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Work Plan for the National Biotechnology Policy 2012

Report Categories:
Biotechnology and Other New Production Technologies
Biotechnology - GE Plants and Animals

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Report Highlights:
On May 15, 2014, the Ministry of Science and Technology gazetted the Work Plan for the National Biotechnology Policy 2012. The Work Plan provides a list of national research and development priorities for biotechnology and a timeline for achieving these objectives. It focuses on agricultural, medical, and industrial biotechnology.

Executive Summary:

On May 15, 2014, the Ministry of Science and Technology gazetted the Work Plan for the National Biotechnology Policy 2012 (WP, 2014). The WP, 2014 provides a list of national research and development priorities for biotechnology and a timeline for achieving these objectives. The overarching goal is to advance the research and development of biotechnology in order to improve food security, increase the standard of living, and eliminate poverty. It focuses on agricultural, medical, and industrial biotechnology.

General Information:

Disclaimer: This summary is based on a *cursory* review of the subject document and, therefore, should not under any circumstances be viewed as a definitive interpretation of the regulation in question, or of its implications for U.S. agricultural trade interests.

This report contains an INFORMAL translation of the Work Plan for the National Biotechnology Policy 2012.

On May 15, 2014, the Ministry of Science and Technology gazetted the WP, 2014, which provides an action framework for section 6.4 of *National Biotechnology Policy 2012*. The WP, 2014 provides a list of national research and development priorities for biotechnology and a timeline for achieving these objectives. The overarching goal is to advance the research and development of biotechnology in order to improve food security, increase the standard of living, and eliminate poverty. It focuses on agricultural, medical, and industrial biotechnology.

The WP, 2014 prioritizes various research activities as well as other related topics such as improving regulations/laws for biotechnology. Some specific focus areas include plant biotechnology, animal biotechnology, medical biotechnology, and industrial biotechnology, as well as other topics such as nanotechnology and bioinformatics. Risk communication is also listed as a priority. Moreover, the WP, 2014 incorporates workforce development ranging from improving school programming to research capacity building. Activities have timelines for completion from between two to 10 years.

Some specific plant biotechnology priorities include the development of nutritionally enhanced crops, as well as pest, disease, and abiotic stress tolerant seed varieties. Animal biotechnology priorities include improving the genetic characterization of cattle and poultry to enhance reproductive performance and the identification of genetic markers to improve milk and meat yields or disease resistance.

An *informal* translation for the Work Plan for the National Biotech Policy 2012 is below. The original text can be accessed here.

BEGIN TRANSLATION

Bangladesh Gazette

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Ministry of Science and Technology

Branch-15

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No. 39.015.006.02.00.003.2005.62- ''Work Plan for The National Biotechnology Policy 2012'' has been approved by the National Task Force of Bangladesh on Biotechnology. The aforesaid ''Work Plan for the National Biotechnology Policy 2012'' is published in the Gazette for information of members of the public.

''The National Biotechnology Policy 2012

Work Plan''

Preface:

''The National Biotechnology Policy 2012'' has been formulated and published in the Gazette in order to improve this technology in the country in congruity with the gradually flourishing biotechnology and its progress, to implement and update its development activities keeping pace with the developed world and to identify its priorities. In accordance with Section 6.4 of this Policy a priority based and time bound Work Plan has been formulated in order to implement activities pursued in the Biotechnology Policy, which is being published under the nomenclature of ''Work Plan for the National Biotechnology Policy 2012''. In order to monitor and implement this Plan a technical committee was formed comprising universities, research organizations and representatives from Ministries at different levels. Activities of this committee will be placed before meetings of the National Executive Committee on Biotechnology and National Task Force of Bangladesh on Biotechnology. Positive development of biotechnology in the country is aimed to be achieved through this.

Md Mostafizur Rahman

Deputy Secretary

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Prologue

The substantial progress in the field of biotechnology achieved in the past few decades manifests that creative biotechnology may contribute significantly in the socio economic development of the country. Short, mid and long term work strategies are required for enhancing capacity and combating challenges, as for example, food security and sustainable environmental management in the field of our national development.

The present Government has taken a number of initiatives in order to build Bangladesh as a medium income country free from hunger and poverty by fruitful use of biotechnology by the year 2021. After discussion with other concerned Ministries relevant to biotechnology, researchers, policy makers and the consumer class, the Ministry of Science and Technology has formulated a Work Plan from 2012 to 2021 for The Biotechnology Policy 2012. In order to implement the National Biotechnology Policy, Work Plan for The National Biotechnology Policy has been formulated keeping in view the work plan as regards activities of biotechnology, especially plant biotechnology, wildlife biotechnology, fishery, medical biotechnology, industrial biotechnology, environmental biotechnology, bio security, bio ethics, intellectual property right etc. Moreover other important sectors have also been included, as for example, medicinal plants, wildlife feeds, diagnoses of diseases and development of crop processing technology to reduce loss in agricultural production.

The strategies of work have been categorized as of short (2 years), mid (5 years) and long (10 years) terms, in order to achieve sustainable development in different branches of biotechnology. Increase in agricultural production, ascertaining food security, poverty alleviation and upgrading standard of living will take place by implementation of the Work Plan.

1. Strategic goals

* Development and transfer of outcome of agricultural, health, industrial and environmental biotechnology.

* Creating appropriate environment for encouraging research and investment in the biotechnology sector.

* Achieving sustainable development in agricultural sector and food security, by using biotechnology.

* Conservation of biodiversity and environmental resources in the country, by using appropriate biotechnology.

* Development of human resources and infrastructure in respect of biotechnology.

* Formulating effective programs in order to create mass awareness about recent achievements in the field of biotechnology.

2. Allied policies

The Policy formulated by the Government of the People's Republic of Bangladesh in respect of research and development of biotechnology in the country includes inter alia, National Biotechnology Policy, Organism Security Instructions, National Medical Biotechnology Instructions, National Fishery and Livestock Biotechnology Instructions, National Crop and Forests Biotechnology Policy Instructions, National Biotechnology Work Structure and draft on Biotechnology Act.

3. Assessing ability, weakness, scope and risk of biotechnology in Bangladesh

This part includes information on ability of biotechnological research and development, weakness, scope and risks in Bangladesh determining intra institutional ability and weaknesses in one hand and extra institutional scope and risks on the other.

Abilities	*Organism resources enriched with plants, livestock, micro organism and fishery species. *Introduction of graduate and post graduate courses on biotechnology and relevant streams. *Policy support on biotechnological research and development. *Sufficient number of young professionals and scientists. *Sufficient number of expatriate expert scientists interested in working for development of biotechnology in the country. *Facility of sufficient number of laboratories up to the mark for research based on biotechnology. *Access to modern communication technology and database.
Weaknesses	*Insufficient fund for conducting research. *Insufficient number of expert researchers and technicians at the institutions. *Insufficient salary and emoluments of scientists and technicians. *Weakness of coordination and communication between biotechnological research institutions and the universities. *Insufficient fellowship activities for higher education and research. *Lack of updated information on scientists, biotechnological research and development. *Procedural complications in respect of strategy for purchase of biotechnological commodities and their customs clearance. *Lack of prompt and environmentally controlled transport system of biotechnological samples. *Lack of biotechnological research and its commercial investment.
Scopes	*Development of biotechnology related policy and controlling system. *Scope of research in the fields of food security, conservation of environment and health. *Interest of private sector institutions in respect of biotechnology based research and development.
Risks	*Delay in transfer of technology owing to insufficient physical infrastructure and transport system. *Development of biotechnological commodities being much time consuming.

4. Human Resource Development

Analyzing points of ability, weakness, scope and risk, it is observed that sufficient number of personnel to cater need of the present day is at place having graduate level degree on biotechnology, but the main limitation persists with the lack of efficient manpower capable to lead activities for biotechnological development. Progress and development of activities are being further limited for lack of biotechnology based efficient manpower, researchers, technical managers and leaders. Therefore, we need to initiate prompt action for introducing institutional course and Ph D course in the country in order to increase the number of expert scientists and engineers. Human resource development plan has to be formulated on the basis of need and requirement in different fields in order to achieve targeted goals. Steps should be taken to formulate human resource development plan in accordance with the need for training, targeted group and appointment of required manpower.

Strategic activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Formation of national technical committee for formulation, observation and implementation of human resource activities in respect of biotechnology.	√	-	-	Ministry of Science and Technology and biotechnology related concerned Ministries, research institutions, public -private universities/ institutions.
2	Initiating field level survey and necessary steps and composition of syllabus for development of human resource in respect of biotechnology.	√	√	√	
3	Appointment of sufficient manpower at biotechnology related research institutions/ universities.	√	√	√	
4	Standardization of existing biotechnology related specific research institutions/ universities/ departments including research and educational institutions by supplementing new syllabus / curriculum.	√	√	√	
5	Introducing post graduate course in specific fields of biotechnology at specific institutions/ universities.	√	√	√	
Sl	Activities	Short	Mid	Long	Implementing agency
6	Composition of syllabus on biotechnology at higher secondary and graduate levels.	√	√	-	
7	Initiating short and midterm fellowship programs for scientists, technologists and educational researchers for higher education and research on biotechnology.	√	√	√	
8	Establishing a training and information center on biotechnology.	√	√	-	
9	Organizing regular training programs/	√	√	√	

	workshops/ seminars for researchers/ technicians/ consumer class and policy makers.				
10	Funding for study tour for scientists and policy makers with a view to acquiring knowledge on modern biotechnology.	√	√	√	
11	Establishing contact with internationally reputed centers with a view to developing human resource under joint venture.	√	√	√	

5. Research and development

Potential biotechnology may contribute enormously by research and innovation in the society and economy. Standard of biotechnology related research should be upgraded to international level. Utmost importance should be attached on strengthening national and international partnership and on converting biotechnological research into pragmatic, profiteering technology production and procedure of transformation capacity.

Biotechnological research and innovation in the country may be encouraged by policy, infrastructural and financial assistance and strengthening national and international relations.

Strategic activities

Strategic activities plan has been formulated after deliberations with and opinions given by scientists at home and abroad. Formulating research projects in different fields of biotechnology, standardization of capacity in respect of biotechnology and acceptable level of progress for the purpose of strategic activities are discussed below.

5.1 Plant biotechnology

Bangladesh is a predominantly agricultural country and her economy is dependent on development in the agricultural sector. Significant success in the agricultural sector of the country has been achieved in the last 30 years through innovation of modern varieties of crops and development of production strategy by affiliated institutions and universities under the Bangladesh Agricultural Research Council. Despite this success agricultural production in the country is facing multiple problems. Bangladesh is perennially suffering from increased population, reduction of agricultural land, increasing demand for varieties of food or diversified food stuff, flood, drought and natural disaster, etc. Traditional technology is not enough for solving future problems in agricultural production. This problem may be settled by introduction and assumption of modern biotechnological tools and strategies in the agricultural sector. Biotechnology is being used in agricultural sector for increasing nutritional value of crops and innovation of biotic and abiotic, disaster tolerant, insect and disease tolerant crop varieties. With this purpose in view, for safe utilization of biotechnology, relevant policies should be formulated and restrictive measures taken for probable success of this technology.

Strategic activities

5.1.1 Restrictive measures

Sl	Activities	Short	Mid	Long	Implementing agency
1	Enhancing national capacity by establishing restrictive measures.	√	√	-	Ministry of
Sl	Activities	Short	Mid	Long	Implementing agency
2	Law regarding protection of local variety of crops and farmers' rights; formulation and implementation of law regarding biodiversity and macro knowledge conservation.	√	√	√	Agriculture and biotechnology related concerned Ministries.
3	Development and institutional implementation of local sanitary and phytosanitary activities.	√	√	√	
4	Formulating and implementing law for restricting standard of food in accordance with Codex Alimentarius.	√	√	-	
5	Developing and coordinating local standard.	√	√	-	

5.1.2 Building and strengthening institutional capacity

Sl	Activities	Short	Mid	Long	Implementing agency
1	Modernization and strengthening of existing biotechnological research institutions and centers/branches of universities engaged in research on modern biotechnology.	√	√	√	Ministry of Agriculture and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Raising necessary equipments and chemical substance along with information technology facility.	√	√	√	
3	Developing facility for examination of corrosive materials, residues of chemicals and pesticides.	√	√	-	
4	Enhancing laboratory facilities to determine and observe risk factors and strengthening institutional framework along with policy support.	√	√	√	
5	Establishing central warehouse for chemical substance and perishable (enzyme, hormone, molecular biology kit, etc.) materials usable at all biotechnological laboratories.	√	√	-	
6	Raising facility for conservation of important micro organisms and plant genetic resources in agricultural sector and determination of molecular characteristics.	√	√		

5.1.3 Priority research activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Developing standard of tissue culture/ micro propagation method, for prompt preparation of high quality and disease free seed/ sapling of important plants producing crop, bamboo and timber.	√	√	√	Ministry of Agriculture and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Selection/ reproduction of very important crops (paddy, wheat, pulse, oil seed, etc.) by marker, for specific use.	√	√	√	
3	Developing nutritional value of crops; producing transgenic plants which are resistant to insects and diseases, abiotic stress tolerant and harmonious to climate change.	√	√	√	
4	Identification, differentiation and determination of characteristics of necessary gene, in order to develop variety of plants by transfer of gene.	√	√	√	
5	Determination and conservation of molecular characteristics of plant (including medicinal plants) genetic resources and necessary micro organisms in agriculture sector.	√	√	√	
6	Revealing genome of important crops and forest grown plants for specific use.	√	√	√	
7	Introduction, evaluation and testing of transgenic crops.	√	√	√	
8	Identifying plant diseases at molecular level.	√	√	√	

5.2 Livestock biotechnology

Livestock is an integral part of agricultural economics in Bangladesh. More than half of the agricultural earning in all developed countries arrives from livestock sector. Even at a crop predominant region like Bangladesh livestock is a significant component of this region. But it is important to note that supply of milk, meat and egg can't keep pace with their growing demand. Availability of per capita milk, meat and egg tends to 14.1%, 22.6% and 26.9% of the whole target respectively.

Recently prevalent technology is not sufficient for production of livestock and poultry, which in no way can cater to the demand of the increased population. Specialized and modern biotechnology health management can also help increase production of livestock at farms. Use of biotechnology in producing livestock is faster in speed compared to plant production. Everywhere throughout the world numerous drugs, diagnostic probes, vaccines are at experimental level of livestock production, which are being used by men from the past till date. Therefore it is imperative to develop, introduce and utilize modern biotechnology, in order to boost livestock production in the country. With this end in view, for success of this technology, concerned policies need to be formulated and restrictive measures taken for facilitating safe use of biotechnology.

Four aspects are covered by this livestock biotechnology: (1) livestock health, (2) procreation selection breeding, (3) food and nutrition, (4) augmentation and production. The above aspects may be prioritized in research.

Strategic activities

5.2.1 Restrictive measures

Sl	Activities	Short	Mid	Long	Implementing agency
1	Enhancing national capacity by establishing restrictive measures.	√	√		Ministry of Fisheries and Livestock and biotechnology related concerned Ministries.
2	Formulation and implementation of biotechnology policy	√	√		

5.2.2 Creation and strengthening of institutional capacity

Sl	Activities	Short	Mid	Long	Implementing agency
1	Introducing livestock biotechnology section.	√	√	√	Ministry of Fisheries and Livestock and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
2	Appointment of manpower and creation of new posts in order to strengthen biotechnology related research.	√	√	√	
3	Enhancing and strengthening research facilities in respect of livestock biotechnology, at BLRI, NIB, universities and livestock research centers.	√	√	√	
4	Ensuring supply of standard chemical substance, reagents, kits, etc.	√	√	√	

5.2.3 Priority research activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Identifying molecular characteristics of important pathogens of livestock and poultry through selection of suitable species for development of vaccine and micro organs.	√	√	√	Ministry of Fisheries and Livestock and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
2	Manufacturing vaccine for identifying important diseases and use as antidotes for livestock and poultry.	√	√	√	
3	Developing micro organs of genetic engineering for proper and prompt identification of important diseases at livestock and poultry farms.	√	√	√	

4	Production, differentiation of gene and identification of characteristics of monoclonal and polyclonal antibody, for development of suitable and identification method.	√	√	√	
5	Selection and safe evaluation of genetically modified food, in order to identify health hazards of livestock at farms.	√	√	√	
Sl	Activities	Short	Mid	Long	Implementing agency
6	Identifying salinity and disaster tolerant gene for development and conservation of salinity and disaster tolerant fodder (grass species).	√	√	√	
7	Differentiation, identification and use of lactic acid producing bacteria in order to enhance ensured fodder.	√	√	√	
8	Enhancing nutritional value of residual crop by enzyme manipulation.	√	√	√	
9	Production of meat and milk by manipulation of micro organisms inside stomach.	√	√	√	
10	Use of suitable micro organism for increasing nutritional value of food and fodder of cattle.	√	√	√	
11	Development and legalization of phytobiotics, prebiotics, probiotics, etc. for use by farm animals and poultry.	√	√	√	
12	Development of starter culture for preparation of dairy products.	√	√	√	
13	Determination, conservation and development of genetic characteristics of potential domestic cattle and poultry, in order to enhance their reproductive capacity.	√	√	√	
14	Development of technology for identification of semen/ embryo.	√	√	√	
15	Implementation of method of development of multiple egg germination and in vitro fertilization and transfer of embryo.	√	√	√	
16	Developing method of semen and embryo conservation in order to increase population with desired characteristics.	√	√	√	
17	Identifying gene marker to determine meat, milk and disease preventive characteristics for	√	√	√	

	livestock development and selection.				
18	Developing method of identification of pregnancy of farm animals with utmost promptitude.	√	√	√	
19	Developing investigation method of in vivo and in vitro fertilization.	√	√	√	
20	Selection of livestock species of high economic value, by marker.	√	√	√	

5.3 Fishery biotechnology

Pisciculture plays an important role in nutrition, income, employment and export earning sectors in Bangladesh. Pisciculture provides 63% of protein and contributes substantially to production of nutrition as well as earns 5% of GDP and 5% of export proceeds. Growth rate in fishery sector was 2.33 in 2002-03 which has increased to 4.11 in 2007-08. Bangladesh, after China and India, with her 807 species living in sweet and saline water and maritime habitation, is the 3rd largest aquatic bio diversified country in Asia. The world's largest swamp (Bangla delta) and the three main river systems (Ganges, Brahmaputra and Meghna) flowing from the Himalayas to the Bay of Bengal are considered to be the main factors of diversity of this mammoth species. The vast expanse of the plentiful water resources may become possible means of food security and living of a few hundred thousand people of the country, in view of limitation of land based opportunity. The fishery resources have the ability to produce fish in abundance through regulated pisciculture in sweet and saline waters.

Currently the Government has initiated sincere steps towards reforms in inland and maritime pisciculture. The Government in the meantime has taken initiative for farmed fishery based on technology and proper management of wild water resources, which is an enormous opportunity for the country. It has not been possible to equally domesticate aquatic species like crops and livestock; so full application of biotechnology for genetic development of fishery species and management and conservation of genetic resources found in wild fish category are not possible.

There is no scope of doubt that biotechnology is a consolidation of a number of developed and most modern technologies which creates prospect for innovation of fast growing developed variety of fish, enhancement of nutritional value of fish-food, conservation and development of fishery health, assistance towards sustainable consumption, management of fishery resources and other allied aquatic resources, revival and conservation of aquatic environment, etc., in order to increase overall production in fishery sector.

Considering the above factors, application of biotechnology with a view to increasing overall fish production, chiefly pisciculture and management of open water fishery resources are expanded to five major fields; : (1) development of genetic storage of economically significant fish ; (2) identification and conservation of genetic characteristics of fish ; (3) fishery health management; (4) development of fish nutrition; (5) post production processing, standardization and commodity development.

Priority research fields and allied policies and restrictions, according to the ''National Fishery and Livestock Biotechnology Instructions'' formulated earlier in the fishery biotechnology sector, are set forth below:

Strategic activities

5.3.1 Restrictive measures

Sl	Activities	Short	Mid	Long	Implementing agency
1	Introducing restrictive system in order to enhance national capacity.	√	√		Ministry of Fisheries and Livestock and biotechnology related concerned Ministries.
2	Converting biotechnology instructions and restrictions into law and its implementation.	√	√	√	

5.3.2 Creation and strengthening of institutional capacity

Sl	Activities	Short	Mid	Long	Implementing agency
1	Establishing rich laboratories at individual research institutions and universities.	√	√		Ministry of Fisheries and Livestock and biotechnology related concerned Ministries, research institutions, public-private universities, non-government organizations.
2	Appointment of manpower for strengthening research on fishery biotechnology.	√	√	√	
3	Providing existing and future laboratories with necessary chemicals, reagents, kits, etc.	√	√	√	

5.3.3 Priority research activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Innovating improved variety through selected breeding.	√	√	√	Ministry of Fisheries and Livestock and biotechnology related concerned Ministries, research institutions, public- private universities, non-government organizations.
2	Gender transformation and layout of chromosome, creating unisex fish category applying both method.	√	√	√	
3	Producing infertile transgenic fish.	√	√	√	
4	Innovating molecular index on the basis of Quantitative Trait loci (QTLs) and selection of all important cultured fish through the index.	√	√	√	
5	Gene cloning of economically significant characteristics of fish and producing fast growing and disease preventive transgenic fish.	√	√	√	
6	Determining characteristics and karyotyping of all important species of fish and prawn, through appropriate molecular	√	√	√	

	index.				
7	Gene mapping of economically significant fish species through microsatellite index.	√	√	√	
Sl	Activities	Short	Mid	Long	Implementing agency
8	Establishing cryogenic gene bank in order to conserve improved variety and near-extinct species.	√	√	√	
9	Innovating molecular technology based on Polymerase Chain Reaction (PCR) in order to diagnose infectious diseases promptly and effectively.	√	√	√	
10	Inventing vaccine against harmful diseases and bacteria, through genetic engineering.	√	√	√	
11	Producing probiotics and metabolites for consumption as supplementary fish-food.	√	√	√	
12	Innovating Single Cell Protein (SCP) for consumption as supplementary fish-food.	√	√	√	
13	Innovating molecular technology to determine post production standard of prawn and fish.	√	√	√	
14	Innovating ingredients of biotechnology to produce standard prawn/ fish products.	√	√	√	
15	Innovating device of conservation of prawn/ fish and products derived from them.	√	√	√	

5.4 Medical biotechnology

Although medical biotechnology has enormous potentials, it has been facing multiple problems in the world market. Wide scope has been created for development of medical science, which includes herbal medicine, diagnostic kit, vaccine, e.g. useful plant vaccine and other medical products and equipments for research, industrial and medical education. The country may soon start working on research and application of genetic diagnosis, therapy and stem cell. New international market has opened a wide door for us to send high quality biotechnology workers, teachers and researchers abroad.

The department of medical biotechnology is deeply connected with human health and nutrition. This department has optimistic and probable future prospect in the fields of health, nutrition and earning foreign exchange. It has already been proved that there is ample scope of achieving economic capacity by earning foreign exchange through export of medical related bio resources in the drug manufacturing sector. Moreover foreign exchange may be saved by stopping import of those commodities through

utilization of local indigenous medical biotechnology.

Genome sequencing of our people may be conducted to comprehend future overall scenario of health and nutrition in the country. We can achieve possible optimum success in health and nutrition sector from even this limited resource, by formulating health and nutrition policy.

Bangladesh is one of the bio-diversified countries in the world, where ample scope is there for conservation, utilization and development of bio resources in respect of indigenous medical treatment.

Strategic activities

5.4.1 Restrictive measures

Sl	Activities	Short	Mid	Long	Implementing agency
1	Formation of different committees with authority in respect of medical biotechnology.	√	√	√	Ministry of Health and Family Welfare and biotechnology related concerned Ministries.
2	Review of existing scenario in respect of medical biotechnology and formulating plan for medical biotechnology.	√	√	√	
3	Establishing laboratories for plant, industrial and medical biotechnology with the help of the consumer class.	√	√	V	
Sl	Activities	Short	Mid	Long	Implementing agency
4	Establishing restricted framework for implementation of application policy in respect of merits and demerits of medical biotechnology.	√	√	√	
5	Extending timely policy support, financial assistance and infrastructural facility to NTSMB and the core group in order to implement medical biotechnology related national policy instructions and promptly establishing medical biotechnology center.	√	√	√	

5.4.2 Creating and strengthening institutional capacity

Sl	Activities	Short	Mid	Long	Implementing agency
1	Establishing a medical biotechnology center under the Ministry of Health and Family Welfare.	√	√	√	Ministry of Health and Family Welfare and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
2	Enhancing required facilities at medical libraries in the country.	√	√	√	
3	Raising molecular/ genetic detection, diagnosis, counseling and medical facility, in order to enhance institutional capacity.	√	√	√	
4	Creating fund to assist projects on medical biotechnology	√	√	√	
5	Opening Department of Medical	√	√	√	

	Biotechnology at the National Institute of Biotechnology.				
6	Enhancing capacity of concerned institutions in order to introduce health hazard or epidemiological surveillance system for people coming in contact with medical biotechnology on consumer or professional grounds.	√	√	√	
7	Establishing center of excellence on medical biotechnology.	√	√	√	
8	Making standard of medical biotechnology related initiatives and infrastructures in the country, competitive in the world spectrum.	√	√	√	
9	Making medical technology related industries, laboratories and services in the country, at par with the trend of contemporary competitive world.				
10	Enhancing capacity of production of medical biotechnology commodities for local market in the country and exporting abroad.				
11	Establishing foundation for educational infrastructure and research on medical biotechnology of global standard in the country in order to cater to the need of fast advancing medical biotechnology at home and abroad.				

5.4.3 Priority research activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Using biotechnology in waste management at hospitals.	√	√	√	Ministry of Health and Family Welfare and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
2	Manufacturing biotechnology related pharmaceutical commodities, e.g. vaccine, drugs, therapeutics materials, herbal drugs, laboratory kits and ingredients, for consumption in the local market of the country and exporting abroad.	√	√	√	
3	Enhancing skill of effectiveness of molecular medicine and its production cost.	√	√	√	
Sl	Activities	Short	Mid	Long	Implementing agency
4	Determining molecular characteristics of pathogen for developing standard of drugs or medicine.	√	√	√	
5	Using DNA based diagnosis for identifying genetic and infectious	√	√	√	

	diseases.				
6	Counseling probable patients attacked by genetic diseases and counseling future parents of offspring with probable complications.	√	√	√	
7	Genome sequencing of bacteria and virus is commonly found in Bangladesh and the same can be treated well by proper drugs and vaccines.	√	√	√	
8	Initiating pharmaco genomics program on human genome diversity in Bangladesh with a view to effectuating the drug policy.	√	√	√	
9	Learning pharmaco genomics by identifying characteristics of single nucleotide polymorphism in order to effectuate the drug policy.				

5.5 Industrial biotechnology

For Bangladesh to develop as an industrial country largely depends on efficiency in industrial sector. The field of development of traditional biotechnology has comparatively expanded in Bangladesh in order to cater to the challenge of modern biotechnology. In spite of that modern biotechnology in the industrial sector is up to expectation, but not of long standing. Therefore, attention should be given on different branches of science, e.g., nuclear and molecular science, chemistry, engineering physics, medicine, agriculture, micro organism technology transfer and commercialization, bio entrepreneur and bio financing and intellectual property conservation management.

Biotechnology is highly prospective in respect of turning bio resource into economic resource and creating opportunity for career. Innovative biotechnology commodities and service development will help achieve more bio based financial system. Substantial progress has been achieved in the field of biotechnology around end of the last twentieth century. There is a far reaching effect of such progress in the field of industrial biotechnology. Moreover Bangladesh is likely to open a new door of prospect in industrial biotechnology sector in the new century. Industrial biotechnology strategic plan has been formulated for institutions related to further development of the country, with a view to giving them instructions to be pursued. In this context national capacity will be intensified in all fields of traditional and modern industrial biotechnology in order to achieve competitiveness of global standard.

Strategic activities

5.5.1 Restrictive measures

Sl	Activities	Short	Mid	Implementing agency
A	.Restrictive measures			
1	Strengthening capacity by raising controlling body.	√	√	Ministry of Industries and biotechnology related concerned Ministries.
2	Formulation and implementation of industrial biotechnology law and rules.	√	√	
3	Determination of standard, application of standard and	√	√	

	establishment of its implementation.			
4.	Formation, control and implementation of standard of processed food.	√	√	
5.	Consolidation of local standard and other standards with a view to coordinating and assisting industrial commodities and training of suitable technical manpower along with financial support.	√	√	
6	Expediting research and development activities of biotechnology farms by substantially reducing tax on research expenditure.	√	√	
Sl	Activities	Short	Mid	Implementing agency
7	Raising regional/ indigenous structure as center of excellence for biotechnology by inviting overseas risk investment.	√	√	
8	Reducing and simplifying administrative tiers or activities through e-governance with a view to establishing new enterprise.	√	√	
B	Incentive measures			
1	Preparing database comprising scientists working in the field of industrial biotechnology at home and abroad with a view to properly utilizing the specialists.	√	√	
2	Forming National Technical Committee on industrial biotechnology.	√	√	
3	Forming core group to encourage and assist industrial biotechnology in the country.	√	√	
4	Need assessment, identification of current assets and survey of prospects (manpower, institutions, industries, opportunities, priorities, etc.), with a view to building up industrial biotechnology research and development in the country.	√	√	
5	Development of industrial biotechnology policy and its modus operandi which will pave its way through.	√	√	
6	Enforcement of law and simplification of procedure in order to develop and expand industrial biotechnology.	√	√	

5.5.2 Institutional capacity building and strengthening

Sl	Activities	Short	Mid	Implementing agency
1	Standardization and modernization of existing laboratories in public and private sectors for research on modern biotechnology.	√	√	Ministry of Industries and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Revision and upgrading of course curriculum in consultation with industrial and research institutions and standardization of e-education module.	√	√	
3	Strengthening biology and biotechnological method at universities on top priority basis.	√	√	

4	Equipping appropriate tools, chemicals and concomitant materials.	√	√	
5	Strengthening laboratory facility and institutional facility with a view to effectively determining and observing risks.	√	√	
6	Building up bio information communication facility.	√	√	
7	Establishing central warehouse for conservation of chemicals and usable materials, e.g., enzyme, hormone, atomic biology, for industrial biotechnological laboratories.	√	√	
8	Building up information technology facility for long term conservation and determination of nuclear characteristics of industrially important micro organism.	√	√	
9	Introducing analysis and testing of transgenic industrial biotechnology.	√	√	
10	Encouraging researchers to pursue training in order to implement research findings and transfer technology.	√	√	
Sl	Activities	Short	Mid	Implementing agency
11	Research and development of biotechnological industries with a view to understanding effective changes arising out of restrictive requirements and access to commercialized establishments and building up relation with research and development at educational institutions for conducting applied research.	√	√	Ministry of Industries and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
12	Raising required institutions for development of human resource in respect of industrial biotechnology.	√	√	
13	Creating special fund for raising pilot plant facility with a view to establishing biotechnology commodity and method and industry.	√	√	
14	Raising laboratories for high standard analytical testing and certification with a view to catering to the need of industrial biotechnology research and development.	√	√	
15	Establishing/ building up biotechnological parks for utilizing their service in the field of research and development including attracting domestic and international investors.	√	√	
16	Creation of a Cell for ensuring prompt restrictive collaboration with governmental organizations, customs clearance, communication and transfer of technology.	√	√	

17	Development of restrictive strategy for biotechnological commodities and establishment of close relationship facility with other restrictive organizations.	√	√	
18	Establishing relationship with educational and research institutions in order to transfer technology and develop human resource.	√	√	

5.5.3 Priority research activities

Sl	Activities	Short	Mid	Implementing agency
1	Producing hormone, vitamin and high quality enzyme for therapeutic and diagnostic purposes and use in industrial sector.	√	√	Ministry of Agriculture and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Conducting research on bio fertilizer as an alternative to chemical fertilizer.	√	√	
3	Conducting research on bio fuel and alternative source of energy.	√	√	
4	Developing strategy of producing Single Cell Protein.	√	√	
5	Developing food for livestock, poultry and fishery for safe human consumption.	√	√	
6	Developing food additive and food supplement for commercial consumption.	√	√	
7	Producing biochemical (acetic acid, citric acid, amino acid, etc.) materials having industrial significance.	√	√	
8	Producing high quality, long lasting and perishable rubber.	√	√	
9	Innovation of perishable plastic as an alternative to traditional plastic.	√	√	
10	Development and production of significant bioactive compounds in agriculture, food and drug industry sectors.	√	√	
11	Manufacturing economically important products by utilizing maritime resources.	√	√	
12	Developing and manufacturing bio pesticide and bio restrictive materials.	√	√	
Sl	Activities	Short	Mid	Implementing agency
13	Developing varieties of micro organisms for use in fermentation process.	√	√	Ministry of Agriculture and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
14	Developing plant tissue culture, micro propagation/ haploid technology for use as raw material of disease free plant micro organism and important plant species industry.	√	√	

15	Conservation and determination of characteristics of industrially significant micro organisms and plant species.	√	√	
16	Processing agricultural products and wastes with a view to manufacturing economically significant commodities.	√	√	

5.6 Environmental biotechnology

Environmental biotechnology is comprehended when natural environment is studied applying biotechnology. Commercial use of environment friendly bio process and its application is also called environmental biotechnology. The topic may be defined as follows: "remedy to polluted environment (land, air and water) by development, use and control of bio system and innovation of environment friendly process (environment friendly technology and sustainable development)".

Fast growth in population and expansion of cities and industrial factories in the country have become an impediment to conserve neat and healthy environment. Biotechnology will play a significant role in the innovation of technology in respect of waste management and fermentation and bio reaction. Wastes from agricultural sector and industrial factories can be transformed in such a manner by using biotechnology, which can produce perishable and other significant ingredients. Innovation and transfer of technology to identify bio polluting materials is also one of the important aspects.

Strategic activities

5.6.1 Restrictive measures

Sl	Activities	Short	Mid	Long	Implementing agency
1	Formation of National Technical Committee on environmental biotechnology.	√	-	-	Ministry of Environment and Forests and biotechnology related concerned Ministries.
2	Collection of field level data, identification and determination of existing resources and prospects (men, institutions, organizations, opportunities, priorities, etc.), in order to analyze the state of affairs.	√	√	√	
3	Preparing policy instructions and work plan in respect of environmental biotechnology.	√	√	-	

5.6.2 Creation and strengthening of institutional capacity

Sl	Activities	Short	Mid	Long	Implementing agency
1	Strengthening centers/ branches of existing research institutions with a view to conducting research and development of environmental biotechnology.	√	-	√	Ministry of Environment and Forests and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
2	Creation of opportunity for testing chemical substance, residue of pesticide, fertilizer, poisonous materials, etc.	√	√	-	

3	Enhancing laboratory facilities for risk assessment and observation and strengthening their policy support and institutional structure.	√	√	-	
4	Gradual increase in research fund for research on environmental biotechnology.	√	√	√	
Sl	Activities	Short	Mid	Long	Implementing agency
5	Creating base for higher education and research in order to address gradually increasing demand for technology in the country and simultaneously ensuring provision of environmental biotechnologists of high eminence.	√	√	√	
6	Continuous supply of quality chemical substance, reagents and kits.	√	√	√	
7	Introduction of Environmental Biotechnology Department in research institutions and universities.	√	√	√	
8	Establishing contact with international excellence centers for joint research activities on environmental biotechnology.	√	√	√	

5.6.3 Priority research activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Bio filtering of underground and surface water and other liquid pollution.	√	√	√	Ministry of Environment and Forests and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Application of biotechnology in waste management.	√	√	√	
3	Innovating bio fertilizer for sustainable agricultural management.	√	√	√	
4	Biodegradation of customary pesticide, herbicide, chemical substances and hydrocarbons.	√	√	√	Ministry of Agriculture and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
5	Evaluation of effects of transgenic organism over surrounding environment.	√	√	√	
6	Innovation and production of bio fertilizer derived from treacle from sugarcane factories.	√	√	√	
7	Innovation of bio censor for	√	√	√	

	determining presence of lead, arsenic and other pollutant materials.				
8	Environment friendly pest management of important harmful insects in agricultural and medical sectors.	√	√	√	

5.6.4 Bio safety and bioethical strategic activities

Sl	Activities	Short	Mid	Long	Implementing agency
A	Policy method, preparation of administrative and restrictive methods				
1	Application of National Bio safety Framework and Bio safety Instructions.	√	-	-	Ministry of Environment and Forests and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Formulation, publication and effectuation of draft law on bio safety.	√	-	-	
3	Preparation of required or proposed format and manual.	√	-	-	
B	Strengthening institutions to conduct matters relating to bio safety.				
Sl	Activities	Short	Mid	Long	Implementing agency
1	Establishment of Cell in the Secretariat including initiation of entire activities, viz. , NCB, BCC, IBCs and FBC in order to pursue activities on bio safety.	√	√	-	Ministry of Environment and Forests and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Introduction or acceptance of NAB at institutional level; capacity building for concerned instructions and manual.	√	√	-	
3	Use of modern equipments and GMO and infrastructural development for facilitating their risk assessment and thereby strengthening existing biotechnology and genetic engineering departments/ laboratories and governmental organizations (DoE, BSTI, IFST, etc.).	√	√	-	
4	Strengthening concerned governmental organizations, e.g., border control (Customs Department), by eradicating bacteria and establishing inspection facilities and information collection, management and preservation facilities.	√	√	-	
5	Establishing reference or accredited laboratories for analyzing security aspects in wider spectrum, e.g., testing effectiveness and qualitative standard of GMO, verifying food stuff produced from GMO and testing their toxicity.	√	√	-	
6	Establishing institutional linkage for safety	√	-	-	

	analysis, reporting, communication and coordination.				
7	Strengthening local and international assistance activities.	√	-	-	
C	Training of scientists/ researchers/ NCB members/ technical members/ officers and staff of other bio safety committees and enforcing organizations.				
1	Higher education and research on bio safety and subjects relating to bio safety (as for example, bio safety, food security, food control, risk assessment, safe use of genetic engineering method including gene differentiation, structural development of gene, gene sequencing and insertion).	√	√	√	
2	Development of scientific method and protocol in respect of risk assessment and management (as for example, extent and effect of gene dominance, significant coherence, etc.); monitoring and application, safe use of equipments at laboratories, pursuing ideal method at laboratories, use of GMO and its safe removal, method of raising quality database and audit and accrediting method, etc.	√	√	-	
3	Training scientists/ technicians having expertise on determination, testing and quality analysis of GMO/ LMO, food security analysis and labeling.	√	√	-	
D	Training for policy makers and determinants				
1	Enhancing capacity in respect of determining concern of different international agreements on bio safety; creating expertise on negotiation in respect of bilateral, local and international agreements on bio safety.	√	-	-	
2	Solidarity with partial law/ policy in respect of bio safety; standard method and procedure for exchanging information.	√	-	-	
3	Arranging reexamination of decisions, restrictive methods (valid policy, application, testing, etc.) in respect of bio safety.	√	-	-	
4	Analysis of multidimensional plan, need assessment and management and consideration of socio economic aspects.	√	-	-	
Sl	Activities	Short	Mid	Long	Implementing agency
5	Formulating suitable policy and method of technology transfer.	√	-	-	Ministry of Environment and Forests and biotechnology related concerned Ministries,
6	Funding and asset management: expertise on capital progression, project preparation,	√	-	-	

	training on project implementation.				research institutions, public- private universities/ institutions.
7	Analysis of bio safety instructions, national bio safety framework and other information in order to successful coordination and application of bio safety related activities.	√	-	-	
E	Method of information management				
1	Raising bio safety clearing house in Bangladesh for information in respect of international cooperation and funding, risk assessment and management.	√	-	-	
F	Information and instruction module for the members of public				
1	Publication of awareness and educational tools (in Bangla); creating mass vicinity and efficiency of participation.	√	-	-	

5.7 Maritime biotechnology

The Bay of Bengal contains an endless treasure of maritime aquatic organisms including planktons, oceanic algae fish, scaled fish, corals, turtles, mammals and useful micro organisms. Currently production of oceanic fish largely depends on procurement from existing natural storage at fish landing in the Bay of Bengal. Therefore, attention is invited to search at new fish procurement areas. Likewise, necessary initiative is imperative in order to safeguard our maritime habitation from lubricant spilling and other pollutions.

Maritime biotechnology can present newest applications in the fields of invention of maritime biotechnology drugs, unique food and food ingredients, bio filtering, bio mass, fisheries and agricultural products, diagnosis of diseases, production process, bio energy, etc. Our efforts need to be consolidated and strengthened further in the field of maritime biotechnology in quest of competitive habitation.

There are five major fields of application of maritime biotechnology: (1) food production; (2) producing sustainable renewable energy; (3) health management; (4) environment friendly environment management; (5) producing industrial raw materials and their bio processing. Priority fields in maritime biotechnology sector and the allied policy and restrictive measures are set forth below:

Strategic activities:

5.7.1 Restrictive measures

Sl	Activities	Short	Mid	Long	Implementing agency
1	Enhancing national capacity by introducing restrictive measures.	√	√	-	Ministry of Science and Technology and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
2	Formulation and implementation of biotechnology policy.	√	√	√	

5.7.2 Creating and strengthening institutional capacity

Sl	Activities	Short	Mid	Long	Implementing agency
1	Raising rich laboratories at research institutions and universities.	√	√	-	Ministry of Science and Technology and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Appointing manpower for research and strengthening of maritime biotechnology.	√	√	√	
3	Ensuring unbroken supply chain of chemical substance, reagents, kits etc. at existing and future laboratories.	√	√	√	

5.7.3 Priority research activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Using skills of modern maritime biotechnology for health, breeding, development and overall welfare of cultured and cultivable aquatic species, e.g., oceanic fish, prawn, crab, oyster, shell etc.	√	√	√	Ministry of Science and Technology and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
2	Identifying and causing production in order to develop standard of products and human health.	√	√	√	
3	Preparing statistical data sheet of bio fuel and micro algae and other organisms for application in industries.	√	√	√	
4	Innovation of search method, efficient culture system collection, differentiation, production and refining of micro algae and maritime weeds.	√	√	√	
5	Identifying bioactive compounds and determining their method of functioning and natural activities.	√	√	√	
6	Risk assessment of harmful algal bloom on human health and forecasting about this along with innovating automated bio sensing technology to test quality aspects of coastal water.	√	√	√	
7	Using DNA based technology for identifying organisms and population in order to create base for and extend	√	√	√	

	assistance to commercial equipments and their traditional analysis.				
8	Causing enzyme screening for cropping up maritime protein.	√	√	√	
9	Producing maritime biopolymer as novel competitive commercial product for food, cosmetics and health.	√	√	√	
10	Genome analysis of maritime organisms with economic significance.	√	√	√	

5.8 Nanotechnology

Currently more quality treatment through encapsulation drugs, protein and other molecules is being possible for cropping up of nano particles which contains minimum level of side effects. The following strategic activities will be undertaken in this new and flourishing branch of nano biotechnology, for capacity building, human resource development, research development and development relating to services.

Strategic activities:

Sl	Activities	Short	Mid	Long	Implementing agency
1	Forming core group for expediting and advancing nano biotechnology in the country.	√	-	-	
Sl	Activities	Short	Mid	Long	Implementing agency
2	Enhancing capacity at selected research institutions and universities in order to encourage research and development in nano biotechnology and bio engineering.	√	√	√	Ministry of Science and Technology and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
3	Developing human resource in respect of nano biotechnology.	√	√	√	
4	Developing elite nano substance in drug encapsulation process.	√	√	√	
5	Preparing bio cohesive and non immunogenic surface coating for effective and convenient drugs.	√	√	√	
6	Innovating transport for drug distribution in order to distribute and control drugs.	√	√	√	
7	Innovating bio censor test chips for identification and observation of metabolites and determination of genetic markers.	√	√	√	
8	Treatment of defects relating to the heart.	√	√	√	

5.9 Bioinformatics or bio information technology and biotechnology based on information technology

Bio information technology is a proven significant matter in the field of research and development of most modern biotechnology. Bio information technology will be able to save expenditure and time in the field of innovation of new varieties of vaccine, plants having specific characteristics and disease prevention capacity, new varieties of protein molecule and bio ingredients.

Strategic activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Forming core group for expediting and advancing bio information technology in the country.	√	-	-	Ministry of Science and Technology and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
2	Creating physical infrastructure facilities for research and development of bio information technology.	√	√	√	
3	Developing human resource in respect of bio information technology.	√	√	√	
4	Establishing wide ranging bio information technology network involving all concerned Ministries, different research institutions, public- private universities/ institutions in the country.	√	√	√	
5	Establishing broadband internet connection by providing subsidy in order to conduct research on bio information technology and develop human resource.	√	√	√	
6	Creating developed and effective computer facilities for development of protein folding and drug design activities.	√	√	√	
7	Ensuring unbroken supply chain in every year, of manpower having fulltime intellect with Ph D, MSC and advanced diploma on bio information technology.	√	√	√	

6. Bio technology industrial entrepreneur and business

Industrial entrepreneurs of the country should be facilitated to build business instructions and capacity by providing facility of transfer and process of biotechnology for biotechnological contribution towards socio economic welfare of the society.

Strategic activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Plan for industrial entrepreneurs: Undertaking evaluation at different sectors to identify requirement of physical infrastructure and finish sector wise work plan, partnership instructions, model implementation, location, etc. within stipulated time.	√	√	-	Ministry of Industries and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Developing appropriate institutional framework with a view to advancing biotechnology business.	√	-	-	
3	Creating capacity for testing commodities produced by biotechnology.	√	√	√	
4	Establishing national Technology Transfer Wing for publicity of information in respect of new technology.	√	-	-	
5	Establishing a bio information technology park.	-	√	√	
6	Creating incubation facilities for facilitating technology development and legitimization.	√	√	-	
7	Developing physical infrastructure at nongovernmental level.	√	√	√	

7. Public awareness, mass communication and participation

It is imperative to create consciousness among members of the public about the scope and prospect of biotechnological development. At the same time it is necessary to earn public trust and self confidence about social and moral acceptability including safety and capacity of biotechnological products by the consumer class and the civil society through publicity of right information in easily understandable diction with transparency. Attention and appropriate steps are required at different points of time in order to earn public trust and self confidence in respect of biotechnology.

Strategic activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Creating National Biotechnology Awareness Fund for extending assistance for education of different consumer classes and preparation of educational tools for them.	√	√	√	Ministry of Science and Technology and biotechnology related concerned Ministries, research institutions, public- private universities/ institutions.
2	Installation of necessary hardware and software facilities at premises concerned with functions of biotechnology and creation of specialized website.	√	√	√	
3	Strengthening data collection system in order to intensify use of most modern/	√	√	√	

	latest information in respect of biotechnology.				
4	Capacity building for persons engaged in biotechnological branches of agriculture, fishery, livestock and health.	√	√	√	
5	Affiliation of research institutions and universities through analysis and comprehension of risks and usefulness relating to GMO/ LMO. Even though they will play a significant role in the local level management of bio diversity and access to distribution of benefits.	√	√	√	
6	Organizing seminar/ workshop/ rally for publicity of prospects and effectiveness of biotechnology in the country.	√	√	√	
7	Arranging intensive awareness boosting publicity with the help of posters, exhibitions and mass media.	√	√	√	
8	Publicity of biotechnological products by publishing articles with the help of mass media and electronic media.	√	√	√	
Sl	Activities	Short	Mid	Long	Implementing agency
9	Creating awareness among undergraduate and postgraduate students in universities and colleges in respect of matters relating to bio safety.	√	√	√	
10	Arranging training/ workshop for promotion of efficiency and comprehension of laws and rules relating to biotechnology and bio safety, means of bio safety, etc.	√	√	√	
11	Creating awareness among the consumer class and the business community about gradually flourishing biotechnological industrial factories and acceptability of products manufactured by biotechnology.	√	√	√	
12	Conducting mass communication among national and international community highlighting prospects of business relating to biotechnology and outcome of investment in Bangladesh.	√	√	√	
13	Training persons involved in mass media and electronic media.	√	√	√	

8. Coordination and cooperation

Progression of science depends on unification of knowledge, development of internal strength, providing inspiration to scientific belief, etc. SWOT analysis clearly indicates that lack of communication and

cooperation among research organizations, universities, etc. is a threat to achieving targets of biotechnological research and development. So enough attention is invited for overcoming this impediment. Therefore, emphasis should be given on existing strength, in order to achieve optimistic results.

Strategic activities

Sl	Activities	Short	Mid	Long	Implementing agency
1	Selecting national focal point for coordination of biotechnological research and development in the country.	√	-	-	Ministry of Science and Technology and biotechnology related concerned Ministries, research institutions, public-private universities/ institutions.
2	Internal and international institutional cooperation: Establishing contact with international institutions. Inviting expatriate Bangladeshi biotechnologists to settle in the country and building cooperation for institutions and research with a view to developing formal understanding with their own universities or institutions.	√	√	√	
3	Establishing contacts with formal/ informal organizations.	√	√	√	

9. Monitoring and implementation strategy-

9.1 National Taskforce on Biotechnology of Bangladesh (NTBB):

National Taskforce on Biotechnology has been formed under the chairmanship of the Hon'ble Prime Minister in order to effectively monitor and analyze National Policy on Biotechnology. Responsibilities of this committee include producing and distributing resources in accordance with need of the country and financial assistance for conducting and undertaking various activities with assistance on behalf of the Government and with probable overseas assistance as well. This Taskforce is the highest policy maker who will issue necessary instructions for development of biotechnology in the country.

Formation of the National Taskforce on Biotechnology:

Serial no	Name and designation	Position
1	Hon'ble Prime Minister, Government of the People's Republic of Bangladesh	Chairman
2	State Minister, Ministry of Science and Technology	Vice Chairman
3	Minster, Ministry of Finance	Member
4	Minster, Ministry of Agriculture	Member
5	Minster, Ministry of Commerce	Member
6	Minster, Ministry of Law, justice and Parliamentary Affairs	Member
7	Minster, Ministry of Industries	Member
8	Minster, Ministry of Health and Family Welfare	Member

9	Minster, Ministry of Environment and Forests	Member
10	Minster, Ministry of Fisheries and Livestock	Member
11	Principal Secretary to the Prime Minister	Member
12	Secretary, Ministry of Public Administration	Member
13	Secretary, Finance Division, Ministry of Finance	Member
14	Secretary, Economic Relations Division	Member
15	Secretary, Planning Division, Ministry of Planning	Member
16	Secretary, Ministry of Health and Family Welfare	Member
17	Secretary, Ministry of Law, justice and Parliamentary Affairs	Member
18	Secretary, Ministry of Agriculture	Member
19	Secretary, Ministry of Commerce	Member
20	Secretary, Ministry of Industries	Member
21	Secretary, Ministry of Environment and Forests	Member
22	Secretary, Ministry of Fisheries and Livestock	Member
23	Chairman, Bangladesh Atomic Energy Commission	Member
24	Chairman, Bangladesh Council of Scientific and Industrial Research	Member
25	Executive Chairman, Bangladesh Agricultural Research Council	Member
26	Expert member on Biotechnology	Member
27	Secretary, Ministry of Science and Technology	Member- Secretary

9.2 National Executive Committee on Biotechnology (NECB)

National Executive Committee on Biotechnology has been formed under the leadership of the Principal Secretary to the Prime Minister. Responsibility of this Committee includes implementation of the National Biotechnology Policy in order to ensure prompt and risk free development of technology in accordance with instructions by the National Taskforce. This Committee will approve various project proposals submitted by the concerned Ministry, in the light of plans from different branches of national economy and National Biotechnology Policy. A very transparent and fruitful strategy will be drafted with a distinct and cautious approach towards development of this new branch of science. This Committee will take over responsibility to attract trust and self-confidence from all strata of life including members of the public, mass media and politicians. The National Executive Committee will also work as patron to controlling authorities of concerned Ministries.

Formation of the National Executive Committee on Biotechnology:

Serial no	Name and designation	Position
1	Principal Secretary to the Prime Minister	Executive Chairman
2	Secretary, Finance Division, Ministry of Finance	Member
3	Member, Implementation, Monitoring and Evaluation Division	Member
4	Secretary, External Resources Division	Member
5	Secretary, Ministry of Commerce	Member
6	Secretary, Ministry of Fisheries and Livestock	Member
7	Secretary, Ministry of Industries	Member
8	Secretary, Ministry of Environment and Forests	Member
9	Secretary, Ministry of Health and Family Welfare	Member
10	Secretary, Ministry of Agriculture	Member

11	Secretary, Ministry of Law, Justice and Parliamentary Affairs	Member
12-13	Expert member on Biotechnology	Member
14	Secretary, Ministry of Science and Technology	Member- Secretary

9.3 National Technical Committee on Biotechnology (NTCB):

An 18 (eighteen)-member National Technical Committee on Biotechnology will be formed under the leadership of Secretary, Ministry of Science and Technology. Director General, National Institute of Biotechnology will act as Member- Secretary of that Committee. Activities of this Committee will be determined in accordance with instructions by the National Executive Committee on Biotechnology and the National Taskforce on Biotechnology. The Committee will review and update the National Policy on Biotechnology and formulate recommendations for development of research on biotechnology in the country.

This Committee will consist of 1(one) member each from the concerned Ministries, e.g., Ministries of Agriculture, Fisheries and Livestock, Health and Family Welfare, Education, Finance, Planning. One scientist each from different branches of biotechnology, e.g., plant, livestock, fishery, medical science, environment, industry, etc. will be co-opted to that Committee. A professional biotechnologist of Bangladesh will also be co-opted to this Committee.

Terms of Reference of the Committee will be as follows:

1. Identifying priorities of national biotechnology;

2. Forwarding project proposal requests;

3. Encouraging investment on biotechnological research and looking for industrial partners;

4. Searching resource flow in biotechnology (efficiency, fund and facilities);

5. Determining subject matters for creating public awareness about advantages of modern and enriched biotechnology;

6. Coordination between national policy and programs;

7. The Committee will meet in every six months to review progress of implementation of the National Policy.

In addition, technical committees will be formed in different branches of biotechnology, comprising experienced biotechnology policy makers in various sections under concerned Ministries and representatives from the private sector.

Sl no	Committee	Coordinating Ministry	Terms of Reference
1	National Technical Committee on Agricultural Biotechnology (NTCAgB)	Ministry of Agriculture	Plant biotechnology (crops and non-crops)

2	National Technical Committee on Animal Biotechnology (NTCAB)	Ministry of Fisheries and Livestock	Livestock biotechnology
3	National Technical Committee on Fisheries Biotechnology (NTCFB)	Ministry of Fisheries and Livestock	Fisheries biotechnology
4	National Technical Committee on Environmental Biotechnology (NTCEB)	Ministry of Environment and Forests	Environmental biotechnology
5	National Technical Committee on Medical Biotechnology (NTCMB)	Ministry of Health and Family Welfare	Health biotechnology
6	National Technical Committee on Industrial Biotechnology (NTCIB)	Ministry of Industries	Industrial biotechnology
7	National Technical Committee on Human Resource Development (NTCHRDB)	Ministry of Science and Technology	Human resource development in biotechnology
8	National Committee on Bio-safety (NCB)	Ministry of Environment and Forests	Bio safety

10. Drawing up and updating work plan:

The Ministry of Science and Technology will periodically review and update (in every three years) Work Plan for implementation of National Biotechnology Policy in consultation with the Concerned Ministry and furnish recommendations to the National Executive Committee on Biotechnology.

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