

**National Biosafety Framework
of the Libyan Arab Jamahiriya**



October 2008

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Preface

The Great Jamahiriya is pleased to have cooperated with the United Nations Environment Programme and the Global Environment Facility in the Development of the National Biosafety Framework for Libya. The technical and financial support of UNEP/GEF is highly appreciated.

The world is witnessing the ongoing discussions on GMOs and researchers differ in their views on the issue of modern biotechnology especially as concerns potential benefits and risks and its impact on the environment and humans. The two key areas of applications of modern biotechnology are in the crops/food and health sectors. The first view is to support the applications of modern biotechnology to ensure food security through the development of improved genetically modified food crops to provide a comprehensive solution to the famine and fill food deficit and support economic independence and stability. This view is supported by the apparent reduction in the use of pesticides and the lesser need for water and higher yields of Genetically Modified crops. This view is expected to lead to positive benefits and impacts on environment and biodiversity through protection of natural resources of which water and soil are the most important.

The second view includes issues on food safety and consumer health. The key priority is to develop and ensure strict regulations to avoid or minimize any potential negative impacts of GMO on human health and the wider biodiversity. This group sees the release of GM crops in the agricultural sector will have negative effects on the local environment, and human and animal health in addition to the negative economic and social implications.

Each of the two views is claiming to be supported by scientific research and proof. We believe that modern biotechnology is a new science and very few in the developing world have an in-depth knowledge about it and there is insufficient awareness about its advantages and hazards among farmers, consumers and decision makers. However, the technology is gaining ground rapidly and will undoubtedly provide both new challenges and opportunities to address the current agriculture problems which have not been solved by traditional agricultural technologies. Modern Biotechnology is unavoidable and we need to take the necessary measures and techniques to ensure the safe use of modern biotechnology as required by the Cartagena Protocol on Biosafety.

It is also important that the promises of modern biotechnology often developed by large multinational companies and with the exception of a few cases, is harnessed and adopted through local scientific research and support for resource poor farmers and also targeted at national problems of concern.

In the Great Jamahiriya, the government has adopted a project to develop capacity in modern Biotechnology with the establishment of the Biotechnology Research Center in the year 2000. The Center has been designated as the national center of excellence on biotechnology issues. The Jamahiriya realized, before the ratification of the Cartagena Protocol in 2005, the need to include the legal standards with respect to biosafety in the Libyan environmental law

(Law No. 15 of 2003) on the protection and improvement of the environment with a special section on biosafety issues to which further legislation and supporting regulations and decrees will be developed through the ongoing biosafety process. The proposed national biosafety framework together with the Biosafety guidelines and the biosafety law which is in preparation will be adopted after further consultation at the national level with all concerned stakeholders. The Environment General Authority is working in cooperation with the Standing National Committee on Bioethics and Biosafety to develop national standards and a clear policy in the field of biosafety. The Committee was an important partner in the preparation of this document in addition to several other institutions involved in the National Coordination Committee for this Project.

The rapid growth in this field makes it imperative for adequate investment by both Government and the private sector to harness the potential of modern biotechnology in a safe manner especially in Agriculture, food production, health and industry. This could create the necessary regulatory systems for the protection of the natural resources for use by Libyans.

This project comes at an opportune time in the light of recent developments and progress in the field of GMOs globally. The national biosafety framework in the Great Jamahiriya would establish the operational framework with the needed institutional biosafety structure the structure in Libya. It will also assess the current status of Biotechnology and biosafety arrangements, resolutions, and the related laws in force relating to the Biosafety system to deal with applications and notifications on the import and export of GMOs. This will assist the country to identify critical areas for a follow up initiative to implement the national biosafety framework for Libya in line with its obligations to the Cartagena Protocol on Biosafety. As already indicated this document has been developed in a consultative process involving several specialists and experts to whom we express our sincere appreciation.

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Definitions

Advanced Informed Agreement: The advanced informed agreement applies to the first transboundary movement of GMOs destined for intentional release into the environment of the importing party. The importing party should be notified and given time to take a decision on approval or disapproval of the importation.

Biodiversity: Diversity of different living organisms from all sources including organisms in terrestrial and marine and other ecological systems as well as the diversity among the species and the ecological systems.

Biosafety: A system put in place to avoid or minimize adverse effect that may arise as a result of the use of GMOs for trade or research purposes.

Containment: Measures that effectively limit the contact of GMOs and their impact with the external environment and the general population.

Contained use: Means any operation or activity, undertaken within a facility, installation or other physical structure, which involves GMOs that are controlled by specific measures that effectively limit their contact with, and their impact on, the external environment.

Food, feed and processing: This term include genetically modified agricultural commodities such as GM soya bean, tomato and maize to be used as direct food or feed, or indirectly for processing

Genetically Modified Organism: An organism that has been transformed by the insertion of one or more transgenes.

Living Modified Organism: means any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology;

Living Organism: means any biological entity capable of transferring or replicating genetic material, including sterile organisms, viruses and viroids.

Modern Biotechnology: means the application of:

- i. in vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles, or
- ii. fusion of cells beyond the taxonomic family, that overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection.

National Biosafety Framework: Is a strategic regulatory framework with policy, legal, administrative, technical and public engagement measures taken by a country to meet its obligations to the Cartagena Protocol on Biosafety

Advance Information: The notification of the importing party by the exporting party before the transboundary movement of the GMOs.

Release: Any non-contained use of the GMOs.

Risk: The likelihood that a substance or an activity might cause adverse effect under certain conditions. This includes hazards to the environment and human health due to exposure to GMOs.

Risk Assessment: It is the process of risk identification, classification and assessment of exposure and the likelihood of occurrence.

Risk Management: This is a separate process from risk assessment. It includes options or measures that can be used for protection of the environment and human health, if needed, from the identified potential risk of the GMOs.

Transboundary Movement: means the movement of a living modified organism from one Party to another Party save that for the purposes of Articles 17 and 24 transboundary movement extends to movement between Parties and non-Parties.

Chapter I

1. General introduction

1.1 General information on Libya

Libya is located approximately at longitude 25.9 east and the maximum extension of its land to the north at latitude 33.9 at Ras Gudair, and to the south at 18-45 N. It is bordered to the west by the Republics of Tunisia and Algeria, to the south by the Republics of Niger and Chad, and to the east by the Republics of Egypt and Sudan.

The area of Libya is about 1.660.000 sq km and the length of the coast is about 2000 km. The population was estimated in the first half of 2006 to be 5,749,929 and the population density as 3 people / sq km. Urban residents represent 86% of the population.

Mediterranean climate prevails in the northern part of the country (at latitude 29 degree north), followed to the south by tropical-continental desert climate. The Mediterranean climate that prevails in the coastal plains and highlands is characterized by rainy and relatively cool winter, hot and dry summer, with two transitional spring and autumn seasons which are characterized by the southern warm and dry winds accompanied by sand storms known locally as “Elgibly” winds.

1.2. Biodiversity in Libya

Biological Diversity in Libya varies according to the ecosystem. Although the majority of the state is dry desert areas with only narrow fertile rainy coastal strip, the prevailing biodiversity in a particular area distinguishes each type of ecosystems. The following four different systems are known:

1.2.1 Coastal ecosystem:

It begins from the sea coast and varies in width from 5 to 25 km along the Libyan coast. It widens in the west to more than 100 km forming what is called Coast Jefara. The average annual rainfall in this region ranges between 200-250 mm. It is characterized

mainly by Mediterranean-type biodiversity with a number of diversity models representing the semi-desert flora and fauna.

1.2.2 Mountain ecosystem:

There are two distinct low-elevation mountains and surrounding plateaus; Western mountain (Nafosa Mountain) in the north-west of the Jamahiriya, and the Green Mountain in the north-east. These mountains compose of lime and sandy stones intertwined with a number of valleys that take rain water to the north. The rate of annual rainfall in the western mountain region ranges between 200-300 mm, while the Green Mountain region receives the largest amount of rainfall in the country ranging between 250-600 mm.

1.2.3 Semi-desert ecosystem:

It represents areas directly south of the mountains forming a transition zone between mountains and desert territory. Rainfall in the area ranges from 50-150 mm. The area is composed of plains of pasture for cattle, sheep and goats with the presence of some agricultural activities in some valleys.

1.2.4 Desert ecosystem:

This ecosystem represents the majority of the land area of the country, which varies from sandy desert to stone or volcanic formation. Because of the scarcity of rainfall, biodiversity is limited to scattered oases in this region and around human activities in agricultural projects on grain and vegetables which exceed 100 thousand hectares of irrigated areas.

1.3 Plant Biodiversity:

Plant biodiversity is directly linked to the pattern of the prevailing ecosystem. Mediterranean plants are dominant in the Green Mountain area while desert or drought tolerant plants and scattered shrubs prevail in the arid and semi-arid as in the Jivara plain and the desert. Dry land plants which are not drought tolerant are found around the oases. Halophytes are common in the humid coastal environments or salty desert.

Plant diversity consists of more than 1776 plant types distributed on more than 745 genera and more than 118 species in addition to about 31 species of cultivated plants. It is worth mentioning that about 75% of these types of vascular plants are located in the coastal belt. About 85 of these plants are unique types, half of which is found in the Green Mountain which is considered as the first Center of origin in Libya. The rest of the unique plants are distributed in the Nafosa Mountain, the plains, deserts and desert mountains to the south. It is estimated that about 50 plant species considered rare or endangered species in Libya in addition to the many completely extinct species.

Table (1) shows the number and proportion of the unique plants in Libya. It is notable that the proportion of unique plants is high when compared with the existing plant types which adds to the importance of the national plant biodiversity

Table 1: The number of species of vascular plants and the proportion of unique ones in Libya

Naked seeds and Ferns	Flowering Plants	Total vascular plants	Number of unique plants	Uniqueness proportion%
25	1800	1825	134	7.3

1.4 Animal biodiversity

Despite the dry climate that prevails in most of the republic, many large wild animals have existed for hundreds of years. These include cheetah, Alodan, deers, and wild Libyan cat. Now days many of these species have become rare and mostly extinct, due to desertification and drought on one side and to various human interventions, such as over hunting and unregulated hunting, habitat destruction (environments) for agricultural, industrial and economic activities, in addition to urban expansion.

The animal diversity can be summarized into 5 types of amphibians, 69 species of reptiles, 76 species of mammals, 320 species of resident and migratory birds, more than 280 species of fishes. Insects and other Arthropods estimated to several thousand from various types spreading across the above mentioned environments. Several types of these

organisms are threatened with extinction, especially some mammals, birds and fishes unless serious steps were taken to ensure their conservation and preservation.

1.5 Introduction to Biotechnology applications in Libya

Biotechnology in its simple context is the use of a number of scientific and technical protocols and procedures to generate benefit from the living organism or some of its tissues or products. These technologies have been utilized to maximize benefits to improve life for human beings and ensure food security and control of infection diseases. The following are some examples of biotechnology applications:

- Agricultural production: Production of plants resistant to diseases and unfavorable environmental conditions with high yield and better product quality.
- Animal Production: Increase milk and meat productivity and enhanced aquiculture.
- Industrial production: production of raw materials, chemicals, foodstuffs, as well as the primary drugs.
- Health: production of cheaper therapeutics and the use of genetic therapy technique.
- Environment: enriching soil fertility and removal of pollutants using microorganisms (Bio remediation).
- Energy: biofuels.

It can be said that Libya is still in the first phase of biotechnology development. Existing activities are on improved crop and animal organisms using conventional methods of breeding. Research in the field of modern biotechnology (especially at the DNA level) is limited to institutional activities by researchers and graduate students.

Biotechnology applications in Libya started only at the end of the nineties the public sector has not been able during the past three decades to carry out its role in the introduction and application of modern biotechnology. Individual initiatives in certain research centers such as the Center for Industrial Research, Center for Agricultural Research, and some colleges of the universities of Elfatih and Gar younis, failed to establish a strong foundation for the advancement in this new area of modern biotechnology. The private sector had not been present and demonstrated its inability to

accommodate various areas of traditional and modern Biotechnology. This might be due to the lack of full understanding of this type of technologies and the lack of desire to invest in areas by the private sector.

The establishment of the Research Centre for Biotechnology in 2000 was the starting point for the transfer and adoption of modern Biotechnology in Libya. This was subsequently followed by the emergence of related activities gradually in other Research Centers and Universities. This led to the state recognition of the importance of modern Biotechnology in various sectors of the economy especially with regard to food security, medicine, but the safety measures and the risk assessment mechanisms are still at a very modest level.

Libya is therefore new in the field of biotechnology and its various applications. With the increasing interest in this technology, some of the Research Centers and universities started to be engaged with limited steps reflected in establishment of specialized laboratories for plant tissue culture and introduction of some related courses in national colleges specifically for postgraduate (Masters) students. However, work in the field of biotechnology in general and in the field of recombinant DNA, in particular, is still very limited due to lack of necessary capacity in terms of equipped laboratories and trained personnel.

Libya depends on the importation of many types of food of both plant and animal origin from abroad, either for direct consumption or for the purpose of manufacturing to produce foodstuffs such as bread, biscuits, juice and dairy products as well as fodder to feed animals. The regulatory institutions require provision of genetically modified organisms (GMO) free certificate from the country of origin for the imported materials to be allowed in the country. However, until now, there is no laboratory in Libya with scientific and technical capacity to verify the credibility of the GMO free certificates, despite the presence of a centre specialized in the regulation of food and medicines.

With regard to the import of seeds for agricultural production, the related institute has issued a decree in 2006 which prohibits the import of all kinds of seeds from abroad. Despite the importance of this decision for maintenance and conservation of local varieties and lines as well as advancing scientific research in the field of crops breeding, it could on the other hand also open the way for smuggling and trafficking of seeds away from the regulatory bodies in the State which may lead to the entry of some plant species with genetically modified organisms that may spread without control.

Chapter II

2. Current status of national policies and strategies and institutional arrangements related to Biotechnology and Biosafety in Libya

2.1 Objectives of research and development programmes of Biotechnology in Libya

Despite the absence of an approved policy at the national level for research and development in the use of modern biotechnology in Libya, the Biotechnology Research Center is trying to develop a strategy and short and long-term research plans in coordination with the Standing National Committee for Ethics in Biology and Biosafety. The objective of the research programmes at the Biotechnology Research Center is to apply the technology in agriculture, medicine, veterinary medicine, plant tissue culture and testing of toxicity through:

- Various applications of the biotechnology in the fields of agriculture, industry, environment and medicine.
- Analysis of micro-organisms and their toxins in food.
- Oversee the establishment, settings and operation of the national laboratories interested in isolating and identifying diseases caused by microorganisms such as bacteria, viruses and fungi.
- The use of modern methods in the culture of animal and human tissue such as skin and bone for medical, industrial and environmental purposes.
- Establishment of plant tissue culture and use it in crop improvement research, mass production of planting materials and conservation of endangered plant species.
- Identification and isolation of the causes of endemic and modern diseases in Libya.
- Propose laws and participate in the development of regulations and legislation related to the safe use of modern biotechnology.
- Coordination and promotion of scientific and technical cooperation between research institutions and universities in different areas of modern biotechnology.
- Promotion of national awareness about modern Biotechnology.
- Organization of conferences, symposia, workshops, discussion panel and lectures on different applications of modern biotechnology.

- Training and upgrading of technical staff in various fields of modern biotechnology and its applications.

2.2 National priorities in the development of Biotechnology

National priorities for the use of modern biotechnology include:

- . Capacity building to provide technically skilled human resources in the field of modern biotechnology.
- . Development of policies and programs for modern biotechnology and its safe applications in the fields of agriculture, health and environmental protection.
- . Enactment of laws, regulations and legislation related to the use of biotechnology.
- . Cooperation with international and global organizations such as UNEP, UNESCO and FAO to develop training programmers in the field of cells and molecular biology and improvement of plant production and protection of the environment.

2.3 Technical capacity and infrastructure available for Biotechnology and Biosafety in Libya

2.3.1 Environment General Authority (EGA)

It is a scientific, regulatory and advisory body concerned with environmental affairs with respect to conservation of biological resources, environmental pollution, and sustainable development and integrated planning of the community. The EGA was established under the General People's Committee for Health and Environment in 2000 in accordance with resolution No. 263 of the General People's Committee. The EGA is an independent autonomous institution which exercises its duties in accordance with the law No. 15 of 2003 to protect and improve the environment.

As spelt out in the founding resolution, all institutions should work to enable the EGA to implement all of its terms of reference and to follow its conditions and guidelines in order to achieve the objectives stated in the resolution for its establishment. The staff of the EGA has the status of enforcement officers in accordance with the Criminal Procedure

Code to catch offenders to the provisions of the Environmental Protection Act and its implementing regulations.

Terms of reference of the EGA

- Proposal of plans and programmes related to the environment in the Great Jamahiriya and supervision of the application and follow up of the implementation of such proposals, taking also into the account the presence of the environmental dimension in the national economic and social development plans.
- Preparation of studies and research on the environment within the Great Jamahiriya to protect and conserve its biological resources, in collaboration with the research Centers and other specialized national and international institutions.
- Awareness campaigns in various ways to publicize the environment and the rules and guidelines to protect it from pollution and its causes if any.
- Monitoring and recording of species imported to or exported from Libyan in implementation of the CITES Convention.
- Granting authorizations for activities which may have adverse effect on the environment including import or export of chemicals. The Authorization states the rules and conditions and requires the beneficiary to comply with the conditions contained therein.
- Recording of all types of chemicals that may result in contamination of the environment including pesticides used for the purposes of public health, agriculture and veterinary.
- Expression of opinions on the environmental impact of projects of various kinds before their inception.
- Follow-up of conventions, treaties and international developments in the field of environment, and coordination with the national committees and the competent authorities to implement the relevant obligations to those conventions.
- Cooperation with international groups to remove the causes of pollution in coordination with the national authorities concerned.
- Development of a national plan to face emergency situations of environmental disaster in cooperation with the relevant agencies.

- Encourage and support public institutions and associations with activities related to the areas of environmental protection.
- Development and review of legislation and decisions concerning the protection of the environment or participate in their preparation.

2.3.2 National Authority for Scientific Research

Libya has paid great attention to scientific research and technological development as they constitute the main pillars for development, community progress and prosperity. For these purposes, the Great Jamahiriya has developed scientific and technological strategies and policies for prosperity and progress of the country.

The General People's Committee issued Decision No. (246) in 1981 for the establishment of the National Authority for Scientific Research (NASR), and then changed the name of the NASR to the National Bureau of Research and Development in its resolution No. (26) 2004, and finally renamed as the NASR according to the resolution No. 654 in 2007. The NASR consists of a Supreme Committee headed by the Secretary of the People's Committee for Higher Education with membership of Secretaries of Health and the Environment, Industry, Planning, Agriculture and Livestock, The Secretary of the NASR is the Rapporteur of the Supreme Committee. The aims of NASR are:

- Implementation of the strategy for scientific research and establishment of policies and priorities for scientific research and development with the necessary programmes of work.
- Develop and implement plans for development of technical and scientific capacities.
- Inventories of scientists, researchers and specialized experts so as benefit from their expertise in the scientific research.
- Supporting institutions and scientific research centers.
- Establishment of basic infrastructure for scientific research and technical development.
- Establishment of research centers according to community demand and the development of existing ones.

- Supervision of the organization of the intellectual property and patent certification.

The NASR works in the following research programs and projects:

- Research in healthy environment and combating desertification.
- Research in marine and cultivation of fishes.
- Research in utilization of available natural resources.
- Research in food security.
- Research in endemic seed improvement and development.
- Research in livestock genetic resources.
- Medical and health research.
- Research in new and renewable energy
- Space Research.

2.3.3 National Standing Committee for Biological Ethics and Biosafety

This Committee was established in accordance with decision of the General People's Committee No. 874 of 2003 and began its work based on specific plans to achieve its goals.

In 2004 the Committee was restructured by Decree which was later amended by the General People's Committee decision No. 79 of 2006 and the standing committee was affiliated to the National Authority for Scientific Research, and entrusted with the following tasks:

- Rating, follow-up and documentation of scientific research and equipments used in Biotechnology research and direct it into peaceful areas.
- Follow-up research in the area of bioethics of cloning and proposal of laws and principles to regulate it.
- Defend the point of view of the Great Jamahiriya with respect to the ethics of the scientific research on cloning in the local and international scientific forums.
- Spreading of awareness in the area of research ethics in the scientific side of cloning, and the preparation and documentation programmes on research ethics.

- Follow-up of the international conventions and treaties and the results of their implementation.

2.3.4 Public Company for Pharmaceuticals and Medical Supplies:

The Company was established for the purpose of medicines production in addition to supplies of different forms of pharmaceutical and medical supplies as well as different kinds of products which may cover commodities needed for public health in the Jamahiriya market and also for export of large quantities.

The company has restrictions for dealing with dangerous microorganisms and very seriously focused on what was in the Libyan legislation especially with respect to health care and medical insurance, according to the laws and resolutions in force. The company has standard specifications related to the establishment and initiation of factories and laboratory for example:

- i. Systems, restrictions and laws related to good manufacturing, storage and laboratory work.
- ii. Laboratory characteristics, services and facilities.
- iii. Method and steps of operation.
- iv. Rehabilitation and training of people.
- v. Total quality management.

2.3.5 Research Centers of the National Corporation for Scientific Research Related to Biosafety

2.3.5.1 Biotechnology Research Center:

The laboratory was established according to the decision of the people's national committee No. in 2000, with the aim of achieving the renaissance of scientific and technical capacity in different modern biotechnology applications in agriculture, industry, medicine and the environment by adopting following technologies: development and analysis in cell science and molecular biology, the use of modern analytical methods and advanced tissue culture for human and plants, as well as programme development,

contribution to preparation of laws and regulations related to cell science and molecular biology research.

Additionally, the centre had activities in research and studies related to the isolation and identification of the endemic and modern diseases caused by some microbes, surveys on Libyan medical research, diagnosis of embryo diseases, and updated developments in the field of microbiology which could be exploited to improve livelihood and build human capacity.

2.3.5.2 Research Centre for Renewable Energies and Water Desalination:

This centre focuses on safe use of nuclear technology through the establishment of solid base for the production of radioisotopes.

The center also carries out environmental research and monitoring of radioactive sources and nuclear materials so as to ensure its safety use.

One of the crucial activities of this Centre is safe use of nuclear technology in the areas of medicine, agriculture, industry and environment.

2.3.5.3 National Centre for Medical Research

The center has many activities including research on pathogenic bacteria resistance and medicinal drugs, vaccines and serum production in the country.

2.3.6 Other Research Centers

2.3.6.1 Agricultural and Animal Research Centre

The centre was established as a public foundation which is administratively and financially independent. The establishment is based on law No. (109), which set up up the Agricultural and Animal Research Centre in 1971, as strategic backbone for the formulation and implementation of plans and development programs in Agriculture.

The Centre consists of four research projects (specialized research centers plus 17 research station):

- Research project (centre) for rain-fed agriculture.

- Research project (centre) for sustainable agriculture.
- Research project (centre) for high land agriculture.
- Research project (centre) for desert area.

The projects focus on research studies and practical experiences related to the specific problems of each region and requirements of the development, and the use of the renewable natural resources. The centre has the necessary infrastructure to enable it to access its responsibilities and perform its mission and achieve its objectives.

The ongoing scientific research in the centre include studies on the plant production, soil and irrigation, animal production, crops and agricultural economy, supporting research, plant protection (Biocontrol), horticulture, pastures and forests and agricultural mechanization.

2.3.6.2 National Centre for seed multiplication

The centre was established according to National People's Committee No. (106) for 1428 in Elkhams city to mainly carry activities in the seeds production (cereal crops and vegetables), and most of them was imported and developed using traditional breeding, or through the development of their own modern varieties using breeding traditional methods.

2.3.6.3 Center for development and improvement of palm and olive trees

Ongoing research activities at the center covers all aspects of palm and olive trees, and development of operational methods to facilitate national capacity building in the development and cultivation of palm and olive trees using modern biotechnology tools.

The Research objectives of the Centre are:

- Conduct research and studies in the areas of development and improvement of olive and palm production including fertilizer application and irrigation, prevention, horticulture, conservation and industrialization and other related activities.
- Create methods and modern techniques in the fields of development and improvement palm and olives production.

- Establishment of farm nurseries of palm and olive and identify the appropriate varieties for each region by using modern technology.
- Tissue culture propagation for Palm and olive.
- Palm pest control using modern technologies and biological control.
- Introduction of modern techniques for the conservation and storage of dates.

2.3.6.4 Center for Marine Research

The center was established by National People's Committee No. (1582) to 1981, in September 1984 the Research Center for Fishing was included to the Centre for Marine Research in order to standardize the potential and benefit from the experience of the centers.

According to the National People's Committee No. (161) 1992 other activities was added to the center such as, applied research and scientific studies, drawing up of technical plans and programmes for the implementation of public policy in this area and to provide data and information on marine wealth, dissemination and offering advice in the areas of fisheries and aquaculture.

The Centre's work concentrated on the development and exploitation of marine wealth and investment using the technologies available in the area, particularly with regard to fish farms and aquaculture. Some of the most important research activities supervised by the Centre are:-

- Study of distribution and spread of natural sponges along Shabiya tuber coast.
- Study of fish harvesting and the collections of statistics for some species of economic importance in Libyan coast.
- Study of biological tuna with blue Flipper.
- Study of biological benthic fish and surface water in Jamahiriya.
- Study of fish Gristliness in Libyan coast, as well as biological types of sharks in Abu Shoka and Elmutsole
- Study of Elsabakh and the organic and wetlands Libya source.

- Control of oil contaminants and heavy metals in the west coast of the Libyan in collaboration with energy research centre for Oil under the supervision of international control of energy.

2.3.6.5 Libya Oil Institute

Libya Oil Institute was established by the National People's Committee No. (130) in 2006 to replace the Oil Research center in the conduct of research and scientific studies, and the preparation and implementation of education and training programmes in the oil industry. The Institute was evolved considerably and has updated the requirements of the modern laboratory buildings, appliances and sophisticated equipment and specialized human elements in the various branches of the oil industry.

The functions of the Institute include:

- Generation of a general policy on research and studies on oil, its derivatives and petrochemicals.
- Collection and compilation of research and studies of oil exploration in Libya.
- Analysis and tests on the exploration and production of oil and its derivatives, petrochemicals.
- Study of environmental pollution caused by oil and its derivatives, through exploitation of biotechnology tools.

List of projects and research at Libyan oil institute that used biotechnology:

1. Bioremediation of soil and polluted groundwater.
2. Study and control of microorganisms in the oil fields.
3. Study and control of the biochips.
4. Removal of sulfur from vital petroleum products from Libya.

2.3.7 Universities

2.3.7.1 University of Elfatih

There are some activities related to biotechnology in some colleges such as the College of Science, agriculture, pharmacy, veterinary medicine. These colleges teach biotechnology related courses such as microbiology, immunology, genetics and molecular biology, and

aquaculture. In addition to some studies and research in the field of plant tissue culture, there has been initial research on gene transfer at Botany Department, Faculty of Science. There is some research on medicines and drugs from local plants at Pharmacy College. Some of these colleges offer selective courses in Biotechnology for students at universities and post-graduate studies.

2.3.7.2 University of Omar Mukhtar

The research unit of biotechnology conducts Microbiology research in fungi fingerprinting protein, as a Master's degree for postgraduate students. The study have been confirmed and adopted as a new method in fungi taxonomy.

Under the programme on vegetative cover and desertification, there is collaborative study between the Centre and some scientists from biological science on Chammari production using tissue culture technique.

From the theoretical point of view, biotechnology courses were introduced for post graduate students at department of biology –at the University of Omar Mukhtar, during 1998-1999 with the following syllabus: molecular cell science, genetic engineering, traditional and modern methods of biotechnology.

2.3.7.3 University of Sabha

Biotechnology research was is done at the Faculty of Sciences and work is focused on DNA isolation from organelles (such as Mitochondria), in addition to research carried out using tissue culture for propagation of wild plants that are threatened with extinction.

2.3.7.4 Academy of post graduate

The Academy started teaching in the humanity sciences. Recently, the academy has introduced some courses in the Applied Sciences including biotechnology even though they lack laboratory facilities.

2.3.7.5 Other Universities

Due to the lack of training, staff and biotechnology laboratory, many universities such as University of October 7, University of April 7, University of challenge, Garyounis University have little or no activity in biotechnology research.

2.4 Effective and proposed legislation for biosafety

2.4.1 Enforced laws

There are many enforced laws related to biotechnology since the mid-sixties till 2006 which can be summarized as follows:

2.4.1.1 Law No. (15) 2003 on the protection and improvement of the environment

The law contains eleven chapters (79 articles) focused on the protection of: air, sea and fisheries, water resources, food, sanitation, environment protection, oil, vegetation and wildlife. This is the only law that directly addresses the biosafety issue, although it is not applicable yet due to the absence of its guidelines.

2.4.1.2 Law No. (93) 1976 on industrial and public safety

The law contains (22 articles) with the necessary precautions that should be taken for laboratory protection and security. The law applies to all areas of Jamahiriya, such as mines and quarries, industrial, communications and transportation etc.

2.4.1.3 Law No. (27) 1968 on plant protection and implementing guidelines

The law contains (28 articles) related to plant protection, chemical pesticides and national and international agricultural quarantine, without prejudice to the oversight of plant health in law No. (76) 1958 as amended by Law No. (9) 1965.

2.4.1.4 Health Law No. (106) for 1973

The law contains 6 chapters with 141 articles covering public health, preventive medicine, pharmaceuticals materials and medical professions.

2.4.1.5 Law No. (17) 1986 on medical liability

The law contains (38 articles) for those belonging to the medical field and is related to the profession and medical insurance.

2.4.1.6 Law No. (2) 1982 on the use of ionizing radiation and the prevention of its dangers

The law contains 29 articles related to the concept of ionizing radiation emitted from radioactive material and radiation released from nuclear reactors or any other source of radiation determined by the guidelines.

2.4.1.7 Law No. (13) 1984 on roles related to domestic services

The law contains 18 articles on rules and the methods related to domestic services. It clearly explains the responsibility and the role of every one living in the Jamahiriya.

2.4.1.8 Law No. 17 1985 on grazing organization

The law contains 14 articles, concerning some grazing definition and how to benefit from the grazing rights and penalties mentioned on the articles (2-3-4-7).

2.4.1.9 Law No. (14) 1989 on the exploitation of marine wealth

This law contains six chapters with 19 articles on the exploitation of marine wealth, its exploration, conservation and management of living organisms, as well as procedures for granting permissions and licensing requirements for foreign vessels and fishing rules.

2.4.1.10 Law No. (14) 1992 on the grasslands and forests protection

The law contains 23 articles related to the replacement of some articles of rule No.5 of 1982 regarding grasslands, forests protection and border determination and resource exploitation. In addition to, forest protection by obtaining prior authorization from the relevant agencies as well as strict penalties for those who contravene these provisions.

2.4.1.11 Law No. (15) 1992 on the protection of agricultural land and its amendments

The law contains 11 articles focused on agricultural land for investment. It prevents any buildings except for farm holder, and any actions of non-agricultural investment. It does not include agricultural land within the cities and villages schemes. It prescribes penalties for those who contravene provisions of the law.

2.4.1.12 Law No. (9) 1428 on the production, reproduction and circulation of seeds

The law contains 10 articles related to seeds production and circulation, according to the regulations and conditions set by the executive guidelines on control and inspection field and laboratories without prejudice to the provisions of the plant protection law. It provides penalties for each contravention.

2.4.1.13 Law No. (5) 1990 on the standards and specifications

It concerns the establishment of national centre for specifications and standards. The latest versions of the center focused on specification and standard that related to food industries, building materials, textile industries, chemical and petrochemical industries, leather industries, metallurgical industry, tires and rubber products, ceramics and glass industries, furniture, electrical and electronic industries, oil industries, safety, machinery and equipment, road vehicles, environmental management and quality insurance.

2.4.1.14 Law No (5) 1982 on the protection of grasslands and forests as amended by Law No. (14) 1992

Law No. 5 contains 27 articles related to all phrases that explain the meaning of forests, pastures whether it is general or protected.

2.4.1.15 Law No. (4) 1973 on provisions for the transfer of hazardous materials on public roads

The law contains 15 articles related to hazardous materials and the penalties prescribed in relation to such transfers.

2.4.1.16 Law of 1965 for prevention of animal epidemic and infectious diseases

2.4.1.17 Law No. (3) 1982 on regulation of exploitation of water sources.

2.4.1.18 Law No. (15) 1989 on animals and trees protection.

2.4.2 Enforced decisions

- . Decision No. (11) 1372 on the reorganization of health-care services.
- . Decision No. (24) 1424 for adoption of national strategy for primary health care.
- . Decision No. (853) 1993 on the classification of sanitation.
- . Decision No. (350) 2005 on drugs rules.
- . Decision No. (654) 1973 on the issuance of the health guidelines.
- . Decision No. 386 issued in 1428 under the guidelines of law No. 7 for 1982 for the environment protection.
- . Decision No. (631) 1992 on the organization of natural parks.
- . Decision No. (3) 1984 on the necessary precautions that should be taken for the protection of grassland pastures and forest from burning.
- . Decision No. (912) 1984 on the creation of art center for the environment protection.
- . Decision No. (176) 1989 on the list of chemical pesticides.
- . Decision No. (7) 1970 concerning the implementing guidelines of Law No. (14) 1989 on marine wealth exploitation.

2.4.3 Approved standard specifications and regulations and the local and international health guidelines.

- . Guide to the standard specifications of the Jamahiriya in 2007, which include all laws on specifications and standards related to food products and public health.
- . Veterinary terms regarding animals and live poultry and fodder.
- . Technical guidelines for law No. (14) 1989 on the exploitation of marine wealth.

- . International health guidelines in 2005.
- . Regulations of Law No. (2) 1971 on mines and quarries.
- . Regulations of Law No. (2) 1982 on the organization of the use of ionizing radiation and the prevention of its risks.
- . Regulations No. (15) 1371 on the protection and improvement of the environment.
- . The national list for safety and occupational health.
- . Guidelines for agricultural pesticides management.

2.4.4 Proposed legislation:

First: The legislation proposed by the Environment General Authority

- . Proposal for regulations of the Law No. (15) 2005 on the protection and improvement of the environment.
- . Draft proposal for regulations and assessment of the environmental impact of activities and economic projects.
- . Draft for environmental requirements from air emission.
- . Draft for management of hazardous materials.
- . Draft for integrated management of medical wastes.

Second: developed by the permanent national committee for biological ethics and biosafety

- . Proposal of legislation on how to deal with pathogenic microorganisms and preparation of a list of diseases with respect to human, animals and plants.
- . Proposal of legislation for early warning system for disease outbreaks.
- . Review of the health law No. (106) 1973 and propose amendments according to national and international legislations.

- . Compilation of national legislation dealing with pathogenic microorganisms, poisons, biological waste and propose legislative uniform text.
- . Proposal of a legislative rule to protect medicinal plants from biopiracy and securing national rights for commercial exploitation, and the need to protect it from illegal traditional medicine.
- . Proposal of a draft law that prevents herbal dealers without doctor consultation.
- . Proposal of a law which limits trade of genetically modified food and its products within the Jamahiriya.
- . Develop legislative text for those involved in medical and food laboratories.
- . Propose legal text for doctors working in Libya.
- . Establish legal text for pharmacists serving the Great Jamahiriya

2.5 Current status of the in the international conventions related to biological

The Environment General Authority has been working with other Libyan institutes to join and ratify many international conventions in different areas, in order to meet their obligations and commitments.

The following are the conventions that have direct or indirect relevance to biosafety:

2.5.1 Convention on Biological Diversity

Libya signed the Convention during the Rio de Janeiro conference in 1992 and then ratified it in 1993, and thus became one of the parties to the Convention. The Environment General Authority (EGA) is the national focal point for the Convention, and is responsible for the implementation of Libyan obligations to the convention. The tasks of the (EGA) are to control and supervise all activities related to the environment, including biodiversity, coordination between national authorities and other regional and international organizations.

Many institutions and centers that belong to National People's Committee (NPC) are involved in activities related to agricultural biodiversity, whereas the Center for Marine Research for Marine conducts studies on marine biodiversity. The national corporation for scientific research follow-up all research techniques related to biological work in addition to conducting research studies.

After joining the convention, the EGA also has been working to address the convention to the stakeholders (NPC) for the formation of a national committee for biodiversity and biosafety however, the Committee has not yet been formed.

In 2002 the EGA prepared a draft document for the National Biodiversity Strategy and submitted to the national People's Congress, which had not yet been ratified and it has requested its revision. The EGA as a national focal point needs to intensify its efforts to meet the obligations of the convention and to benefit from the programmes and projects offered by the contracting parties. The most important factors behind the slow implementation of the convention are:

- The non-availability of sufficient number of elements eligible to work in this respect.
- Lack of coordination of work among the different national partners in relation to the Convention.
- Irregular participation in the meetings of the Convention.
- The lack of stability of identifying national focal point for the convention.

2.5.2 Cartagena Protocol on Biosafety

The Cartagena Protocol on Biosafety was signed on 29 January, 2000, as a Protocol to the Convention on Biological Diversity, in order to provide adequate protection in the transfer, handling and use of Living Modified Organisms (LMOs) resulting from modern biotechnology that may have an adverse effect on the protection of biological diversity, taking into account risks to human health and safety for transboundary movement of LMOs. Libya acceded to the Cartagena Protocol on Biosafety in 2005 after ratification by

the General People's Congress. Libya did not participate in any of the meetings of the Parties to the Protocol, resulting in the slow implementation of the Cartagena Protocol on Biosafety. Perhaps the current project to develop a National Biosafety Framework is first serious step towards the implementation of the articles of the Protocol and could lead to participation in its activities. The Environment General Authority (EGA) is the National focal point for the Protocol.

2.5.3 Protocol on specially protected areas and biodiversity in the Mediterranean

This protocol is one of the 7 protocols following the Barcelona Convention for the Protection of the Mediterranean Sea from pollution, signed in Geneva 3/4/1982 and entered into force on 23/3/1986. Libya endorsed in Libya on 6/6/1989, then amended it in 1995. The Protocol encourages Mediterranean countries to establish marine protected areas and preserve marine and coastal biodiversity. It has contributed to the setting up of a regional center for special protected areas which is responsible for monitoring and implementation of the Protocol in the Member States. The Regional Center implementing the protocol contributed by helping the Libyan technically and physically in several areas. This includes the implementation of a set of regional plans of action approved by the Contracting Parties to the Convention including studies and surveys of the marine environment and coastal protection programme and in particular sea turtles, seals and Mediterranean studies, winter census of migratory water birds, surveys and studies of seaweed, and the establishment of protected marine studies. In addition to granting several short training opportunities in subjects concerning the Protocol, and support for the presence of the EGA in the meetings of national experts.

2.5.4 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES):

It is an international convention on wildlife and trade with binding provisions for achieving the goals of preserving the species and sustainable use of natural resources. It was signed on 1/7/1975 and ratified by the Libya in December 2002. The EGA started activities in 2006 to activate the implementation of the Convention in the Jamahiriya such

as the organization of training courses for guards and customs officers in collaboration with the Global Fund to the Humane Society and the Customs Department.

The EGA, the National focal point, issues certificates for the export and import of animal and plant species in accordance with the CITES Convention.

2.5.5 Convention on the Conservation of Migratory Species of Wild Animals (CMS):

The Convention was signed in the city of Bonn in 1979 as a follow up to a conference attended by 50 countries during the period 11-23/6/1979, and divided the States Parties to the Convention by the various regions. Libya is part of the so-called mass-scale coastal and desert regions, which is interested in the protection of the Convention 10,000 species of wild animals.

Libya signed this Convention, which concerns the protection of migratory animals in the city of Bonn, and became a party on 24/06/2002. National focal point is the Environment General Authority.

Not much work has been done specifically on activities of the Convention rather Libya has been more active with the secretariats of the treaty emanated by the treaty AEWA and ACCOBAMS.

2.5.6 African-Eurasian Migratory Water-Bird Agreement (AEWA):

The Treaty is specialized in the study and protection of migratory waterbirds between Europe, Africa and Asia, and provides an administrative tracking of the International Convention for the protection of migratory species of animal. Libya acceded to the Treaty on 1/06/2005. The Convention since that date has provided support to Libya in conducting the annual winter bird census. Libya is regional coordinator of the Convention in North Africa since the last Conference of the Parties to Senegal 2005. The National focal point is the Environment General Authority.

2.5.7 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)

It is a regional treaty that specializes in the study and protection of species caught in areas of the Mediterranean, Black Sea and the Atlantic Ocean, an administrative body for the

Convention on Migratory Species, has been involved in numerous public activities of the treaty such as training, conferences and meetings, and assisted in the preparation of the Libyan national plans for the protection of cetaceans and Programme of Action for the study and protection of cetaceans adopted in 2006. The national focal point is the Environment General Authority.

2.5.8 Ramsar Convention on Wetlands

Ramsar Convention on the protection of wetlands of international importance especially the Waterfowl is the international convention 2/2/1971 adopted in the Iranian city of Ramsar. The expanded scope of the Convention includes all environmental regulations on Wetlands, the Convention entered into force in 1975. UNESCO has oversight of the convention and the headquarters of the Permanent Secretariat of the Convention is in the city Gland, Switzerland. The Great Jamahiriya to the Convention on 16/6/2000 to become party to the Convention.

The convention has designated a special committee for States of the Mediterranean basin (Commission on the Mediterranean Wetlands MEDWET) which coordinates the work of countries in the region and is headquartered in city of Athens, Greece. A proposal has been made for assistance of experts from (MEDWET) to begin the national inventory of wetlands areas.

2.6 Notes and Agreements for Cooperation in the Field of Biotechnology

The Biotechnology Research Centre signed many of the Agreements that would strengthen the bonds of cooperation in the field of biotechnology research, these include:

2.6.1 Cooperation Agreement with the United Nations Education, Scientific and Culture Organisation (UNESCO).

This Cooperation Agreement was signed on 14/5/2000 between the Secretary of the People's Committee for Education and Vocational Training and the Deputy Director-General of UNESCO to provide scientific and technical assistance to the Biotechnology Research Centre including assurance of the right to acquire the know how and training and assistance in the supply of scientific instruments for the purposes of scientific

research. The value of the Agreement is \$ 5,400,000 valid for a period of 5 years from the date of signature.

2.6.2 Cooperation Agreement with the International Institute for Goat in France:

The cooperation is aimed at providing scientific and technical assistance to the Biotechnology Research Centre and it includes know how, training and assistance in the supply of scientific instruments, the Agreement also included the supply of a number of French 1 for hybridization experiments to improve local goats. The value of the Agreement is 576,000 Euros and it will continue for a period of 5 years from the date of signature.

2.6.3 Cooperation Agreement with the Egyptian Atomic Energy Agency:

This Agreement was signed between the Centre for Biotechnology Research and the Egyptian Atomic Energy Authority in Tripoli 29/4/2002 aimed at joint scientific research in the field of peaceful use of atomic energy and Biofertilization.

2.6.4 Cooperation Agreement with Chalmers University and the Center for Tata in Sweden

The aim of this agreement is training in the use of genetic engineering for modification of plants.

2.6.5 Cooperation Agreement with the Bulgarian Institute (EPR):

This Agreement aims to train and rehabilitate national systems in the use of magnetic resonance imaging (MRI) for detection and identification of irradiated food, environmental pollution and radiation including the establishment of joint research and provision of necessary training courses and laboratories.

2.6.6 Cooperation Agreement with the Ukrainian Foundation for World Link:

The duration of the convention is one year renewable term and aimed at the rehabilitation and training staff of the centre in several areas such as oil analysis and detection of food contamination and upgrading of the capacity of the Center.

2.6.7 Cooperation agreement with the Aizumid University in Spain:

This Agreement aims to train and rehabilitate national staff and joint research in the area of bacteria Helicobacter Gastroenterology and disclosure of the extent of their presence in Libya.

2.6.8 Cooperation agreement with the University of Malta:

This Agreement was signed between the Centre and the University of Malta on 23/3/2001 with the purpose of promoting scientific cooperation in the field of joint genetic mapping of hereditary diseases in the blood and hold seminars and joint scientific workshops in areas of interest such as the status of food analysis and research in the area of genetic mapping for leishmaniasis disease.

2.6.9 Cooperation agreement with the Belgium Institute of Genetic Engineering:

This Agreement was signed with the Institute of Genetic Engineering, Belgium, on 21/3/2001 and aims to provide scientific and technical assistance to the Centre including know how, training and assistance in the purchase and supply of equipments necessary to conduct scientific research in the area of genetic engineering.

2.6.10 Cooperation Agreement with the Institute of Higher Education and Development in Canada and North America:

This Agreement was signed between the Centre and the World Institute for Education and Development on 23/9/2000 aimed at training of center staff components in the areas of genetic engineering and ensures supply of scientific journals and holding courses in English and French languages.

2.6.11 Cooperation Agreement with the Foundation Sinerjeen:

The aim of this Agreement is joint research work and the genetic mapping of endemic diseases in Libya such as the blood disease thalassemia using genetic mapping instrument (EPR) in Bulgaria.

2.6.12 Cooperation Agreement with German CET and GFA Foundations:

The Agreement was signed on 20/11/2000 aiming at training in the detection of food and assistance in the establishment of reference laboratory control and inspection of food.

2.7 National Policies and Strategies Related to Biosafety

The national policies and strategies related to biosafety in Libya can be summarized in table (2), which includes national policies in the areas of conservation of biodiversity and combating desertification, environmental sanitation, agricultural research, and scientific research.

Table (2) the features of national policies and strategies related to biosafety policy / Strategic goal in the executing chests.

Policy / Strategy	Objective	Year of release	Executive body
National Strategy for the conservation of biodiversity	<ul style="list-style-type: none"> -- Achieving sustainable development through the rational use of biological and other natural resources. -- Conservation of biodiversity in various environments. -- Establishment of a national network of nature reserves in the middle of environmental land and sea. 	2002	Environment General Authority
National Programme to Combat Desertification	<ul style="list-style-type: none"> -- Improve the ways of life in areas affected by or vulnerable to desertification. -- Improving the use of natural resources and land use. -- Improve the management of major external requirements, reduce pesticides, agricultural management, Integrated pest management etc ... 	2002	National Committee to Combat and stop Desertification
National Programme for the environmental sanitation	<ul style="list-style-type: none"> -- Assessment of the environmental situation of the Libyan and prepare periodic reports. -- Integrating environmental 	2006	Environment General Authority

	<p>concepts in school curricula.</p> <ul style="list-style-type: none"> -- The formulation of a plan to cope with environmental emergencies. -- National capacity-building in various areas of environment -- Development of environmental legislation. -- Raising awareness of the community. 		
Strategic research in agriculture	<ul style="list-style-type: none"> -- Reduce the use of pesticides and encourage organic agriculture -- Development of standards and procedures to ensure the maintenance of irrigation water by using modern methods. -- Production ceiling of food without damaging natural areas and avoid soil and nutrients erosion. -- Establishment of a National Bank of different wild and agricultural seeds, and cooperation with similar banks abroad. -- Establishment of nature reserves and Agriculture and forest conservation -- continuing Agricultural outreach. 	2000	Agricultural Research Centre
Strategy of	-- Adopt a focus of scientific	2006	National

<p>scientific research and technological development</p>	<p>research for all sectors to contribute to increased productivity and competitiveness.</p> <ul style="list-style-type: none"> -- Ensuring a constant increase in the number, the efficiency and quality of researchers. -- Promote applications of scientific research to contribute to the advancement of the national economy -- Development of science parks and cities. -- Increase public awareness of the importance of scientific and technical research. 		<p>Authority for Scientific Research</p>
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Chapter III

3.1 Biosafety Policy

There is no Libyan endorsed biosafety policy, and this is the first document that addresses this issue extensively. The Permanent National Bioethics and Biosafety Committee is tasked to develop a biosafety policy through various activities as recommended by the Biosafety Protocol. This committee will be the main consultative body for the Environment General Authority, which is the national focal point, and the legally mandated for registration, licensing and granting process to control or prevent the entry and circulation of genetically modified products, as well as licensing, testing and release into the environment of the modern biotechnology products developed in Libya. In particular the Environment General Authority has to cooperate with the National Committee on:

- Building human resources and institutional capacity in the areas of biosafety
- Supervision of the evaluation programs on risk assessment and management, and inventory the experts in the area of biosafety.
- Raise awareness, participation and education at all levels
- Exchange of information and data management, including full participation in developing the biosafety clearing house.
- Scientific and technical cooperation between the institutions at national, regional, sub-regional and international levels.

3.1.1 Biosafety Bill

Despite the presence of law no. 15/2003 concerning the improvement and protection of the environment, it includes only basic definitions and general guidelines about approval process of the Environment General Authority and does not cover biosafety issues. Looking at the National Biosafety Framework, there is a growing need for a specific biosafety law to address issues on transport, storage, research, trade and use of genetically modified organisms, and the other products of biotechnology. A recommendation was therefore made for the establishment of a national committee to

prepare a biosafety draft law in harmony with other related laws in Libya and the region, and which is consistent with the Biosafety Protocol ratified by the Libyan General People's Congress. This draft law would be finalized in the next stage of implementation of the national framework.

The national law on biosafety would be finalized through several stakeholder consultative workshops illustrating the importance of the law at both official and popular levels, and benefiting from the experiences of the other countries in the region.

3.1.2 Objectives of biosafety legislations

The basic objective of the biosafety legislation is to minimize the risks that could result from the products of modern biotechnology, the environment and public health taking into account the promotion and development of scientific research. Thus, the goals of biosafety legislation are:

- Ensure levels of protection in the areas of safe transportation, handling and use of genetically modified organisms resulting from modern biotechnology.
- Ensure minimization of potential risks resulting from the use of modern biotechnologies.
- Provide high levels of protection for the environment and public health.

3.1.3 Basic steps for the development of biosafety legislations at the local level

To develop a biosafety system in Libya, in consistent with the Convention on Biological Diversity and the Cartagena Protocol on Biosafety the following steps must be taken:

1. Development of the existing legislation in conformity with the biosafety systems, in particular legislation of agricultural and veterinary quarantine or formulate new legislation in consistent with the international convention and Cartagena Protocol.
2. Development of technical / professional system to assess and manage risks resulting from genetically modified organisms and their products, as well as identifying the degrees of potential risks.
3. Strengthening scientific research in the field of modern biotechnology.
4. Development of biosafety monitoring systems, which includes networks and working mechanisms.

5. Develop various tools and methods for public awareness in the field of modern biotechnology.
6. Development of cooperation between the relevant local authorities.
7. Activate cooperation with the related international organizations and institutes.
8. Building the human capacity in the field of biosafety.

3.1.4 Components of biosafety legislations

To develop the local legislations in biosafety, or new legislations in particular, the following points must be considered:

- i. Definitions and terminology of biosafety must be clear and specific.
- ii. Basic objective of the legislation is organizing the various activities dealing with genetically modified organisms (GMOs) and their products in order to protect the environment and public health.
- iii. Legislations should be clear, applicable and identify the legal and illegal uses of the GMOs and their products.
- iv. Identify structural, functional administrative and operational points of the relevant organizations, as well as identifying the functions, responsibilities and duties of each partner.
- v. Define user of the GMOs and their products, the necessary permits and visas in cases of transit.
- vi. The supervision level of the various activities that contain the sources of risk, and the extent and limits of control over such activities.
- vii. Steps and criteria for risk assessment and management, including the purpose, the rates and methods of release and the receiving environment.
- viii. Essential steps to obtain the necessary permit for the various activities, its validity and the notifications of safe transit.
- ix. How to deal with the cases of intentional and unintentional release in the environment.
- x. Rules of writing information to label industrial products that contain partially or entirely genetically modified products.
- xi. How to protect the confidentiality of information and its management.

- xii. Education, awareness and public participation in monitoring and supervision.
- xiii. Methods and mechanisms for the implementation of legislation and penalties on violators, as well as possible legal ways to remedy decisions taken.

3.2 National Institutions dealing with Biosafety

The national institutions that deal directly or indirectly with the safe transfer, handling and uses of the GMOs and their products are the following:

- General People's Committee for Health and Environment
- General People's Committee for Agriculture, Animal resources and Marines
- General People's Committee for Economy and Trade, represented by the Chamber of Commerce and the Customs Department
- General People's Committee for Public Security
- General People's Committee for Justice

In addition to the Environment General Authority (the national focal point for the Convention on Biological Diversity and Biosafety Protocol) and the Permanent National bioethics and biosafety committee.

The powers and functions of these authorities are clearly stated in the existing legislations. However, the policies for dealing with the GMOs are not specified in the required form. The law No. 15 /2003 on the protection and improvement of the environment is exception in that chapter ten is devoted to biosafety. The Environment General Authority is entrusted to oversee the granting of licenses and permits for the handling and transfer of modern biotechnology products in coordination with the relevant national authorities. However, that law is still without an operational instructions and guidelines as of the date of this document. The National Biosafety Framework is attempting to propose specific institutional arrangements in accordance with the existing legislation and the Cartagena Protocol, and specify the functions and duties of all relevant institutions to ensure safe dealing with the GMOs and their products.

3.3 Administrative and implementation arrangement for the National Biosafety Framework

The Environment General Authority (EGA) is the national focal point for Cartagena protocol and the National Competent Authority for the implementation of the National Biosafety Framework (NBF). The Permanent National Bioethics and Biosafety Committee (NPBBC) is responsible for the consultative and scientific aspects in issuing permits and licenses on GMOs imported to and exported from Libya. In addition, the NPBBC is to serve as an Emergency Focal Point for illegal or unintentional transport of genetically modified organisms, while the EGA is responsible for issuing licenses and permits based on the recommendation of the NPBBC. The fundamental role of the General People's Committees for the sectors of agriculture, health, economy and trade should be emphasized in the decision making process on GMOs in consultation with the NPBBC. The specializations of the member of the NPBBC must be updated to ensure the implementation of the national biosafety system. The NPBBC is an advisory committee for the implementation of the NBF through provision of assistance and scientific advice to the National Competent Authority, the EGA, and high ranking authorities in the following areas:

1. Identify and classify the potential risks associated with the GMOs and their products and specify the level of the risk (A, B, C, D) as well as making the necessary adjustments with updating of relevant information.
2. Reporting of the scientific risk assessment, and provide recommendations for the methods to be followed to minimize the risks.
3. Provide recommendations for the risk assessment survey programs and assess the potential impacts of GMOS on the environment and public health.
4. Develop action plans consistent with the national priorities of the biosafety policies.
5. Develop guidelines on risk assessment.
6. Develop a national information data base for the modern biotechnologies and GMOs and their stockholders, through the establishment of a National Biosafety Clearing House (BCH).

7. Review the areas of application of permits for the use of GMOs and develop the necessary recommendations.
8. Prepare and recommend the use of control and inspection programs and public awareness.
9. Propose mechanisms and steps to be followed to reduce the unintentional release of GMOs into the environment, and develop plans to be followed in such cases.

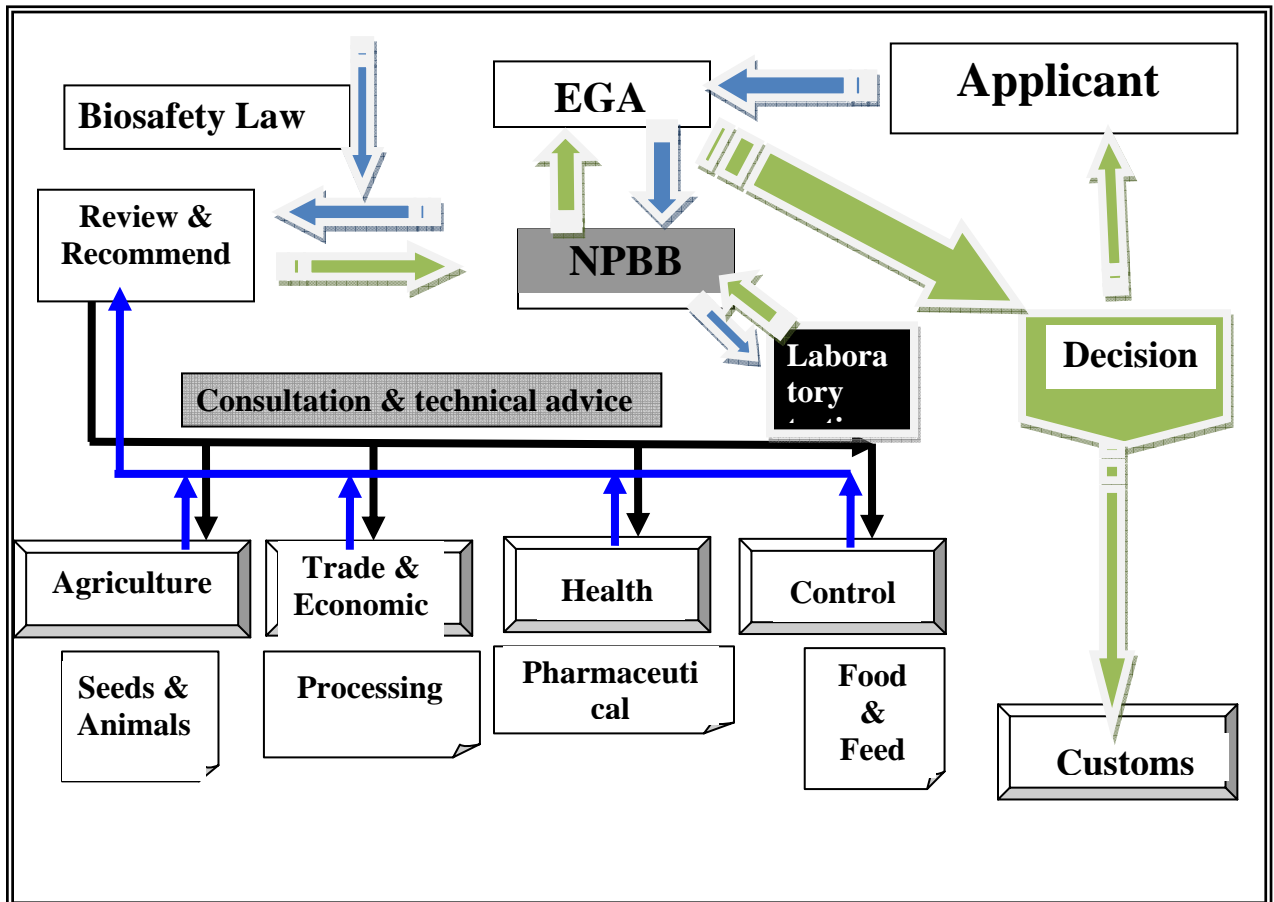
3.4 Proposed system for dealing with notifications and requests for approval

As defined in the Cartagena protocol, notification is the documentation that must be submitted by the exporting party to the competent national authority of the importing Party prior to the intentional transboundary movement of any GMOs. The notification should contain, at a minimum, the information specified in the Annex I of Cartagena Protocol of Biosafety. Applications for approval include various activities related to GMOs such as:

- Export, import and transit.
- Domestic use.
- Placing on the market.
- Intentional release into the environment.
- Field trials.
- Contained use.

Requests for notification dealing with GMOs should be submitted to the Environment General Authority (EGA) which would open registry and keep information on public and private applicants. Processing of the application towards submission of a decision to the applicants should follow the diagram shown in Figure 1.

Figure 1. Diagram showing the proposed arrangements for handing of application of GMOs and decision making process in the Libyan National Biosafety Framework



3.4.1 Genetically Modified Organisms (GMOs) included in the lists (A, B, C, D)

- The user submits a request for permit to use GMOs including all required documents. It must also include the type/types and quantities of organisms that can be imported, and the specific purpose of use.
- The user gets (in the case of acceptance of the documents) receipt note showing the serial number of the application and the time required to process the application and get the final reply on the permit to perform the activity.
- The user must retain a copy of the permit to be submitted to the customs authorities at every repeated import of the modified organism / organisms.
- The user must notify the Environment General Authority at least two weeks before the arrival of a shipment of the GMOs into any border outlet. The notification should include

the type/types of the GMOs and the purpose of the use in conformity with the approved permit.

- The user must strictly follow the activity as indicated in the approved permit.

The approval of a request for the use of GMOs included in the lists (A, B, C, D) is directly from the Office of Biosafety of the Environment General Authority or the request might be transferred to the National Consultative Commission if deemed necessary.

3.4.2 Non Listed Genetically Modified Organisms

- The user submits a request for an annual license to use GMOs including all required documents. It must also include the type / types and quantities of organisms that can be imported and the specific purpose of use.
- The user gets (in this case an acceptance of the documents) a receipt note showing the serial number of the application and the time required to process the application and get the final reply on the permit to perform the activity.
- Request will be submitted to the National Biosafety Committee for scientific / technical review. For risks assessment and management, the committee can make use of any other additional scientific documents that can be obtained through the national and global biosafety clearing houses. In addition, the national committee may contact any relevant sector for consultation and collection of information or consult any national/ international expert for the purpose of assistance in the risk assessment process.
- National Committee must present its decision in a form of a detailed report on the results of its review including potential risks and their management to the Biosafety Office of the Environment General Authority.
- The Environment General Authority must notify the Applicant and the Customs Department of the final decision on the request.

3.5 Time frame for decision making process

The time frame of the administrative procedures in the Libyan biosafety framework must agree with the time frame of the Biosafety Protocol. The Environment General Authority (EGA) must notify the applicant in the case of extension of the time-frame by written

letter explaining reasons for the delay. The delay of EGA in processing the application should not be considered as approval.

The proposed time frame is indicated in the following Table:

Table 2. The time frame of the administrative procedures of the Libyan National Biosafety Framework in processing of applications for GMO approval

Administrative procedure	Time frame	Reference
Declaration of the importing party to the exporting party through receipt of notification regarding the intentional transboundary movement.	90 days	Article 9 (1)
Inform the exporting Party and the Biosafety Clearing-House of the decision regarding intentional transboundary movement.	270 days (from the date of receipt of application)	Article 10 (3)
Decision regarding the import of modified organisms for use as food, feed or for processing.	270 days	Article 11 (6 b)
Notify the Biosafety Clearing House (BCH) of the decision on the use of GMO as food, feed, or for processing, including the supply in the market.	15 days	Article 11 (1)
Inform the applicant of the change of the decision regarding the intentional transboundary movement.	30 days	Article 12 (1)
Reply to the applicant or the re-consideration of the decision on the intentional transboundary movement.	90 days	Article 12 (3 a)

Notification of the BCH of the unintentional movement across the state borders, which could have adverse effects on the environment and public health.	immediately	Article 17 (1)
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3.6 Risk analysis

Risk analysis is the scientific methods conducted to assess the potential risks of any new technology that poses hazards to living organisms and the environment. It is used as guidance for decision makers to decide on dealing with release into the environment and trade in GMOs.

3.7 Risk assessment

Due to its importance to the Cartagena Protocol on Biosafety (CPB) specified in Annex III to assess the risks of GMOs as stated in Article (15) of the BP. Usually, risk is assessed in the following steps:

- The definition and identification of risk.
- Estimate the consequences of the risk.
- Estimate the possibility of preventing the risk.
- Estimate the possibility of containing the risk.
- Identify methods of risk management.

Risk assessment is very important factor in the evaluation, monitoring and implementation of biosafety system. Risk assessment is conducted by professional experts in different relevant areas.

The contents of the risk assessment are not fixed, and must take into account the following points:

- Purpose of the release.
- Methods of the release.
- The receiving environment.
- Methods and degrees of required monitoring.

- Methods of data collection, analysis and drawing of conclusions.
- Methods of risk management if it happens.
- Institutions to be notified in case of emergency.

Thus, the release rates are determined based on extensive estimates of the points above. On the other hand, estimates of the risks to trade and processing of GMOs should be based on biosafety precautions in various institutions dealing with GMOs or their products, such as laboratories, farms, factories, hospitals, as well as the use of biological, toxicity and pharmaceutical testing methods when assessing the risks resulting from the direct and indirect use of products containing GMOs to determine the impact of these products on public health and the environment. The method used in risk assessment must also be characterized by:

- Sufficient experience of the evaluator in the sciences relevant to the type of evaluation.
- Sufficient flexibility.
- The possibility of application to different situations on case by case basis
- Transparency
- Based on recognized scientific backgrounds
- Conducted in reference laboratories

In this matter, the technical details regarding the donor and recipient organisms, vectors used, induced genetic changes, information on the purpose of use and the receiving environment must be clear and specific.

3.8 Risk management:

Due to the importance of biodiversity conservation, and the danger of horizontal gene flow particularly in plants, which could result in the transmission of genes from GMO to wild relatives, some precautions must be considered in the introduction of genetically modified plants and animals. These include:

- Following the known isolation steps and use of biological containment whenever possible.
- Exclusion of alien or invasive plants.
- Restrict the use to agricultural land and animals farms for GMOs only for the authorized purpose.

- Follow approaches to limit the movement of pollens and avoid the blend of non-transgenic animals with transgenic especially among genetically related species.
- Use of traditional and modern DNA analysis methods to verify the horizontal gene flow in the areas adjacent to the release and experimental areas.

In addition, the following points must be taken into account when dealing with genetically modified organisms:

- Release into the environment must be gradual beginning with the experimental level and followed with the prescribed inspection and monitoring methods.
- Dealing with GMOs must be limited to professionals only, and the involvement of non-specialists (NGOs and others) must be under direct and accurate supervision of specialists.
- Consideration of the safety precautions when transferring organisms between laboratories and research centers.
- Obtain permission from the competent authorities and locate sites of testing, and notify competent authority in case of any errors.
- Establishment of a database for the GMOs and their products and their effects on biodiversity, public health and the environment.

3.9 Challenges in developing systems for risk assessment and management

Specialized human resources in the area of biotechnology in general and especially biosafety are meager in Libya. The increased attention to the field of modern biotechnology in recent years has led to some improvement in activities of research centers and universities to capacity building and human resources in the field of modern biotechnology and biosafety. The difficulties facing the development of risk assessment and management systems can be summarized as follows:

- Lack of national component and qualified personnel in the fields of biotechnology and biosafety, and the dispersal of the limited number of specialists among the various state institutions.
- Weakness of cooperation between the different institutions operating in the area of biotechnology.

- Weakness of the existing centers capacity in terms of laboratory equipment and the lack of supplies (such as chemicals) to conduct studies and research on Biotechnology and Biosafety.
- The poor infrastructure in the area of scientific research in general, and the lack of scientific environment that encourages research and innovation.
- Lack of easily accessible databases on domestic biotechnology and biosafety.
- The poor state funding of scientific research including the area of biotechnology, and the lack of interest of the private sector to contribute to the development of scientific research.
- Lack of domestic legislation with respect to the various uses of biotechnology, biosafety systems and risk assessment and management.
- Lack of clarity in policies and lack of infrastructure for dealing with GMOs and biosafety systems, and risk assessment and management and the lack of working plans (short / medium / long term) to go into this area.
- Lack and absence of public awareness on the importance of biotechnology and biosafety.

3.10 Implementation Tools/Mechanisms:

The role of the implementation tools is to ensure that the procedures for dealing with various GMOs or their products are compatible with the required precautions and follow the biosafety systems. The regulatory agencies in the state are many and some examples are:

- Customs Guard.
- Municipal Guard.
- Public Security.
- Agricultural Police.
- Agricultural quarantine.
- Animal health.
- Food and medicine control center.

These agencies belong to various state departments, and this may lead to a lack of coordination or confusion particularly in the absence of a reference point for

coordination, supervision and follow-up. In addition, the poor scientific level of personnel increases the severity of the problem.

In spite of the differences in terms of specializations of these agencies, they deal directly or indirectly with importation and exportation of goods, movement of people entering and leaving the different state border outlets, international traffic through the territory of the state and public activities in different markets and others. Therefore, they may be forced to deal with GMOs and their products, and this requires taking some initial steps such as:

- Creation of a coordination mechanism among the various regulatory bodies through central point dealing with various topics related to GMOs and their products.
- Improve the capacity of the personnel in these agencies to deal with the GMOs and their products.
- Develop the necessary legislation.

3.11 Access to information through the Biosafety Clearing House

Project team completed the consultations with the EGA for signing a memorandum of understanding with the United Nations Environment Program and the Global Environment Facility for the establishment of the Biosafety Clearing House (BCH), and the project was signed in 27/10/2007. Preparations are under way for acquisition of a site and technical needs for this National BCH. The BCH will be represented at the international information network (Internet) site as a national site connected to the biosafety protocol server in Montreal, Canada. The site will allow a lot of useful information on current biosafety frameworks, laws and legislation. Also it will include a detailed list of national experts in the field of biotechnology and biosafety applications. In addition, connections will be developed within the site to other sites in the Libyan pages. National network will be established between the EGA and the relevant institutions for information flow and exchange, and permanent sites update as similar as to the other sites in the world. Also the system will allow the secretariat of the Protocol to track the progress on the implementation of the Libyan commitment in the transfer of GMOs through the state borders. It is expected that this work will be completed by the beginning of June 2008.

Chapter IV

4. Public awareness, education and decision-making in the field of modern biotechnology

Public information, educate and participation in issue related to risks to biodiversity as a result of GMOs are stated in the objectives of Convention on Biological Diversity.

Modern biotechnology, including its huge potential in different areas could alleviate many of the harmful effects to environment and health. For example, to reduce the excessive use of fertilizers and pesticides in various types of agricultural production could be managed through the use of genetically modified plants, and pollution control through the use of genetically modified bacteria having the ability to degrade these pollutants.

However, on the other hand efforts must be made to educate and sensitize the citizens of potential risks that could result from the use of genetically modified organisms and their products in order to create a balance between the benefits and potential risks to public health and the environment in general, and biological diversity in particular.

Public awareness is essential for the recognition of the importance of safe use of genetically modified food in the area of agricultural biotechnology for food and economic security and the fight against hunger and poverty prevailing in the developing world, particularly in Africa.

Communication is very important between specialists in the field of biotechnology and among all segments of the society, particularly the decision-makers and the media both in safe use of biotechnologies and assessment of associated risks.

4.1 Objectives of public participation

The most important goals of public participation in biosafety include:

- Prediction and prevention risks
- Participation in decision-making and assistance in its implementation.
- Building a trust between the public and the relevant institutions.

4.2 The role of media in public communication

Media aim to achieve the following:

- Public awareness on potential risks and benefits in smooth manner without intimidation or trivializing.
- Narrow the differences between scientists and students in the field of modern biotechnology and the public.
- Gaining public trust in discussions on modern biotechnology, and the ability to easily analyze the results.
- Simplifying the analysis of the risk, its assessment, prediction and the possibility of its avoidance in the future.
- Avoid display of programs that undermine the confidence between the public and the officials at a time of risk which might lead to a disaster. Moreover, irresponsible media may conceal important information or mislead or work for interest groups at the expense of the other.

4.3 Strategies and ways of public participation

1. The Important strategies for public involvement and communication between scientists and officials and the general public for effective decision-making to reduce the risks that might arise from the release of genetically modified organisms or from the use of such organisms and products should include the following important points:

- Organization of a team of experts for the risk analysis and assessment and the prediction of different scenarios of the expected results.

- Identify the goals, the targeted individuals and institution by the strategy.
- The need for the participation of interested citizens and the private sector effectively in the decision-making about the risks, implementation, evaluation and follow-up.
- Develop a plan to inform the public so as to facilitate public understanding across all sectors of the society.

2 Important ways for public participation are:

A – Collection of public views and proposals using the following mechanism:

- Obtain the views of the public through various information collection models such as direct, paper or electronic data collection including possibly interviews (Internet questionnaires).
- Access to important data and details of the proposals, analysis and development and risk management plans for the application relevant to the public.

B - Public participation in decision-making and development and solutions in the following ways:

- Direct communication with the public through workshops, seminars, forums, lectures, meetings and media awareness days, which highlights the importance of safe application of biotechnology and how to reduce the risks on the environment and biodiversity.
- Participation of the officials and decision-makers and the expression of their views and suggestions on the safe applications of Biotechnology and the discussion with the experts across various media.
- Establishment of constructive views agreed unanimously that may contribute to the introduction of safe Biotechnologies particularly genetically modified crops and micro-organisms for economic development and food security, taking into account the safety precautions approved by the Cartagena Protocol.

4.4 Safe Biotechnologies, effective human capacity building and basic needs in the area of public information

The media sector in Libya lacks significant knowledge on issues of modern biotechnology and its safe use, and how to deal with it in an easy and simplified manner.

Some of the media simply transfer the images and the news about discoveries in this area without linking it to local situation and the extent of public awareness. The media just shows this news as inventions and discoveries confined to the more advanced countries. However, it must be noted that many developing countries have taken specific national strategies to raise the awareness and knowledge of its citizens on the potential benefits and risks of modern biotechnology.

Based on the issues raised above, the media sector in Libya ends up bringing specialists who may use scientific terms not understandable for most recipients, or the information presented are compiled from sources which may not be scientifically appropriate and reflect imbalanced opinion on the subject. In both cases, the recipients are confused on the information presented.

In light of the foregoing the areas of human capacity building in the types of biotechnology in research centers, universities and higher institutes would include the following:

4.5.1 Needs for human capabilities in the area of information:

- An inventory of distinguished experts in all fields relevant to GMOs would facilitate their contribution in public awareness.
- Qualification of national experience in the various branches of biodiversity.
- Activation of the role of the media in public communication between professionals and researchers and communication between the relevant agencies.

4.5.2 Infrastructure needs:

Although there are a number of research centers and universities with some potential research and study in the field of modern biotechnology, there is still the need for more enhanced specialization to assist in the continuous development to keep pace with developed countries in this field. In addition, training should be given to regulatory staff to manage transboundary movement and detection of genetically modified materials.

- Activation of the role of the consumer and citizen on the benefits and risks of genetically modified materials through the development of various audio-visual media and print materials.
- Strengthening international cooperation with foreign experts in the Arab States in the area of modern biotechnology.
- Promote postgraduate programmes and encourage scientific universities and institutes of higher education to undertake training and research in the field of biotechnology.
- Encourage development of Education curricula on modern biotechnology accompanied by appropriate laboratory facilities for training.
- Increase the efficiency of professionals in the field of biotechnology and laboratory and field applications.
- Activation and application of legislation in the control of genetically modified.
- Hold seminars, workshops and conferences in the field of biotechnology at the local and international participation.

4.4.3 Extent of the Libyan consumer acceptance of genetically modified materials:

A systematic study to assess consumer acceptance of genetically modified materials has not been done apart from the periodic and limited public engagement on the issue by the Consumer Protection Society. It is therefore difficult to engage the different opinions on the extent of consumer acceptance in Libya.

4.5 Activities of scientific associations in the area of awareness about Biotechnology:

There are about 65 Libyan General scientific and civil registered organisations under the framework of the National Center for Research and Development in accordance with the legal systems of work and the establishment of NGOs. However, it is a fact that only a few of these associations have activities directly related to modern biotechnology and it will be useful if these organizations design programmes to create awareness in the area of modern biotechnology.

4.5.1 Libyan Association for Biotechnology:

The Association seeks to engage Libyans on modern biotechnology techniques through its activities and to encourage participation of Libyans in modern biotechnology programmes in friendly countries so as to raise the level of awareness and knowledge in several areas of the technology. The main scientific topics raised under the banner of biotechnology prospects include the following:

- Who are we as human beings? What is the importance of the human genome?
- Use of the interaction of polymerization and serial hybridization to reverse types of genetic virus hepatitis C.
- Techniques which plays a vital role in lifting the prospects of the agricultural and livestock production in quantity and quality for the benefit of all.
- Techniques vital in the area of marine fish resources in Libya.
- Early diagnosis of genetic diseases.
- Gene and sports
- Disclosures medical-binding and practice.
- Human genetics and cancer.
- Biodiversity of medicinal plants in Libya.
- Environmental Protection joint responsibility.
- Fruit flies: pest management theory and practice.
- Environmental sanitation for disease vectors.
- Diversity of the Group of animals in Libya.
- Fingerprint genetic techniques to predict the fungal diseases of barley seeds.

Libya generally participated in several conferences and seminars in the area of scientific techniques vital to modern biotechnology both at the local and international levels. In addition to taking a seat in the African Union's Economic, Social and Cultural Council in Addis Ababa; and cooperation in the area of expertise vital to medicinal plants with Belgium. Assembly members also participated as specialists in the various branches of medical science, agriculture and fisheries and animal and plant science, the environment

and ethics of the environment in many activities through public education in all its forms and information technologies vital in raising the level of economic and food security at the local and global levels. The magazine issued by the Association specialized in scientific cultural "vital" look in the various disciplines biotechnology.

4.5.2 Activities of the National Standing committee for Biological ethics and Biosafety

The Committee has established two workshops on:

- Bioethics and safety issues vital to the establishment of laboratories.
- Security and safety as a vital requirement for laboratory establishment.
- It is planned to assess the two workshops during the current year, according to the following proposal:
 - Early warning system for disease outbreaks.
 - Legislation relating to the Convention on the Prohibition of Biological Weapons.
 - Databases and Bioinformatics.

- The committee also provided oversight for the establishment of the two training sessions in the use of PCR techniques (a basic and advance course).

- The Committee collected and studied data on the activity of research in the area of biotechnology, including national researchers at home and abroad and research projects of existing / proposed / completed. It has also created an inventory of equipment and devices available and their locations in preparation for the development of a database system and bioinformatics for Libya.

- The committee a symposium on Ethics to deal with the techniques of modern biotechnology in the city of Tripoli.

- Contributed to the discussions on Permanent National Ethics biological and vital safety issues with the National Committee to Combat Bird Flu by holding seminars and lectures to educate extension educators, on the relationship and also through the printing and dissemination of posters.

- The committee participated in the workshop on the development of national legislations on the Conventions on nuclear, chemical and biological weapons, which was held under

the auspices of the Centre for Research verification, training and information-British (VERTIC) and the Jordanian Cooperative Monitoring Center (CMC) in Jordan.

- Established the Committee and the national workshop on drinking water safety and its vital role in Tripoli.

Chapter V

5. Institutional capacity building in the areas of biotechnology and biosafety in Libya

5.1 Capacity building in biosafety issues in Libya

5.1.1 Available capacities in relevant institutions to detect genetically modified materials:

Biotechnology and genetic engineering contribute effectively to the detection of the genetically modified materials, therefore some of the specialized institutes, with special reference to the centre of biotechnology, the research centre for oil and industrial research, can , at this stage, detect some materials, though there is a need to improve and replace many of equipment with a modern ones to carry sophisticated levels of specialized tests, because most of these equipment could be used only for traditional biotechnology, it is therefore necessary to support these institutions with both technical and human resources.

5.1.2 Available capacities in relevant institutions for food safety:

The National Authority for the control of food (food control centre) is responsible of investigating foodstuffs, for both analytical and safety aspects to ensure their suitability for consumption but the presently analyses of the genetically modified material is still at its infancy due to the lack of well trained and skilled expertise in this field and non-recognition of this issue until the preparation of this document. The National Center for Animal Health is responsible of analysis of animal feed, as well as the National Institution responsible for both imported and locally produced feed.

5.2 Areas necessary for capacity building

5.2.1 Need for human resources

It is clear from this report that there is an urgent need for many of the official, research and educational sectors to be well trained in the technical elements to do the work assigned to them, through conducting specialized courses at home and abroad in the areas of biotechnology and biosafety.

From the questionnaires distributed, it is obvious that there is a clear shortage in the number of specialists of relevant training in biosafety, and actually almost no professionals are available in all sectors, particularly in the areas of risk assessment and management, which requires the development of an urgent plan to train the workers in the research centers and related institutions, through direct postgraduate programs in the areas of biotechnology and biosafety and development of projects of biosafety for research, agricultural and industrial sectors that produce and deal with genetically modified organisms.

5.2.2 Need for Infrastructure:

Although the State has established a base for biotechnology research by establishing a center of biotechnology at the South of Tripoli and the establishment of research units like those located at the University of Omar Mukhtar at Bawhita, however, issues of biosafety received little attention among the programs of this centre, due to limited research in this area. Moreover, the results of those research did not go beyond exceeded research stage and are not published yet and nor could reach use in commercial activities. Thus there is a need to develop national infrastructure which should include rehabilitation of all educational and research at Libyan universities, research centers, as well as relevant facilities at the marine research and agricultural research centre, the centre for research of palm and olive trees, and others.

5.2.3 Regional cooperation in the analysis of the risks of GMOs:

There is the need for Libya to participate in workshops and regional meetings organized by the United Nations Program on Environment, or any regional and sub-regional mechanisms in North Africa and the Mediterranean, the Middle East and Africa as a whole, will be a great opportunity at efforts in raising the level of regional cooperation between the countries of these regions on the implementation of effective biosafety frameworks. The development of regional mechanisms in the case of an emergency concerning biosafety of environments and species shared by these regions is important in terms of assisting in the management of potential region disasters in the future especially when activities in modern biotechnology increases through national/regional developments and imports from developed countries.

Chapter VI

Recommendations

It is the responsibility of the all relevant stakeholders to support technical and biosafety issues and assist in coordination as specified by the national framework for the implementation and developments of the following recommendations as proposed:

6.1 In the field of study of biodiversity protection

- Accelerate legal structure reformulation of the natural protected areas and support their management with physical and qualified human resources.
- Establishment of new natural protected areas and national parks in a way that could grantee biodiversity protection in all environments.
- Make use of the genetic fingerprinting technique in the documentation and protection of the genetic diversity available in Libya.
- Protection of the Libyan intellectual property right to its genetic resources as national sovereign resources and documentation of the genetic resources at both national and international levels and development of the intellectual property law to include all these aspects.
- Support the national bank of plant genetic resources and link it with similar Arabic, African and international banks.
- Accelerate establishment of genetic bank for animals in Libya.
- Biodiversity protection in the agricultural and pastoral areas through adoption of environmentally sustainable agricultural and pastoral management practices.
- Development of the proper traditional knowledge technologies, natural resources management and genetic resources conservation.
- Mitigate the potential dangers associated with the use and release of genetically modified organisms and introduction of biotechnologies on biodiversity through development and application of national structure of biosafety and developments of biosafety laws in Libya.

- Reevaluate of the agricultural policies that depends on satisfying the needs of the community from one side and conserving the natural resources from the other side, in addition to activating of the universities, research and the governmental institutions role in the fields related to research and development.
- Encourage the non-governmental organization, associations and consumer protection association that aim at protecting the environmental components especially the biodiversity, and the other environmental association to participate in making and taking decision.

6.2 In the field of biosafety

- Support the national committee on bioethics and biosafety physically and scientifically.
- Establishment of institutional biosafety offices within the secretariat that have a relevant relationship to biosafety.
- Establishment of two central laboratories specialised in genetically modified goods detection before use.
- Emphasis on not introducing and releasing genetically modified products before subjecting them to studies and comprehensive investigations and safety testing on genetically modified foods.
- Emphasis on not introducing any genetically modified organism without prior approval from the Environment General Authority.
- The need to establish and develop mechanisms for the study of the potential effects for these organisms and products on human and animal health and the environment and to deal with these organisms on a case by case basis according to their biological characteristics and to the receiving environment.
- Review the laws on quality control, agricultural, veterinarian and health quarantine in the line with the new developments and regional and international agreements in the field of genetically modified organisms and products with the necessity of implementing the appropriate and specialized policies and legislations to deal with these organisms and materials.

- The necessity of building and strengthening human and institutional capacities and strengthening the cooperation and coordination among institutions, centers and the specialized organizations nationally, regionally and internationally to develop and implement training programs in the fields related to the genetically modified organisms and products including the research material with the monitoring and evaluation of the environmental impacts, quality control and expiry of the products.
- Support, intensify and unify efforts in order to conduct further research on the genetically modified products for the sake of conserving the human and animal safety and the ecosystem.
- Investigating the source and the safety of all plants, vegetables, fruits, grains, seeds and fodder and fodder crops and the imported animal breeds to determine whether it is genetically modified or derived from a genetically modified organism.
- Risk assessment and management taking into account all aspects related to biosafety, to ensure detection of the interactions with the environment and biodiversity and the economical and the social aspects and human health and food safety
- Emphasis on the control of the agricultural seeds before and during planting and harvesting.
- Emphasis on not to cultivate the genetically modified products in the center of the origins, especially for the cross-pollinated crops.
- Work on the conservation, maintenance and development of local lines and varieties and support programs for the natural pests control and the establishment of gene banks to protect what is left of the genetic resources.

6.3 In the field of capacity building

Capacity building requires development of a national program for cooperation between the institutions and the agencies working in modern biotechnology in Libya. It should

focus on the improvement of scientific research and application in the field of experiments and biotechnology research through international and regional cooperation in order to ensure the followings:

- Cooperation among specialists in the field of exchange of information and research related to biosafety of the genetically modified materials and their derivatives through establishment of national and regional networks and collaboration with advanced laboratories in the field of modern biotechnology at both regional and international levels.
- Priorities setting in modern biotechnology application with a detailed action plan among all the institutions working biotechnology in the State and establishment of research projects which is linked to research programs and teams that includes researchers from different and integrated disciplines so as to avoid duplication and create synergy.
- Emphasis on the development of human resources, consisting of researchers, technicians and assistants through activation of specialized training courses biosafety and modern biotechnology in Libya and abroad and encouraging establishment of a communication network supported through meetings and conferences in this regards.
- Development of competencies in the area of genetic engineering and the exchange through training and held courses on modern biotechnology and biosafety among the specialists and creation of specialized post doctoral programs.
- Facilitate security of the equipments and chemical substances essential for biotechnology research through securing the process of procurement and remove the taxes from any equipment used in scientific research.
- Organization of regional and international meetings for experience exchange and quality strategies development and measures taken in each country.
- Development and improvement of national scientific capabilities for workers in biotechnology at the technical field and in the field of risk assessment and evaluation through training and held specialized courses for experts and workers in this field and secure all facilities and equipments needed for the search.

And all of this requires:

- The necessity of putting guide, rules and safety legislations, particularly those related to field testing and commercial release of the genetically modified live organisms in clear and simple terms.
- The necessity to enact a special law for import, export and dealing with genetically modified materials.
- The necessity of putting laboratories on genetically modified materials to facilitate food safety which will build consumer confidence.
- The necessity of systematic and accurate construction of human and institutional capacities.
- The necessity of the existence of international and regional supporting mechanisms for early warning about any positive or negative development concerning any genetically modified organism.

6.4 In the field of raising public awareness

Perhaps the Environmental General Authority, the national committee for bioethics and biosafety in collaboration with the Libyan society of biotechnology should form a framework for implementation to put these recommendations in action with regards to raising public awareness

- Work on raising public awareness about biotechnology and its relationship with biosafety and its importance and future prospects and also safe use considerations for its products.
- Open public awareness to all sectors with advantages and disadvantages of the genetically modified crops and their potential effects on the environment and the biodiversity and involve them in such programs including activating the role of the NGOs in participation in decision making concerning the use of and circulation of the genetically modified products, taking into account the citizen right to know in deciding to reject or accept based on the awareness of information on potential risks benefits associated with the genetically modified products especially since there is a lack of knowledge about modern biotechnology and its products.

- Development of pamphlets on how to deal with circulation of the GMOs and their products.
- Making programs and using different media directed towards different actors and society sectors about various aspects of the GMOs and products.