



New Partnership for Africa's Development/North Africa Biosciences Network

NEPAD/NABNet BUSINESS PLAN 2010-2015

(Adopted by the NABNet Coordination Committee, July 2009)

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Abbreviations

ADB	African Development Bank
AMCOST	African Ministerial Council for Science and Technology
AMU	Arab Maghreb Union
AU	Africa Union
AU/NEPAD	New Partnership for Africa's Development
AUC	African Union Commission
AUF	Agence Universitaire de la Francophonie
BecANet	NEPAD/Biosciences East and Central Africa Network
BMGF	Bill and Melinda Gates Foundation
BP	Business Plan
BTRC	Biotechnology Research Center, Tripoli, Lybia
CBBC	Centre de Biotechnologie de Borj Cedria; Tunisia
CC	NABNet Coordination Committee.
CEN-SAD	Communauté des Etats Sahélo-Sahariens
CIDA	Canadian International Development Agency
CIHAEM	Centre International des Hautes Etudes Agronomiques Méditerranéennes
COMESA	Common Market for Eastern and Southern Africa
CPA	Africa's Science and Technology Consolidated Plan of Action
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community Of West African States
EU	European Union
FAO	Food and Agricultural Organisation
GA	NABNet/General Assembly
GDP	Gross Domestic Product
ICARDA	International Center for Agricultural Research in the Dry Areas
ICGEB	International Centre for Genetic Engineering and Biotechnology
IDB	Islamic Development Bank
IDRC	International Development Research Center, Canada
IPRs	Intellectual Property Right(s),
ISC	NABNet Interim Steering Committee
JICA	Japanese International Cooperation Agency

MDGs	Millenium Development Goals
MOU(s)	Memorandum (a) of Understanding
NA (n)(s)	North Africa (n) (s),
NABNet	North Africa Biosciences Network,
ND	NABNet Director
NEPAD	New Partnership for Africa's Development
NEPAD/ABI	NEPAD/African Biosciences Initiative
NEPAD/NABNet	NEPAD/North Africa Biosciences Network,
NEPAD/OST	NEPAD/Office of Scien and Technology
NGOs	Non-Governmental Organizations
NRC	National Research Centre
R&D	Research and Development
RECs	Regional Economic Communities
SAB	Scientific Advisory Board
SANBio	Southern African Network of Biosciences,
TWAS	Third world Academy of Science
UMC	Universite Mentoury, Constantine
UNECA	UN-Economic Commission for Africa
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDT	University of NDjamena, Chad
WABNet	NEPAD/West Africa Biosciences Network
WHO	World Health Organization

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Partner organizations

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- African Ministerial Council on Science and Technology (AMCOST), <http://www.nepadst.org/>
- African Union Commission/Human Resources Science and Technology Directorate (AU-HRST), <http://www.africa-union.org/>
- Agricultural Genetic Engineering Research Institute (AGERI), <http://www.ageri.sci.eg/>
- Biosciences eastern and central Africa Network (BecANet), <http://www.africabiosciences.org/>
- Biotechnology Research Center (BTRC), <http://www.btrclibya.com/>
- Canadian International Development Agency (ACDI-CIDA), <http://www.acdi-cida.gc.ca/>
- Centre de Biotechnologie de Sfax (CBS), <http://www.cbs.rnrt.tn/>
- Faculté des Sciences de Tunis (FST), <http://www.fst.rnu.tn/>
- Genetic Engineering and Biotechnology Research Institute (GEBRI), <http://195.246.41.242/>
- Institut National de la Recherche Agronomique de Tunisie (INRAT), <http://www.iresa.agrinet.tn/>
- Institut National de Recherche Agronomique d'Algérie (INRAA), <http://www.inraa.dz/>
- Institut National des Sciences Agronomiques de Tunis (INAT), <http://www.iresa.agrinet.tn/>
- Institut Pasteur de Tunis (IPT), <http://www.pasteur.tn/>
- Institut Pasteur du Maroc (IPM), <http://www.pasteur.ma/>
- National Academy of Scientific Research Libya (NASR), <http://nasr.ly/>
- National Research Center (NRC), <http://www.nrc.sci.eg/>
- New Partnership for Africa's Development (NEPAD), <http://www.nepad.org/>
- Société Tunisienne de Microbiologie
- South African Network for Biosciences (SANBio), <http://www.nepadst.org/sanbio/>
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Abstract

Through the New Partnership for Africa's Development (NEPAD), African countries have committed themselves to establish networks of centers of excellence in biosciences (under NEPAD/ABI) covering priority innovating thematics in agriculture, food, health and environment. Four regional networks were established aiming to advance biological R&D in Africa. They include those for Southern Africa, East and Central Africa, Western Africa and North Africa (i.e. respectively SANBio, BecANet, WABNet and NABNet, respectively).

North Africa is a highly polymorphic pedoclimatic area, with a wide wealth of biological diversity adapted to various stressful conditions. The population shows different demographic, socio-economic and political profiles and even it is diverse, it is a continuum of human genetic and cultural patrimony. The North African region appeared to have a promising potential to innovate in biosciences based on a wide, complementary and diverse skill. Then, to meet its challenges, NA should be able to command the knowledge base.

NABNet, as an intergovernmental network comprising centres of excellence and platforms including research organizations and universities connected to socio-economic institutions dedicated to cutting edge innovation areas in biosciences, has been initiated for NA since April 2005 and it is still under improvement. The overall NABNet basic strategy is conceived here for the period 2008-2015. The time-frame corresponds to MDGs deadline which is 2015. This deadline corresponds also to an important milestone for which African (AU, Summit of Nairobi, January 2007) and Arabic (Arabic league, Summit of Riyadh, March 2007) states committed themselves to decuple at least about 2015 the average budget dedicated to Scientific Research Technology and Innovation.

During the period 2008-2015 NABNet will implement its strategy in two major phases complementing each other for the launching of a high caliber NAn biotechnological research platform. The first phase (2008-2010) is dedicated to the establishment of the consortia and initiation of the processes of NABNet program implementation. During the second phase 2011-2015 major progress will be achieved in results acquiring and innovation to the benefit of the development sector and capacity building especially for human resources development.

The thematic projects of NABNet will be selected in the seven priority areas of scientific research and innovation identified following the regional consultations. These projects will be dealing globally with: (i)the development of sustainable agriculture, crop and livestock improvement, (ii)the improvement of the human health against diseases based on genomics approach, biopharmaceuticals and Bioprospecting. The projects will be implemented regionally using the capacities and committment of the organizations composing the formed consortia, and using their link with the economic sector and international collaboration.

The launch of the NABNet activities focussing on projects identification and preparation, consortia building and initiation of flagship and horizontal projects and platforms is based on the seed money from NEPAD/CIDA fund and basic support from North African organizations and governments. This launching phase will lead to the establishment of a secretariat and other governance structures. Thereafter the NABNet will focus on developing links with international partners and rising fund from regional and international donors for following up with the implementation of the overall NABNet program.

Executive summary

Challenges and opportunities for North Africa

Africa lags globally behind in biosciences, three interrelated bioscience areas, namely, biodiversity, indigenous knowledge and biotechnology, were acknowledged as crucial to its development. Through NEPAD, African countries have committed themselves to establish networks of centers of excellence in biosciences for agriculture, food, health and environment. The NEPAD/ABI was designated to translate the commitment and related ministerial decisions (AMCOST in its sessions 2003, 2005, 2006ex and 2007 and related instances, Bureau and Steering Committee) into concrete programmatic actions.

Within this perspective, R&D in biosciences will be carried out at the regional level through regional bioscience networks which comprise organisations that have agreed to make their physical and human resources available for sharing. Four regional networks were established aiming to advance biological research in Africa. They include those for Southern Africa, East and Central Africa, Western Africa and North Africa Biosciences networks (i.e. SANBio, BecANet, WABNet and NABNet, respectively).

In spite of the heteroclitic context which marks the countries of NA on the level of the heterogeneity of their economic and social evolution as well as of their current assessment in terms of development, there are lot similarities and affinities between them. At the natural level there is a remarkable continuity of the climatic, maritime and terrestrial conditions. Vast common spaces are shared by several NAn countries. This situation led to the establishment of common plant and animal communities. The human population has a wide knowledge useful for valorization and exploitation of these resources as well as their protection. The area offers as a whole an exceptional wealth of animal, vegetable and micro-organisms germplasm. These species have virtues very required as well as gene pool and support for the production of substances useful for pharmacology, cosmetology and food. Concerning the population, following the interbreeding from which it results it has a broad inheritance of genetic adaptation to the diseases.

From the point of view of creation in NA of a space of research in biosciences it would be judicious to take for support the assets of the various countries like their programs in progress and their aspirations. The bonds set up with well advanced countries deserve to be integrated in the coming NAn research tissue to nourish its collaborative components for the future federative programs. In this context the Business plan of NABNet will offer with its thematic and horizontal areas and plateforms a prerequisite for a sound partnership.

Modern biotechnology offers ways of harnessing and utilizing NA's biological capital to improve human well being and promote sustainable development. To effectively utilize these opportunities and face the accompanied challenges, NA must command the knowledge base. It requires institutions dedicated to cutting edge research and innovation and needs policy measures and related institutional arrangements to address social, political and ethical issues. The NAn countries need to establish informed policies and strategies to respond to developments associated with biotechnology. They should prioritise involvement in agendas set for their region.

In NA, investments into biotechnological research are a basic prerequisite for the effective implementation of the principle "biosciences for development". The levels of investment vary widely from one country to another. However, in spite of these limiting conditions, the region has built, through ongoing national efforts and international collaboration, some powerful potential in various areas of biosciences. These capacities need to be networked for optimizing their use into dealing with regional priorities.

In fact, many NAn countries have been building up and/or investing in R&D institutions. Some of these institutions have attracted national and international support and may have made pronounced contributions to NA's sustainable development. However, in many cases, they have operated as isolated initiatives with limited relevance to national and regional needs. They have articulated interests of small groups of scientists often with peripheral linkages to economic production and policy-making in the region. In a variety of new fields, African countries have tended to create and invest their limited human, organizational and financial resources in short-term programs often on an ad hoc basis. For example in the area of biotechnology, there is a tendency for each country to have its own agenda and programs even where such efforts address similar problems and where resources could be pulled together to focus on shared R&D opportunities.

NABNet nature and program

NA forms a demographic continuum even with polymorphic human genetic patrimony and socio-economic heritage. Nevertheless, the NA zone, appeared to have a promising potential for improving science and technology, and to use it for its economic development and competitiveness. The NABNet was established in April 2005, comprising now of NA centers of excellence complementing each others and focussing each on a forefront of the biotechnology sciences and linked to economy.

Vision: NABNet is to utilize biosciences for the improvement of the life of NAn populations.

Mission: NABNet will create a NAn biotechnological research platform to the benefit of the regional economy and the welfare of the population. This entails networking and utilization of the existing institutions for the use and the development of innovating technologies and new strategies,

Objectives and major principles: NABNet adhere to the basic concepts and orientations of NEPAD and conceives its programs and goals among the MDGs in the frame of the strategy of the CPA and NEPAD/ABI BP, as well as the Arabic strategy of using valorisation of the knowledge for economic development. Its major goals are to put individually and collectively NA countries in a sustainable process of growth and development and eradicate poverty. It seeks to improve complementarity between concerned countries in Biosciences and support the benefit exchange between them and increase their credibility at the continental, Arabic and international level. The adherence of NA countries to the global economy is expected to make them through NABNet acquiring a higher competitiveness. The network seeks globally to a higher presence and involvement in its structure and instances for women and young scientists and related organisations. The principles of NABNet can be summarized in increasing self reliance and reducing dependancy through encouraging the spirit of initiative partnership and ownership, and transparency in the management.

Roles: The collective role of the hub, node and other NABNet organizations will include: (i) Acting as foci radiating scientific excellence in their communities with all its repercussions particularly using biosciences for the development of the society and initiating its economic competitiveness, (ii) Providing affordable and accessible facilities for NABNet and other African and arabic scientists to implement their programs, (iii) Acting as a two-way information vehicle to ensure the effective interaction among laboratories and enterprises among scientists and societal structures, (iv) Active participation in the capacity building, creation of potential leadership and program ownership in the whole NA region based on the local skill and drain of international support.

NABNet program: The research areas have been grouped in seven domains. The flagship innovating projects will be selected following calls and according to a competitive process in the following areas:

- Genomics, Bioprospecting and biopharmaceuticals for Human health improvement and fight against genetic and infectious diseases
- Biopesticides and biofertilizers for sustainable agriculture

- Improvement of cereals and legumes
- Protection of diversity and valorisation of the aquatic resources (pisciculture...)
- Management, conservation and use of agropastoral systems.
- Arboriculture improvement and related resources exploitation (olive trees, palm trees...)
- Assessment of diversity and valorisation of animal resources and livestock

The implementation of the flagship projects could be implemented through an integrative or federative approach as the case could be in rural development or climatic change initiatives. The implementation of thematic or integrative projects need accompanying measures and core facilities. To this end seven domains have been identified. They will offer an integral frame for developing horizontal projects and technological platforms. These will improve the efficiency of the flagship projects and their outcomes, they will help for the dissemination of the results and enhance the economic and social impact and economic competitiveness. These horizontal projects and platforms will be launched according to a selective process and following public calls and will cover:

- Technological resources: Laboratory facilities and technical analyses, data bases, biological resources conservation units, virtual and physical regional centres of expertise...
- Competency development: Doctoral/Post Doc formation, individual/group training, distance/on site learning, programs in various areas of expertise in Biosciences and related domains (bioinformatics, molecular biology, biostatistics economy, management and biosafety) as well as economy and biopolicy will be implemented
- Dissemination, technology transfer, IPR and entrepreneurship development
- Science and development networking and regional ownership of programs
- International collaboration
- Building Regional political leadership and awareness
- Marketing and fund rising

NABNet intends to identify and implement its thematic and horizontal programs and platforms into two phases with the major following outcomes:

Initiating phase: First phase 2008-2010:

This phase will allow globally start building regional consortia charged through important R&D projects and, to finalize their approaches, identify their requirements and initiate research programs. It is expected that during this first phase, publications will be obtained and a set of valorising results will be delivered. This phase will develop ownership of NABNet and awareness on its program, and prepare a generation of researchers interacting at the regional level for subsequent developments. The major expected output of this phase is that a high level scientific production will be initiated and its valorisation by the economic development through innovating will be planned.

Development phase: Second phase 2011-2015:

This phase will lead globally to build capacity in the region and produce consistent results and will improve standards relative to scientific research for the countries and for the whole region. This phase will also lead to improve the rank of NAn countries based on the innovating activities particularly those linked directly to the valorisation of biosciences and involvement of that in the competitiveness of the economy of the concerned countries. This phase will lead to the progress of integration between NAn countries a self funding sustainability of their projects and significant improvement of partnership with and donation from partners and sponsors, and high level international collaboration.

Governance and Management of NABNet

- The NABNet is governed autonomously by the NABNet coordination committee (CC) which consists of members representing R&D organizations, regional economic communities and AU/NEPAD. The CC is supported for some of its functions by its subcommittees. The network is composed by the Hub, the nodes and other partner R&D organizations. The National Research Center (NRC), Egypt as a hub will host the secretariat in its premises. Whereas Center of Biotechnology Borj Cedria Technopark (CBBC), El Mentoury University of Constantine (UMC), Biotechnology Research Center in Tripoli (BTRC), University of NDjamena (UNDT) will host respectively nodes in Tunisia, Algeria, Lybia and Chad and can establish NABNet offices to manage programs and platforms. The other or NABNet organizations are s follows: Agricultural Genetic Engineering Research Institute (AGERI), Cairo, Egypt; Centre de Biotechnologie de Sfax (CBS), Sfax, Tunisia, Faculté des Sciences de Tunis (FST), Tunis, Tunisia; Genetic Engineering and Biotechnology Research Institute (GEBRI), Minufyia, Egypt; Institut National de Recherche Agronomique d'Algérie (INRAA), Algiers, Algeria; Institut National de la Recherche Agronomique de Tunisie (INRAT), Tunis, Tunisia; Institut National des Sciences Agronomiques de Tunis (INAT), Tunis, Tunisia; Institut Pasteur de Tunis (IPT), Tunis, Tunisia; Institut Pasteur du Maroc (IPM), Casablanca, Morocco; Union du Maghreb Arabe (UMA), Rabat, Morocco; Université de Nouakchott (UNC), Nouakchott, Mauritania; Université des Sciences et de la Technologie Houari Boumediene (USTHB), Algiers, Algeria; Université d'Oran Essenia (UOE), Oran, Algeria. All the partner organisations implementing the NABNet program for the General Assembly.

The day-to-day management of NABNet will be the responsibility of a small secretariat located at NRC, and led by a network director as a chief executive officer. The ND can supervise also the NABNet offices in the region. The post of the network director will be open to all citizens from NAn countries not hosting the NABNet hub. The network director will be selected from the applicants and appointed by the CC. The CC and the Secretariat gets support for handling the scientific activities from a scientific board, the Scientific Advisory Board (SAB).

Communication, Marketing and Financing

The major challenge that NABNet will face in the region will relate to the lack of perception of the pivotal role of networking R&D organizations expressed through uncertainties of decision makers, skepticisms of funding bodies and the lack of pertinent information among the general public and the very reduced integration in a NAn regional economical and societal program. This situation imposes tremendous responsibilities on the NABNet initiative. It is therefore foreseen that it will exert communication, marketing and dissemination efforts in more than one venue.

NABNet depends in its starting phase on the seed funds provided by CIDA to NEPAD for the establishment of the four regional networks of NEPAD/ABI. The network intends financing its projects based on the funds to be collected from international or regional donors, National governments, and drained from its own activities. The proposed budget (\$US 10 millions) describes the major financing process covering Governance and management, Capacity building -especially for human resources development-, and R&D and demonstration. As the NABNet and its programs get mature, it is expected that other models will be adopted. The budget suggested here for a 6 years period is calculated to allow the minimum sustainable operationalization of the NABNet program.

Chapter 1. Background

1.1. Science, Technology and Innovation: drivers of the economic and social development

At the millenium Summit in September 2000, world leaders adopted the millenium declaration establishing the MDGs. Since that date these Goals have been set quantifiable targets to be achieved in all countries by 2015 and became the reference for tracking and measuring the improvement of the human condition in developing countries. Lessons learned from quick growth of southeast Asia and the newly industrialized countries show that three elements are critical to the achivement of the MDGs:

- Basic infrastructure, including schools, sanitation, water, roads, telecommunications and energy,
- Small and medium-size enterprise supplying goods and services to the agriculture and natural resource sector, supported by maintenance and wide pool of expertise,
- Government support and funding to establish and nurture technological sciences, and industrial and trade associations. The scientific engineering and technology communities have to be fully integrated into a system encouraging and enabeling development.

Then, it can be concluded that the economic development of the nations is related to their degree of progress in science and technology.

In the last decades many nations discovered the basic need of Science and Technology to their development. Various experiences have shown the importance of approaching development regionally and based on innovation in science and technology areas. The recent responses came from South and East Asia, Latin America, China, Brazil... The technological innovation in public health, nutrition, agriculture and environment areas has led to the major improvements in the human welfare.

1.2. The African response based on S&T for development: the birth of NEPAD

The marginalisation of Africa in all points of view and its high rate of poverty have been well documented and this continent entered the new millennium as the world's poorest continent, with economies growing slowly or declining, and per capita incomes low or falling.

The global average of GDP for all Africa dedicated to scientific research and technology is not more than 0.02%. Through NEPAD, the issue arising these last years is how to arrest this downward trend and put Africa back firmly on the world's development agenda, and on the path to irreversible and sustainable development, so that Africa truly claims this millennium. In the 2007 summit (Nairobi), African states committed themselves to reach at least 1% GDP in their budget for Scientific research and Technology at 2015. The Arabic states committed also themselves to increase GDP for R&D in their budget from 0.15 at 2007 to 2.5 at 2017.

NEPAD has been conceived by African Heads of State to guide Africa's development. Then, R&D, technology transfer, IPR, public and private sector, public capacity building, have been considered basic components for the development of an overall framework that will lead African countries to initiate a healthy process, hence the emphasis on partnership. It is based on the realisation that Africa has offered and continues to offer much to the world and humanity, and the rest of the world owes it a duty to respond to its present situation. The AU summit endorsed recently (Syrte, Libya, July 2009) that the continent has to unify itself as a political, economic and trading bloc to increase its competitiveness. NEPAD recognises that to do so, Africa must first put its house in order and all African countries must work together toward common goals and objectives. NEPAD brings not just a message of hope, but concrete actions and programmes to realise the hope.

A plethora of programs have been approved by the Heads of State and Government Implementation Committee of NEPAD. Many continental and international organisations are contributing to this continental effort. An integral approach relating S&T and the other priorities of NEPAD has been developed. Particularly, CPA was approved by the AMCOST at their second meeting, held in Senegal, September 2005. Thirteen Flagship programmes have been adopted in the CPA: Biodiversity, Biotechnology, Indigenous Knowledge and technologies, Water, Energy Technologies, Desertification, Material Sciences, Science of Manufacturing, Laser Technology, Post Harvest and Food Technology, Information and Communication Technology, Space Science and Mathematical sciences.

The CPA as an AU/NEPAD gathered plan of action presents an extensive programme of work required to build up processes to support regional initiatives in Science and Technology as support for development in Africa. The outcomes of the 2nd AMCOST meeting were presented at the 2006 Summit of the African Union along with a recommendation to adopt the theme of science and technology for the 2007 summit. This recommendation was adopted and the work of AMCOST, AU and NEPAD given extra impetus. These groups presented a plan for implementation of CPA to Heads of State at the 2007 Summit who adopted it and now AU/NEPAD and AUC are making significant progress into implementing the African Agenda of Science and Technology.

1.3.NEPAD/African Biosciences initiative (NEPAD/ABI)

The NEPAD explicitly recognizes that life sciences and biotechnology offer enormous potential for improving Africa's development. Through NEPAD, African countries have committed themselves to establish networks of centers of excellence in biosciences for agriculture, food, health and environment. This commitment is deposited in the framework of NEPAD documents, decisions of ministerial conferences on science and technology, of agriculture, of water and gathered in Africa's Science and Technology Consolidated Plan of Action (CPA). These documents articulate Africa's common objectives and commitment to collective actions to develop and use science and technology for the socio-economic transformation of the continent and its integration into the world economy. This comprised specific flagship R&D programs and projects that would be developed and implemented over 2006-2015 period. The programs are organized in clusters based on their relationships and potential of establishing inter-related networks of implementing institutions.

The CPA is particularly focused in relation to NEPAD/ABI on programme cluster 1 including three flagship programmes: Biodiversity, Biotechnology and Indigenous knowledge and technologies. The NEPAD/ABI, same as whole CPA is erected on three interrelated conceptual pillars. These are:

- Capacity building
- Knowledge production, and
- Technological innovation.

Capacity building in this context refers to the creation, improvement and mobilization of human skills, physical infrastructures, financial resources and the necessary policies for science and technology to be produced and used to solve specific African problems. Knowledge production is about the conduct of science, the generation of scientific and technical knowledge about Africa's problems and identification of specific ways to solve the problems. Technological innovation entails the generation of specific products, processes and services.

The NEPAD/ABI seeks broadly to formulate and implement programs that can:

- Promote cross-border co-operation and connectivity by utilizing knowledge currently available in existing centers of excellence in the continent;
- Develop and adapt information collection and analysis capacity to support productive activities as well as for exports outside Africa; and
- Generate a critical mass of technology expertise in targeted areas that offer high growth potential, especially in biotechnology.

The NEPAD/ABI focuses precisely on harnessing biological applications through the following strategic objectives:

- Address African problems in agriculture, food, health and environment through the application of bioscience technologies;
- Create a critical mass of African scientists and technicians with skills to engage in frontier life sciences;
- Increase access to and sharing of affordable state-of-art class research facilities for genomics, bioinformatics, gene technology, immunology, etc... to be conducted in Africa by African scientists;
- Guide modern Biotechnology developments at national, regional and continental levels, as well as providing guidance on how Africa deals with the rest of the world in relation to international negotiations, references and standards relevant to biosafety.
- Increase mobility of scientists across the continent to conduct research on common priority problems;
- Stimulate the emergence and growth of African centres of expertise in biotechnology and related innovating companies;
- Use new developments in biosciences to protect the environment, conserve and valorize biodiversity in Africa;
- Improve the quality of gene-banks and promote the sharing of scientific facilities to conserve germplasm;
- Add value to Africa biodiversity and generate natural products through bio-prospecting;
- Harness indigenous knowledge and technology of the African people for sustainable utilization of natural resources and wealth generation.

Within this perspective, R&D and innovation in biosciences will be carried out at the continental level through regional biosciences networks which comprise institutions, laboratories and enterprises that have agreed to make their physical and human resources available for sharing. Each regional network is managed by a secretariat that is administered by a regional director. Four regional networks were established as follows; South Africa (SANBio), East and Central Africa (BecANet), West Africa (WABNet) and North Africa (NABNet). The main reason for creating regional biosciences networks is that in biosciences research and development there is a need for a critical mass of infrastructure, equipment, services and support technicians, expertise and creation of economic enterprises to provide a conducive environment for high quality research of international standard, innovation and competitiveness. In the short term, there is a lack of such facilities in the regions. Thus, it is realistic to utilize the existing individual national institutions with such capacities, for linkage and sharing of their facilities. It is also recognized that for hubs and nodes and related research and innovation structures

and universities, to produce research outputs with impact on development, it is required that a range of other laboratories and companies with complementary capacities move the research into a regional context and concrete products and innovation dynamics. The regional biosciences network is therefore composed of a hub loading a secretariat and having major core facilities, nodes, a plethora of laboratories and socio-economic enterprises and organizations.

Chapter 2. North Africa: the general background, challenges and opportunities for biosciences

2.1. Overview:

NA includes in NEPAD/ABI distribution, Mauritania, Morocco, Algeria, Tunisia, Lybia, Chad and Egypt. This area of the African continent has a great climatic diversity. It is subjected to an Atlantic influence on the western coast of Morocco and Mauritania, and a Mediterranean and red sea climate elsewhere. NA includes a vast desert area common to the various countries which extends from Mauritania to Egypt. A Saharan southern fringe of sahelian type, characterized by a thorny steppe is spread out south of Mauritania to the centre of Chad. A zone with wet tropical climate in the south of Chad offers a landscape of shrubby savannah and clear forest.

NA is a wide area where human populations have generally related or common histories. It contains about 18% of the area of Africa among which about 90% is Saharan and arid lands. The NA countries have various dimensions and population structures. Indeed Mauritania the least populated country counts 3,069,000 inhabitants in 1,030,700 km² and Egypt which has an almost equivalent surface of 1,002,450 km² has a population 25 times more (76,000,000 inhabitants), the highest population of the region. The pattern of the settlement differs from one country to another. The rural proportion varies from 81% in Chad to 39% in Tunisia while passing by 55% in Egypt, but it remains overall much more higher when compared to the urban population in the countries considered as a whole. NA associates with this an imbalance between the population distribution like disproportion in Algeria between 90% of a population confined in the extreme north of the country on the Mediterranean coast and the remainder elsewhere, and 95 % of an Egyptian population gathered around the Nile.

The populations of NA belong to various ethnic groups and different religions and confessions. The relatedness of the population with old communities like the Berber ones, Arabians and those of central and western Africa, without forgetting those of European origin, make population of NA the most crossbreded of the continent. The majority of Moslems in the Arabic countries does not hide the presence of the Christians who represent 7 % in Egypt. The Christians and the animists together represent approximately half of the population of Chad. The Arab language is certainly the first official language in the 7 countries (in Chad the French is also a first language) of NA and constitutes a significant bond of communication. But, several languages and dialects are practised by the populations of NA, 120 languages can be counted in Chad only.

The current borders of these countries are the result of their XIXth century history marked by a European colonization. The Morocco-Mauritania area was shared between Spain and France. The latter granted Algeria and Tunisia, and the United Kingdom took Egypt whereas Italy occupied Lybia. Contours of Chad were drawn during negotiations between France, United Kingdom and Germany and the country was given to France. The countries of NA reached their independence after important sacrifices on the basis of border bequeathed essentially by the former colonizers. They became independent according to different steps and through variable contexts. Egypt freed itself from the United Kingdom at 1922 following the First World War. The independence of Lybia in 1951 was essentially the result of the defeat of Italy in Second World War. Autonomy was granted by France in a way spread out following its defeat in Indo-China, in Morocco and Tunisia at 1956, Chad and Mauritania at 1960 and Algeria at 1962.

The countries of NA were confronted following their independence with various animated stories where national aspirations for construction, after-effects of colonization and new international economic situation intermingled. Each country faced its destiny through a specific way characterized by working on its own program. The result of this diverse political evolution is a multiplicity of

economic and social schemes. The consequence of this in the current history of these countries is a varying level of economic and social development.

While basing on indicator nominal GDP per capita one sees that in north Africa it varies from 862 USD for Chad and 1,042 USD for Mauritania to about 15,000 for Libya. For the other countries nominal GDP ranges from 2,161 for Egypt to 4,588 for Algeria. In parallel, the demographic growth from one side, the life expectancy and the elimination of illiteracy from the other side follow an opposite diagram. Indeed in Chad the demographic growth is the highest (3% against 1,2% in Algeria or 1% for Tunisia) and it is associated there with 48 years for life expectancy (against 75 years in Tunisia) and an elimination of illiteracy not exceeding 53 %.

In terms of telecommunications, contrast in the region is obvious since Algeria has approximately 1,000,000 of connections with 2,500,000 regular users of Internet, whereas Mauritania has 500 connections to the maximum. The commercial exchanges between the countries of NA are weak and sometimes completely absent. For Algeria, the first partner is Europe with 55% of importation and as much for export. Chad imports 49% of France and the United States. Three maghrebian countries (Tunisia Algeria and Morocco) together, however bound by conventions within the framework of the Arab Maghreb Union (AMU) do not make more than 3% of exchanges between them. The absence of common currency, the mediocrity of the means of communication and the appearance of frontier conflicts or various policies accentuate these dissensions and make sterile the concretization of the occasional slogans to build bonds for complementary economy and integral regional development.

As attempts to get more linked in their environment and between each other during last decades NAn states have initiated and have been involved in various frames. Inside the continent for example, Mauritania and Chad belong respectively to ECOWAS and ECCAS. Lybia and Egypt belong together to COMESA. All the countries except Algeria belong to CEN-SAD, all except Egypt and Chad belong to AMU and all except Chad are involved in Arab League. NAn countries have also established links outside Africa. Some of them are dealing with Aghadir agreement linking Morocco, Tunisia, Egypt and Jordania with Barcelona convention. The five maghrebian countries are linked with the five Western Europe countries (Spain, Portugal, France, Italy and Malta) by the convention 5 + 5.

2.2.Starts of research in biosciences: national contexts

In the national contexts, research in science and technology in general and biosciences in particular is the image of the social and economic diversity and disparity of NAn countries. When this activity exists, it is in general recent and thus does not profit from a sufficient experience. Indeed, research is overall making in NA its first steps and there is a great need to make it perceived as promising activity. However to make the scientific research fruitful at the medium and long term, it will have to obey a suitable vision and to be led within the framework of an adequate strategy. It must also be carried out through mechanisms defined on the basis of a specific context and of the regional requirements and it must be adopted as a major priority in the level of the spheres of science itself as well as those of the political decision to make it profiting from long term strategy and necessary accompanying measures.

It is quite obvious that taking into account the historical differences between the countries there cannot be only one scheme for the installation of scientific dynamics of research. In addition there cannot be regional programs if there is no experience sharing and if there is not an effort of synthesis integrating the common prospects.

The young States of NA have been confronted with the need of having competences for the wheels of the administration. Initially the young graduate students of the country coming from the foreign universities, often those of the former colonizers, return to animate and manage the local structures. This met for example the pressing need for teaching an increasing number of students. Research was born in these teaching institutions to meet the need for formation of the trainers, the managers, the

executives and the persons in charge of local companies and organizations. A first generation of structures of research was built under the instigation of the young graduates who return enthusiastic from abroad. But these centres were generally designed and launched to haste without precise program and meticulous study of the real need for the sector considered. Thereafter many of these centres were transformed into institutions of formation or were absorbed by them. Research in these structures was not regarded yet as a developing tool and thus did not cover a major national interest for the decision makers. Currently, the most advanced countries in NA live a debate on the strategies, the priorities and the appropriateness of such research structure. Egypt, country pioneer in the area built centers during the beginning of the second half of last century. It still now tries to identify and set up the adapted programs, to offer adequate logistics and to grant the durable financings to them. Tunisia and Morocco have developed the relatively recent concept still under experimentation, that of technopark gathering the three sectors of the development (formation, research and companies). This concept is being applied for 10 years in Tunisia and has been just adopted in Morocco. Algeria and Lybia set up research centers and try to develop inside the country federative projects funded according to local priorities. Mauritania and Chad still focus their efforts on the reinforcement of spaces of university and vocational training.

During this process launched in each country according to a particular context, the scientific community tends to adjust with the political believe to carry out its aspirations while taking as a starting point an internationalized scientific debate. Then, reforms are undertaken in the various research institutions, and new programs are initiated in agreement with the needs of each country. The researchers who occupy unceasingly the steps of the hierarchy of the political and economic decision, generated designs and strategies more adjusted with the reality of their countries. The scientists, in contact with the evolution of research on the international scale and witnesses of problems of their structures imply themselves more and more in international projects and networks (bilateral, Euro-Mediterranean, other international initiatives), and are brought to be integrated in networks and consortia to put their local initiatives into practice. It is true that the more important regroupings are the work of international research centers or international organizations and sponsors (FAO, WHO, ICARDA, EU, AUF, CIHAEM, TWAS, ICGEB, UNECA, UNEP , UNESCO, JICA, ADB, IDB, IDRC...). These regroupings represented opportunities without precedents to learn and for linking the researchers of the countries of NA, and constituted the start of the germination of the national initiatives carrying hope. Attending international workshops, congresses and courses opened also the way to Nan scientists to meet and to learn from international processes of research and to come up with their concepts of launching research structures.

Developing national research and development programs remains relatively a new wave of not more than three or four decades in the best cases. The acquired knowledge and the need for developing national strategies and economies increased the demand of local initiatives. For crop improvement for example, the climatic and soil conditions are generally severe and crops and livestock need to be tolerant to these conditions to survive. Rather than relying on imported germplasm, native adapted flora, fauna and microorganisms have recently been considered as the adequate genetic patrimony for a sustainable agriculture well linked to the economic development and the protection of the environment. NA's biodiversity was then highlighted as a major source of its economic and social transformation. Biodiversity appeared also as a potential source of medicinal, food and chemical products. This increased the efforts dedicated particularly to human health improvement. The unique species of plants and animals as well as ecosystems constitute the regional natural wealth. However, this diversity is underutilized and is being lost at alarming rates. To conserve and sustainably use biodiversity, NAN countries have to combine efforts to harness and apply science and technology. In fact conservation and sustainable use of biodiversity at the regional level are knowledge-intensive activities and cannot be attained without investments in the joint generation and application of scientific knowledge and technological innovations.

NA has a relatively important wealth of indigenous knowledge and related technologies. This is embodied in the continent's cultural and ecological diversities and has been used by the NAn people for thousands of years to solve specific developmental and environmental problems. Indigenous knowledge and technologies play major roles in biodiversity conservation, sustainable use and prospecting. In addition, their contributions to increasing food production, fighting disease, and stemming environmental degradation are considerable. Despite their contributions, indigenous knowledge and technologies are not adequately promoted and protected in most NAn countries. Institutions to safeguard the rights of indigenous knowledge holders are weak and links between the formal research and development (R&D) institutions and local communities that hold and use the knowledge are poor. This has denied NA the opportunity to better understand and use its indigenous knowledge base.

Behind the weakness of improvement of science and technology and its national impact is *inter alia* the lack of targeting the regional frame and wealth as a basic dimension for national economic development. The regional conception would help to valorize the extensive network of universities and research institutions employing thousands of scientists in biosciences related areas. The identification of regional areas of medical technologies, agriculture, food and environment, and the combination and coordination of efforts in innovating activities, in developing biotechnological approaches and preparing for post genomic exploitation will help too much for the birth of a regional efficient and useful frame.

2.3.Opportunities for regional initiatives

In spite of the heteroclit context which marks the countries of NA on the level of the heterogeneity of their economic and social evolution as well as of their current assessment in terms of development, one can highlight similarities and affinities between them. Indeed, at the natural level there is a remarkable continuity of the climatic, maritime and terrestrial conditions. Vast common spaces are shared by several NAn countries. This situation led to the establishment of common plant and animal communities. The human population has a wide knowledge useful for valorization and exploitation of these resources as well as their protection. The area offers as a whole an exceptional wealth of animal, vegetable and micro-organisms germplasm. It is the centre of origin and diversification of several plants of interest. It lodges species adapted to the most varied edaphic and climatic constraints (salinity, drought, cold...). These species have virtues very required as well as gene pool and support for the production of substances useful for pharmacology, cosmetology and food. NA has with its coast of more than 15,000 km on the Atlantic, the Mediterranean and the Red Sea, like its rivers and its lakes and dumps a priceless wealth of water resources. Concerning the human population, following the interbreeding from which it results it has a broad inheritance of genetic adaptation to the diseases. The geographical, historical and social differences could be rather perceived as an enrichment offering to all the area multiple exploitable facets in an integrating strategy of collective development. The multiple local experiments and the richness of the indigenous knowledge are in this context as many useful resources for the whole of the population. The local communities can make use of it to improve quality of their life and to fulfil solutions for some of their problems. The differences of language, religion and culture represent invaluable heritages which offer various designs as reference marks enriching the unit and the complementarity of the population. In their oppression by different colonizers and in what they had invented as tools to survive it is expected that they can resist to the new constraints generated by the globalization.

From the point of view of creation in NA of a space of research in biosciences it would be judicious to take for support the assets of the various countries like their programs in progress and their aspirations. The bonds set up with developed countries deserve to be integrated in the coming NAn research tissue to nourish its collaborative components for the future federate programs. In this context the BP of

NABNet will offer with its flagship and horizontal projects and platforms a prerequisite for a sound partnership.

Modern biotechnology offers ways of harnessing and utilizing NA's biological capital to improve human well being and promote sustainable development. To effectively utilize these opportunities and meet the accompanied challenges, NA must command the knowledge base. It requires institutions dedicated to cutting edge research and innovation and needs policy measures and related institutional arrangements to address social, political and ethical issues. The NAn countries need to establish informed policies and strategies to respond to developments associated with biotechnology. They should prioritise involvement in agendas set for their region. In fact the absence of NAn consensus and strategic approaches to address emerging biotechnology issues will allow different interest groups to exploit uncertainty in policy-making regardless of what may be the objective situation for the region and for Africa.

In NA, investments into biotechnological research are a basic prerequisite for the effective implementation of the principle "biosciences for development". The levels of investment vary widely from one country to another. However, in spite of these limiting conditions, the region has built, through ongoing national efforts and international collaboration, some powerful potential in various areas of biosciences. These capacities need to be networked.

Many NAn countries have been building up and/or investing in R&D institutions. Some of the institutions charged with this mission have attracted national and international support and may have made pronounced contributions to NA's sustainable development. However, in many cases, they have operated as isolated initiatives with limited relevance to national and regional needs. They have articulated interests of small groups of scientists often with peripheral linkages to economic production and policy-making in the region. In a variety of new fields, NAn countries have tended to create and invest their limited human, organizational and financial resources in short-term programs often on an *ad hoc* basis. For example in the area of biotechnology, there is a tendency for each country to have its own agenda and programs even where such efforts address similar problems and where resources could be pulled together to focus on shared R&D opportunities.

2.4.Strategy

The main reason for creating NABNet is that for biosciences R&D in the region, there is a need for critical mass of competences, infrastructure, equipment, services, support technicians... These conditions will provide an environment that is conducive for high quality research of international standard and facilitate establishing environmental conditions for social and economic development at the national and regional level.

In the short term, there is a lack of such facilities in NA when the various countries are considered separately. Thus the concept of a strong shared facility is advocated for NA and NABNet. This would produce research outputs with impact on the development of the whole region by creating a network of institutions with complementary capacities to move the research into concrete products. The network concept is thus seen as composed of a Hub, Nodes, partner R&D organisations and a broader set of membership including various social, economic and political components.

The adequate model of organisation for NABNet based on the available skill widespread in the region is to have a network of excellence built on various research and development components where the academical, economical and entrepreneurship levels can progress concomitantly with mobilising their potential through common projects and by offering and exploiting the available platforms. In this approach the NABNet R&D participants would work in complementarity and synergy to service each others whereas the economic institutions will drain the gain from the available knowledge by useful channels of technology transfer and dissemination for the benefit of the national development and the regional complementarity and integration. On the other side this scheme will offer various useful connections with ABI Networks and those of the

other African and Arabic consortia and programs. This model is more conducive for sustainability in the sense that it promotes synergies and a collaborative culture which lead naturally to the development of long term viable partnerships and the involvement in the global economy. Such partnerships are more likely to continue beyond donor support by mobilising regional involvement and ownership, and beyond NAn area by linking with the whole continent.

In that model the hub will beyond its role as a node in its own country, loadge the secretariat and then contribute to facilitate the network activity and play a major role by linking NABNet with the other ABI Networks and contribute for building continental initiatives. The nodes, the hub and their partner organizations, with their academic and economic links in the region will establish regional plateforms, will offer an international and continental vis-a-vis for international collaboration and will promote economic competitiveness. Overall, the hub, Nodes and partner R&Dorganizations will provide a common research platform, research and innovation related services, capacity building and training of young scientists in the region.

Since donors will want to see commitment from national governments before committing their own resources, the success and long term viability of the network calls for strong national and regional support. The other prerequisite for the success and sustainability of a network is to ensure that the right competencies for the regional initiatives are well identified in the participating organizations in order to provide efficient operations in the whole network.

Equally important to the success of the network is the need to ensure that all partners in the network cultivate a sense of belonging to it. This could be achieved by ensuring that each country should be identified by at least one centre of excellence, by doing so, no one will feel left out. Those centres less endowed with technical resources can then be supported or nurtured through the network. On the other side nodes with less competence can get benefit from the skill of the others offering their technological resources and competences and so valorising their expertise. Given the many limiting factors to R&D in biosciences, there is need to prioritize areas of research depending on identified capabilities and strengths of the various players in the network.

While being based on their own potentialities, the countries of NA should start within the framework of NABNet a process of revival of research and development in biosciences by initiating reforms on essential levels, regionally targeted and including the following:

- To consolidate the interactions between scientific and development teams in NA in NABNet biosciences areas through a debate on the common priorities of the development, which leads them to conceive and implement common projects. This target is accessible because qualified teams recognized internationally are available and thus being able to continue their collaboration with their international partners while building regional bonds. This is cost effective and is based on already established conditions linking the structures and researchers having common experiences in the region.
- To reinforce the implication of the decision makers and the social and economic actors in the improvement, the adoption and the implementation of thematic flagship projects, horizontal programs and the establishment of plateforms. This target can be fulfilled through the intensification of the contacts and the explanation campaigns. Indeed to make the strategy adopted by the decision makers it is necessary to install transparent mechanisms of follow-up including governance utilities, to adopt legal arrangements such as agreements, to offer tools for evaluation and dissemination of the activities and results (workshops, websites, brochures, bulletins...). These procedures have to be planned not only for the short term, but they have to be established for the medium and long term to show the validity of the targeted prospects and the success in their achievement. The results of research as well as the creation of opportunities for the development sector will be much useful during this process.

- To attract and encourage the participation of high level scientific community and its association with african diaspora and international experts in preparing and implementing the regional projects, as well as the promotion of the criteria of excellence for selecting flagship and horizontal projects and technological platforms as well as the implementing organisations. This target will be fulfilled by encouraging competition for establishing consortia involving the most qualified teams in the NABNet projects platforms and initiatives concomitantly with their involvement in international networks and projects.
- To attract funds. This should be based first on commitments from NAn countries and R&D organizations about the programs of NABNet. Governments should contribute in the financing of the network program. A strategy of participation, according to a cascade of actions, of the various countries should be established. The international funds could be attracted through various ways and based on well established arguments. International organizations, centers and foundations should be solicited as well as donor foreign governments and Communities. The success of the bond between the mechanisms of financing and social and economic repercussions will play a decisive role.

It should be noticed that the strategies suggested for establishing a regional approach are intended to complement and not replace yet existing links and approaches. The regional NABNet projects and initiatives are intended to pursue the current efforts of R&D and Innovation and to make evolving a new regional panorama involving commitment and ownership of the NABNet program. Then, the NABNet approach is conceived to be a valorising one with adding value by establishing a strategic new trend for developing overall a new important regional frame.

Chapter 3: NABNet R&D areas of priority, Program and platforms

3.1. Major objectives

The NABNet long term goal is to develop a high calibre platform for biological research that aims to improve the life of NAn people. In NA, there is an extensive network of universities and research institutions employing thousands of scientists in biosciences-related areas. Moreover this network is to be connected with economic structures. Unfortunately, currently the productivity in terms of innovation and product development is low and does not match the existing institutional hope and human resource potentials. The following objectives deserve to be targeted by NABNet:

- To provide focal points for the NAn scientific community to support the activities of national, regional and continental entities addressing, human health priorities, agriculture-related problems and food needs for reducing poverty, protecting environment, creating wealth and promoting Africa's development. The main objective is to bring improved and marketable products and initiate processes that benefit to NAn community. This will help solving the most important development constraints affecting the health, the agriculture and the environment leading to a well being of people in NA
- To create and strengthen human resources in biosciences and related disciplines in NA to promote scientific excellence. The main objective is to bring together a critical mass of scientists drawn from national, regional and international institutions in modern facilities where they can undertake jointly cutting edge research.
- To increase access to affordable, world-class research facilities within NA. This will serve as a platform to forge partnerships with skilled international biosciences laboratories and will stimulate economic entities responsible for product development and delivery, within NA and globally.
- To produce, manage and disseminate bioscience information and knowledge relevant to NA's need. This will facilitate access to advice and training on intellectual property, biosafety and other regulatory issues and new developments in biosciences to protect the environment, conserve and valorize biodiversity in Africa will be affordable.
- To strengthen the role of women and young in science and technology activities relating to agriculture health food and environment sectors.
- To attract additional investments for biosciences in and for NA from governments, the private sector, and regional and international bodies.

3.2. Expected outcomes

By targeting these objectives, NABNet will attain the following outputs:

- Food security in the region through agricultural advances and sustainable development,
- Health status improvement in NA countries,
- Capabilities of NA scientists upgraded through creating an innovative research-friendly environment, thus promoting individual and institutional welfare and reducing the brain drain,
- Released biotechnological products within the fields of health, agriculture, food and environment, with high commercial values, thus promoting national development,

- Society transformed to a knowledge-based one through aiding in the shaping up of the research-related legislations in the NA countries,
- Links between the private enterprises and the academia established,
- Globalization-oriented technological approach acknowledged and adopted among the NA scientific communities, through international exploitation of regionally produced technology, global generation of innovation and global technological collaboration.

3.3. Priority areas for flagship projects

The research areas proposed by the NABNet workshops, and enriched by exchanges among NAn and international scientific community, and agreed by the CC meeting are grouped in seven domains. The flagship innovating projects will be selected following calls and according to a competitive process among the following areas:

- Genomics, Bioprospecting and biopharmaceuticals for Human health improvement and fight against genetic and infectious diseases
- Biopesticides and biofertilizers for sustainable agriculture
- Improvement of cereals and legumes
- Protection of diversity and valorisation of the aquatic resources (pisciculture...)
- Management, conservation and use of agropastoral systems.
- Arboriculture improvement and related resources exploitation (olive trees, palm trees...)
- Assessment of diversity and valorisation of animal resources and livestock

The guidelines for selection of the flagship projects should include the following criteria:

- The topic is approached by organizations from three or more countries in NA
- Proposed outputs should correspond to market demand
- Products should be acceptable to consumers and their potential for impact and likelihood of success should be high
- The developed initiatives should combine at least biodiversity and biotechnology approaches. Involving indigenous knowledge and technologies, impact on social and economic development will be an advantage.
- High quality of science and strong link to capacity building and training activities
- Contribute to pursuit of NABNet vision and mission and enhancement of its reputation.
- International partnership involved in the implementation of the project.

All the areas have an equal priority. No one from them could be hidden by another. However the implementation of a project in one area needs to have the adequate critical mass of human resources and the sufficient awareness of its importance for the region. Then the projects belonging to various domains may be initiated at different periods and their progress may be not fulfilled with the same pace. This will depend on the financial support and institutional commitment.

3.4. Horizontal projects and basic platforms

The implementation of the flagship projects needs accompanying measures and core facilities. To this end seven domains of action have been identified. They will offer an integral frame for developing horizontal projects and technological platforms. These will improve the efficiency of the flagship projects and their outcome. They will help for the dissemination of the results and enhance the economic and social impact and regional competitiveness. These horizontal projects and platforms will be launched to cover:

- Technological resources: Laboratory facilities and technical analyses, data bases, biological resources, conservation units, virtual and physical regional centres of expertise...
- Competency development: Doctoral/Post Doc formation, individual/group training, distance/on site learning, programs in various areas of expertise in biosciences and related domains (bioinformatics, molecular biology, biostatistics, management and biosafety) as well as economy and biopolicy
- Dissemination, technology transfer, projects preparation and management, IPR and entrepreneurship development
- Science and development networking and regional ownership of programs
- International collaboration
- Building Regional political leadership and awareness
- Marketing and fund raising

3.5. Phases of NABNet program and major expected outcomes

NABNet intends to identify and implement its thematic and horizontal programs and platforms into the two following phases with their respective major outcomes.

Initiating phase: First phase 2008-2010:

This phase will allow globally start building regional consortia charged through important R&D projects and, to finalize their approaches, identify their requirements and initiate research programs. It is expected that during this first phase, publications will be obtained and a set of valorising results will be delivered. This phase will develop ownership of NABNet and awareness on its program, and prepare a generation of researchers interacting at the regional level for subsequent developments. The major expected output of this phase is that a high level scientific production will be initiated and its valorisation by the economic development through innovating will be planned .

Development phase: Second phase 2011-2015:

This phase will lead globally to build capacity in the region and produce consistent results and will improve standards relative to scientific research for the countries and for the whole region. This phase will also lead to improve the rank of NAn countries based on the innovating activities particularly those linked directly to the valorisation of biosciences and involvement of that in the competitiveness of the economy of the concerned countries. This phase will lead to the progress of integration between NAn countries a self funding sustainability of their projects and significant improvement of partnership with and donation from partners and sponsors, and high level international collaboration.

Chapter 4. North Africa Biosciences Network (NABNet)

Nature, structure and links

4.1. Nature

The NABNet is directly affiliated to the NEPAD/OST and NEPAD/ABI and will abide to their rules and regulations. More importantly, it will exert its maximum efforts through its secretariat, ND and CC as well as NA researchers and R&D institutions to integrate their activities with those of other NEPAD/ABI regional initiatives and stimulate the development of other NEPAD/OST networks. This implies to coordinate the programs with the Arabic region frames and priorities and by taking into account the opportunities offered by the euro mediterranean as well as the international contexts. It is foreseen that through NABNet complementing other NEPAD structures, will result an integrated continent wide research and development platform.

For NABNet three primary sources of technological and scientific innovation need to be kept in mind as basic components. The first is governments and RECs, which can act as a facilitators and promoters of technological learning and development. The second is institutions of higher education and research centers, collectively referred to as academia, which create indigenous capacity in relevant fields. The third is enterprises, the engines of economic change, where technological capabilities of economic importance and competitiveness accumulate.

The first step in improving the application of science, technology, and innovation to development is to align governance structures with technological missions or programs. This cannot be done without articulating development visions and strategies that focus on the role of technological innovation in development. These strategies should seek to facilitate the transition to knowledge-based economies that are guided by sustainability principles. Then, for NABNet the external context including international organizations would help developing the science culture, expand the application of science and technology, promote technological innovation, and adjust rule-making and standard-setting activities to better meet the interests of the concerned countries.

4.2. Vision

NABNet is to utilize biosciences for the improvement of the life of NAn populations. The challenge is then to use new developments in the biosciences to reduce poverty and create wealth in North Africa in sustainable ways. Many of the problems constraining NA's development require solutions specifically tailored to the unique local, national and/or regional circumstances. Some solutions may be developed from existing knowledge and adaptation of available technologies. Many, however, require new knowledge, new discoveries and endogenous innovation by africans.

4.3. Mission

NABNet will create a NA biotechnological R&D platform to the benefit of the regional economy and the welfare of the population. This entails networking and utilization of the existing institutions for the use and the development of innovating technologies and new adapted strategies.

4.4. Structure of the NABNet

NABNet is structured in hub, nodes and other partner organizations. It includes academic components, and research and development organizations. In some cases like as in NRC and CBBC in Borj Cedria

Technopark, technological centers, company incubators, and production companies complement each other. For others components of NABNet, some links are under initiation with economic partners like as in Algeria and Lybia. Links with the various sectors of health, agriculture, food and environment are under progress for implementing research and development projects and background in competency development and technical resources. It has been decided during the interim steering committee meeting of April 2005, Borj Cedria, Tunisia, that NRC will be the hub hosting the secretariat, whereas the Nodes as others radiating focal points can take leadership for regional and continental initiatives. The identified nodes were El Mentoury University in Constantine, Algeria, CBBC of Borj Cedria Technopark in Tunisia, University of N'Djamena in Chad and Biotechnology Research Centre in Tripoli, Lybia. It was also decided that NABNet involves in its program universities, research organizations and economic actors to be identified as partners whenever their contribution is useful and from any relevant sector.

4.4.1. National Research center (NRC), Cairo, Egypt,

The NRC is a multidisciplinary institute that has a wide spectrum of research fields and interests. It was identified as a hub to share its skill with other components of NABNet, and to lodge the NABNet secretariat. It is the largest of all institutions affiliated to the Ministry of Scientific Research of Egypt. It was established in 1956 as a national center to conduct basic and applied research. It is composed by 13 divisions. Currently over 5000 research scientists supported by 2500 research assistants, technicians, and administration staff are engaged in research and development programs. The NRC occupies an area of 12 acres on which laboratories, pilot plants, fermentors, green houses, central services laboratory, growth chambers, central library, instrument maintenance center and computer services are located. Some of R&D activities running in this center are in fields directly or indirectly related to the various disciplines involved in biosciences.

4.4.2. El Mentouri University, Constantine, Algeria (UMC)

It comprises numerous research laboratories with programs in various areas of biosciences. These cover Micro propagation and *in-vitro* culture, Improvement of crop resistance to drought, production of bio-fertilizers, biodiversity conservation of Aquatic ecosystems, Diagnosis, genetics analysis, and therapy of human genetic diseases, contributing to the creation of bio-industrial firms

4.4.3. Biotechnology Research Center (BTRC), Tripoli, Libya

The BTRC is a specialized institute in biotechnological research. Its programs cover: pathogens, anti tumors in dates , Isolation and identification of bacteria associated with secondary infection of Leishmaniasis, epidemiological survey on some blood diseases in elementary schools, Detection and Quantification of CMV infection in pregnant women, DNA Fingerprinting, Detection of HIV, HBV and HCV infections, Training in food safety.

4.4.4. Biotechnology Center, Borj Cedria Technopark, Tunisia (CBBC)

The Borj Cedria Biotechnology center is located in The Technopark of Borj Cedria. This technopark aims to be a catalyst between R&D activities and industry. The CBBC is formed of 5 laboratories and has over 160 scientists working on various aspects of Plant Biotechnology including microorganism isolation, and evaluation for biocontrol, production of anti microbial substances and enzymes, plant improvement against biotic and abiotic constraints, bioassays with biological molecules from medicinal plants, development of biopesticides and biofertilizers, survey and protection of biodiversity.

4.4.5. Ndjaména University, Chad (UNJ)

This university having 72 scientists, was established in 1971. In collaboration with faculties and research institutes belonging to various ministries, the university research activities in the field of biosciences are covering: human and animal health, Plant and animal genetics and production, food technology and biosecurity, microbiological processes, natural plant resources

4.4.6. Other partner organizations of NABNet

During the period 2007-2008 and along with the start of the implementation of NABNet program some organizations in the region got involved in the activities of the network and in the same time expressed their will to be part of NABNet as regional platform of R&D. By doing so they became founders and participants of the network and committed themselves to share their facilities and resources with the other participants of the network. They contributed to the conception and implementation of the network strategy and as stakeholders they got involved in the governance and follow up of the process.

These organizations are as follows

- Agricultural Genetic Engineering Research Institute (AGERI), Cairo, Egypt
- Centre de Biotechnologie de Sfax (CBS), Sfax, Tunisia
- Faculté des Sciences de Tunis (FST), Tunis, Tunisia
- Genetic Engineering and Biotechnology Research Institute (GEBRI), Minufyia, Egypt
- Institut National de Recherche Agronomique d'Algérie (INRAA), Algiers, Algeria
- Institut National de la Recherche Agronomique de Tunisie (INRAT), Tunis, Tunisia
- Institut National des Sciences Agronomiques de Tunis (INAT), Tunis, Tunisia
- Institut Pasteur de Tunis (IPT), Tunis, Tunisia
- Institut Pasteur du Maroc (IPM), Casablanca, Morocco
- Union du Maghreb Arabe (UMA), Rabat, Morocco
- Université de Nouakchott (UNC), Nouakchott, Mauritania
- Université des Sciences et de la Technologie Houari Boumediene (USTHB), Algiers, Algeria
- Université d'Oran Essenia (UOE), Oran, Algeria

4.5. Role of hub and nodes and other organisations of the network

The collective role of the NA hub, node and partner organizations will include:

- Acting as a tool and frame for conceiving regional integrated projects for the whole region to solve common economic problems
- Acting as foci radiating scientific excellence and economic competitiveness in their communities with all its repercussions particularly using biosciences for the development of the society,
- Providing affordable and accessible facilities and platforms for NA, other African and arabic scientists to implement their programs,

- Acting as a two-way information vehicle to ensure the effective interaction among national structures (laboratories and enterprises) and the rest of NA, other African and Arabic scientific communities,
- Attaining the role of a thinking tank for the NA region in the fields of biosciences.
- Community orientation about the NEPAD's related activities, concepts and programs
- Active participation in the capacity building in the whole NA region based on the available competencies and support from the National Governments, and regional and international cooperation.

The hub, nodes and other research and developments organizations of NABNet will be pivots for research and capacity building activities. Utilizing their local and regional connectivity, human resources and leadership, they will be instrumental in orchestrating research and development programs and platforms to be executed by various NABNet consortia, as well as with those of other African subregions, arabic community and european partners. Also, NABNet organizations will attain a major role in the implementation of the capacity building and training programs. Based on their training experience, NABNet organizations will compose an open platform for all African scholars and researchers and project holders to further their career through various training programs.

The NRC will host the secretariat and provide assistant secretarial staff and offer technical and managerial support for the NABNet activities, space and infrastructure at no cost to the NABNet. It will be much beneficial that the NABNet Nodes establish also NABNet offices with a management role as well as a coordination mandate at the national level, and continental and international leadership in specific areas and priorities and in capacity building.

4.6.Regional and international linkages

One of the most important factors governing the success and sustainability of NABNet activities is to convince public sectors, media and policy makers about its effective role in sustainable development. Such important mission needs various resources for both financial and logistic support. International relations and continued negotiations of NEPAD are continuously needed in this regard. Within this framework, a list of international bodies will be sought for collaboration. Negotiations with the concerned bodies must focus on increasing the allocated fund for Africa for R&D. They should include training and developing research skills of African juniors and women in modern Biotechnology and development.

4.7.Stakeholders

The NABNet serves two main groups, the beneficiaries and the investors. To be successful, both groups will need to be satisfied. The immediate beneficiaries are members of the scientific community and development research in NA whereas the ultimate beneficiaries will be the whole society.

The characteristics of the target groups are:

- Immediate beneficiaries are the scientists from national and regional research organizations, African universities, and the broader scientific community. The scientists assess the initiative on the basis of the means it provides to assist them in furthering their research goals through promoting an environment focused on overcoming obstacles and finding solutions to priority problems.
- Ultimate beneficiaries are the NA societies, they will assess NABNet performance based on its impact on solution for their national problems.

- Potential investors are the African governments, the bilateral and multilateral development agencies, private foundations, science foundations and corporate firms. Potential investors assess NABNet on the basis of its worthiness, credibility, and effectiveness. The reputation and credibility of management is key, together with the confidence that funds are prudently managed. The development agencies consider how activities fit with their current policy and programming areas. Science foundations are concerned with the quality of science. Private firms assess NABNet on how it fits with their strategic marketing and development plans.

The key stakeholders with whom NABNet needs to communicate are:

- Political supporters: such as African governments, Regional Economic communities and African Union
- Investors and non-profit organizations: such as Canadian International Development Agency (CIDA), Melinda and Bill Gates Foundation (BMGF),; as well as other targeted, potential investors in the development community and selected science-funding agencies.
- Scientific community: research networks, research partners and scientists willing to collaborate in Africa, including regional bodies; international agricultural research centers; advanced research institutes; universities; and the global scientific community.
- Users of research outputs (e.g. farmers, rural and urban communities, NGOs, private companies...).
- Local communities and consumers who are concerned by the NABNet activities.
- Environmental and health advocates.
- The media, as opinion formers and ways and means to reach different stakeholders.

NABNet communications activities need to be targeted toward these different groups of stakeholders and meeting their varying needs and expectations.

Chapter 5. Governance and Management

5.1.policy

- The NABNet is an intergovernmental tool supervised by the ministries charged with scientific research, technology and innovation, it services AMCOST plans of action and it is part of its mechanisms.
- The NABNet is governed autonomously by the CC composed by representatives of NEPAD, national R&D organizations, NGOs, regional economic or academical communities, and the development sector.
- The NABNet is one of four networks of centers of excellence in biosciences in Africa being established by NEPAD and then should abide to its rules and regulations and adhere to its principles.
- The NEPAD, as a mediator of nations and stakeholders, shall assist NABNet in mobilizing political and financial support, and in awareness creation with policy and decision-makers in African governments and with international partners.
- The CC of NABNet shall report to NEPAD and to the hierarchies it is dealing with about the outputs and outcomes of its activities.
- The NRC as a center of excellence hosting the NABNet hub will take leadership in the NABNet program implementation at the regional and international level. NRC will also host the secretariat in its premises with no cost and be represented in the CC.
- Other centers of excellence like NABNet nodes shall offer a leadership at national level by gathering local critical competencies and technological background and should be able to champion NABNet initiatives at regional level and provide continental and international links. NABNet offices can be established in NABNet partner organizations represented in the CC.
- Hosting NABNet secretariat and offices should be formalized through MOUs and service thematic or horizontal projects and platforms

5.2.Network Director (ND)

The day-to-day management of NABNet will be the responsibility of a small secretariat that can be located at the NABNet Hub, and led by a ND as a chief executive officer. The post of the network director will be open to all citizens from NA countries not hosting the NABNet hub. The ND will be selected from the applicants and appointed by NEPAD.

The functions of the network director will include:

- Directing the scientific and administrative activities of NABNet under the leadership and guidance of NEPAD/OST.
- Managing, administering and furthering the vision, mission and objectives of NABNet.
- Implementing the decisions of the CC.
- Serving as the secretary to the CC and its sub committees and the SAB.

The specific responsibilities of the ND are to:

- Provide leadership to all components of NABNet;
- Provide day-to-day management of NABNet secretariat, and supervise the activities of NABNet offices elsewhere..
- Liaise with CC Members;
- Enter into NABNet project agreements with participants for the conduct of activities;
- Ensure that NABNet resources are used in accordance with the annual budget and any directions of the CC;
- Monitor and keep the CC informed of activities;
- Prepare reports required by donors and NEPAD/OST;
- Prepare draft Annual Budgets and Business Plans and submit them to the CC for advice and NEPAD for approval;
- Identify new research opportunities and supervise project preparation in coordination with NA teams leaders and in concertation with SAB ;
- Authorize public statements about NABNet in accordance with the CC guidelines;
- Inform NEPAD on progress in activities following a day to day basis and through periodic reports;
- Identify opportunities to link with and coordinate activities with other bioscience centers of excellence, networks, and programs, including those belonging to NEPAD in other regions in Africa;
- Carry out any other duties in coordination with the CC and the SAB
- Prepare and advertise calls, identify partner organizations, receive projects proposals, propose areas for flagship projects and platforms,
- In consultation with SAB, screen, review and select of proposals, award of advertised fellowships, projects and grants for trainings
- Monitor and evaluate fellows and funded projects
- Disburse and administer grants
- Develop Implementation plans
- Manage Knowledge including Web design and development and distribution of other knowledge Management tools
- Liaise under NEPAD/OST with the other NEPAD networks dealing with science and technology in the continent

5.3.Coordination Committee (CC)

The NABNet will have independent governance with a CC.

5.3.1.Functions of and membership in the CC

Since the CC is responsible for the governance and oversight of NABNet, it will:

- Oversee and further the mission and objectives of NABNet.

- Reinforce the ownership of NABNet program by all the parties of the network and strengthen their joint contribution to the regional process
- Oversee the development of strategic plans in the short, medium and longer term.
- Oversee and contribute to the resource mobilization, partnership development, knowledge dissemination and network marketing.
- Oversee periodic reviewing, monitoring and evaluation of the quality and relevance and overall operations of NABNet to ensure compliance with the set benchmarks and objectives.
- Ensure an appropriate balance and synergy between the core, strategic, and other research programs; and between capacity building, thematic research and platforms development
- Ensure compliance with statutory requirements
- Contribute to the identification of the SAB.

The NABNet CC members will include representatives from NEPAD, R&D participant organizations, regional and social economic communities. The members can include experts in the various fields of biosciences. The members selected in the CC will represent the civil society, the scientific community, the decision makers in the NA region, and should include women.

The chairperson of the CC will be elected by the CC members in their first meeting after a new committee board is formed. In the case of continuous absence, severe illness or resignation of the elected chairperson before the completion of his term the CC will elect an other chairperson.

5.3.2.Term of service

The CC members will serve for a period of two years renewable. The chair of the CC shall serve for two years and is elected based on rotation principle.

5.3.3.Operation of the CC

The CC will meet every 6 months for major executive and policy decisions, and discussions dealing with strategic and relevant issues. The expenses of the mission of the CC members will be on the cost of the organizations represented. The CC members may decide to participate in the meeting by communicating via any technological means by which they are able simultaneously to hear each other and to contribute to the decisions. The CC may form subcommittees such as

(a)The programs committee: to supervise thematic activities, competency development and capacity Building. This committee shall meet at least two times per year and will report to the CC at subsequent meetings.

(b)The resource mobilization committee: to supervise fund raising, international collaboration and marketing the network. This committee shall meet at least two times per year and will report to the CC at subsequent meetings.

(c)The partnership committee: to supervise development of collaboration inside the network, information, ownership raising and awareness. This committee shall meet at least two times per year and will report to the CC at subsequent meetings.

5.4.General Assembly (GA)

The NABNet will have access to advice and supervisory through the GA that is the widest body of advocacy to the network. All the organisations parties of this venture are members of the GA that will be held when possible to assess the general progress of the network and adopt long term strategies. The expenses of the mission of the GA members will be on the cost of the organizations represented.

5.5.Consortia and platforms

The R&D activities and capacity building programs in NABNet can be organized through consortia and platforms to be designed by their founding parties and to be managed through NABNet secretariat or offices. Scientific committees, governing boards and any suitable bodies for governance, where the CC will be represented, can be created to deal with the follow up of the activities and management of these consortia and platforms.

5.6.Scientific Advisory Board (SAB)

The CC has access to independent scientific advice through a Scientific Advisory Board (SAB), which will include scientists from the African and the international scientific communities. The NABNet CC will be advised by the SAB on scientific and technical matters relating to the activities, including capacity building and training activities and research projects funded by NABNet.

5.6.1.SAB Functions

The Board members will be responsible for:

- Peer reviewing and selection process of proposals and approving/endorsing for funding.
- Evaluation of progress reports of thematic and horizontal projects and platforms.

5.6.2.NABNet-SAB Membership

The board membership will have a temporary status. A panel of experts identified based on their expertise and recognition in fields relevant to the NABNet activities, will be approved by the NABNet CC. The composition of the panel will be cognizant of geographic and gender dimensions.

5.7.Secretariat Financial Management

NABNet funds will be deposited in NABNet designated account(s) at the NABNet secretariat or NABNet offices. All NABNet accounts, records, and documents will be open for annual auditing.

5.8.Grant soliciting, selection and monitoring

The NABNet strategy is to promote scientific progress in the field of biosciences through sponsoring competitive research and development thematic projects, horizontal projects and platforms, fellowship awards and training programs. Calls for proposals will be announced for and advertised through several venues, (i.e. The NABNet, NEPAD and relevant websites, circulars to potential grant applying organizations, media, ...etc).

After selection of the project, a contract will be formulated between the research team leaders or the consortia coordinators, and the ND. Monitoring and evaluation of the project will be the responsibility of NABNet CC and ND with the assistance of the NABNet SAB. Evaluation criteria will be established

and used. Other forms with shorter application forms and procedures could be adopted for fellowship and training course applications.

5.9.Contractual Arrangements

The NABNet secretariat will undertake the responsibility of formulating contractual arrangements for a variety of reasons. Contractual agreements will be done with the grant PIs, consortium coordinator, training program PIs, fellowship awardees and respective organizations. Other venues will include specific contractual agreements between NABNet or NEPAD/OST and funding agencies and/or international organizations or corporations.

Chapter 6. Communication, Marketing and Financing

6.1. Communication Marketing and Public Awareness

Perceptions about the benefits and risks of scientific research, technological innovation and economic development have become a major aspect of international discussion and dialog. Moreover developing supranational networks to deal with these activities at regional level deserves special attention to design these networks for their relevant niches. While investors focus on the benefits of new and existing structures and technologies, others worry about their risks. It is expected that NABNet initiative will face the same traditional challenges that any network and its R&D program does. The challenges cast doubts on the pivotal role of scientific research in society development when programs are to be conceived, implemented and managed regionally. These include the uncertainty of decision makers, the skepticism of funding bodies and the lack of pertinent information among the general public and the very reduced integration in a NAn regional economical and societal program. This situation imposes tremendous responsibilities on the NABNet initiative. It is therefore foreseen that it will exert communication, marketing and dissemination efforts in more than one venue.

The role of public discussion on both the practicalities and valuations of the regional network establishment and knowledge production is crucial to the acknowledgment of the central demand-led regional research and economy development. Stakeholder participation in the various stages of research and economy development of then NABNet regional program can provide such a forum for public discussion, enabling not just a needs-based research agenda that brings together expertise from various disciplines and spheres. It will also ensure that the knowledge generated is accessible to stakeholders and is shaped by their needs and interventions. Such a process of knowledge generation is not just an alternative mean of development, but is development itself, as knowledge generation and empowerment go hand-in-hand. In order to leash a process like this it is necessary to develop a new culture of research and development.

Moreover, one of the assumptions underlying demand-led regional research and development is that agenda setting and prioritization through stakeholder participation will reflect the societal need for knowledge. Therefore, any capacity that is built up should ultimately enable the researchers and project holders to understand and interpret what indeed is demand-led regional research and development. Such a judicious, discretionary capacity in a development context cannot exist separate from an ethical stance. The local research capability (like NABNet) can facilitate public debate among researchers, economists, economic project holders, non-researchers, policymakers and other end users, highlighting the multiple interests and positions of power in society.

With an understanding of beneficiary and investor needs and expectations, decisions about meeting those needs and expectations can be taken to ensure a coherent marketing plan that is consistent with the Vision and Mission of the NABNet. Relating to potential investors and other stakeholders amongst African governments, and regional and ontinental organizations and economic communities, including NEPAD and the African Union, communications need to be targeted toward describing how NABNet contributes to meeting the needs and expectations of the particular countries and NAn region, and the overall development goals of Africa's leaders, potential investors, economic project holders, nationally, regionally and continentally. In regard to communicating with the science funding agencies, in Africa and globally, the communications activities need to be focused on NABNet ability to facilitate and deliver high quality and innovative science in Africa at the regional scale. Communicating with the primary beneficiaries and the scientific research teams will stress on issues of networking, openness, research quality and applicability.

6.2. Financial strategy

NABNet depends in its starting phase on the seed funds provided by CIDA to NEPAD for the establishment of the four African regional networks of NEPAD/ABI. NABNet intends financing its projects based on the funds to be collected from international or regional donors, National governments, and drained from its own activities. The commitment of the NA organizations adhering to the consortia of NABNet is by itself a support because of their contribution of human resources, basic expenses and costs. The belonging of these organizations to NABNet reinforces the policies of heading authorities targeting the creation of a NAn tissue of research and development structures. Then, it is expected that ministries dealing with research and technology in the region, and National governments and regional communities would dedicate to NABNet in their budget, supportive lines. The directive of the financial strategy of NABNet will depend on the available resources, on the progress level in implementing the overall strategy. The budget planning will depend also on the policy of the donors. The proposed budget (Table 1) will put more stress during the first phase on strengthening the networking, capacity building for human resources development, governance and management tools. In this phase a follow up with the initiated ongoing projects will be continued. In the second phase which is the development phase R&D and demonstration as well as dissemination and information will be increased with more dedication to projects having economic impact and capacity building

The items into which budget can be scheduled and the overall distribution among items varies between years and phases. The projects can be divided into those characterised by a major research component, a major capacity building component or by a major innovation and demonstration component. The distribution of funds will depend also on the nature of the thematic or horizontal project and the platform to be developed. Minimum funds will be planned at the beginning and after that, financing will depend on the progress assessed by the evaluation committees and available funds. The consortia to be supported are those having better results and sufficient skill, technical resources and competences, necessary to undertake their tasks; and those having support from their own national organizations.

The proposed budget describes below the major financing process including: (i) Governance and management (secretariat activities and related costs, CC, SAB, workshops for management teams), (ii) Capacity building (technical resources, competency development and awareness and ownership), (iii) Research and development and demonstration (competitive research grant programs, technology transfer and demonstrations...). As the NABNet and its programs get mature, it is expected that other models will be adopted. The budget suggested here for a 6 years period is calculated to allow the minimum sustainable operationalization of the NABNet program.

Table 1: The NABNet indicative budget for the years 2010-2015 (US\$ x 1000)

Year Item	First phase: starting phase (suite)	Second phase: development phase					Tot	%	%	
	2010	2011	2012	2013	2014	2015				
Governance and management								10	10, governance and management	
Competency development								10	35, Capacity building	
Technological Resources								20		
Awareness and Ownership								5		
Res and Technol devel/Innov (R&D)								20	50, R and D and Demonstration	
Demonstration								25		
Techology transfer								5		
Dissemination and Information								5	5, dissemination and information	
Tot	1000									
Sub Tot	1000	9000								
Grand total		10000							100	100