, large, length-breadth ratio of lamina 2.9:1; Fruit green, cylindrical, dehiscent; Seed steel grey colour with red in three edges; plant height 370 cm; Average stalk (base) diameter 22 mm; Dry fibre yield 2316 kg/ha; Fibre recovery 6.62%, Flowering 118-132 days after sowing.
	O-9897 (BJRI Tossa 2)	Improved	National	1987*	All over Bangladesh	Stem green; Stipule green; Leaf green, ovate-lanceolate, length-breadth ratio of lamina 2.7:1; Fruit green, cylindrical, dehiscent, single or cluster of 2-5; Seed brown but with green tinge on seed coat; Plant height 335 cm; Average stalk (base) diameter 24 mm; Dry fibre yield 2505 kg/ha; Fibre recovery 6.70%; Flowering 130-150 days after sowing.
	OM-1 (BJRI Tossa 3)	Improved	National	1995*	All over Bangladesh	Stem green; Stipule green; Petiole green; Leaf green, ovate-lanceolate, upper surface glossy, length-breadth ratio of lamina 2.5:1; Fruit long, cylindrical, indehiscent; Seed brownish; Height 313 cm; Average stalk (base) diameter mm; Dry fibre yield 2490 kg/ha; Fibre recovery 6.72%; Flowering 120-130 days after sowing.
Jute	O-72 (BJRI Tossa 7)	Improved	National	2002	All over Bangladesh	Stem green; Stipule green; Petiole green; Leaf green, ovate non-shiny, length-breadth ratio of lamina 2.2:1; Fruit long, cylindrical, indehiscent; Seed brownish; Plant height 545 cm; Average stalk (base) diameter 24 mm; Dry fibre yield 3170 kg/ha; Fibre recovery 6.72%; Flowering 120-130 days after sowing. Can be seeded at least 20 days earlier than O-9798 and 10 days earlier than OM-1.
	Atompat-38	Improved	National	1987	All over Bangladesh	Height 280-300 cm, strong stem, Stipule modified into leaf; Base diameter 1.9- 2.0 cm; more fibre bundles per unit area (compared to other varieties); Duration 120-125 days; Yield 2.8 t/ha. Max yield 3.3 t/ha.
	Binadeshi pat-2	Improved	National	1997	All over Bangladesh	Height 300-320 cm; Stem light green; Base diameter 1.9-2.0 cm; Duration 120-125 days; Yield 3.0 t/ha. Max yield 3.5 t/ha
Kenaf	HC-2	Improved	National	1977*	All over Bangladesh	Stem green, pigmented; Stipule filiform, green; petiole green, pigmented; Leaf simple, cordate, minute prickle on the lower surface of lamina, entire; slightly encuped at maturity; Sepals green with coppery subreniform greyish brown; Plant height 319 cm; Average stalk (base) diameter 20 mm; Air dry matter 29.15 t/ha (stem without leaves); Fibre recovery 7.3%; Flowering 150-155 days after sowing.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	HC-95	Improved	National	1995*	All over Bangladesh	Stem green; Stipule filiform, green, pigmented; Leaf simple, lobed (5-7), green, lamina palmately lobed, minute prickles on the lower surface of lamina; Sepals green; Petals yellow with very light red shadow on the inner basal portion; Fruit capsule, ovoid, indehiscent; Seed subreniform, greyish brown; plant height 333 cm; Average stalk (base) diameter 22 mm. Air dry matter 35 t/ha (stem without leaves); Dry fibre yield 3340 kg/ha, Fibre recovery 6.23%; Flowering 145-1650 days after sowing
Mesta	HS-24	Improved	National	1977*		Stem deep green with nodes purple at maturity; Stipule filiform green; Leaf 5-lobed with lanceolate segments which are serrated, leaf lobes dark green with veins and margins purple, rough; Sepals light green with purple spots at maturity; Petals yellowish, crimson red at the inner basal portion; Fruits capsule, hairy; Seed dehiscent dull brown, reniform; Plant height 330 cm; Average stalk (base) diameter 18 mm; Dry fibre yield 3012 kg/ha; Fibre recovery 6.23%; Flowering in the first fortnight of November irrespective of time of sowing.
Tea	Clone BT1	Improved	National	1966*	All tea growing areas of Bangladesh	Leaf size medium, semi dark green; compact bush with excellent spread; early flashing; above average quality. Very good pruning recovery. Planting preference cooler face and flat area. Tea quality coloury with bright and brisky liquor. Yield 3298 kg/ha.
	Clone BT2	Improved	National	1975*	All tea growing areas of Bangladesh	Leaf size medium, dark green; orthotropic; good spread with early and uniform flashing, above average. Planting preference both hot and cooler face and flat Pruning recovery is rated as very good. Tea quality coloury liquor with consistent touch of flavor. Yield 4874 kg/ha.
	Clone BT3	Improved	National	1975*	All tea growing areas of Bangladesh	Leaf size medium, light green; good spread; early flashing; Pruning recovery rated as good, Planting preference cooler face and flat. Tea quality above average, coloury and brisky liquor. Yield 3431kg/ha.
	Clone BT4	Improved	National	1981*	All tea growing areas of Bangladesh	Leaf size medium, dark green glossy; compact bush with good spread; excellent drought tolerance; pruning recovery very good; planting preference both hot and cooler face and flat.. Tea quality excellent, coloury, bright, brisk, full and creamy liquor. Yield 2581 kg/ha.
	Clone BT5	Improved	National	1987*	All tea growing areas of Bangladesh	Leaf size medium to large, semi dark compact bush with excellent spread; early flashing; pruning very good; planting preference not too hot face, cooler face and flat. . Tea quality above average, coloury and brisky liquor. 2811 kg/ha.
Tea	Clone BT6	Improved	National	1987*	All tea growing areas of Bangladesh	Hybrid line; leaf size small to medium, light green; compact, pruning recovery good; planting preference both hot and cooler face and flat.;. Tea quality excellent, very coloury, brisk, full and very creamy liquor. Yield 2916 kg/ha.
	Clone BT7	Improved	National	1991*	All tea growing areas of Bangladesh	Leaf size larger, dark green and quite glossy; compact; high drought tolerance. pruning recovery good; planting preference cooler face and flat. Tea quality above average, coloury, brisk with good strength. Yield 2790 kg/ha.
	Clone BT8	Improved	National	1992*	All tea growing areas of Bangladesh	Leaf size small to medium, dark green glossy. Pruning recovery good; high drought tolerance; planting preference hot and cooler face and flat. Tea quality average, coloury and brisky liquor. Yield 3316 kg/ha.
	Clone BT9	Improved	National	1994*	All tea growing areas of Bangladesh	Leaf size medium, semi dark green; compact; high tolerance to drought pruning recovery good; planting preference hot and cooler face, flat. Tea quality above average, coloury, thick brisky liquor. Yield 3784 kg/ha.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	Clone BT10	Improved	National	1995*	All tea growing areas of Bangladesh	Leaf size large and broad, light green; compact bush with a very good spread and thick shoots; pruning recovery good, planting preference hot and cooler face and flat. Tea quality average to above average, coloury, bright and brisky liquor. Yield 4600 kg/ha.
	Clone BT11	Improved	National	1999*	All tea growing areas of Bangladesh	Hybrid line; Leaf size medium, dark green, orthotropic with dense plucking tables; high tolerance to drought; pruning recovery very good; planting preference hot and cooler face and flat. Tea quality above average, coloury,bright and brisk liquor. Yield 3713 kg/ha.
	Clone BT12	Improved	National	2000*	All tea growing areas of Bangladesh	Leaf size small to medium, dark green, glossy; compact bush; very high tolerance to drought, planting preference hot and cooler face and flat. Tea quality above average, colour, bright and brisk liquor. Yield 4018 kg/ha.
	Clone BT13	Improved	National	2000*	All tea growing areas of Bangladesh	Leaf size large and broad light green; compact bush with dense plucking points and thick shoots; pruning recover very good; high tolerance to drought; planting preference hot and cooler face and flat. Tea quality above average, coloury, bright and brisk liquor with good strength. Yield 3203 kg/ha.
	Clone BT14	Improved	National	2002*	All tea growing areas of Bangladesh	Hybrid line; leaf size medium, light green; good spread; early flashing; high tolerance to drought; pruning recovery very good; planting preference hot and cooler face and flat. Tea quality above average, coloury, bright and brisky liquor with good strength. Yield 3450 kg/ha.
	Clone BT15	Improved	National	2002*	All tea growing areas of Bangladesh	Hybrid line; leaf size; medium, semi dark green, semi orthotropic; compact bush with early flashing habit; high tolerance to drought; pruning recovery very good, planting preference hot and cooler face and flat. Tea quality excellent, coppery bright infusion, strong liquor with good strength; brisky and creamy. Yield 3735 kg/ha.
	Clone BT16	Improved	National	2005*	All tea growing areas of Bangladesh	Leaf large and broad, light green; compact table, thik plucking shoots above average quality. Moderate to high tolerance to drought; pruning recovery very good. Planting preference not too hot face; cooler face and flat. Tea quality above average, coloury, bright and brisky liquor with good strength. Yield 3604 kg/ha.
	Clone BT17	Improved	National	2006*	All tea growing areas of Bangladesh	Hybrid line; Leaf size medium, dark green, glossy, orthotropic with good spread and compact plucking table; pruning recovery very good; planting preference hot and cooler face and flat. Tea quality above average, coloury with good strength and briskness. .Yield 3897 kg/ha.
	(Seed Stock) BTS1	Improved	National	1985*	All tea growing areas of Bangladesh	Good branching habit with uniform growth, compact plucking table, leaf size medium, light green with semi erect leaf pose; above average quality. Yield 3217 kg/ha.
	(Seed Stock) BTS2	Improved	National	1985*	All tea growing areas of Bangladesh	Medium branching habit, compact plucking table, with evenly distributed plucking points; leaves slightly darker, medium in size; above average quality.
Tea	(Seed Stock) BTS3	Improved	National	2001*	All tea growing areas of Bangladesh	Semi orthotropic growth habit,highly compact plucking table with dense plucking points; above average quaity. Yield 3380 kg/ha.
	(Seed Stock) BTS4	Improved	National	2001*	All tea growing areas of Bangladesh	Semi orthotropic growth habit with a good spread and compact plucking table; leaves semi dark green, quite glossy; above average quality. Yield 3314 kg/ha.
Cotton	Rupali (BC-005)	Improved	National	1985*	Not under cultivation	Plant erect, green, hairy; Leaf entire; Petal colour cream, Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour white; Lint white; Yield of seed cotton 2.0-2.5 t/ha.
	Ava (BC-037)	Improved	National	1990*	Not under cultivation	Plant erect, green, glabrous; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit oval boll; Seed fuzzy; Fuzz colour grey; Lint white; Yield of seed cotton1.8-2.5 t/ha

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	CB-1 (BC-0306)	Improved	Introduced	2005 1992*	Jessore region	Plant erect,green, glabrous; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 151 cm; Yield of seed cotton 2.5 t/ha
	CB-2	Improved	Introduced	2005 1994*	Not under cultivation	Plant erect, green with short hairs; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 121 cm; Yield of seed cotton 2.0 t/ha
	CB-3	Improved	Introduced	2005 1992*	Dhaka & Rangpur regions	Plant erect, green, glabrous; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 110 cm; Yield of seed cotton 2.5 t/ha
	CB-4	Improved	Introduced	2005 1992*	Not under cultivation	Plant erect, green with short hairs; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 134 cm; Yield of seed cotton 2.25 t/ha
	CB-5	Improved	Introduced	2005 1996*	Jessore region	Plant compact, green, hairy, Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 133 cm; Yield of seed cotton 2.5 t/ha
	CB-6	Improved	Introduced	2005 1996*	Not under cultivation	Plant erect, green with short hairs; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 129 cm; Yield of seed cotton 2.5 t/ha
	CB-7	Improved	Introd-uced	2005 1997*	Not under cultivation	Plant erect, green, hairy; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 121 cm; Yield of seed cotton 2.5 t/ha
	CB-8	Improved	Introd-uced	2005 1998*	Not under cultivation	Plant erect, green, hairy; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 105 cm; Yield of seed cotton 2.5 t/ha
	CB-9	Improved	Introd-uced	2005 1999*	Jessore, Rangpur & Dhaka regions	Plant erect, green, hairy; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 126 cm; Yield of seed cotton 3.0 t/ha
	CB-10	Improved	Introd-uced	2005 2005*	Rangpur region	Plant erect, green,glabrous; Leaf entire; Petal colour cream; Petal spot absent; Pollen colour cream; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 126 cm; Yield of seed cotton 2.5 t/ha.
	Pahari Tula 1 (Hill Cotton-1)	Improved	Indigen-ous variety of Chittagong Hill Tracts	2005 2005º	Cultivated in Chittagong Hill Tracts	Plant erect redish, green with short hairs; Leaf lobed; Petal colour cream with large spot; Pollen colour yellow; Fruit conical boll; Seed fuzzy; Fuzz colour grey; Lint white; Plant height 205 cm; Yield of seed cotton 1.8 t/ha (sole crop) and 0.7 t/ha (Jhum crop)
	Pahari Tula- 2 (Hill Cotton-2)	Improved	Indigen-ous variety of Chitt-agong Hill Tracts	2005 2005	Cultivated in Chittagong Hill Tracts	Plant erect redish green with short hairs; Leaf lobed; Petal colour cream with large spot; Pollen colour yellow; Fruit conical boll; Seed fuzzy; Fuzz colour Khaki; Lint khaki; Plant height 205 cm; Yield of seed cotton 1.0 t/ha (sole cotton) and 0.7 t/ha (Jhum cotton)
Sugarcane	Isd 1-53	Improved	National	1967	All over Bangladesh	Medium tall (2.65-3.05m) and straight variety having thin stalk diameter (1.89 cm). Stalks are yellowish green in colour and generally yellowish near the bud may appear ash colour due to moderate deposition of wax bloom, and turn purple to red on exposure to sunlight. Internode is conoidal shape and rind is hard enough. Growth split, ivory marking, bud-groove, corky patch and pith-pipe are absent. Node swollen, leaf scar prominent and slightly protruding below the bud. Eye-bud is long and triangular shape. The upper part of the mature eye-bud crosses the growth ring. Bud cushion is absent. Leaves are pale green narrow width (~2.5 cm) and medium length (~135 cm). Leaves are not self-detrashing. Most leaves are curved. Leaf-sheath (22.-24 cm) is light green with purplish blotches on the older leaves, partially shed when dry, sheath base saclike, spines very few and present only on the dorsal side of the younger leaves. Dewlap purple

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
						green, medium and triangular shape. Ligule horizontal and asymmetrical with raised tip. Inner auricle lanceolate and outer auricle transitional-3 type. The variety is non-flowering and mid-maturing in habit. It contains the highest recoverable sucrose content of 12.11% and produces 74.0 tons of cane/ha, Isd 1-53 is resistant to red rot disease and tolerant to water-logging conditions. The variety is good for making medium quality gur.
	Isd 2-54	Improved	National	1967	All over Bangladesh	Medium tall (2.60-3.10m) variety with medium thin stalk diameter (~2.32 cm). Stalk colour is yellowish-green but the uncovered part appears pink in colour. Heavy deposition of waxy material is observed on stem for which the cane sometimes appears ashy colour. Internode is cylindrical shape and the rind is medium hard. Pith, pipe, bud-groove and ivory markings are absent but sometimes growth and corky patches are observed. Node even with the internode, leaf scar prominent and slightly inclined below the bud. Eye-bud medium in size and ovate shape. The upper part of the mature eye-bud surpasses the growth ring. Bud cushion is absent. Leaves are light green, narrow (~3.98CM) and of medium length (~145 cm). The younger leaves are erect but the older leaves are droopy in nature. Leaf-sheath (25-30 cm) is yellowish-green and remains loosely clasping with the stalk. Sheath spine is absent. Dewlap is triangular shape, medium in size and pink in colour. Ligule is symmetrical. The inner auricle is transitional-1 while the outer one is transitional-3 type. The variety is mid-maturing and non-flowering in habit. It contains 10.40% recoverable sucrose. Yiele 79 tons of cane/ha. The variety is good for medium quality gur. It is resistant to red rot disease, and tolerant to flood and water-logging conditions.
	LJ-C:	Improved	National	1982	All over Bangladesh	Medium tall (2.68-3.15m) and medium thin (~2.20 cm) variety. Stalk colour is yellowish-green with yellowish colour near the bud. Colour may become purplish green when exposed to sunlight. Internode is cylindrical with slightly bulging above the growth ring. Rind is hard. Pith-pipe, corky patch, ivory marking, bud-groove and growth split absent. Node swollen, leaf-scar prominent and slightly inclined below the bud. Eye-bud is ovate shape, medium in size, tip overlaps the growth ring. Leaves are medium in length (~140 cm) and breadth (~4.50 cm) and light green with purplish colouration on the dorsal side. Leaf-sheath light green, partly shed when dry, spineless and clasping tightly. Dewlap medium in size, purplish green and triangular shape. Ligule crescentiform and asymmetrical. Inner auricle lanceolate but the outer auricle transitional-2 type. LJ-C is non-flowering and mid-maturing variety of sugarcane. The variety contains recoverable sucrose 10.75%. Yield 79.0 tons cane/ha. It is resistant to red rot disease and tolerant to flood and water-logging conditions. Medium quality gur can be produced from this variety.
Sugarcane	Isd 16	Improved	National	1981	All over Bangladesh	Tall (2.90-3.40 m) and medium thick (~2.85 cm) in diameter. Cane is vigorous and stalk is greenish-yellow in colour but the uncovered part becomes reddish in sunlight. Internode is cylindrical in shape having no growth split, ivory markings and corky patches but bud-groove is prominent. Rind is very hard. Pith and pipe is present. Node is slightly swollen and leaf-scar is evident. Growth ring is swollen, wide and eminent. Eye-bud is medium and rectangular in shape. Upper part of the mature eye-bud surpasses the growth ring and lower part remains attached with the leaf-scar. Leaves are medium in length (~155 cm) and breadth (~5.00 cm) and deep green in colour. Younger leaves erect but older leaves curve broadly. Leaf sheath (26-28 cm) is green colour and remains loosely clasping with the stalks.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
						Dewlap is deltoid shape and brownish in colour. Ligule is horizontal type free edge forms a slightly round tip. Inner auricle lanceolate but outer auricle deltoid types. It is a flowering and early maturing variety of sugarcane. It contains about 12.28% recoverable sucrose and produces 92.0 tons of cane/ha. Isd 16 is excellent for gur making. The variety is moderately resistant to red rot disease.
	Isd 18	Improved	National	1988	All over Bangladesh	Tall (2.85-3.25m) variety having medium thickness of ~2.80 cm. Stalk colour is yellowish green but uncovered part generally shows pinkish-red in colour. Heavy deposition of waxy material is found on the stem for which sometimes it looks pinkish-ashy colour. Internode is conoidal shaped and the rind is medium hard. Pith, pipe, bud groove, corky patch and ivory makings are absent. Leaf scar is prominent. Eye-bud small in size and oval shape, tip touches the growth ring. Leaves are medium in length (~150 cm) and breadth (~4.15 cm); green and erect in nature. Leaf sheath (30-35 cm) is light green with purplish blotches near the basal portion. Few spines are present on the upper portion of the sheath. It is a self-detrashing variety. Dewlap medium in size, triangular shape and greenish coloured. Ligule crescentiform and symmetrical. Inner auricle transitional-1 and the outer auricle transitional-2 shaped. It is a non-flowering and mid-maturing variety of sugarcane. The variety is good for late planting. Recoverable sucrose content is 10.71%; Cane yield 86.0 tons/ha. The variety is moderately resistant to red rot disease. Isd 18 is good for gur making and also good for ratooning.
	Isd 19	Improved	National	1988	All over Bangladesh	Semi-dwarf (2.20-2.80m) and medium thick (~2.65 cm) variety. Stalk is greenish-yellow in colour but becomes pinkish-yellow when exposed to sunlight. Internode is conoidal shape and the rind is hard enough having no growth split, corky patch, ivory markings and bud groove. Pith-pipe absent. Node slightly bulging than the internode and leaf-scar is prominent. Eye-bud is medium in size and round shape, tip just touches the growth ring. Leaves are medium in length (~155 cm) and breadth (~4.75 cm) light green and semi-droopy in nature. Leaf margin is serrated. Leaf sheath (28-35 cm) pinkish in colour, spines present at the middle and loosely clasping. Dewlap is triangular shape, medium size and light green in colour. Ligule crescentiform and uneven. Inner auricle transitional-3 but the outer auricle deltoid shaped. It is a flowering and mid -maturing variety of sugarcane. Recoverable sucrose content is 11.06%. Cane yield 83 tons/ha. The variety is resistant to red rot disease and medium for gur production.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	Isd 20	Improved	National	1990	All over Bangladesh	Tall (2.95-3.15m) and erect variety with medium thin stalk diameter of (~2.38 cm). Stalk colour is greenish-yellow but uncovered portion becomes black due to deposition of waxy material. Internode is conoidal shape and rind is hard. Small pipe present at the basal part of cane. Growth split occasionally present but bud grooves always present. Corky patch and ivory markings are absent. Node is swollen than the interode and leaf-scar is prominent. Eye-bud medium in size, triangular shape, the tip overlaps the growth ring but not compact with the ring. Growth ring remarkably greenish in colour. Leaves are light green narrow (~3.75 cm), medium length (~145.5 cm) and serrated. Younger leaves erect but older leaves curve broadly. Leaf-sheath (30-34 cm) light green in colour with purplish blotches in older leaves, spineless and loosely clasping. Dewlap greenish in colour, triangular and eminent. Ligule crescentiform and symmetrical. Inner auricle deltoid. Isd 20 is a sparse-flowering and mid-maturing variety of sugarcane. Recoverable sucrose content is 11.02%. Cane yield is 72.0 tons/ha. The variety is highly resistant to red rot disease, and tolerant to drought flood and water-logging conditions. It is good for ratooning. The variety is suitable for making medium quality gur.
Sugarcane	Isd 21	Improved	National	1990	All over Bangladesh	Tall (2.98-3.25 m) medium thick (~2.68 cm) and erect variety. Stalk is yellowish-green in colour but the uncovered parts become greenish-pink. The colour becomes greenish-ashy due to deposition of waxy materials. Internode is conoidal shape having no growth split, ivory markings, corky patches and bud-groove. Rind is medium hard and internally has no pith or pipe. Node is even with the internode, and leaf-scar is prominent. Eye-bud medium in size and ovate shape, upper part surpasses the growth ring zone and lower part remains attached with the leaf-sheath. Leaves are light green, long (~196 cm) and medium in breadth (~4.75 cm). Leaf margin is serrated. Leaf - sheath (26-28 cm) is greenish-pink in colour and remains loosely attached with the stalk. Huge spines are present on the dorsal side of sheath. Older leaves do not fall down even after drying (not self-detrashing). Dewlap transitional-1 while outer auricle is deltoid shape. The variety is early maturing and sparse-flowering in habit. It contains the highest recoverable sucrose content of 12.10%. Cane yields 71.0 tons/ha. The variety is excellent for gur making. It is moderately resistant to red rot disease but tolerant to water logging conditions.
	Isd 22	Improved	National	1993	All over Bangladesh	Medium tall (2.70-3.00 m) medium thin (~2.25 cm) fast growing variety. Stalks are yellowish-green in colour but due to deposition of wax it becomes black in mature cane when exposed to sunlight. Internode is cylindrical in shape and rind is hard. Ivory marking and bud groove are absent but sometimes corky patch and growth-split are observed at the basal internode. Pith absent but small pipe is present. Node swollen and leaf-scar is prominent. Eye-bud medium in size and ovate in shape, tip just touches the growth ring, bud cushion absent. Leaves are light green narrow (~3.75 cm) medium length (~122 cm) and edge serrated. Younger leaves erect but older leaves curve at the tip. Leaves are generally spineless. Dewlap pinkish colour, triangular in shape and separated from one another by midrib base. Ligule crescentiform and asymmetrical. Inner auricles are transitional-3 and outer auricle deltoid types. Isd 22 is late flowering and early-maturing in habit. The variety contains as much as 11.34% recoverable sucrose. Cane yield is 65.0 tons/ha. It is resistant to red rot disease and tolerant to flood, drought and water logging conditions. The variety is suitable for making good quality gur.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
Sugarcane	Isd 24	Improved	National	1993	All over Bangladesh	Medium tall (2.60-3.10m) erect and medium thick (~2.65 cm) variety. Stalk colour is greenish- yellow and generally reddish near the bud area. The cane becomes blackish due to deposition of waxy material under sunlight. Internode is cylindrical to conoidal in shape. Rind is soft, so suitable for chewing. Bud groove present and prominent. Growth split absent but sometimes corky patches are found on the stem. Pith absent while small pipe present. Leaf-scar prominent. Eye-bud medium in size ovate shaped and swollen the upper end touches the growth ring. Bud cushion absent. Leaves are green, medium in length (~145 cm) and breadth (~4.5 cm) mostly erect and edge serrated. Leaf-sheath (25-30 cm) light green to purplish green with narrow scarious border and clasping loosely. Spine present only on the dorsal side of the younger leaves but deciduous. Dewlaps are pinkish-green in colour and triangular in shape. Ligule crescentiform and symmetrical. Inner auricle short lanceolate and outer auricle transitional-2 type. The variety is flowering and early maturing in habit. It contains 10.98% recoverable sucrose; Yield is 53.0 tons/ha. The variety is suitable for making improved quality gur. Isd 24 is resistant to red rot disease and tolerant to water-logging conditions.
	Isd 25	Improved	National	1993	All over Bangladesh	Medium tall (2.50-3.00 m) and medium thin (~2.27 cm) variety. Stalks are greenish-yellow in colour but become blackish under sunlight due to depositional waxy material. Internode cylindrical in shape, growth- split present but ivory marking corky patch and bud groove absent. Pith absent but small pipe present. Rind is hard. Node almost even with the interode and leaf-scar prominent. Eye -bud medium in size and ovate in shape tip crosses the growth ring and bud cushion absent. Leaves are deep green, medium in length (~129 cm) and breadth (~4.6 cm) and slightly serrated. Younger leaves erect but older leaves curve at the tip. Leaf-sheath (24-26 cm) is greenish white, clasping loosely, scarious border present and glabrous. Dewlap pinkish in colour and squarish shaped. Ligules are deltoid and symmetrical. .Inner auricle transitional-3 and outer auricle transitional-2 type. The variety is early flowering and mid-maturing in habit. It contains recoverable sucrose; 10.56%. Yield is 62.0 tons/ha. Resistant to red rot disease but tolerant to flood water. Medium quality gur can be made from this variety.
Sugarcane	Isd 26	Improved	National	1995	All over Bangladesh	Tall (2.80-3.20 m) variety having medium thickness (~2.81 cm) of stalk. Stalk colour is greenish-yellow but uncovered part appears greenish-pink in colour due to deposition of waxy material under sunlight. Internode is cylindrical in shape having no growth split, ivory marking and corky patches but bud groove is prominent. Rind is very hard and pith and pipe are present. Node is slightly bulging and leaf-sear is eminent. Growth ring is swollen, wide and evident. Eye-bud is medium in size and rectangular in shape, tip crosses the growth ring. The growth ring is medium, uneven and bulging. Leaves are medium in breadth (~4.48 cm) and length (~165 cm) and deep green in colour. Younger leaves erect but older leaves curved broadly. Leaf-sheath (24-30 cm) greenish and loosely clasping. At the base of the sheath, some spines are found. Dewlap distinct, brown in colour and deltoid shape. Ligule is horizontal type and symmetrical. Inner auricle lanceolate but outer auricle deltoid shaped. It is sparse-flowering and early maturing in habit. Sucrose content is 11.80%. Yield is 60.0 tons/ha. The variety is moderately resistant to red rot disease. It is excellent for gur making.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	Isd 27	Improved	National	1995	All over Bangladesh	Medium tall (2.70-3.00 m) erect and medium thin (~2.20 cm) variety. Stalks are yellowish-green in colour but due to heavy deposition of wax material the exposed portion becomes pinkish under sunlight. Internode is cylindrical and growth ring is prominent. Bud groove present but growth split, corky patch, ivory marking, pith and pipe are absent, Rind is hard enough. Node is swollen than the internode and leaf-scar is prominent. Eye-bud medium in size, oval shape but becomes round at maturity, tip touches the growth ring. Bud cushion absent. Leaf is light green and medium in length (140 cm) and breadth (~4.70 cm). Younger leaves erect but older leaves curved. Leaf-sheath (25-35 cm) is light green, sometimes purplish blotches present in older leaves, scarious border present and clasping loosely. Few spines are found on leaf-sheath. Dewlap pinkish colour, triangular and prominent. Ligules are deltoid symmetrical. Inner auricles are transitional-3 while outer auricle transitional-2 type. The variety is early maturing in habit. The highest recoverable sucrose content of the variety is 12.40%. Yield is 70.0 tons cane/ha. It is moderately resistant to red rot disease and moderately tolerant to drought and water -logging conditions. The variety is suitable for gur making.
Sugarcane	Isd 28	Improved	National	1995	All over Bangladesh	Tall (3.00-3.50m) erect and medium thick (~2.70 cm) variety. Canes are vigorous and stalks are greenish-yellow in colour with yellow colour near the bud but they may become reddish colour when exposed to sunlight. Internode is conoidal shape. Growth split, bud groove and ivory marking are present. Rind is hard enough. Node is slightly depressed from the internode. Leaf-scar prominent and forms a lip below the bud. Eye-bud is oval shape and medium in size, tip touches the growth ring. Bud cushion absent. Leaf light green medium width (~4.35 cm) and medium length (~160 cm); edge serrated.
Sugarcane	Isd 28					Younger leaves erect with droopy tips but older leaves curve broadly. Leaf-sheath (28-38 cm) light green in colour with few purplish blotches on the older sheath, The cane is not self-detrashing. Dewlap prominent, triangular, greenish to pink colour. Ligule is deltoid and symmetrical. Inner auricle short lanceolate type while outer one deltoid shaped. The cane is mid-maturing and flowering in habit. It contains as much as 11.30% recoverable sucrose content and in average produces a yield of 78 tons of cane/ha. The variety is moderately resistant to red rot disease and tolerant to drought, flood and water-logging conditions. Very good quality gur can be made from this variety.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	Isd 29	Improved	National	1998	All over Bangladesh	Tall (3.00-3.20 m) and medium thin (~2.48 cm) variety. Stalks are yellowish-green and generally yellowish near the bud but the exposed portion appears greenish-yellow under sunlight. Due to deposition of wax bloom, sometimes the stalks look ashy in colour. Internode is cylindrical shape, rind hard and solid. Bud-groove present but growth split, ivory markings and corky patch are absent. Node is yellowish in colour and even with the internode. Leaf -scar is slightly inclined below the bud. Eye-bud small in size and ovate shape, tip just touches the growth ring. Bud cushion absent. Leaves are medium in length (~162 cm); but narrow (~3.50 cm) and green in colour. Most of the younger leaves are erect with droopy tips but older leaves curve broadly. Leaf -sheath (32-35 cm). Dewlap triangular shape, green in colour and waxy bloom spread all over the dewlap. Ligule crescentiform and symmetrical. Inner auricle lanceolate and outer one transitional-3 type. It is a flowering and mid-maturing variety. Sucrose content is 10.75%. Yield 71.0 tons cane/ha. The variety is suitable for making quality gur. Isd29 is moderately resistant to red rot disease. The variety is moderately tolerant to draught and water logging conditions but highly tolerant to flood condition.
Sugarcane	Isd 30	Improved	National	2000	All over Bangladesh	Erect, medium thick (~2.6 2cm) and semi - dwarf (2.52-2.80 m) variety. Stalk is greenish yellow in colour but becomes yellowish green when exposed to sunlight. Internode is cylindrical shape and rind is hard enough. Growth split, ivory markings and bud grooves are absent. Corky patch may be present or absent. Node swollen. Leaf -scar prominent and inclined below the bud. Eye-bud small in size, ovate shape and upper end touches the growth ring. Bud cushion absent. Leaf medium in length (~155 cm) and breadth (~4.5 cm) and light green in colour. Both the younger and older leaves curve broadly. Leaf-sheath (30-34 cm) greenish in colour with few purplish blotches. Dewlap prominent, triangular, pinkish green, medium in size and whitish wax coating is present. Ligule crescentiform and symmetrical. Both the inner and outer auricle are short lanceolate type. Isd 30 is a flowering and early maturing variety. It contains 10.39% recoverable sucrose; Yield 78.0 tons/ha. The variety is very good for gur making. It is resistant to red rot disease. Isd 30 is moderately tolerant to drought and water -logging conditions but tolerant to flood stress condition.
	Isd 31	Improved	National	2000	All over Bangladesh	Tall (3.00-3.35 m) and medium thin (~2.39 cm) variety. Stalks are yellowish-green in colour but become purplish yellow when exposed to sunlight. Some stalks appear ashy in colour due to deposition of wax bloom. Internode is cylindrical shape, long and rind is hard. Growth split, bud groove, corky patch and pipes are absent but pith present and sometimes ivory markings are also observed. Leaf-scar is prominent. Eye-bud is medium in size, long and is ovate shape, lower side remains attached with the leaf-scar while the upper end touches the growth ring. Leaves are green colour, medium length (~163 cm) medium breadth (~4.22 cm) and margin is serrated. Leaf-sheath (28-35 cm) pinkish green with purplish blotches on the dorsal side but deciduous. Leaves do not generally shed when dry. Dewlap green colour, triangular and medium in size. Ligule deltoid shape and symmetrical. Inner auricle short lanceolate type but outer auricle transitional-3. The variety is flowering and mid-maturing in habit. Recoverable sucrose content is 10.21%. Cane yield 90.0 tons/ha. Isd 31 is good for gur production. It is moderately resistant to red rot disease, and tolerant to drought, flood and water-logging conditions.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
Sugarcane	Isd 32	Improved	National	2002	All over Bangladesh	Erect, medium tall (2.70-3.10 m) and medium thick (~2.80 cm) variety. Canes are vigorous and stalks are yellowish-green colour but the exposed portion appears reddish colour in sunlight. Due to heavy deposition of wax material, sometimes the cane looks blackish in colour. Internode is conoidal shape and rind is hard enough. Growth split, corky patch and bud grooves are absent but pith and pipe are present. lvory markings are present at the basal portion of canes. Node is swollen where leaf-scar is evident and forms lip below the bud. Eye-bud is oval shape and sometimes round, basal side is attached to the leaf-scar but tip overlaps the growth ring. Bud cushion is absent. Leaves are green in colour and medium in length (~150 cm) and breadth (~4.50 cm). Younger leaves erect but older leaves curve broadly. Leaf-sheath (30-31 cm) is green with dry edges on the older leaves, clasping tightly, and profuse spines are present on the dorsal side of the sheath. Dewlap pinkish green, tightly and medium in size. Ligule deltoid shaped and symmetrical. Both the inner and outer auricles are deltoid shape. Isd 32 is flowering and mid-maturing in habit. The variety contains as much as 10.23% recoverable. Cane yields 104 tons/ha. It is suitable for making medium quality gur. Moderately resistant to red rot disease Isd 32 is very tolerant, tolerant and moderately tolerant against flood, drought and water-logging conditions, respectively.
	Isd 33	Improved	National	2002	All over Bangladesh	Straight medium tall (2.80-3.10 m) and medium thin (~2.18 cm) variety of sugarcane. Stalks are yellowish-green in colour but become pinkish yellow when exposed to sunlight. Sometimes, cane may be ash colour due to deposition of wax bloom. Internode is cylindrical. Growth split ivory marking and corky patches are absent but superficial bud groove, and small pith and pipe are present. Rind is hard. Node is slightly bulging yellow and leaf-scar is prominent. Eye-bud small in size, round shape, lower side remains attached to the leaf-scar while the tip crosses the growth ring. Leaves green in colour, narrow in breadth (~3.75 cm) and medium in length (~140 cm). Most of the younger leaves are erect with droopy tips but the older leaves curve broadly. Leaf-sheath (30-33 cm) green with purple colour, clasping tightly, profuse spines present on the dorsal side of the sheath, and the spines are persistent. Dewlap pinkish green triangular shape, medium in size with heavy deposition of wax. Ligule steeply sloping and sometimes horizontal. Both the inner and outer auricles are transitional-3 type. The variety is flowering and early maturing in habit. Recoverable sucrose content 11.31% and produces an average cane yield of 99.0 tons/ha. Moderately resistant to red rot disease; Tolerant to flood and drought but moderately tolerant to water- logging condition. The variety is suitable for making medium quality gur.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
Sugarcane	Isd 34	Improved	Exotic	2002	All over Bangladesh	Semi-dwarf (2.50-2.85 m) erect and medium thin (~2.19 cm) variety. Stalk colour is yellowish-green with yellow area near the bud. Under sunlight the exposed portion turns to pinkish-yellow but sometimes the stalks become ashy colour due to deposition of wax material. Internode is bobbin shape and rind is medium hard. Growth split, corky patch and ivory marking are absent but superficial bud groove, and small pith and pipe are present. Node is swollen and even with internode. Leaf-scar is prominent and slightly inclined below the bud. Eye-bud medium in size triangular and tip crosses the growth ring. Bud tips are green in colour. Leaves are green in colour, medium in length (~145 cm) and breadth (~4.0 cm), leaf edge serrated. Leaf-sheath (30-40 cm) green with purplish blotches, clasping loosely, spine absent and leaves partially shed when dry. Dewlap pinkish green, triangular and whitish wax coating present. Ligule crescentiform and symmetrical. Inner auricle deltoid and outer auricle deltoid shape. Isd 34 is sparse flowering and mid-maturing in habit. It contains as much as 10.68% recoverable sucrose and produces an average cane yield of 93.0 tons/ha. The variety is moderately resistant to red rot disease and is tolerant to flood, drought and water logging conditions. Medium quality gur can be made from this variety.
	Isd 35	Improved	National	2003	All over Bangladesh	Medium tall (2.80-3.00 m) stalk diameter (~2.25 cm). Stalks are yellowish green in colour but on exposure to sunlight they become reddish colour. Internode is cylindrical in shape. Growth split, ivory markings, corky patch and bud grooves are absent. Rind is hard and solid. Node is swollen than the internode and leaf-scar is evident. Eye-bud is round and medium in size and upper part of mature bud remains in touch with the growth ring. Leaves are green in colour medium in length (~140 cm) and narrow in breadth (~3.73 cm). Leaf edge serrated. Leaf sheath (30-35 cm) is purple green and remains loosely clasping with the stalk. Dewlap triangular shape, small in size and pinkish-green in colour. Ligule is deltoid shape and symmetrical. The inner auricle is deltoid and outer auricle is transitional-3 type. It is a flowering variety having 11.02% recoverable sucrose content. Yield 94.0 tons of cane/ha. The variety is early maturing in habit and good for gur production. It is moderately resistant to red rot disease. The variety is highly tolerant to flood but tolerant to drought stress conditions.
Sugarcane	Isd 36	Improved	National	2003	All over Bangladesh	Erect medium tall (2.70-3.10 m) and medium thickness (~2.63 cm) of stalk. Stalk colour is yellowish-green but the uncovered part remains yellowish-pink. Sufficient waxy materials are deposited on the stem which makes the cane ashy colour. Internode is bobbin to cylindrical shape. Rind is hard and small pipe is present. Growth split, corky patch and ivory markings are absent but bud-groove prominent. Node even with the internode and leaf-scar is prominent. Eye-bud is oval shaped medium size and upper part of the mature bud crosses the growth ring. Leaves are medium in length (~140 cm) and breadth (~4.50 cm) and deep green in colour. Leaf margin is serrated. Leaf sheath (32-35 cm) is green with purple blotches loosely clasping with the stalk and spine absent. Dewlap medium and triangular shape and pink in colour. Ligule deltoid shaped and symmetrical. Inner auricle deltoid but outer auricle short lanceolate type. It is a non-flowering variety. It contains 11.49% recoverable sucrose. Yield is 89.0 tons of cane/ha. The variety is early maturing in habit and good for gur production. It is moderately resistant to resistant against red rot disease and tolerant to flood and drought stress condition.

Crop	Cultivar	Type	Origin	Year of Registration/ Release	Target AEZ	Important characteristics
	Isd 37	Improved	National	2003	All over Bangladesh	Erect medium tall (2.75-3.15 m). Stalk colour is yellowish-green Internode is cylindrical shape. Ring is hard and small pipe is present.. Growth split, corky patch and bud-groove and ivory markings are absent. Node even with the internode and leaf-scar is prominent and slightly inclined below the bud. Eye-bud is round in shape, small size and touches the growth ring. Leaves are medium in length (~158 cm) and breadth (~5.00 cm) and deep green in colour. Leaf margin is serrated. Leaf sheath (32-35 cm) is green with purple blotches loosely clasping with the stalk and spine absent. Dewlap medium and triangular shape and pink in colour. Ligule deltoid shape and symmetrical. Inner auricle deltoid but outer auricle short lanceolate type. It is a non-flowering variety contains 11.49% recoverable sucrose. Yield 89.0 tons of cane/ha. The variety is early maturing in habit and good for gur production. It is moderately resistant to resistant against red rot disease and tolerant to flood and drought.

* Parenthesis indicates year of release

Appendix Table III.14. Efforts made towards developing value-added processing of "diversity-rich" products for commercial purposes, andY incentives needed for promoting markets for local varieties and diversity-rich products (as perceived by different stakeholder organizations)

Stakeholder	Efforts for value-added processing	Incentive
Bangladesh Agricultural Research Institute	• No efforts made to develop value-added processing of cereals and pulses • Research programmes undertaken on post-harvest technology mainly on fruits and vegetables	Organic farming, Strengthening cooperation of producers; Street fairs
Bangladesh Agricultural Development Corporation	-	Strengthening cooperation of producers, Initiative in schools
Coastal Development Partnership	• No efforts made to develop value-added processing of "diversity rich" products for commercial purposes	Organic farming, Labelling of products that use non-standard crop varieties, Strengthening cooperation of producers; Initiatives in schools, Street fairs
Cotton Development Board	• No efforts made to develop value-added processing of "diversity rich" products for commercial purposes	Incentives are scarce
Department of Agricultural Extension	• There are few projects for developing value-added processing of "diversity rich" products fiord internal (domestic) use	Strengthening cooperation of producers
Seed Certification Agency	• No efforts. The institute should be encouraged to develop diversity rich products	Niche-variety registration systems; Organic farming, Strengthening cooperation of producers, Initiative in schools, Street fairs
East West Seed Ltd	• The institute should be encouraged to develop diversity rich products	Strengthening cooperation of producers

Stakeholder	Efforts for value-added processing	Incentive
Bangladesh Rice Research Institute	• Efforts made in some areas where local varieties are still available and produced commercially. Rice made cake and rice packets are now-a-days made for commercial purposes. Aromatic rice has a high demand in the market, which is processed as value-added products.	Organic farming, Street fairs
Bangladesh Sugarcane Research Institute	• *Saccharum spontaneum* (wild) is being used in hybridization programme with *S. officinarum.*	-
Bangabandhu Sheikh Mujibur Rahman Agricultural University	• Research undertaken on post-harvest technology mainly on fruits and vegetables	Organic farming, Strengthening cooperation of producers, Initiatives in schools.

Appendix Table III.15. Programmes related to PGR implemented so far

Programmes	Reference
Preparation of Draft PGR Acts	• Draft Biodiversity and Community Knowledge Protection Act of Bangladesh. • Plant Variety and Farmers Rights Protection Act
Contract Research Project, BARC	• Khan, M. S. and Fariduddin Ahmed. (2001). A Tentative List of Plant Genetic Resources of Bangladesh, BAAG/BARC, Dhaka (Mimeo)
Contract Research Project, BARC	• Khan, M. S. , M. M. Rahman and M. Arshed Ali. 2001. Red Data Book of Vascular Plants of Bangladesh, Bangladesh National Herbarium (BNH), Dhaka

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