

National States of-the-Art Report

1. Name of the country: People’s Republic of Bangladesh
2. Name, Address and Contact details including telephone, fax, email, etc. of the focal Ministry/Institution on Biotechnology

a) Ministry

Name : Ministry of Science & Technology
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b) Institution (National Focal Point on Biotechnology)

National Institute of Biotechnology
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3. Name, Address and major activities of the key R&D organizations/academic institutions involved in Biotechnology activities (Government, NGOs and private organizations)

Please see annexure: 01

4. Present Status of different areas of Biotechnology

4.1 Plant Biotechnology

4.1.1 Plant tissue culture

The programme on plant biotechnology in Bangladesh was initiated in late 1970s in the Department of Botany, University of Dhaka with tissue culture of jute. Thereafter within a span of 10-12 years tissue culture research laboratories had been developed in different universities, R&D organizations, and private entrepreneurs. A few NGOs are also working on plant tissue culture, BRAC & PROSHIKA have already marketed tissue cultured plantlets such as potato, banana and ornamental plants in Bangladesh & Neighboring countries. As a result of intensive works on plant tissue culture protocols, plant regeneration and micro-propagation have been developed on different crops, forest, fruit, ornamental, medicinal and commonly important plants as well as vegetables.

4.1.2 Genetic Modified Crops (GMO)

Transgenic plant development of some key crop plants (rice, jute, brinjal, grain legumes, papaya, etc.) has also been initiated at several laboratories in Bangladesh. University of Dhaka, Bangladesh Rice Research Institute (BRRI), Bangladesh Institute of Nuclear Agriculture (BINA) and National Institute of Biotechnology (NIB) is now performing research on development of stress tolerant (salinity, drought, flood) crop varieties through genetic transformation. Bt-brinjal for shoot and fruit borer, golden rice (vitamin A rich) and late blight

resistant potato variety are on field trails stage. Besides, Marker aided selection and molecular characterization by RAPD, RFLP, microsatellite DNA and isoenzyme studies have been developed in different plants.

4.2 Animal Biotechnology

Animal biotechnology encompasses a broad range of techniques for the genetic improvement of animal species, animal vaccines and development of rapid test kits to diagnose the health of livestock and companion animals. National Institute of Biotechnology (NIB), Bangladesh Livestock Research Institute (BLRI) and Bangladesh Agricultural University (BAU) are working to adopt modern livestock biotechnological programmes. Techniques of traditional biotechnology like artificial insemination and selective breeding are being practiced extensively in the country. *In vitro* fertilization and embryo transfer have been carried out successfully in the laboratories and in field trial, and are being used in some selective areas. A number of vaccines have been developed against cattle, poultry and goat, e.g. Goat Plague (PPR), goat pox at BLRI. Besides, vaccines against rinderpest, ranikhet, and foot & mouth diseases are under field trial. Recently, poultry industries of the country are facing avian influenza epizootics in increasing frequencies; National Reference Laboratory for Avian Influenza at Bangladesh Livestock Research Institute has been engaged to detect avian influenza virus subtype and molecular characterization of the pathogen. Research on DNA fingerprinting and microsatellite genotyping methods for parentage verification and molecular characterization of indigenous goat, sheep, cattle and buffaloes are carrying on at NIB, BAU and BLRI. Karyotyping and blood protein polymorphism of goat, sheep, cattle and buffalo are also under research in BLRI and BAU.

4.3 Health and Industrial Biotechnology

4.3.1 Health/Medical Biotechnology:

Biotechnology in health care and diagnostic services is at the preliminary stage. The two organizations engaged are International Centre for Diarrhoeal Disease Research 'Bangladesh (icddr,b) and Institute of Public Health (IPH). In the icddr,b, PCR and microsatellite marker based diagnosis of diarrhoea, cholera and hepatitis A, B, C has been established. Development of *Shigella* vaccine is being carried out at icddr,b. R&D of animal genetic engineering is very limited.

The IPH is engaged in the production of vaccines and antisera. Intensive effort of scientists of IPH has made small pox eradication program successful by producing sufficient quantity of highly potent small pox vaccines. Since 1992 the IPH is also engaged in the production of high quality tetanus vaccines.

4.3.2 Industrial Biotechnology:

In the field of industrial biotechnology, Bangladesh is yet to make real breakthroughs. Modern biotechnological programmes involving gene transfer technology have yet to be started in real earnestness. However, the results are quite encouraging and a good number of projects are in advanced stage, which can be taken up for commercialization. Mass scale production of *Spirulina*, biofertilizer, bakers yeast, citric acid has been reached at the commercial stage. A few distilleries in the country are already utilizing >50,000 MT of molasses for the production of ethyl alcohol. Research is also going on enzymes, single cell protein, etc.

4.4 Others

4.4.1 *Insect Biotechnology:*

In Bangladesh Atomic Energy Commission low dose of gamma radiation to the silkworm has been employed for the enhanced production of silk. Significant progress has been achieved on sterile insect technique (SIT) by utilizing gamma radiation. Besides, hormonal and pheromonal control of insects and also the integrated pest management (IPM) programme are now being adopted for insect management. Isolation and characterization of *Bacillus thuringiensis* strains for the control of Lepidopteran insects has been initiated at the University of Dhaka.

4.4.2 *Sericulture:*

Sericulture Research Institute has been working for a long time for the improvement of sericulture production in Bangladesh. During recent past genetic engineering techniques have also been adopted for the purpose.

4.4.3 *Bioenergy and Environmental Biotechnology*

A significant achievement has been made in the field of 'BIOGAS' production from animal excreta (cow dung) and agricultural residues. The Institute of Fuel Research and Development (IFRD) have been working since long in this field. As a result of research findings and its subsequent development in collaboration with Department of Energy (DOE) at present more than 20,000 biogas plants have been installed in rural areas. An extended programme to set up about 100,000 biogas plants throughout the country has also been taken up by the government, which is now under implementation.

Rhizobium biofertilizer production in a pilot scale had been successful and its use in pulse crops has been found to be effective in farmer's field.

4.4.4 *Fisheries Biotechnology:*

Bangladesh Fisheries Research Institute (BFRI) conduct some basic Biotechnological research on seed production of endangered fish species through in vitro fertilization, production of carps, catfishes & genetically improved farmed tilapia GIFT through selective breeding, production of monosex tilapia, development of hybrid variety of magur & punti, and freshwater pearl production. Besides, faculty of fisheries of the Bangladesh Agricultural University (BAU), Mymensingh, develops the techniques for characterization of different commercially important fish species through RAPD, mt DNA and RFLP techniques. No transgenic strain of fish has been produced in the country yet.

4.4.5 *Genomics, Proteomic and Bioinformatics*

Modern research activities on these fields have been taken on some institutes and universities.

5. Government policy/legislation regarding application of biotechnology in national development

Government has taken significant initiatives to promote biotechnological research and infrastructure development, now several research organizations, universities, private companies, NGOs are doing biotechnology research in Bangladesh. Universities have launched academic programs in this area. For enhanced productivity, quality and value of products, stability of production systems and environmental conservation leading to sustained food security, poverty alleviation and livelihood security, the following strategies, actions and documents have been taken and approved by the government of Bangladesh.

- National Task Force on Biotechnology of Bangladesh: Headed by the Hon'able Prime Minister
- National Executive Committee on Biotechnology: Headed by the Principal Secretary of Hon'able Prime Minister
- National Biotechnology Policy
- National Crops and Forest Biotechnology Policy Guidelines
- National Guidelines for Fish and Animal Biotechnology
- National Guidelines on Medical Biotechnology
- Bio-Safety Guidelines of Bangladesh
- National Institute of Biotechnology (NIB)

6. Priority areas for cooperation

- (i) Biofertilizer
- (ii) Plant Genetic Transformation
- (iii) Industrial Biotechnology
- (iv) Fisheries Biotechnology
- (v) Livestock & Animal Biotechnology

7. Areas of expertise available for cooperation

- (i) Biofertilizer
- (ii) Plant Tissue Culture
- (iii) Livestock & Animal Biotechnology
- (iv) Fisheries Biotechnology
- (v) Health/Medical Biotechnology

8. Recent Biotechnology products/process developed/ready for transfer

Bt-brinjal resistant for shoot and fruit borer, golden rice (vitamin A rich) and late blight resistant potato variety are on field trails stage.

9. Issues and challenges

- Food security and safety issues for the socioeconomic development of the country
- Capacity buildings on Biotechnology
- Biodiversity Conservation

Annexure- 01

Name of Institution involved in Biotechnology activities

Sl no.	Institute	Major Research Areas
A.	Research Institute	
1	National Institute of Biotechnology (NIB)	<ul style="list-style-type: none"> ▪ Plant Biotechnology ▪ Animal Biotechnology ▪ Fisheries Biotechnology ▪ Environmental Biotechnology ▪ Microbial Biotechnology ▪ Molecular Biotechnology
2	Bangladesh Rice Research Institute (BRRI)	<ul style="list-style-type: none"> ▪ Plant Biotechnology
3	Bangladesh Agricultural Research Institute (BARI)	<ul style="list-style-type: none"> ▪ Plant Biotechnology
4	Bangladesh Jute Research Institute (BJRI)	<ul style="list-style-type: none"> ▪ Plant Biotechnology
5	Bangladesh Sugarcane Research Institute (BSRI)	<ul style="list-style-type: none"> ▪ Plant Biotechnology
6	Bangladesh Livestock Research Institute (BLRI)	<ul style="list-style-type: none"> ▪ Animal Biotechnology
7	Bangladesh Fisheries Research Institute (BFRI)	<ul style="list-style-type: none"> ▪ Fisheries Biotechnology
8	Bangladesh Tea Research Institute (BTRI)	<ul style="list-style-type: none"> ▪ Plant Tissue Culture
9	Bangladesh Forest Research Institute (BFRI)	<ul style="list-style-type: none"> ▪ Plant Tissue Culture
10	Bangladesh Council for Scientific and Industrial Research (BCSIR)	<ul style="list-style-type: none"> ▪ Plant Biotechnology ▪ Industrial Biotechnology
11	Bangladesh Atomic Energy Commission (BAEC)	<ul style="list-style-type: none"> ▪ Plant Biotechnology ▪ Environmental Biotechnology ▪ Insect Biotechnology
12	Bangladesh Institute of Nuclear Agriculture (BINA)	<ul style="list-style-type: none"> ▪ Plant Biotechnology ▪ Industrial Biotechnology ▪ Environmental Biotechnology
13	International Center for Diarrhoeal Disease Research, Bangladesh (icddr,b)	<ul style="list-style-type: none"> ▪ Health/Medical Biotechnology
14	Institute of Public Health (IPH)	<ul style="list-style-type: none"> ▪ Health/Medical Biotechnology
B.	Academic Institute/University	
1	University of Dhaka	<ul style="list-style-type: none"> ▪ Plant Biotechnology ▪ Animal Biotechnology ▪ Industrial Biotechnology ▪ Medical Biotechnology
2	Rajshahi University	
3	Chittagong University	
4	Agricultural University	
5	Jahangirnagar University	
6	Khulna University	
7	Shahjalal Science and Technology University, Sylhet	
8	Kushtia University	
9	Sher-E-Bangla Agricultural University	
10	Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU)	
11	Moulana Vashani Science and Technology University	
12	Patuakhali Science and Technology University	
13	Hazi Danesh Science and Technology Univesity	
14	Sylhet Agriculture University	

15	Chittagong Animal and Veterinary University	
16	Comilla Science and Technology University	
C.	Private University	
1	BRAC University	▪ Plant Tissue culture
2	North South University	
3	Bangladesh University	
4	University of Development Alternative	
D.	Private organizations	
1	Biotech seeds	▪ Plant tissue culture
2	Genetic seed	
3	Grameen Krishi Foundation	
4	Rantic Limited	
5	Lal teer seed company	
6	Matex BD Limited	▪ Plant tissue culture ▪ Industrial Biotechnology
7	Safe Agriculture, Bangladesh	▪ Biocontrol agents
8	East West Seed Company	▪ Plant tissue culture
E.	NGO	
1	DEBTECH	▪ Plant tissue culture
2	PROSHIKA	
3	Swiss organization for Development and Cooperation	
4	BRAC	
F.	Other	
1	Institute of Integrated Rural Development (IIRD)	▪ Plant tissue culture
2	Rural Development Academy (RDA)	
3	Botanical Garden, Dhaka	

**Nomination of Resource Person under program of cooperation in the field of
biotechnology between the SAARC Member States:**

Serial No.	Name and contact address	Field of expertise
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02	Dr.M. Imdadul Hoque Professor & Dean, Faculty of Biological Sciences Department of Botany University of Dhaka Dhaka-1000, Bangladesh Fax: +88-02-8615583 Cell: +8801711224350 Email: mimdadul107@yahoo.com	Plant Tissue Culture
03	Dr. Sharif Akhteruzzaman Professor Department of Biochemistry & Molecular Biology University of Dhaka Dhaka-1000, Bangladesh Phone: +88-02-9661900-59 Ext.7641 Fax: +88-02-8615583 Cell: +8801714111267 Email: sharif_akhteruzzaman@yahoo.com	Medical Biotechnology
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05	Dr. Jahangir Alam Senior Scientific Officer Bangladesh Livestock Research Institute Savar, Dhaka, Bangladesh Fax: +88-02-7791675 Cell: +8801712819098 Email: alamjahan2003@Yahoo.com	Animal Biotechnology
06	Dr. Mohammad Al-Forkan Professor Department of Genetic Engineering and Biotechnology University of Chittagong Chittagong-4331, Bangladesh. Fax: +88-031-726310 Cell: +8801819383213 Email: alforkancu@hotmail.com	Genomics