MINISTRY OF SCIENCE & TECHNOLOGY OF SRI LANKA

NATIONAL BIOTECHNOLOGY POLICY

NATIONAL SCIENCE FOUNDATION

NASTEC

NATIONAL BIOTECHNOLOGY POLICY

National Science Foundation

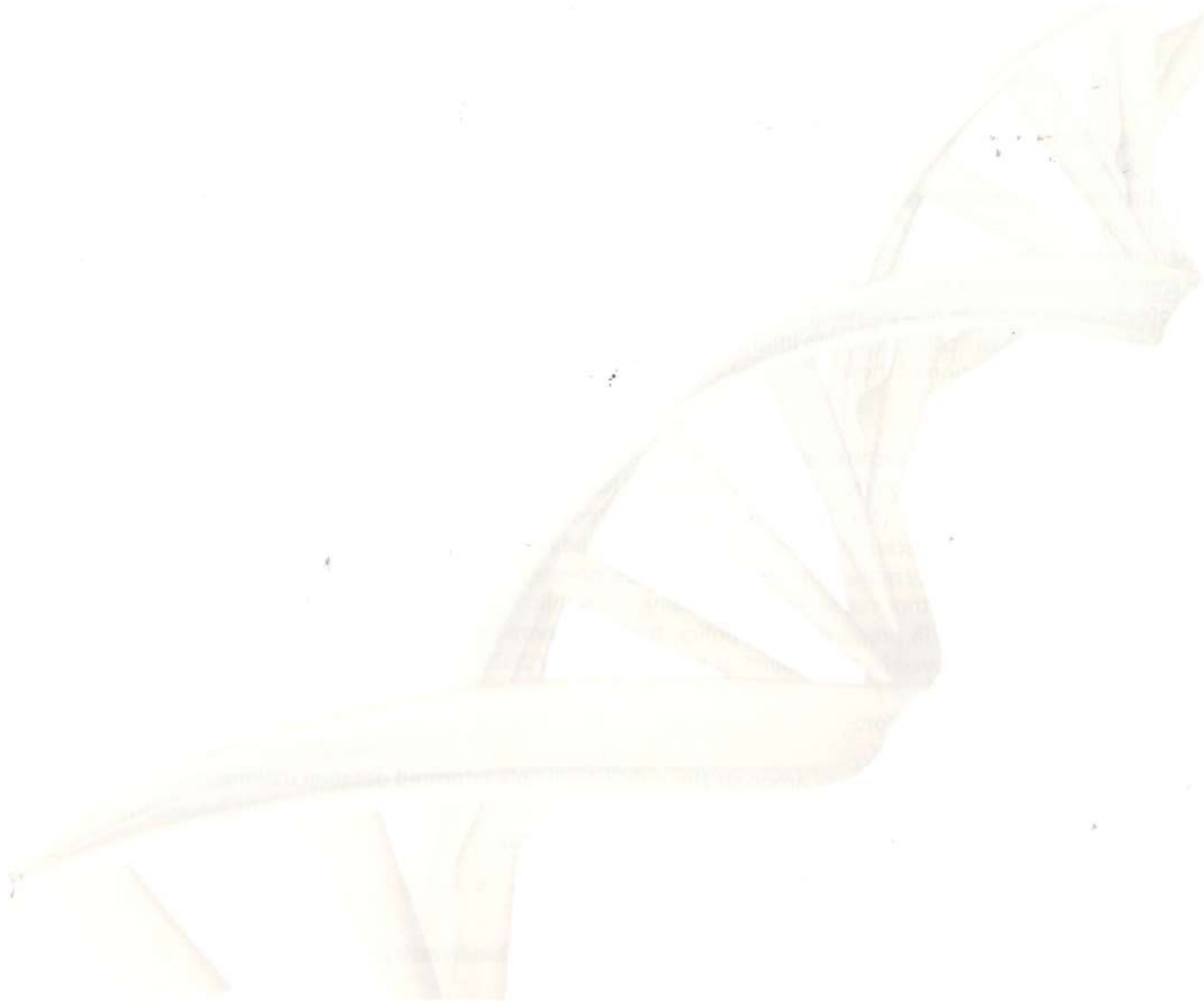
&

National Science and Technology Commission

Ministry of Science and Technology of Sri Lanka

2009

National Science Foundation
47/5, Vidya Mawatha, Colombo 07, Sri Lanka
Emial : info@nsf.ac.lk
Web : www.nsf.ac.lk



Message from Minister of Technology and Research

Technology and innovations make a major contribution to enable a country to improve competitiveness and productivity resulting in a higher standard of living and better quality of life for its people. The impact on competitiveness and productivity is further enhanced by high-end technologies such as biotechnology, which has been identified as a thrust area for development by the Ministry of Technology and Research and the Council for Agricultural Research Policy (CARP). It is therefore imperative that a strong commitment is made through a National Policy to harness the potential of biotechnology in a safe and ethical manner for development of relevant sectors of the Sri Lankan economy and to improve the quality of life of our people, minimizing duplication of these efforts by a well coordinated strategy.

This is the **first policy statement on biotechnology** for Sri Lanka, developed jointly by the National Science Foundation (NSF) together with the National Science and Technology Commission (NASTEC) **through an extensive consultation process**. The inputs from scientists and technologists including academics as well as researchers, policy makers of the key ministries, private sector industrialists, the NGO's and other stakeholders, including the public have been taken into consideration in preparing this policy. It would complement the second revision of the National Science and Technology Policy approved by the cabinet of Ministers in July 2009.

The National Policy highlights the need for:

1. Creating **awareness on biotechnology amongst the public** to enable informed decision making and to position biotechnology in our society
2. Enhancing **opportunities for local industries through biotechnology**
    a. Agriculture – Promoting **food production**
    b. Health – well being of the people through **health care**
    c. Industry- promotion of **industrial biotechnology**
    d. Energy – promotion of **bio-energy and sustainable use of biodiversity**
    e. Environment – promote **clean energy**

3. Building **human resources** and establishing **Centers of Excellence** in biotechnology and **biotechnology parks**

4. Establishing a **National Biotechnology Council** to plan, coordinate, monitor and evaluate all activities related to biotechnology including facilitating and supporting bio-industries while ensuring safe and ethical practices

I am pleased to inform all stakeholders that this document has now been **adopted as the National Biotechnology Policy for Sri Lanka by the Cabinet of Ministers** at its meeting held on 21 July 2010. I request the NSF to develop the strategic direction and an action plan for implementation in line with the 5-year Science, Technology and Innovation Strategy for 2011-2015.

I take this opportunity to record my appreciation to the NSF and its National Committee on Biotechnology and the NASTEC for preparing this much needed policy for the country.

Prof. Tissa Vitarana
Ministry of Technology & Research

Ministry of Technology & Research
No. 408, Galle Road, Colombo 03
15 September 2010

ABBREVIATIONS

AIDS	Acquired Immuno Deficiency Syndrome
ADB	Asian Development Bank
CARP	Council for Agricultural Research Policy
CBD	Convention on Biological Diversity
CEA	Central Environment Authority
DNA	Deoxy Ribose Nucleic Acid
EPI	Expanded Programme on Immunization
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FFP	Food, Feed and Processed Products
GAIN	Global Agriculture Information Network
GM	Genetically Modified
GMO	Genetically Modified Organism
HIV	Human Immunodeficiency Virus
HRD	Human Resource Development
IPR	Intellectual Property Rights
ME & NR	Ministry of Environment & Natural Resources
MoST	Ministry of Science and Technology
NBC	National Biotechnology Council
NIE	National Institute of Education
NRC	National Research Council
NSF	National Science Foundation
SLAAS	Sri Lanka Association for the Advancement of Science
UNCED	United Nations Conference on Environment and Development
USDA	United States Department of Agriculture
WHO	World Health Organization

CONTENTS

NATIONAL BIOTECHNOLOGY POLICY

1 INTRODUCTION

Biotechnology is a broad term used to describe a group of technologies based on the application of biological processes. The term biotechnology has been defined by many international organizations (FAO, WHO, Convention on Biological Diversity (CBD), The Commission of the European Communities, The European Federation of Biotechnology etc.). For the purpose of this policy document, which relates to the Sri Lankan context, Biotechnology is defined as follows:

> "All technologies involving the use of organisms, cells and bio-molecules leading to industrial, agricultural, medical, energy and environmental applications"

Biotechnology involves the use of living organisms or parts of living organisms to generate new processess or products and to find ways to improve the quality of life through diverse applications in medicine, agriculture, industry, energy and environment management. The term biotechnology includes the traditional biotechnological processes used for centuries in the manufacture of bread, alcohol, wine, beer, fermented milk products and some medicines, as well as modern biotechnology that involves amongst others, recombinant DNA technology, genomics, proteomics and bioinformatics. Biotechnology has made rapid strides as a knowledge-based industry during the last two decades contributing to the global economy in agriculture, healthcare, social well-being and environmental management. Biotechnology has offered, significant opportunities for both industrialized and less industrialized countries to address social and economic problems such as poverty alleviation, job creation, food security etc. as well as specific industrial development problems, in order to improve the quality of life of the people.

Governments of many Asia Pacific countries such as Japan, Australia, India, Malaysia, Thailand and Singapore are promoting biotechnology as their "economic driver" of the future.

The vast potential that opens up for Sri Lanka through biotechnology has long been recognized by policy makers as well as the scientific community. The National Science Foundation (NSF) established a Steering Committee for Biotechnology in 1992 to promote and support biotechnology research in universities and research institutions. In 1997, the Ministry of Science & Technology (MoST) identified biotechnology as a thrust area for development in Sri Lanka and a loan from Asian Development Bank (ADB) was made available for the development of human resources and capabilities in some selected universities and research

institutes. Local funding agencies such as NSF, Council for Agricultural Research Policy (CARP), National Research Council (NRC) also funded research in biotechnology. Over the years, despite limited funding, significant capacity, both in human resources and infrastructure, has been built in different fields of biotechnology at various institutions.

The National Report of Sri Lanka prepared by the previous Ministry of Environment and Natural Resources (ME & NR) for the World Summit on Sustainable Development in 2002, identified biotechnology as a thrust area for development. The MoST has identified biotechnology as a priority area for development in Sri Lanka and the CARP of the Ministry of Agriculture has identified priorities in agricultural biotechnology.

At present, there are more than 200 personnel in Sri Lankan institutes engaged in teaching and research in different areas of biotechnology according to the National Science & Technology Management Information System of the NSF and database established by the ME & NR (2005). Although the number is slowly on the increase with a few university degree programmes in biotechnology in place, the key issue at present is the absence of a critical mass of biotechnologists with appropriate competence for meaningful development of biotechnology in the country. To reap true benefits of biotechnology and pave way for building such a critical mass, Sri Lanka needs to promote biotechnology applications in various fields and create entrepreneurial and job opportunities in related fields in tandem with nurturing of human talents needed for success. This policy document intends to build up that critical mass.

A recent United States Department of Agriculture (USDA) Foreign Agricultural Services Report (Global Agriculture Information Network Report, 2005) reveals that Sri Lankan biotechnology is at a nascent stage and that the national policy and regulations are still evolving. The potential of biotechnology, especially industrial applications, is still greatly underexploited in Sri Lanka and the people of Sri Lanka have not been able to reap benefits of global developments in biotechnology. The industrial and commercial applications in biotechnology and the establishment of biotechnology industries need more state patronage to make it sustainable. Further, the private sector in Sri Lanka is yet to play an important role in contributing to the economic development through biotechnology innovations.

One of the constraints that hamper the development of biotechnology in Sri Lanka is lack of adequate financing for biotechnology research and development in research institutes and universities. The human resources that can be engaged in meaningful research and development are not available in the required number and adequate

competence in Sri Lankan institutes. As a result, limited activities of research work in biotechnology are carried out in a dispersed way without proper co-ordination. The inability of local biotechnologists to gain fast access to literature in advanced techniques and the necessity to import equipment, biochemical reagents, glassware etc. at exorbitant costs seriously affect the progress of biotechnology research in the country. There are also bureaucratic constraints that hamper biotechnology research. Lack of partnership with the industry is also a serious constraints.

The commercialization of biotechnology has become a major industry worldwide, even before the long-term effects of some of these technologies are fully evaluated and understood. Biotechnology and bio-industry are becoming an integral part of the knowledge-based economy, since they are closely associated with progress in both life and applied sciences. This is ushering a new era of economic activity with a great potential to spur economic growth and industrial productivity.

It is imperative that the field of biotechnology should be regulated flexibly but firmly. That all parties involved should be made clear about the underlying responsibility for basic values in the society as well as safeguarding health and environment. There are also ethical and religious concerns that must be taken into account and dealt with carefully if the country is to benefit from the great potential of biotechnology. Adequate measures need to be set in place to avoid adverse consequences. The National Biosafety Policy which has already been established will facilitate this and cover all areas of research in biotechnology. This would be further complemented by the "guidelines for the safe use of recombinant DNA technology in the laboratory" prepared by the Special Committee on Biotechnology of the NSF in 2003. The Bioethics Committee of the NSF is in the process of drafting a bill on Human Reproduction and Genetics to be presented to the parliament. It is also preparing legislation to ensure that Sri Lanka abides by the provisions of the International Declaration on Human Genetic Data.

2 NEED FOR A POLICY

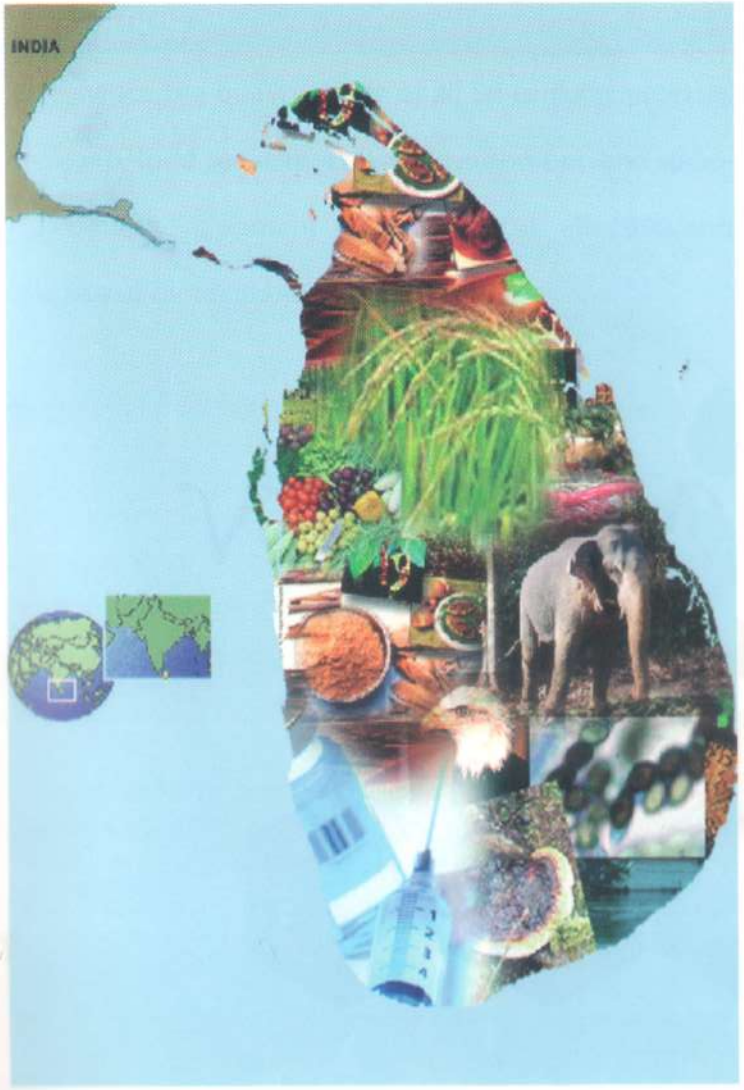
The global scientific community as well as international and regional organizations have identified biotechnology as a new technology that can bring about improved healthcare, improved environmental management, poverty alleviation, achievement and maintenance of food security and industrial development, while recognizing the need to address the relevant safety issues.

Considering the vast potential that exists in biotechnology, the decision-making and priority setting in biotechnology R&D, product development, commercialization, access to and use of various technologies and products of biotechnology must be nationally driven and coordinated for the benefit of the country and its people. Well planned use of biotechnology in Sri Lanka can lessen the impact of the growing population on over-exploitation of natural resources and support the efforts of the government on poverty alleviation. This would, however, require the immediate enhancement of the national institutional capacity and the human resource base, so that Sri Lanka could make the correct decisions on biotechnology applications and adopt appropriate biosafety measures.

Considering the above situation as well as the strengths and weaknesses in the existing biotechnological activities and applications, the National Committee on Biotechnology at NSF, strongly believes that Sri Lanka needs a National Biotechnology Policy directed at harnessing the full potential of biotechnology for economic and social development. This would be achieved through promoting biotechnology based industries driven by a strong research and development effort based on a thematic approach and supported by capacity building, adequate resource allocation and financing.

All over the world, the development of biotechnology has received government patronage at the initial stages owing to its multi-disciplinary nature and heavy investment costs. In Sri Lanka, the activities connected with current biotechnological research come under the purview of several ministries. Therefore, a national policy will provide a framework for the government to work with and coordinate all the stakeholders, to capture the benefits of biotechnology for the development of Sri Lanka.

Sri Lanka is rich in natural biological resources distributed in a wide range of different terrestrial and aquatic ecosystems and has been identified as one of the world's biodiversity "hot spots". Many of the biological resources are endemic to our country. Biotechnology offers many opportunities to convert these biological resources into economic wealth and employment opportunities within a framework established for sustainable utilization.



3 NATIONAL DEVELOPMENT OBJECTIVES

The Constitution of the Democratic Socialist Republic of Sri Lanka and the Policy Statement of the Government has stipulated the following national development objectives:

- Realization of an adequate standard of living, including adequate food, clothing etc. to its people
- Sustainable development of the economy
- Poverty alleviation
- Creation of employment opportunities
- Reduction of inequalities in incomes

The key areas in which biotechnology applications can be expected to make a substantial contribution are in the promotion of sustainable agriculture including crops, livestock, fisheries, forestry and industries such as pharmaceutical, food and feed, brewery, cosmetic, leather, ornamental plants and fish, bioproducts such as biopesticides and biofertilizer, environmental management, conversion of waste and development of alternate sources of energy.

VISION & MISSION

4 VISION

To enhance the quality of life of all Sri Lankans in terms of health, food security, a clean environment and socio-economic development through ethical, effective and safe use of biotechnology.

5 MISSION

The development, application and promotion of biotechnology in a responsible manner to catalyze sustainable socio-economic development of Sri Lanka.

POLICY FRAMEWORK

6.1 Scope of the Policy

This policy covers all biotechnologies and includes the following:

- All areas of agriculture, livestock, fisheries, forestry, human and animal health, food production, energy and environment
- All research and development in biotechnology
- All promotional and regulatory activities for product development and commercialization
- All measures to ensure public health and environmental safety with regard to biotechnological applications in Sri Lanka

6.2 Policy Objectives

The major objectives of the National Biotechnology Policy are,

- position all biotechnologies, i.e. agricultural, medical, environmental, energy and industrial as key contributors in enhancing the quality of life of the citizens and to support the national development of Sri Lanka through economic advancement
- provide economic, legal and a regulatory framework to facilitate development and co-ordinate multidisciplinary research, product development and commercialization in biotechnology
- provide an institutional framework i.e. Apex Body for national decision-making, coordinating, monitoring biotechnology R&D, promoting, networking, funding and performance managing in biotechnology
- promote applications of all biotechnologies with adequate consideration to ethical and biosafety issues
- support research and development as well as human resource development in biotechnology

- guide the judicious use of biodiversity in innovations in all biotechnologies to ensure the sustainable use of environment and biodiversity
- safeguard intellectual property rights and traditional knowledge in development and application of all biotechnologies
- nurture and promote the public-private cooperation and collaboration in developing biotechnology based industries for the development of the country

6.3 Guiding Principles

Sri Lanka reserves the sovereign right to protect its national heritage and property, and to exploit its own resources pursuant to its environmental and developmental policies. It also bears the responsibility to ensure that activities within its jurisdiction do not cause damage to its environment or to other states or areas beyond the limits of national jurisdiction. As a party to United Nations Conference on Environment and Development (UNCED) and CBD, Sri Lanka is obliged to regulate biotechnology applications, which may harm its biological diversity, environment and human as well as animal health.

This biotechnology policy aims to promote the accumulation of knowledge in biotechnology and use it in safe, effective biotechnology based industries, following national policy principles.

(i) Research and Development

Sri Lanka will place utmost importance on developing its own capabilities related to biotechnology through research and development, in achieving sustainable socio-economic development of the country.

(ii) Economic Asset and Management Responsibility

Biodiversity is recognized as a natural capital that is to be conserved as an investment. Any aspect of biotechnology that will modify or affect one or more components of it shall be to meet the development and environmental needs of the present and future generations.

(iii) Promotion and Regulation

Sri Lanka shall endeavour to strike a healthy balance between biotechnology promotion and regulation and encourage biotechnology innovations in both public and private sectors through public-private partnership.

(iv) Regional and International Cooperation

Sri Lanka shall endeavour to establish regional and international cooperation in promoting biotechnology industry and commerce.

(v) Public Awareness and Education

Public awareness and education is essential for ensuring the judicious use of biotechnological applications, practices and products for socio-economic development, while safeguarding the environment, biodiversity and human health.

(vi) Safety Guidelines

Modern biotechnology has great potential for human well being if developed and used with adequate safety measures.

(vii) Fair Sharing of Benefits

Biotechnology applications based on or inspired by the knowledge, innovations or practices of communities or individuals in Sri Lanka shall be subject to national legislation related to intellectual property rights, and shall incorporate contractual agreements to share financial or other benefits arising from such applications with these communities or individuals, on a just basis.

(viii) Transparency and Information Disclosure

The industries involved in the use of biotechnology shall reveal information on organisms used and other test data, in order that consumers are aware of the substances they are exposed to. Safety test data, especially for genetically modified organisms (GMOs) and human genetic testing, manipulations and applications shall be fully disclosed and made available for public scrutiny.

(ix) Apex Body

The Sri Lankan government via MoST shall establish the National Biotechnology Council (NBC), as the apex body, to drive policies, facilitate, coordinate and monitor all activities related to biotechnology research, promotion and application. Further this apex body should ensure safety of all R & D and biotechnology applications in both state and private sectors, and also address all ethical issues.

POLICY STATEMENTS

Realizing the need for developing our own capabilities in biotechnology through research and development, technology transfer, commercialization and human resource development, the National Policy on Biotechnology states the following:

I. The present and all future governments shall make a strong commitment to biotechnology and biotechnology industry and an Apex Body - National Biotechnology Council (NBC).

II. Biotechnology and all related activities shall always safe guard the human health, the environment and protect our rich biodiversity.

III. A comprehensive mechanism of funding for biotechnology R&D and product development shall be established through public-private partnership.

IV. Human resource development required for national biotechnology objectives shall be the responsibility of the state and supported by the industry.

V. A national strategy to address ethical issues and public awareness related to all biotechnology activities among community at large, policy makers, legislators, administrators, private sector shall be developed.

VI. Technology and expertise acquisition through strong international linkages with institutions at the leading edge of their fields shall be established.

VII. A positive atmosphere conducive for growth and innovation shall be created by establishing administrative, legislative and regulatory mechanisms for the procurement and sourcing, development and commercialisation of Biotechnology.

VIII. Institutions that are currently/could be involved in biotechnology, research and development including industry, shall be assisted to evolve into a network of national Centres of Excellence (CoE).

IX. Industrial opportunities for agricultural, medical, bio-industry, energy and environmental biotechnologies shall be improved and created.

X. Biotechnology industries shall be developed by establishing one or more Biotechnology parks with state-of-the-art research and incubator facilities under the auspices of the NBC.

Annexure

NATIONAL BIOTECHNOLOGY STRATEGY

NATIONAL BIOTECHNOLOGY STRATEGY FOR SRI LANKA

A coordinated and an effective strategy for biotechnology is needed to promote development and utilization of biotechnology & related industry in Sri Lanka. Implementation of this strategy can play a major role in addressing national development objectives such as improvement in quality of life, creation of employment opportunities, poverty alleviation and sustainable development of the national economy. Six key themes that encompassed various aspects of the National Biotechnology Policy emerged based on consultations and assessments with the public and experts in the relevant fields have been identified and following section of this document elaborates on the strategy for each of the identified key themes.

It is imperative that the proposed strategy safeguard human health and the environment, while protecting our rich biodiversity. The six key themes identified in order to meet these objectives are,

1. Government commitment for research, development and commercialization of biotechnology
2. Promote public awareness and position biotechnology in society
3. Human resource development to build capacity in biotechnology
4. Sustainable use of biodiversity for biotechnology
5. Enhance opportunities for biotechnology related industries and entrepreneurship in agriculture, health, industry, energy and environment
6. Establish Centres of Excellence (CoE) and biotechnology parks

1. Government commitment for research, development and commercialization of biotechnology

1. Government commitment for research, development and commercialization of biotechnology

The importance of biotechnology, its related industry and significance to the development of knowledge-based economy has been recognized by the Government of Sri Lanka. It is envisaged that biotechnology can make a substantial contribution for achieving our national development objectives, particularly in the areas of food security, human health, energy and environmental sustainability. Therefore, biotechnology is an important strategic economic and developmental tool. Nevertheless, due to its multi disciplinary, highly networked and research intensive nature with long gestation periods and high investments (both capital and recurrent), biotechnology and related industry demand strong government commitment for its sustenance and success. Hence, through the National Biotechnology Policy the Government of Sri Lanka will drive the development of biotechnology industry in the country with sustainable financial commitment, consistent policy and private sector partnership.

Policy Thrust I

Establishment of an apex body - National Biotechnology Council (NBC).

Strategies

1. NBC shall be appointed by H. E. the President on recommendation of the Minister of S&T and function under the MoST.
2. NBC shall be the authority responsible for successful implementation of policy initiatives, its planning, funding, monitoring and evaluation (including safety and ethical aspects) of all biotechnology activities within the country.
3. NBC will be the authority to prioritize all research areas covering all sectors of biotechnology with the concurrence of ministries, S&T institutes, universities and agencies involved in biotechnology and register all ongoing R&D activities.
4. NBC will develop a mechanism to collect and analyze data, and to establish a benchmarking mechanism for periodic monitoring and evaluating the status of biotechnology (R&D and industry) for reviewing policies and strategies.
5. NBC will ensure that the government's biotechnology objectives and strategies be fully deployed and that all agencies are committed to the successful implementation of the biotechnology initiatives.

Policy Thrust II

Establish an innovative sustainable funding mechanism for biotechnology

Strategies

1. A strong dedicated financial commitment through an identified budget line together with the commitment from the banking and the private sectors will be established to create a sustainable funding mechanism.
2. Encourage and motivate the private sector by offering soft loans, tax credits and tax exemptions to invest in biotechnology R&D.

Policy Thrust III

Establish an environment conducive to innovation, product development and commercialization.

Strategies

1. Develop an operational framework and an efficient supply chain to facilitate efficient procurement and customs clearance of equipment, chemicals, consumables and scientific literature for biotechnology R&D and industry.
2. Encourage R&D and innovation by providing incentives in the form of recognition and awards at the inventor and the institutional levels.
3. Encourage biotechnology industry development through granting pioneering status.
4. Establish international cooperation for technology and expertise acquisition by encouraging strong international linkages with institutions at the leading edge of their fields.
5. Promote and create public-private partnership programmes in research and product development in biotechnology. Establish an enabling framework for industry-institute-state partnerships for industrial development.
6. Emphasize on aligning basic research with commercialization objectives.

7. Setup a biotechnology enterprise development fund to bridge R&D into commercialization within dedicated biotech parks with specific incubator facilities and pilot plants

8. Setup a separate Biotech Consortium to spearhead commercial developments and to ensure growth of the bio-industry sector.

9. Develop state promoted nexus between the National Nanotechnology Initiative and bio-industrial development.

Policy Thrust IV

Enact legislative reforms and compliances

Strategies

1. Introduce appropriate regulatory protocols for biotechnology research, applications and safety related issues regarding humans, animals and the environment.

2. Develop legislative frameworks pertaining to IPR and technology transfer collaboratively with the National Intellectual Property Office of Sri Lanka to provide guidelines to universities, institutes and industries on IP rights.

3. Update safety guidelines and ensure its adaptation by R & D institutes and biotechnology industries.

4. Review and amend existing legislation with implications for biotechnology periodically, to reap the best benefits of emerging technologies.

5. Develop a mechanism to address ethical issues related to all biotechnology activities at the national level.

6. Establish an enabling framework to ensure consultation of all relevant departments, institutions and universities, for the development and commercialization of biotechnology, prior to signing agreements of national importance.

7. Enforce all biotechnology research, industry and commerce to comply with national regulations and international conventions to which Sri Lanka is a signatory.

2. Promote public awareness and positioning biotechnology in society

2. Promote public awareness and position biotechnology in society

Biotechnology will play a key role and gain a strong foot hold if its potential is well disseminated in society. Traditional methods of improving plants and animals and the use of products from such improved organisms including microorganisms have been accepted by the public as being safe for human consumption and the environment.

Recent biotechnological advances have shown tremendous potential as a tool for numerous applications in many scientific disciplines for enhancing productivity, quality of products and processes for meeting the challenges of human survival and improvement of living standards with minimum risk. Therefore, it is imperative to make the public aware of biotechnology as a tool that can be used judiciously for betterment of the society as accepted by many developed and developing countries. Also, Sri Lanka has the advantage of learning from the experiences, both positive and negative, of the early adopters of biotechnology.

Strategies

1. Incorporate important aspects of biotechnology into school (*via* the National Institute of Education (NIE) to support primary and secondary levels of education) and university (including postgraduate) curricula.
2. Identify resource persons, including legal experts to provide accurate information on all aspects of biotechnology to the public.
3. Identify and train potential trainers (NSF, CARP, universities, R&D institutes, Vidhatha etc.) and provide financial support for them to disseminate information to enhance the public awareness on biotechnology.
4. Create public awareness of the National Bio-safety Framework.
5. Develop awareness, conduct training programmes and produce educational materials for different stakeholders, including policy-makers, on all aspects of biotechnology.
6. Establish a National Biotechnology Information Centre.

3. Human resource development to build capacity in biotechnology

3. Human resource development to build capacity in biotechnology

Development of a viable, sustainable biotechnology industry depends heavily on a strong research strategy focused on basic research and novel technology development, generation of products from new ideas and commercialization of novel products. Successful development and application of biotechnology necessitates the convergence of skills from different fields of science. It requires a multidisciplinary approach involving scientists with skills in molecular biology, biochemistry, cell biology, genetics, agriculture, bioinformatics, etc., working with engineers, economists, business managers and lawyers.

There is an urgent need of expertise and skilled personnel in biotechnology which has to be addressed in order to develop biotechnology and related industries.

Strategies

1. Promote curriculum development to include life sciences, biotechnology, entrepreneurial and business skills at secondary and undergraduate curricula.

2. Encourage and promote postgraduate research & training (local and overseas) in biotechnology in universities and research institutes and in biotechnology industries.

3. Attract young scientists to life sciences and biotechnology through grants, special internships, scholarships and fellowships.

4. Create more career opportunities for scientists in biotechnology in CoE, universities and R&D organizations.

5. Supplement & enhance existing schemes to attract scientists from overseas with innovative packages in terms of fellowships and R & D support.

6. Promote short term training in biotechnology as a regular human resource development activity for development of skilled personnel.

4. Sustainable use of biodiversity for biotechnology

4. Sustainable use of biodiversity for biotechnology

Sri Lanka is a biodiversity 'hotspot', with a high percentage of endemic species. Biodiversity refers to all forms of life and ecosystems that contain and sustain diverse forms of life. The goal of the CBD, to which Sri Lanka is a signatory, is the protection and use of biological resources in ways that do not diminish the world's variety of genes and species or destroy important habitats and ecosystems. The three basic elements of the CBD are, (i) saving biodiversity (ii) studying biodiversity and (iii) utilizing biodiversity in a sustainable and equitable manner.

Biodiversity prospecting or bio-prospecting is the "examination of biological resources for features that may be of value for commercial development". Biotechnology depends on bio prospecting for the search for biological resources or their products to be applied as commercially valuable goods and services.

Policy Thrust I

Sustainable use of biodiversity

Strategies

1. Promote manufacturing of bio-products, bio-fertilizer and bio-pesticides (microbial, plant based, biochemical) and bio-herbicides.

2. Improve traditional biotechnological processes such as fermenting, retting, composting and garbage recycling using locally available microbial consortia.

3. Establish a national data bank/information centre for biodiversity

   (i) Characterize animals and plants including marine and fresh water fauna and flora and high valued ornamentals using molecular markers

   (ii) Identify and catalog indigenous animal species, such as cattle and fish, by DNA fingerprinting techniques.

   (iii) Conserve local plant and animal germplasm and characterize using molecular markers in an effective manner for efficient utilization in breeding.

Policy Thrust II

Bio-prospecting of natural resources

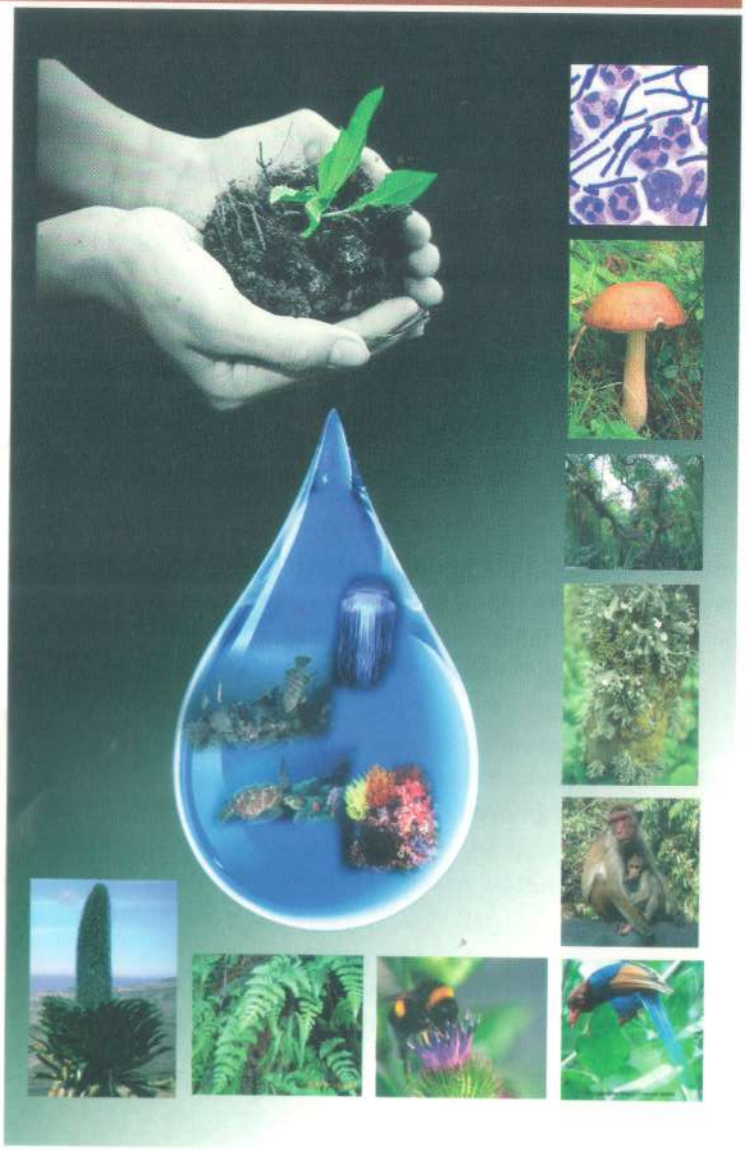
Strategies

1. Establish a policy on bio-prospecting and identify strategic actions to ensure utilization of biological resources based on conservation in a sustainable manner, to promote equitable sharing of benefits and the protection of indigenous traditional knowledge.

2. Promote and encourage research on conservation based bio-prospecting and sustainable use of biological diversity.

3. Utilize the National Policy on Biodiversity Conservation on Sri Lanka as the framework for development of bio-prospecting.

4. Establish research centres for bio-prospecting of biological resources of terrestrial, coastal and marine ecosystems and promote collaborative research.



5. *Enhance opportunities for biotechnology related industries and entrepreneurship in agriculture, health, industry, energy and environment*

5. Enhance opportunities for biotechnology related industries and entrepreneurship in agriculture, health, industry, energy and environment

Enhancement of opportunities in biotechnology related industries will focus on the areas of food production, healthcare, industrial biotechnology, promotion of bio energy and the clean environment with increased opportunities for bio entrepreneurship.

Policy Thrust I

Promoting food production

The agricultural sector is the cornerstone in Sri Lanka's economy with more than 70% of the population living in rural areas depending on agriculture for their livelihoods. This sector is responsible for ≃ 18% of the GDP and ≃36% of the employment. Sustainable development of agriculture is imperative for domestic food production and food security, to achieve self reliance at national level, poverty reduction and improvement of living standards.

The population growth and the challenges imposed by limitation in land area, detrimental effects of current agricultural practices and the global climatic changes demand a sustainable food production system to meet these challenges. Safe and judicious use of biotechnology tools have been identified as having a potential to remedy the above situation and reach the goal of self reliance in food production. Thus the need to modernize and transform the agriculture sector to a modern science based industry through the use of biotechnology tools is recognized.

Strategies

1. Enhance efficient utilization of germplasm in plant breeding programmes employing cell and tissue culture and molecular techniques.
2. Develop crop plant varieties better adapted to stresses such as drought, salt, adverse soils and different agro climates by modern plant breeding techniques in conformity with national bio-safety regulations.
3. Promote novel breeding technologies for rapid improvement in breeding animals of high production capacity adaptable to different farming systems.
4. Develop value added new agro based food products through biotechnology.
5. Develop pest and disease resistant crop plants to reduce the impact of pesticides on the environment.

6. Develop research programmes in biotechnology platforms such as functional genomics, proteomics and bioinformatics utilizing our rich biodiversity to discover new genes for improving important crop plants in enhancing agricultural productivity.

7. Promote studies on development of transgenic organisms for enhanced productivity and quality in crop plants, in conformity with national bio-safety regulations.

8. Develop crop plants and livestock animals with improved nutritional value of the food and feed through the use of biotechnological tools.

9. Improve animal vaccine production facilities.

10. Develop relevant sectors,

    a) Agriculture and Livestock,
    b) Fisheries and Aquaculture,
    c) Plantations,
    d) Forestry,

    through applications of biotechnology in line with national policies.

Policy Thrust II

Well-being of the people through Healthcare

Recent advances in biotechnology provide opportunities for improvement in disease prevention, diagnosis and management. It is important to synchronize new technologies and products with the local needs of the healthcare system and facilitate technology diffusion into health practices in an ethical manner.

Pathogenesis of major diseases, molecular mechanisms of disease transmission, disease prevention by vaccination, better patient management, reduction of treatment cost as well as prevention of epidemics need to be investigated. Moreover, medical biotechnology could be used in establishing strong pharmaceutical and other healthcare related industries in Sri Lanka.

Strategies

1. Strengthen basic, applied and developmental research in tropical, genetic and emerging diseases relevant to Sri Lanka.

2. Support production of test/diagnostic kits, molecular testing services and vaccine production locally. Develop a mechanism for granting state approval for these tests and services.

3. Promote development of premium health care products from local ingredients with appropriate quality control studies and clinical testing.

4. Promote product development in the areas of vaccines, diagnostics, recombinant therapeutic products, stem cell research, tissue engineering, new therapies based on cell and tissue replacement, therapeutic antibodies, drug and vaccine delivery systems and new anti microbial agents.

5. Promote ethical genetic testing and screening of individuals to identify their risks of developing genetic diseases and transmitting to the next generation.

6. Encourage development of medical devices such as implantables, dental, orthopaedic and tissue materials with collaborative bioengineering research on polymer-ceramic composites, large segment bone and tissue repair, advanced burn and wound dressings.

7. Promote bioinformatics in reducing the cost and time for development of new products and management of bio-resources plus managing complex data required to plan and monitor major national programmes.

Policy Thrust III

Promotion of industrial biotechnology

Industrial biotechnology is the application of biotechnology for industrial purposes, including manufacturing, alternative energy (or "bioenergy"), and biomaterials with the aid of microorganisms and enzymes. This area also known as White Biotechnology encompass the future vision of biorefineries producing biofuels and biochemicals and can include the extensive use of genetically modified organisms. Currently industrial scale production of enzymes as biocatalysts for chemical reactions is a major industrial biotechnology activity. Industrial biotechnology is a highly dynamic, competitive sector with high stakes. Sri Lanka should understand the potential along with the challenges and must see the potential of its development for the national economy.

Strategies

1. Develop the industrial biotechnology sector with proper understanding of the elements of the value chain and within the framework of the national bio-safety policy.

2. Identify key priority areas for development in the industrial biotechnology sector and in the early stages provide a conducive environment, coupled with proper tax incentives to encourage a sustainable manufacturing environment.

3. Provide incentives and technical knowledge to local businesses for production industries, i.e. production of industrial enzymes, microbial production of industrial chemicals etc.

4. Nurture and develop technology platforms based on local bio-resources.

5. Encourage research in discovery of new and better biocatalysts to add higher value for products in the food, chemical and pharmaceutical industries as well as manufacturing processes.

6. Ensure supporting infrastructure and assistance for major global biotechnology players to establish their new base operations in Sri Lanka.

Policy Thrust IV

Promotion of bio-energy

At present, Sri Lanka is heavily dependent upon imported fossil fuels in meeting the energy needs of the country. The country's vast biomass including the organic waste fraction has the potential to meet some of the energy needs, thus, the objective is to promote the utilization of bio-energy.

Bio-energy will support and nurture a multitude of activities which will stimulate the interest and growth of broader economy. Principle of incorporating bio-energy systems to the National Energy Scheme also supports the concept of indigenous energy delivery systems and as such a greater degree of energy security to the nation.

Strategies

1. Exploit all three fronts of bio-fuels (e.g. solid, liquid and gaseous) as well as new technologies that will utilize bio-energies.

2. Develop technology pathways and human resources along with identification of infrastructure needs for switching to a bio-energy facilitated economy.

3. Define the percentage of energy requirements (electricity and transport) to be delivered by the bio-energy streams and to ensure that adequate resources are provided in realizing this goal in the time frame intended.

4. Develop conventional bio-fuels which use traditional biotechnology (e.g. ethanol, conversion of cellulose and starch feedstock to bio-fuel) and promote research to optimize conventional processes.

5. Develop bio-diesel technologies and algal bio-energy systems.

6. Promote research in plant biotechnology in developing biomass systems and increasing biomass production.

7. Develop optimal biogas reactors within waste-to-energy programs and expand small-scale composting programmes.

8. Support research on microbial fuel cell systems and bio-films.

9. Promote and utilise conversion of solid waste into energy e.g. land-fill gas.

Policy Thrust V

Promote clean environment

The objective is to utilize biotechnology towards achieving a cleaner environment; air, water, soil and natural resources. Rapid increase of industries, livestock & agricultural farms, urbanization and infrastructure development led to the enhanced release of waste products polluting the environment. Various biotechnology related solutions can address these problems for minimizing harmful effects of waste products.

Strategies

1. Develop cost effective biotechnology systems to treat household, agricultural, and industrial waste for generating energy and /or useful by-products.

2. Promote manufacture of bio fertilizer for improving soil quality and minimizing the usage of chemical fertilizer.

3. Utilize soil micro organisms in degrading industrial and toxic waste.

4. Promote use of bio-sensors to bio-monitor the state of the environment and individual ecosystems.

5. Develop and promote bio-pesticides (bio-control agents and botanicals) for reducing the use of chemicals.

6. Bio-remediate degraded lands and polluted water ways.

7. Provide incentives to industries encouraging 'green operations' utilizing biotechnolgy.

Policy Thrust VI

Poverty reduction through bio-entrepreneurship

Biotechnology has tremendous potential for commercial applications at both high and low ends of the economic scale. Knowledge and awareness of biotechnology should be provided to a wider cross section of the society in an effective manner. Bio-entrepreneurship uses the principles of biotechnology to create new (or add value to existing) products and services at all levels of the value chain. These products and services can be used for reducing poverty, especially in rural communities.

Strategies

1. Quantify the potential economic contribution in adopting biotechnologies in different sectors such as agriculture, manufacturing and health care, and utilize the results in developing long term strategies for implementing bio-entrepreneurship in sectors of potential benefit.

2. Include biotechnology activities in the programmes currently being conducted by the MoST (i.e. Vidhatha) and establish methods to ensure adequate state support to promote clustering of biotechnology business activities.

3. Provide appropriate financial schemes to support pioneering ventures and biotechnology business activities under SME development schemes (manufacture of new products, improvement and diversification of existing products and mass propagation of planting material).

4. Establish favourable tax regimes and financial mechanisms (supporting investments in R&D, pioneering status conditions, accelerated depreciation etc.) for bio-industries to develop and mature.

6. Establish Centres of Excellence (CoE) and biotechnology parks

6. Establish Centres of Excellence (CoE) and biotechnology parks

The importance of establishing CoE is recognized in order to implement biotechnology related research programmes of national importance, coordinate research activities with the emphasis on collaborative, cross disciplinary and industry oriented research. It is expected that CoE will improve the efficient use of resources through multi-user facilities, provide an environment conducive for translating research outcomes into marketable products and services *via* incubator facilities with IP protection and licensing.

It is expected that establishment of one or more Biotechnology Park(s) under the auspices of the NBC will provide centralized incubator facilities to enterprises for developing ideas and commercializing biotechnology products, processes and services. The park(s) will host a cluster of life science companies (start-ups, mid-stage), research institutes, state laboratories and offer the advantages of scientific collaboration , world class business support and specialized facilities designed in order to grow in today's global biotechnology environment.

Policy Thrust I

Establish Centers of Excellence

Strategies

1. Identify the centres currently involved in biotechnology research in the public or private sector with the potential of evolving into CoE.
2. Commission and provide financial support to CoE to engage in research identified by the NBC.
3. Encourage and support for linkages and collaborative research among national and international CoE.
4. Provide matching funds in order to encourage CoE to obtain external research funding.
5. Establish a coordinating office to link the activities of CoE to be in line with the National Biotechnology Policy.
6. Promote and assist universities and public & private sector R&D organizations to evolve into CoE.

Policy Thrust II

Establishment of biotechnology parks

Strategies

1. Promote creation of biotechnology incubation systems in universities, research institutes and private companies.

2. Initiate development of business and management skills in personnel working in biotechnology research.

3. Introduce a key business support initiative to promote development of parks and attract technology investors.

BIOTECHNOLOGY POLICY DEVELOPMENT PROCESS

- First meeting of the NSF National Committee on Biotechnology identified the need of policy document for BT
- Discussion on formulation of policy and appointing a Sub Committee
- Board of Management appointed a Sub-Committee
- Discussion on action plan for policy formulation
- Prepared first draft and discussed among the Committee Members
- Amended the first draft
- Board approval granted for paper advertisement, web and circulation
- The first draft on the web and circulated to the relevant institutions * for public opinion (paper advertisement in all three languages and 1 month given to comment)
- Translated into Sinhala and Tamil as requested
- Prepared second draft based on the public opinion received
- Board approval granted for public meeting
- Organized a public meeting to get views on the second draft
- Prepared third draft based on the opinion received at the public meeting
- Discussed by the Committee
- Amendments made and the amended draft was tabled and discussed (separated policy and strategic approach)
- Obtained legal views
- Third draft edited
- Edited document was tabled for views of the Committee
- Finalized the document
- Handed over to the Hon. Minister of S & T after getting approval of the Board
- Amended the document addressing the comments made by the Hon. Minister
- Meeting with the Minister
- Incorporated suggestions made at the meeting
- Finalized the document

* Policy document recipients

BIOTECHNOLOGY POLICY DOCUMENT (FIRST DRAFT) RECIPIENTS

Ministries

01. Ministry of Agrarian Services and Development of Farmer Communities
02. Ministry of Agricultural Development
03. Ministry of Agriculture, Irrigation and Mahaweli Development
04. Ministry of Education
05. Ministry of Environment and Natural Resources
06. Ministry of Finance
07. Ministry of Fisheries and Aquatic Resources
08. Ministry of Healthcare and Nutrition
09. Ministry of Indigenous Medicine
10. Ministry of Industrial Development
11. Ministry of Plantation Industries
12. Ministry of Power and Energy
13. Ministry of Rural Industries and Self-Employment
14. Ministry of Samurdhi and Poverty Alleviation
15. Ministry of Science and Technology
16. Ministry of Skills Development and Public Enterprise Reforms
17. Ministry of Trade, Commerce, Consumer Affairs and Marketing Development
18. Prof. Tissa Vitarana , Minister of Science and Technology
19. Prof. P.W. Epasinghe, Advisor on Science and Technology to H. E. President

Universities

01. University of Colombo/Faculty of Medicine
02. University of Colombo /Faculty of Science
03. University of Colombo/The Institute of Biochemistry, Molecular Biology and Biotechnology
04. University of Colombo/PGIM
05. Eastern University of Sri Lanka/Faculty of Agriculture
06. Eastern University of Sri Lanka/Faculty of Science
07. Eastern University of Sri Lanka/Trincomalee Campus/ Faculty of Applied Science
08. University of Jaffna/Faculty of Agriculture
09. University of Jaffna/Faculty of Medicine
10. University of Jaffna/Faculty of Science
11. University of Jaffna/Vavuniya Campus/ Faculty of Applied Science
12. University of Kelaniya/Faculty of Medicine
13. University of Kelaniya/Faculty of Science
14. University of Moratuwa/Department of Chemical and Process Engineering
15. Open University of Sri Lanka/Faculty of Natural Sciences
16. University of Peradeniya/ Faculty of Agriculture
17. University of Peradeniya/ Faculty of Dental Sciences
18. University of Peradeniya/ Faculty of Medicine
19. University of Peradeniya/ Faculty of Science
20. University of Peradeniya/ Faculty of Veterinary Medicine and Animal Science

21. University of Peradeniya/ Faculty of Engineering/ Department of Chemical and Process Engineering
22. University of Peradeniya/PGIA
23. University of Peradeniya/PGIS
24. Rajarata University of Sri Lanka/ Faculty of Agricultural Science
25. Rajarata University of Sri Lanka/ Faculty of Applied Science
26. University of Ruhuna/ Faculty of Agriculture
27. University of Ruhuna/ Faculty of Medicine
28. University of Ruhuna/ Faculty of Science
29. Sabaragamuwa University of Sri Lanka/Faculty of Agricultural Science
30. Sabaragamuwa University of Sri Lanka /Faculty of Applied Science
31. South Eastern University of Sri Lanka/Faculty of Applied Science
32. University of Sri Jayewardenepura/ Faculty of Medical Sciences
33. University of Sri Jayewardenepura/ Faculty of Science
34. University of Sri Jayewardenepura/Vice Chancellor Prof. Narada Warnasooriya
35. Wayamba University of Sri Lanka/Faculty of Agriculture and Plantation Management
36. Wayamba University of Sri Lanka/ Faculty of Applied Science
37. Wayamba University of Sri Lanka/Faculty of Livestock, Fisheries and Nutrition

R&D Institutes

01. Coconut Research Institute of Sri Lanka (CRI)
02. Field Crops Research and Development Institute (FCRDI)
03. Food Research Unit(FRU)
04. Forum for Research and Development
05. Grain Legumes and Oil Crops Research & Development Centre
06. Hector Kobbekaduwa Agrarian Research and Training Institute
07. Horticulture Crop Research and Development Institute (HORDI)
08. Institute of Fundamental Studies (IFS)
09. Institute of Post Harvest Technology
10. Industrial Technology Institute (ITI)
11. Medical Research Institute (MRI)
12. National Aquatic Resources Development and Research Agency (NARA)
13. Plant Genetic Resources Centre (PGRC)
14. Pulses Grains Research and Production Authority
15. Regional Agricultural Research and Development Centre
16. Rice Research and Development Institute (RRDI)
17. Rubber Research Institute of Sri Lanka (RRI)
18. Seed Certification and Plant Protection Centre
19. Sugar Cane Research Institute of Sri Lanka (SRI)
20. Tea Research Institute of Sri Lanka (TRI)
21. Veterinary Research Institute (VRI)
22. Agricultural Biotechnology Centre (AgBC)

S&T Institutes / S&T Policy and Funding related Institutes / S&T Related Boards

01 Energy Conservation Fund
02 National Research Council (NRC)
03 National Science and Technology Commission (NASTEC)
04 Ceylon Electricity Board
05 Coconut Cultivation Board
06 National Dangerous Drugs Control Board
07 Palmyra Development Board
08 Rubber Research Board

Corporations/Authorities/Commissions/Councils/Agencies

01 State Pharmaceuticals Corporation
02 Sri Lanka Ayurvedic Drugs Corporation
03 State Pharmaceuticals Manufacturing Corporation
04 Central Environment Authority
05 Coconut Development Authority
06 Marine Pollution Prevention Authority
07 Sri Lanka Council for Agricultural Research Policy (CARP)
08 University Grants Commission of Sri Lanka (UGC)

Private Sector

01 Chemical Industries Colombo
02 Ceylinco Foliage
03 Biopower Lanka
04 Environment and Management Lanka
05 Genetech Research Institute
06 Hayleys Ltd
07 Link Natural Products (Pvt) Ltd.
08 Mike Biotech
09 Sri Lanka Export Development Board

Professional Organizations/other

01 Cancer Hospital/Maharagama
02 College of Microbiologists
03 College of Oncologists (Dr. Indira Amarasinghe/Cancer Hospital - President)
04 College of Paediatricians
05 College of Pathologists (Dr. Dilani Lokuhetti/University of Colombo - President)
06 College of Surgeons
07 Institute of Biology Sri Lanka
08 Institute of Chemistry
09 The Institution of Engineers
10 Institute of Policy Studies of Sri Lanka
11 Sri Lanka Association for the Advancement of Science
12 Sri Lanka Institute of Development and Advancement
13 Ceylon Chamber of Commerce
14 Sri Lanka Medical Association (Dr. Chandrani Wanigatunga/USJP – Secretary)
15 Sri Lanka Standards Institute

NGOs

01 Care International Sri Lanka
02 Centre for Women's Research
03 Community Water and Environment Forum
04 Dambadeniya Development Foundation
05 Family Planning Association of Sri Lanka
06 FORUT Sri Lanka
07 German Agro Action
08 Habitat for Humanity Sri Lanka
09 Helpage Sri Lanka
10 Institute of Human Development and Training
11 Institute for Social Development and Action
12 Institute of Human Rights
13 Intermediate Technology Development Group (ITDG) South Asia
14 IUCN - The World Conservation Union
15 Lanka Jatika Sarvodaya Shramadana Sangamaya(Inc.)
16 Marga Institute
17 National Council for Child and Youth welfare (NCCYW)
18 National Council for the Deaf
19 Organization for Resource Development & Environment (ORDE)
20 Organization for Rural Community Education Environment Development
21 Organization for the Protection of Social Environment (O.P.S.E)
22 Participatory and Action Learning Methodologies Foundation (PALM)
23 Population Services Lanka
24 Reach Human Resources Development Foundation
25 READ (Rehabilitation Education Agriculture Development) Foundation Gurantee
26 Regional Centre for Strategic Studies
27 S.O.S. Children's Villages of Sri Lanka
28 Sarvodaya
29 Save the Children- In Sri Lanka
30 South Asia Partnership
31 Sri Lanka Anti Narcotic Association
32 Sri Lanka Heritage Foundation
33 Sri Lanka Red Cross Society
34 The Asia Foundation
35 United Nations Association in the Democratic Socialist Republic of Sri Lanka
36 United Nations Children's Fund (UNICEF)
37 United Nations Development Programme(UNDP)
38 United Nations Human Settlements Programme
39 United Nations International Strategy for Disaster Reduction
40 United Nations Population Fund
41 Women Development Foundation
42 World Food Programme (WFP)
43 World Health Organization (WHO)
44 Christian Children's Fund (CCF) - Sri Lanka

Contributed by the Members of the National Committee on Biotechnology of the NSF (up to 2007)

Prof. Athula Perera, Chairman
Director, PGIA, UoP

Prof. Sirimali Fernando, Chairperson, NSF and Professor of Microbiology, USJP

Prof. Ajith de Alwis, Head, Dept. of Chemical & Process Engineering, UoM

Mr. J. M. D. T. Everard, Deputy Director (Research), CRI

Dr. S. Gunawardene, Senior Lecturer, Dept. of Chemical & Process Engineering, UoM

Dr. S. Handunetti, Senior Lecturer, IBMBB, UoC

Prof. K. Hirimburegama, Head, Dept. of Plant Sciences, UoC

Prof. J. Perera, Head, Dept. of Microbiology, UoC

Prof. Tuley De Silva, Retired Special Advisor, UNIDO

Dr. S. Yasawardene, Head, Dept. of Anatomy, USJP

Prof. S. Widanapathirana, Senior Professor, Dept. of Microbiology, UoK

Contributed by the Members of the National Committee on Biotechnology of the NSF (from 2008 onwards)

Dr. Anil Jayasekera, Chairman
Senior Lecturer, Dept. of Plant Sciences, UoC

Prof. Sirimali Fernando, Chairperson, NSF and Professor of Microbiology, USJP

Prof. Athula Perera, Director, PGIA, UoP

Prof. Ajith de Alwis, Head, Dept. of Chemical & Process Engineering, UoM

Mr. J. M. D. T. Everard, Deputy Director (Research), CRI

Dr. S. Gunawardene, Senior Lecturer, Dept. of Chemical & Process Engineering, UoM

Dr. S. Handunetti, Senior Lecturer, IBMBB, UoC

Prof. S. Yasawardene, Head, Dept. of Anatomy, USJP

Dr. K. P. A. Senaratne, Deputy Director, Technical Services, ITI

Dr. Priyanjalie Wijegoonawardane, Research Officer, NARA

Dr. Dharshan de Silva, Director, Genetech Research Intitute

Dr. Nimal Dissanayake, Director, RRDI

Co-opted Members

Prof. N Ratnasiri, Chairperson, NASTEC
Mrs G Gunaruwan, Consultant Economist, Ceylon Chamber of Commerce

Compiled by the Sub-Committee

Prof. S Widanapathirana
Prof. Athula Perera
Prof. Ajith de Alwis

Edited by

Mrs Nilooka Dissanayaka, Managing Director, Athwela Private Limited & Co-Editor of Athwela Business Journal

Coordinated by

Dr S A V Moorthy, Scientific Officer, NSF

Assisted by

Mrs Amali Manori Ranasinghe, Scientific Officer, NSF

Typesetting & Page Designing

Mrs K N R H D Mahapitiya, Stenographer, NSF
Mrs P M D D Fernando, Stenographer, NSF

Acknowledgement

- Inputs from the members of the National Biotechnology Committee and the Sub-Committee for the formulation of the policy throughout the process
- Comments from scientists and the general public on the draft policy document
- Contributions from the participants of the open forum
- Encouragement, support and guidance received from Prof. Tissa Vitarana, Hon. Minister, Science & Technology