



REPUBLIC OF BURUNDI
Ministry of High Education and Scientific Research

BURUNDI

NATIONAL POLICY FOR SCIENTIFIC RESEARCH AND TECHNOLOGICAL INNOVATION

BUJUMBURA, June 2011

ACRONYMS AND ABBREVIATIONS

- AGROBIOTECH:** Agro-Biotechnology
- ANSTI:** African Network for Scientific and Technological Institute
- ATRAPRABU:** Association of Burundi Traditional Medical Practitioners
- ADB** : African Development Bank
- BBES** : Office for Study Scholarships and Internships
- CAM** : Agro-Pastoral Center of Mutwenzi
- CEBEA** : Burundi Research Center for Alternative Energies
- CELAB** : Burundi Language Research Center
- CENAP** : National Center for Conflict Warning and Prevention
- CEPGL:** Economic Community for the Great Lakes Countries
- CERADER** : Agronomic and Rural Development Research Center
- CHUK** : Kamenge University Hospital
- CNCA:** National Commission for Aid Coordination
- CNES** : High Education National Commission
- CNR** : National HIV/AIDS Reference Center
- CNSTR:** National Commission for Science, Technology and Research
- CNTA** : National Center for Food Technologies
- CNU:** National Commission for UNESCO
- CRUPHAMET:** University Research Center on Codex and Traditional Medicine
- CSLP** : Strategic Framework for Growth and Fight Against Poverty
- DEA** : « Diplôme d'Etudes Approfondies »
- DEPSP** : Directorate of post-Secondary Vocational Education
- DES** : Directorate of High Education
- DESS** : « Diplôme d'Etudes Supérieures Spécialisées »
- DPSTI** : Directorate for the Promotion of Science, Technology and Innovation

DRS : Directorate of Scientific Research

EAC : East African Community

ENA : National School of Administration

ENS : Teacher Training High School

ESCO : High School of Commerce

FCE : Education Common Fund

IDEC : Institute of Economic Development

IGEBU : Burundi Geographic Institute

INASE : National Institute of Space Science

INEAC: National Institute of Agronomic Studies in Belgian Congo

INECN: National Institute of Environment and Nature Conservation

INSP : National Institute of Public Health

IRAZ : Institute of Agronomic and Zootechnical Researches

ISA : High Institute of Agriculture

ISABU : Institute of Agronomy in Burundi

ISAR : Institute of Agronomy in Rwanda

ISCO : High Institute of Commerce

ISTAU: High Institute of Technicians of Land Management and Urban Planning

ISTEEBU: Institute of Statistics and Economic Studies in Burundi

IUSE : University Institute of Education Science

LACA : Laboratory for Chemical Control and Analysis

LMD : Licence Master Doctorate

LNBT : National Laboratory of Construction and Public Works

MINAGRIE : Ministry of Agriculture and Livestock

NEPAD: New Partnership for African Development

MDG : Millennium Development Goals

WIPO : World Intellectual Property Organization

NGO : Non Governmental Organization

UN : United Nations

CAP : Consolidated Action Plan

PAGE : Support Programme for Economic Management

PARES : Project of Support to High Education

PDDAA : Detailed Program of Agriculture Development in Africa

GDP : Gross Domestic Product

SME : Small and Medium Enterprises

SMI : Small and Medium Industries

PNRSIT : National Policy for Scientific Research and Technological Innovation

PSSTR : Strategic Plan for Science, Technology and Research

R/D : Research / Development

REGIDESO: Utility for Water and Power Production

SETIC: Executive Secretary of ICT

SHS: Social and Human Sciences

SIG: Geographic Information System

STI: Science, Technology and Innovation

STR: Science, Technology and Research

ICTs: Information and Communication Technologies

TWAS: Third World Academy of Sciences

AU : African Union

UB: University of Burundi

UNECA : United Nations Economic Commission for Africa

UNESCO : United Nations Educational, Scientific and Cultural Organization

UNg : University of Ngozi

UOB : Official University of Bujumbura

HIV/AIDS : Human Immuno-deficiency Virus /Acquired Immuno-Deficiency Syndrom

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I. PREAMBLE

The design of a National Policy of Scientific Research and Technological Innovation is very important for the future of the nation. It is first of all the national responsibility whose rigorous care taking is testimony of the people's will to put under control one of the major elements of its development.

The main concern of the Burundian Government vis-à-vis the scientific research and technological development falls under an approach of integrated development of the Burundian society. For an integrated and coherent development, the policy of scientific and technological development must match with other major sectors of the collective life: social, cultural and economic development.

The key for socio-economic development is in the context of culture of science and technology oriented towards social and economic impacts and industrialization. We can then privilege the emergence of a culture of « entrepreneurship » translatable into concrete attitudes and actions and highlighting the innovation and invention in a bid to reach a better production.

In the context of integrated approach, the development of science and technology as basis for socio-economic development has got the mandate to bring in endogenous, adequate and integrated solutions on issues and challenges of the socio-economic development in Burundi.

This draft policy has been drafted by members of a committee (see the list in appendix) established by the Minister in charge of High Education and Scientific Research. This is an outcome of an onsite focus group made of men and women whose mandate was to come up with priorities likely to promote the scientific research and technological development.

This policy document is subdivided into three parts: the first part highlights the situation of the sector of Science, Technology and Research in Burundi, its constraints and tools. It also evokes the regional aspect by positioning the National Policy of the Scientific Research and Technological Innovation (PNRSIT) vis-à-vis the regional strategies. The second one highlights the elements of reflection and the ideas on the priority areas likely to contribute to resolve the challenges of the sector. The third and last part evokes the structures of implementation, monitoring and evaluation of the PNRSIT.

Finally, the document was presented and validated in a workshop organized in the premises of CELAB on May 26, 2011 under the auspices of His Excellency the Second Deputy President of the Republic of Burundi.

II. EXECUTIVE SUMMARY

The sector of Science, Technology and Research did not manage to capture the attention of the Burundi decision makers' since the independence up to recently. The necessity of promoting the sector, so that it becomes the very engine of economic and social development, is an idea dated since only a few years ago.

It is only in January 2009 that the first national workshop on Science, Technology and Research was held in order to try to define the role of Science, Technology and Research for a sustainable development of our country.

Since then, a number of activities were undertaken in a bid to set up a national policy for scientific research and technological innovation. Among them, we can notably mention the workshop/sub-regional exposure on Science, Technology and Research held in November 2009 and the drafting in 2010 of the strategic plan for Science, Technology and Research by a committee appointed for that end and supported by two consultants.

In January 2011, a committee in charge of designing the summary draft national policy of scientific research and technological innovation was appointed by the Minister of High Education and Scientific Research. In this respect, the committee first dealt with the collection and analysis of the available documents before drafting the draft policy document.

The National Policy of Scientific Research and Technological Innovation covers the following priority areas:

1. Agri-Food Technology ;
2. Medical Science ;
3. Energy, Mines and Transport ;
4. Water, Desertification and Environment ;
5. Biotechnology and Indigenous Knowledge ;
6. Materials, Engineering and Industries Sciences;
7. Information and Communication Technologies, Space and Mathematical Sciences.
8. Social and Human Sciences;
9. Implementing Agency.

In the first eight areas, we identify the challenges, goals and priority programs for the development of Science, Technology, Research and Innovation. The first area is defined as a cross-cutting area and concerns the aspects related to funding, dissemination structures and give a scope of the legal framework for the implementation of the National Policy for Scientific Research and Technological Innovation.

Finally, the culture will remain a cross-cutting issue in any research program to allow particularly the beneficiaries to capitalize the outcomes.

III. GENERAL INTRODUCTION

After the African countries got independent, the ideology which was prevailing and communicated through literatures and human sciences stipulated that the scientific and technological knowledge resulted from a halogenous culture, the one of the colonizer and could not firmly establish itself among Africans at the expense of their own cultures. This constituted, since long ago, a real obstacle for the development of Science and Technology over the continent. In a world with an increasing competition among businesses, nations, continents, research and innovation constitute the foundation of progress/growth.

In fact, the development of Science and Technology allows the promotion of Small and Medium Enterprises, which, through research and innovation, evolves towards highly competitive enterprises on the local, regional and global markets. The long term analysis of development in Western Europe and South-Eastern Asia is an eloquent illustration.

Through the promotion of enterprises, the progress of Science and Technology leads to job creation in the secondary sector and thus allows decongestion of the primary sector. In Western Europe, the farmers' population, which was then higher than 90% similar to ours, is now estimated at about 3%. The rest is mainly absorbed by the industrial sector.

In Burundi, inspired from experiences of Western Europe and South-Eastern Asia, our concern is to set up a new National Policy for Scientific Research and Technological Innovation which is likely to kick start the development of the sector, to serve as engine for the Small and Medium Enterprises' promotion, job creation and diversification, and decongestion of the primary sector.

Together with other projected development policies in our country, as the globalization, reforms in the primary, secondary and high education, the reforms of the agriculture sector, etc..., this policy constitutes one of the key tools to eradicate poverty and achieve sustainable development.

The Burundi development goals, defined in the Strategic Framework for Growth and Fight Against Poverty (CSLP of 2006-2015), require support from Science, Technology and Innovation essentially for 3 over the 4 CSLP strategic axes, notably:

- Axis 2: The development of the production sector (with the contribution of agriculture and livestock, energy, transportation networks, equipment, tourism and services, etc.)
- Axis 3: The development of the human capital (with education and training, health, access to drinking water, etc.);
- Axis 4: The fight against HIV/AIDS.

Science, Technology, Research and Innovation are going to contribute for the improvement of the living conditions of the population through the achievement of those goals. They intervene to solve the real issues faced by the communities and identified in the different sectors of the social and economic life of our country.

The development science, technology, research and innovation will be achieved among policy makers, the scientific world, economic operators and grassroots communities, with the support of donors. This close collaboration among the different stakeholders of the sector will urge the researcher to be at the service of the producer in order to allow him addressing the daily encountered issues. It will therefore take the producer up to a position where he consults the researcher in order to come up with better solutions to address the issues he is faced with.

IV. STATUS OF SCIENCE, TECHNOLOGY AND RESEARCH IN BURUNDI

IV.1. Historic overview of the development of Science, Technology and Research

In Burundi, scientific researches actually started with the Belgian colonization and essentially covered the agronomic field. These activities targeted the increase of food production and promotion of export crops, notably coffee and tea. Scientific institutions and agencies for agronomic research were established for Ruanda-Urundi with a double mandate of research and agriculture production. Established in 1934, The INEAC (National Institute for Agronomic Research in Belgian Congo) was the first institute to expand its research activities in Ruanda-Urundi.

In 1958, the Official University of Belgian Congo and Ruanda-Urundi established in Astrida initiated a Faculty of Agronomic Science. In 1960, the Faculty Institute of Jewish Fathers launched its activities and hosted the Faculty of Philosophy and Arts, the Section of Law and Faculty of Economic Sciences.

After independence, the Burundian Government began to think about its national potential in terms of research through a set of bilateral and multilateral cooperation initiatives with other countries notably France, Germany and regional and international institutions, as well. In 1960, the University of Belgian Congo and Ruanda-Urundi was transformed into an Agronomic Institute of Ruanda-Urundi and transferred in Bujumbura. All the same, the Faculties of Philosophy, Arts and Economic Sciences were integrated in the Bujumbura Official University (UOB), which further became University of Burundi (UB) in 1977. Concerning the INEAC, it gathered in 1962, beside the Yangambi Research Center, 32 stations, plantations or research trial centers distributed in 8 geographic sectors covering the whole of Congo, Burundi and Rwanda.

After Independence, the INEAC was split in 2 research institutions: the ISABU (Burundi Institute of Agronomic Science) and the ISAR (Rwanda Institute of Agronomic Science). To open doors for transboundary perspectives, the Institute of Agronomic and Zootechnical Research (IRAZ) was created in 1979 in the context of the Economic Community for the Great Lakes Countries (CEPGL).

In 1964, the Official University of Burundi (UOB) was created while the High Teacher Training School (ENS) was created in 1965. The latter was intended to train teachers of the junior cycle of the secondary education. The ENS changed its naming in 1973 and became « University Institute for Education Science (IUSE) ». The Department of Management Administration was also introduced in 1972 with the creation of the « National School of Administration » which was merged with the Faculty Economic and Administration Science in 1975 which had just been created. On June 29, 1977, the UOB and IUSE merged and became the current University of Burundi (UB). The High Education Institutions (High Institute for Technicians in Land Management and Urban Planning, ISTAU; High Institute of Agriculture

(ISA) ; School of Journalism, High School of Commerce, (ESCO) were also integrated in the UB the same year.

The history of research in Burundi shows that this activity is now well established in the country through High Education Institutions (public and private universities), research institutions and centers. In fact, the scientific and technological fields were initiated and developed since long in special fields and notably in Agronomic, Engineering, Electro mechanics, Mechanics, Physics, Chemistry, Biology sciences, etc.

Despite this national scientific and technological potential, the impact of the development of the STR in Burundi on the improvement of the living conditions of the population is not visible. This situation is, inter alia, related to the crises and cyclical wars which seriously hampered the country and did not preserve research institutions. It is also due to the lack of close collaboration between the sector of STR (Scientific and Research people) and the production sectors such as Agriculture and Industry (user sectors of the results from the development of STR).

Today, beside the high education assured by the University of Burundi, there is a private high education: over 27 high education institutions, 21 of them are private, that is 77.7%. The existence of a large number of private universities in Burundi does not necessarily imply higher performance of the private sector than the one of the public sector in this area. In fact, all those universities operate thanks to the services provided by the lecturers from the University of Burundi.

Despite the importance of research in the private high education, the collected data show that the private universities in Burundi are no longer carrying out research; over 21 private high education institutions, only the University of Ngozi hosts a research center, the CERADER is unfortunately less operational due to lack of material and financial means.

At ISABU, the research conducted during the last five years was in relation with the following areas:

- Variety improvement of industrial crops (coffee, tea, macadamia);
- Variety improvement of leguminosae (bean, soya bean, peanuts, pigeon pea);
- Variety improvement of grain crops (rice, maize, wheat, sorghum);
- Variety improvement of root and tuber crops (potato, sweet potato, cassava, malanga);
- Variety improvement of fruits and vegetables;
- Crop protection: entomology, phytopathology, virology, nematology, phytosanitary stock ;
- Seed production and phyto-genetic resources: pre-basis, seed quality control, germoplasmic conservation;
- Stock production: Genetics improvement, Zootechnics, Stock health, Agrostology;
- Conservative management of water and soils: soil fertility, sylviculture, agroforestry, erosion pedology, mapping;

- Rural socio-economy;
- Technology transfer in rural area.

IV.2. Human resources

Since 1980, the Government of Burundi has established a trainers' training policy which benefited from a lot of support from bilateral partnership. A particular emphasis was put on the training of lecturers of the University of Burundi. Between 1987 and 1993, 163 assistant lecturers of the University of Burundi were sent abroad for postgraduate studies, especially in Canada, France and Belgium. Over that total of 163, 83 did not return back, that is a loss of 50%.

During the Academic Year of 2008-2009, the University of Burundi counted 132 PhD holder lecturers among whom 88 full lecturers, 26 Associate professors and 18 ordinary professors against 189 during the Academic Year of 1985-1986, i.e., a decrease of 30%. While analyzing the evolution of the total number of lecturers (PhD holder or non PhD holder), the trend remains the same. In fact, in 1985, the UB counted a total of 371 lecturers against 333 lecturers in 2009, i.e., a decrease of more than 10%; the more crucial academic years were 1995-1996 (230 lecturers) and 2001-2002 (238 lecturers) where the decreases have been respectively of 38% and 36%.

The number of PhD holder lecturers repeatedly decreased over the whole period under analysis. The statistics indicate that the problem of departures mainly lies among the higher grades whose number decreases, in 1985-1986 to 2005-2006, from 189 to 116, i.e., a decrease of 38.6% while the grades of assistant lecturers (engineering and bachelors) whose number tends to take an ascending trend increasing up from 124 in 2002-2003 to 173 in 2005-2006, i.e., an increase of 28.3%.

This situation referred to as internal and external « **brain drain**» does not favor the evolution of the research activities in Burundi in general and at the UB in particular. First, the « **brain drain**» is internal as the private universities are too dependent (60 to 90% of dependence) on the UB lecturers. The lecturers, although full time employed at the UB, are busy doing part time jobs in private universities with a higher workload which overpasses the one prescribed at the UB. Then, the « **brain drain**» is external because the departure of UB lecturers towards Rwanda universities has caused a big loss at UB. According to a study conducted by MIDENDE (2008) (quoted by Kakana *et al.*, 2010), during the Academic Year of 2005-2006, 119 PhD holder lecturers were present at UB, 186 assistant lecturers were sent for postgraduate studies but did not return back and 35 Burundian lecturers were employed

on a full time basis in Rwanda universities. For the Academic Year of 2009-2010, the number of full time employed lecturers at UB (all faculties and institutes put together) was 295 and among whom 44 were women (UB, 2011).

The other indicator of the STR activities' development at UB is the poor level of students' supervision by lecturers, i.e., the students/lecturers ratio.

Finally, the organization of postgraduate studies at the University of Burundi deserves particular attention for the institutional capacity building in terms of STR. At the University of Burundi, only the Faculties of Science, Medicine, Arts and Human Sciences, and Faculty of Law still organize specialized trainings leading to higher level grades.

In 2010, the ISABU counted 198 researchers and technicians distributed among commissioned executives (4), qualified researchers (76), A2 agronomic and veterinary technicians (64) and A3 agronomic technicians (54) (PARES, 2010).

IV.3. Material Resources

The material resources in diverse STR centers and institutions are diversified both in quantity and quality. These resources especially concern plant, property and equipment (land and buildings, office equipment, laboratory and training centers' equipment, diverse library documents, audio-visual and other equipments of ICTs).

Some High Education institutions, and other research institutions and centers do not own lands, buildings and equipments and then must rent them. In addition, even where they exist, infrastructures, furniture, equipments and documents are in extremely poor condition. The training, practice and research premises are so small. Some lecturers and researchers do not have offices or else several of them are obliged to share the same room.

We still have a critical lack of IT equipments and other ICT materials required for students, researchers, lecturers, administration staff and supporting staff members. The libraries do not have recently published books and other didactic materials.

IV.4. Research Funding

Burundi is classified among the poorest countries. Due to the civil war, the GDP per capita decreased from 160 US\$ in 1993 to 100 US\$.

Similar to most African countries, Burundi allocates a very small portion of its GDP for scientific and technical activities. Although the contribution is already poor for the UB, it has been split into three between 1992 (Amount allocated: BIF 14 586 317) and 1995 (Amount allocated: BIF 3 881 980).

However, the public funding has slightly resumed, the last years, in some strategic sectors notably ISABU. The donors slightly resume their contributions but the funding rates are still low compared to the situation before the war.

The government budget allocated in 2008 for research activities with an amount of US\$ 2 078 000 over the total budget of US\$ 473 000 000 represents 0.44 %.

Three types of projects are funded in Burundi: projects designed abroad but implemented in Burundi, inter-university projects, local projects designed by the nationals.

The general budget of the University of Burundi originates from five funding sources:

- Annual public subsidies mentioned in the budget for the Ministry of High Education and Scientific Research;
- Financial supports from bilateral and multilateral cooperation;
- Donations and gifts which must be approved by the Ministry in charge, upon notice to the Board of Directors ;
- Cash inflows collected from works, researches and sale of products;
- Fees paid by the students.

Beside the public subsidies, the other item lines are of a less significant importance and even for some (cooperation, donations and gifts, cash inflows) are hit or miss.

Concerning the other universities, the budget allocated for research originates from:

- Self financed funds (registration fees, sale of diverse products, cash inflows from research studies and works) ;
- Diverse internal and external supports in form of donations and gifts, twinning, etc...
- Bank loans and others.

Concerning diverse research centers and institutions, the funds used are made of:

- Public subsidies for public institutions
- Equity for private institutions
- Self financed fund from the sale of products and services
- Donations and diverse gifts.

The analysis of the budgets allotted for research indicates that it is a context of both a value erosion of the public subsidies and a significant freezing of external funding. Consequently, it is an austerity budget which results in downsizing/writing down or even abandoning the item lines considered as « with no priority » (notably research) by the Government.

These last days, the Burundian Government is trying to make profit of the NEPAD development initiatives. In the framework of the detailed development program for the African Agriculture (PDDAA/NEPAD), the MINAGRIE (Ministry of Agriculture and Livestock) has notably designed a proposal for the promotion of Agriculture and Agri-Food Technologies.

V. VISION AND GOALS FOR THE NEW PNRSIT

V.1 Vision

The National Policy for Scientific Research and Technological Innovation (PNRSIT) intends to contribute for the improvement of the quality of the population living conditions, the economic growth and improvement of the population's knowledge in Science and Technology. It is designed in a way to meet the needs of the country in terms of poverty reduction and sustainable development.

One of the consequences expected from the PNRSIT is notably the transformation of the rural area in order to make of it an area with good knowledge of STR. This will allow the communities to no longer live only on agriculture but rather consider undertaking other income generating activities in a more sustainable manner. This will create a national dynamics of economic and social growth both in Burundi and in the region. No country in the world has therefore managed to develop itself without using science, technology and innovation.

No matter how short, medium or long term it might be, the establishment and success of the strategic plan for Science, Technology and Research (PSSTR) is necessarily doomed to pass through knowledge acquisition, creation or transfer as well as the culture of innovation.

V.2 Goals

The main goal of the PNRSIT is to contribute for the fair, equitable and sustainable development of the Burundians. The PNRSIT falls under the Strategic Framework for Growth and Fight Against Poverty (CSLP) and intends to address numerous concerns of the Government of Burundi formulated in its sector based policies and development programs. It intends to incorporate those policies in the socio-economic development of Burundi as factors of creativity, productivity, job creation and welfare.

It is a question of incorporating Science, Technology, Scientific Research and Innovation in a coherent national structure and put the STR at the service of the development of Burundi.

More specifically, the PNRSIT intends to:

- assure coordination of a research centered on the development of Burundi by integrating all institutions and centers involved in the STR, in the same dynamics;
- Value the available tools and cover up the existing gaps in all the key areas in order to promote STR in Burundi;
- Focusing STR on the resolution of current and future major issues faced by the Burundian population;
- Making of STR a development tool for the country and local communities.

To achieve the intended goals, the following principles must guide the activities in the PNRSIT:

- Encourage and support the Burundian researchers to identify the themes, needs and priorities which must retain their attention in terms of STR based research;
- Support the research intended for capacity building which helps to deal with the main issues related to the STR policies in Burundi (seeking to respond to the priorities and national research proposal and granting research funds to institutions) ;
- Establish horizontal links among all areas of the Government program in general and the Ministry of High Education and Scientific Research in particular in the fields of intervention retained by the PNRSIT ;
- Adopt an attitude of receptiveness vis-à-vis all perspectives and all view points from actors and partners of PNRSIT ;
- Ensure systematic integration of the gender dimension (taking into account the gender dimension) in all the areas of research of PNRSIT ;
- Facilitate and privilege national, regional and international partnerships according to the goals of PNRSIT.

VI. PARTS OF THE PNRSIT IN THE REGIONAL STRATEGIES

The National Policy for Scientific Research and Technology Innovation must be designed in such a way that it can be implemented through centers or institutions that can operate in a network at the national level.

These networks must put together their intellectual, infrastructural and financial resources to avoid working in isolation, which would otherwise lead to mismanagement of the available means.

The main goal targeted by this new working vision of research centers and bodies is to make profit of the synergy of information sharing and share outcomes and good practices.

These national networks must integrate the regional and international networks of a similar nature and working objective.

To achieve a group work in a coordinated manner, the working centers and bodies must combine a set of principles notably:

- commit to work together;
- engage some of their resources to achieve and implement common programs and projects;
- recognizing that no institution can unilaterally generate and have knowledge and information required to implement the programs and projects;
- commit to provide financial resources and technical capacities required at the national, regional and international levels.

Besides, the established networks will have to set in place the strategies intended to:

- Easily access infrastructures, laboratories, libraries and other tools allowing to undertake large scale researches;
- Efficiently contribute for the socio-economic development and poverty reduction;
- Promote information sharing on the findings of the works and good practices;
- Create a new scientific dynamics.

We must also implement adequate strategies so that the national, regional and international partners are sensitized and involved in:

- The organization of workshops and seminars to create a framework for consultation, definition of modules and adequate teaching programs ;
- The establishment of a network of partners during the implementation of Science, Technology and Research related policies;
- The public and policy makers' awareness rising on the benefits of Science, Technology and Research in the economic transformation and sustainable development.

Finally, the parts of PNRSIT must target the capacity building in terms of regional and international cooperation, the promotion of good practice sharing in STR cooperation and creation of a common framework of STR cooperation.

VII. PRIORITIES OF SHORT AND MEDIUM TERM INTERVENTION

The area of Science, Technology and Research is faced with a number of challenges hindering its full development:

- Low level of investment in the area and low rate of public funding;
- Insufficiency of human, material and financial resources to implement defined programs;
- Lack, in the high education, of several fields although very important for the socio-economic life of the country;
- Lack of professionalization of education at all levels and especially at the high education level;
- Very limited number of Master's, DEA, DESS training programs and lack of PhD training;
- Lack of a clear policy to orient the research activities in a legal and institutional coordination framework;
- Lack of institutional structure.

However, the country has got some tools that can be used to develop the sector, notably:

- Membership of Burundi in different regional and international organizations;
- The visible will of the Government to make of Science, Technology and Research a tool for the rural development;
- Knowledge of on-ground realities and the status of needs;
- Availability of the C.S.L.P. and sector based policies of ministries.
- The existence of some scientific and training institutions (some research centers and universities) ;
- The number of researchers who have acquired intensive skills in their areas of expertise.

Besides, some solutions have already been considered in order to address some of the challenges mentioned above for which we still wait for necessary means for their effective implementation, notably:

- Creating a Central campus for Science, Technology and Research ;
- Creating a Campus for agri-food technology gathering faculties, centers and institutes dealing with agri-food area on the site of Zege (Gitega, central part of the country) ;

- Creating Vocational High Institutes with fields that meet the priority needs of the Burundian community.

The Committee in charge of designing the summary project of PNRSIT has identified eight intervention priority areas and an institutional implementation framework. The activities of these areas will directly respond to the Millennium Development Goals retained by the International Community to fight against poverty in the world. The schedule here below indicates those areas and highlights, though in a non exhaustive manner, centers and institutes within which the relevant activities are undertaken.

Schedule 1 : Intervention priority areas vis-à-vis research centers and MDGs

	Intervention priority areas	Centers and institutes (existing or to be created)	Links with MDGs
1	AGRI-FOOD TECHNOLOGY	CNTA, ISABU, UB, CAM (MUTWENZI), UNg, IRAZ	MDG1, 3
2	MEDICAL SCIENCE	CHUK, FAC OF MEDICINE (UB), INSP, CRUPHMET, CNR	MDG4, 5, 6
3	ENERGY, MINES AND TRANSPORT	REGIDESO, LACA, LNBTP, CEBEA, WATEL	MDG1, 7
4	WATER, DESERTIFICATION, ENVIRONMENT	INECN, IGEBU, UB,	MDG1, 7
5	BIOTECHNOLOGY, INDIGENOUS KNOWLEDGE	UB, AGROBIOTECH, ISABU, CNTA, ATRAPRABU	MDG1, 3, 6
6	MATERIALS, ENGINEERING AND INDUSTRIES SCIENCES	UB, LNBTP, ENS	MDG1, 3
7	INFORMATION AND COMMUNICATION TECHNOLOGY, TECHNOLOGY OF THE SPACE SCIENCE, MATHEMATICAL SCIENCE	SIG*, ISTEEBU, UB, SETIC	MDG1, 4, 5, 6, 7
8	SOCIAL AND HUMAN SCIENCES	UB, ENS, CENAP, MIN. CULTURE, ISTEEBU, IDEC, CERP en STAPS*	MDG2, 3
9	INSTITUTIONAL IMPLEMENTATION FRAMEWORK	CNU, CNCA, PAGE, CNSTRI*	MDG8

* : Center or research institute to be created

AREA 1 : AGRI-FOOD TECHNOLOGY

Challenges

- Significant post-harvest losses;
- Climate changes ;
- Strong demographic pressure on cultivated croplands;
- Continuous degradation of the cultivated croplands;
- Rain wash ;
- Very low degree of agro-pastoral and halieutic products processing;
- Difficulties of access to agriculture loans;
- Low level of training and information;
- Low monetary income of the population;
- Lack of equipment and storage material and agro-pastoral and halieutic products processing;
- Lack or poor quality of storage and processing infrastructures;
- Poor control of post harvest technologies;
- Insufficiency of technology innovations and adequate production systems;
- Insufficiency of processing and storage technologies of agriculture, fish farming and livestock products;
- Insufficiency of laboratories and qualified human resources for the quality control of food and export products.

Goals

- Strengthen processing and storage of each subsector's products;
- Allow consumers to regularly access food products;
- Increase the market value of products and increase the producers' income;
- Reduce the post harvest losses to the strict minimum;
- Strengthen the capacities of beneficiaries;
- Support the creation of food product storage community centers in the production areas;
- Promote food and stock production;
- Strengthen food security;

Priority programs, projects and activities

- *Promotion of Technologies to reduce post harvest losses*
 - Establish a platform for information sharing on adequate technologies;
 - Make a list of new Technologies and practices used to reduce post harvest losses;
 - Stimulate new research and technological innovation; and
 - Encourage multidisciplinary research networks and technicians to work on initiatives of food product processing technologies;

- *Promotion of irrigation to produce the whole year;*
 - Construction of dams on existing rivers;
 - Rainfalls collection;
 - Marshland management

- *Strengthening research and dissemination of best anti-erosion methods;*
 - Construction of radical terraces;
 - Contour lines and gradual terraces management

- *Promotion of farm mechanization ;*
 - Reintroduction of animal draught power
 - Use of tractors for vast areas

- *Promotion of fishery, aquaculture and bee farming;*
 - Promote good fishing practices
 - Diversify aquacultural organizations by including molluscan shellfish, Rana species (frogs), crocodiles, shrimps, algae, etc.
 - Diversifying fish species to cultivate (adapted to cooler high altitude regions, such as Cyprinus carpio (carp));
 - Create bee farming production and processing

- *Promotion of off-land crops and other non-traditional crops*
 - Conducting researches on the possibilities of livestock and insect and Agaricaceae (edible mushrooms) farming;
 - Promoting non-traditional crop farming (patchouli, Tamarindus indica (tamarind), Macadamia ternifolia (macadamia); etc.)

- *Promotion of agro-sylvo-pastoral integration*
 - Establish a system of monitoring, control and fight against epidemics and diseases of pet animals;
 - Establish a system of monitoring, control and fight against diseases and crop pests;
 - Promote heavy and light livestock good species breeding to improve stock production and fertilization of cultivated croplands;
 - Promote and disseminate the integrated fertilization of agriculture productions;
 - Encourage the production and use of highly productive and good quality seeds;

- *Promotion of agri-food processing*
 - Revive the milk sector (dairy, cheese, cannery, ...)
 - Promote diverse agriculture product processing and storage

AREA 2: MEDICAL SCIENCE

Challenges

- Less developed research in Medical Science;
- Non-harmonized training programs;
- Lack of adequate infrastructures, equipments and structures to promote research in Traditional Medicine;
- Misconception of the Traditional Medicine and traditional medical practitioners by the public and policy makers;
- Insufficiency of general medical practitioners and medical specialists, researchers and technicians;
- Insufficiency of vocational training institutes in Medical Science;
- Insufficiency of laboratories and equipment for the promotion of research in Modern Medicine;
- Scarcity of medical specialist training programs;
- Poor collaboration with the sub-regional, regional and international Medical Science training institutions;
- Lack of strategy to develop training programs adapted for the needs of the Burundi Community ;
- Very poor access to primary healthcares;
- Persistency of diseases particularly in the rural area;
- Still high infant mortality rate ;
- Insufficiency of general HIV/AIDS infection caretaking.

Goals

- Find solutions to the main health issues of the population by particularly highlighting the diseases which cause the worst damage: HIV/AIDS, Malaria and others.
- Improve life expectancy

Priority programs, projects and activities

- *Capacity building in terms of public health*
 - o Design national projects dealing with very advanced trainings, research, fundamental development applied in the basic Medical area, clinical medicine and other health sciences;

- Establish and equip vocational Medical science training institutes
 - Harmonize training programs;
 - Strengthen the collaboration and coordination of medical science training institutions at the national, regional and international levels;
 - Promote the establishment of medical specialist training programs in diverse areas;
 - Create a Pharmacy Department at the UB;
 - Organize and train traditional medical practitioners.
- *Promotion of medication production and management, including Anti-Retro-virals (ARV)*
 - Strengthen the control mechanism for the medication production and trading processes;
 - Create generic medication production units;
 - Promote the use of medical plants in the medication manufacturing process.
- *Promotion of diagnostic tools for different diseases*
 - Create new Laboratories for medical analysis;
 - Promote the use of medical and laser imaging;
 - Promote tele-medicine.

AREA 3 : ENERGY, MINES AND TRANSPORT

ENERGY

Challenges

- Poor access of the population to energy and critical inequality in terms of power consumption between urban and rural areas;
- Scarcity of renewable and environment friendly energy sources;
- Poor industrialization related to the availability of energy;
- Inefficient use of available energy;
- Lack of private sector investment in the energy sector;

Goals

- 30% of the total population should access energy by 2025 ;
- Increase access to environment friendly energy sources;
- Improve energy effectiveness;
- Increase and diversify energy sources for family and commercial use;
- Set up a data base on research and energy technology: energy source and environment friendly energy technologies.

Priority programs, projects and activities

- *Promotion of existing technologies used in the energy sector.*
 - Develop research and innovation on energy;
 - Assess the energy related needs for the country.
- *Promotion of renewable and environment friendly energy technologies likely to be developed in Burundi but are not yet developed.*
 - Assess the impacts of different energy technologies;
 - Assess the cost of diverse types of energy technologies;
 - Draft acquisition policies and technologies of energy technologies.
- *Promotion of combined heat and power generation with local resources.*
 - Conducting researches on the efficient energy consumption by different equipments ;
 - Conducting research – development in the following areas:
 - Biomass or recovered fuels gasification;
 - Techniques of forest fuels collection;

- Pyrolysis to produce liquid biofuels ;
- Possibility of promotion of solar energy, wind energy, geothermal energy and H₂ fuel pile or liquefied H₂;
- Possibility of promoting the national gas to supersede firewood and wood charcoal.

MINES

Challenges

- Burundians' lack of awareness about the role of the Geological Service;
- Lack of legislation of the mining sector;
- Deterioration of the research environment on mines and quarries;
- Lack of domestic expertise valuation.

Goals

- Review and rehabilitation of research on mines;
- Establishment of a platform around issues related to mines;
- Contribution for the increase of tax revenues;
- Capitalization of the existing information on mines.

Priority programs, projects and activities

- *Capacity building in mining industry*
 - Create a high school for geology and mines.
- *Promotion of the mining sector*
 - Set up a mining legislation;
 - Disseminate findings of research on the mining sector.
- *Optimal exploitation of mine deposits*
 - Design an industrial mining exploitation strategy;
 - Still undiscovered mines and quarries related research and prospection.

TRANSPORT

Challenges

- Insufficiency of human resources;
- Insufficiency of financial means;
- Lack of access to some areas due to difficult topography.

Goals

- Reduce the cost of transport;
- Make different areas of the country more accessible;
- Diversify the modes of transport;
- Improve the movement of goods and people;
- Decongest towns.

Priority programs, projects and activities

- *Strengthening capacity in human resources*
 - Research on local materials;
 - Research on conducive environment for transport (maritime, refrigerating,...) ;
 - Strengthen the existing transport network.

AREA 4: WATER, ENVIRONMENT & DESERTIFICATION

WATER

Challenge

- Mismanagement of water resources (managed as if they were unlimited resources) ;
- Poor access to drinking water, waste of water supplied on standpipes and managed water sources;
- Negligence in the management of water infrastructures;
- Agriculture production which do not make profit of the availability of water:
 - Only a few irrigation infrastructures likely to allow agriculture intensification.
 - Water splashing from the flanks of collines which is not harnessed for irrigation.
 - Rain water which is not collected for irrigation.
- Lack of coherent policy for waste water management.

Goals

- 1) Assuring a sustainable access to healthy and adequate drinking water and guaranty the public health especially for needy people.
- 2) Planning and better manage water resources so much that they can constitute, for our country, the basis for the development of agriculture, energy, tourism, etc ...
- 3) Assuring a fair management of waste water.

Priority programs, projects and activities

- *Strengthening capacities in water resource management*
 - o Encourage information and experience sharing;
 - o Assure technology transfer;
 - o Promote the production of scientific knowledge and technological innovations in water supply and management;
 - o Set up a data base on water resource and water ecosystems for a better planning of the water resource management.
- *Promotion of water resource storage and use.*
 - o Systematically assess surface and underground water and water systems (river basins, lakes and underground water) ;

- Manage new water resource to improve water availability in quantity and quality both in urban and rural area;
- Create centers for waste water analysis and treatment;
- Assure the dissemination of information collected on water resource and water ecosystems.

DESERTIFICATION

Challenges

- The erosion and soil and ecosystem degradation are gradually taking an alarming speed likely to lead, in a near future, to disappearance of some ecosystems and worsening of the drought situation.
- The drought and desertification are critical environmental and socio-economic issues with very bad consequences on the living conditions of the population.
- The erosion and soil degradation, due to overexploitation and bad farming practices, strongly affect the farming production and the sustainability of the environment and gradually evolves towards drought and desertification.
- Lack of strategic measures engaged to adapt to climate changes and mitigate their impacts.

Goals

- Better know the causes and scope of drought in our country.
- Fight against deforestation, rain erosion, cultivated cropland degradation, drought and desertification.

Priority programs, projects and activities

- *Capacity building in the fight against erosion, soil degradation, drought and desertification*
 - Create a framework for training and scientific and technical information sharing about the best practices on the nature of soil degradation;
 - Strengthen the technical capacities in soil science and water management;
 - Identify the best solutions in order to definitely prevent drought and desertification;
 - Sensitize the Government and donors for a firm commitment to fund the search for adequate and sustainable solutions to erosion and land degradation issues.

- *Promotion of the vegetation cover conservation*
 - o Protect forests and creating new ones;
 - o Strengthen measures for protected areas conservation;
 - o Fight against grass fire;
 - o Promote the use of improved furnaces and fire places using solar energy.

ENVIRONMENT

Challenges

- Lack of strategic measures engaged to adapt to climate changes and mitigation of their impacts;
- Lack of enough commitment to fight against erosion, soil and natural ecosystems degradation;
- Lack of good policy for hard wastes and wasted water management;
- Lack of effective will to protect lakes and rivers against any kind of pollution;
- Insufficiency and lack (in some areas) of rain water draining devices;
- Lack of sensitization for awareness rising on the importance of fight against soil and air pollution;
- Lack of firm commitment to fight against the proliferation of freshwater invasive species;
- Lack of programs to exploit the potentials offered by natural resources of our country (tourism, hospitality, thermal water site management, etc...);
- Significant environmental degradation due to the exploitation of natural resources;
- Laws governing environmental protection are enforced.

Goals

- Preserve the biological diversity and natural resources;
- Clean up the polluted ecosystems in order to improve the living conditions of human beings, animals and vegetation in place;
- Assure a better environment which sustainably allows the increase of both qualitative and quantitative production of our land and aquatic ecosystems;
- Exploit the potentials offered by our natural resources.

Priority programs, projects and activities

- *Strengthening the capacities, at all levels, for a sustainable environment management*
 - Establish technical secondary schools and vocational high institutes for environment management;
 - Integrate training on environment management in existing schools or vocational high institutes;
 - Promote eco-tourism through specialized training on hospitality and tourism;
 - Providing an adequate training to guards of protected areas.

- *Eradication of environmental impacts*
 - Assess the physical and socio-economic impacts of climate changes and determine the adaptation and mitigation measures to be taken for each type of impact;
 - Conduct thorough studies allowing to identify the challenges listed here above and mobilize necessary funds to implement the solutions resulting from those studies;
 - Sensitize the public on all key issues concerning the environment preservation, restoration and sanitation;
 - Promote technologies likely to reduce greenhouse gas emissions;
 - Create centers for solid waste treatment.

- *Sustainable conservation and use of biodiversity*
 - Mobilize and train scientific professionals in conservation of biodiversity;
 - Assess the scientific capacities of the existing gene library in Burundi ;
 - Create a center for the vegetal, aquatic and animal preservation.

AREA 5: BIOTECHNOLOGY AND INDIGENOUS KNOWLEDGE

BIOTECHNOLOGY

Challenges

- Scientific and technical constraints;
- Limited capacities in human, material and financial resources;
- Non significant sensitization and underestimation of the role of biotechnology in the resolution of key issues related to the socio-economic development of the country (research-development);
- Inadequate policy and legal framework;
- Lack of enterprises dedicated for production and sale of biotechnological products.

Goals

- Strengthen the capacity of the country for the development and implementation of biotechnology namely in sectors of agriculture, health, mining, industry, etc.... ;
- Mobilize and integrate human, material and financial resources and scientific expertise available to appropriate and efficiently apply biotechnology.

Priority programs, projects and activities

- *Capacity building on biotechnology*
 - o Create departments of biotechnology within universities and vocational high institutes;
 - o Mobilize scientific expertise;
 - o Organize scientific mobility in order to undertake research on common priority issues at the regional level and privilege international cooperation in the area;
 - o Initiate training and research on genomics and proteomics expression;
 - o Create a multidisciplinary laboratory in Biotechnology (bioinformatics, biogenic, molecular biology, etc.);
- *Promotion of biotechnology in production areas*
 - o Intensify the production of pesticides and biological fertilizers for a sustainable agriculture;

- Promote biotechnology for anti-erosion fighting;
- Promote biotechnology to increase production of edible and non-edible vegetal species, fight against diseases (HIV/AIDS, malaria, tuberculosis, etc...), stopping the environmental degradation, adding value on natural resources and stimulating industrialization;
- Stimulating the emergence and growth of enterprises engaged in the production and innovation biotechnology products.

INDIGENOUS KNOWLEDGE

Challenges

- Lack of enough competence to conduct deep research on local technologies and practices in different areas;
- Lack of adequate methodology of data collection on indigenous knowledge;
- Lack of legal framework of sensitization about the area at all levels;
- Poor relationships among research institutions and local communities.

Goal

- Sensitize the public and improve his knowledge on the nature and inputs from the indigenous knowledge and technologies;
- Contribute for the protection and promotion of the indigenous knowledge and technological innovation;
- Strengthen the capacities of the country to value, apply and protect the indigenous knowledge and technologies;
- Value the indigenous knowledge likely to contribute for the socio-economic development of the population.

Priority programs, projects and activities

- *Strengthening capacities on the indigenous knowledge*
 - Set up a national data base on diverse kinds of knowledge and technologies used by the traditional and/or local communities in BURUNDI ;
 - Integrate indigenous knowledge and traditional practices in the training programs;
 - Promote cooperation between research institutions and indigenous knowledge and technologies holders;
 - Create a network of national documentation centers on the indigenous knowledge and technologies.

- *Revaluation of indigenous practices*
 - Strengthen museums and historic sites;
 - Create a counter for sales and marketing of indigenous products;
 - Organize trade fairs;
 - Improve the knowledge of holders of indigenous technologies through an adequate training.

AREA 6: MATERIALS, INGENEERING AND INDUSTRIES SCIENCE

MATERIALS SCIENCE

Challenges

- Lack of national training and research programs;
- Lack of enough competence and expertise;
- Dependence on foreign materials;
- Inadequate imported materials;
- Low human and material capacity of research institutions;
- Low scientific and technological capacity.

Goal

Strengthening capacities to provide to the maximum of Burundians with knowledge allowing them to implement Science, Technology and Research;

Priority programs, projects and activities

- *Strengthening materials science*
 - o Strengthen capacity through post-university practical trainings in the area of materials;
 - o Strengthen the expertise through research and innovation;
 - o Design a national program for information exchange and partnership with local, regional and international programs.

- *Promotion of production of the local materials;*
 - o Set in place laboratories for research and quality control;
 - o Create a research center in materials science.

INGENEERING AND INDUSTRIES

Challenges

- Low development of small and medium industries;
- Lack of development of the industrial revolution illustrated by the absence of manufacturing and processing industries;
- Lack of capacity to produce original commodities which can meet the local and international market's needs;
- Low level of industrialization;
- No varied economic activities related to the inability to exploit its own natural resources through transformation.

Goals

- Strengthening the capacities in science, engineering and technology;
- Reviving the engineering training in High Education Institutes by identifying the priority training areas.

Priority programs, projects and activities

- *Strengthening capacities in engineering*
 - o Provide universities and high institutes with infrastructures and equipments as well as training programs;
 - o Create vocational high institutes;
 - o Diversify technical secondary schools and post-primary vocational schools well distributed over the national territory;
 - o Promote partnership between the universities and industries for the training in engineering.
- *Promotion of the use of laser imaging*
 - o Strengthen post-university training and research in the laser area ;
 - o Create a Burundian Center for lasers.

AREA 7: INFORMATION AND COMMUNICATION TECHNOLOGY, TECHNOLOGY OF SPACE SCIENCE, MATHEMATICAL SCIENCE

INFORMATION AND COMMUNICATION TECHNOLOGY.

Challenge

- Notable delay of Burundi in the establishment of the optic fiber network;
- Low level of training in ICT and lack of adaptation of the training programs to the needs of the country at all levels of the Burundian education system and in particular in the high education;
- No coordinated system of computerizing different services both in public and private sectors;
- Lack of enough funds, ICT infrastructures and materials, less developed and inequitably distributed in the different services over the national territory;
- Low level of development of the ICT sector in Burundi compared to other countries in the region and in the world;
- Lack of enough qualified human resources likely to engage in the research and development of softwares;
- Lack of visibility of the ICT contribution for poverty reduction and economic growth in Burundi;
- Expertise in computer science and related subjects which are more visible in enterprises and private businesses than in academic institutions, while the trend is a reverse in developed and emerging countries.

Goals

- Having well developed ICT and establish a national ICT basic network ;
- Setting in place a national research and development center on ICTs in order to:
 - Stimulate the technical evolution and innovation in the ICT sector;
 - Develop skills in the research and production of softwares;
 - Disseminate available resources and promote applications in diverse sectors of the economic life of the country.

Priority programs, projects and activities

- *Strengthening capacities in ICT*
 - Promote post-graduate studies and high level research - development in the National Research Center in order to develop skills in research and development of software in collaboration with regional and international institutions;
 - Promote the use of specialized softwares in diverse scientific areas;
 - Develop and use softwares for e-learning;
 - Develop capacities in e-health;
 - Expand distance learning to university education institutions.

- *Promotion of the use of ICT;*
 - Expedite the establishment of an optic fiber network to develop internet connection and telecommunication system;
 - Create a national center for Geographic Information System (SIG) ;
 - Set up an ICT regulatory framework.

SPACE SCIENCE

Challenges

- Low level of development of human and material resources and products (publications, satellite image, maps, other technological tools) in terms of space science such as Remote Sensing, Meteorology, geodesy, Satellite technology and applications, photometry, radioactive methods, solar rays, etc...
- Consequently, low level of development of tools required for the design, implementation and monitoring-evaluation of an effective policy on:
 - Sustainable management and exploitation of natural resources;
 - Environmental protection;
 - Management of water distribution, power, transport, care services, market establishing and other community infrastructure networks, security in general, etc...

Goals

- Ring the awareness of the public and policy makers about the benefits of the space science;
- Significantly develop the capacities in all aspects of the sector for economic and social transformation of our country.

Priority programs, projects and activities

- *Strengthening capacities in Space Science*
 - o Create a National Institute of Space Science (INASE) ;
 - o Promote post-graduate training and high level research – development in all special programs of INASE; with regional and international collaborations;
 - o Organize media and training sessions, scientific meetings, etc... of dissemination of research - development findings on space and interrelation science of diverse stakeholders intervening in the sector (the researchers, the public, policy makers, economic operators and other partners).

MATHEMATICAL SCIENCE

Challenges

- Lack of enough human, material and financial resources in Burundi for the development of a wide scope of mathematical methods;
- Consequently, low level of findings (publications and other elements of scientific literature, technological and innovative tools, etc...) in Burundi in comparison with other countries in the region and in the world:
 - Data collection and processing techniques;
 - The formulation of concepts (prediction model, algorithm, etc...);
 - The development of applications (production of materials and systems, control, management and exploitation of systems, etc...) ; and this is practically in all scientific disciplines governing the socio-economic life of the country (bioinformatics, biophysics, management and exploitation of natural resources such as water, energy, etc ..., materials science and technology, ICT, Human and Social Science, etc...).
- Lack of culture of local, regional and continental competitiveness in Mathematical Sciences;

- Poor collaboration with other regional and international institutions targeting training and high level fundamental and applied researches in priority development areas;
- Low visibility or lack of researches achieved in the area in Burundi High Education Institutions;
- Lack of Geographic Information System (SIG) to effectively manage natural resources;
- Non-coordinated ICT companies;
- Lack of education in Applied Mathematics such as Modeling Mathematics, Probability Mathematics and Finance, Mathematical Engineering, etc...

Goals

- Strengthen capacities in the area and, in particular, in the key aspects for the socioeconomic development of our country where this ring of Mathematical Science must intervene;
- Produce a generation of scientific-researchers in the area who have required expertise to bring about adequate solutions to specific issues faced by the communities;
- Train new lecturers and researchers to strengthen education and research in Mathematical Science and prepare students for practice research papers in diverse disciplines related to Mathematical Science;
- Strengthen IGEBU so that it becomes an effective center for Geographic Information System;
- Train a significant number of competitive scientific researchers likely to attend the development of applications of Mathematical Science for the local, regional and continental development.

Priority programs, projects and activities

- *Strengthening capacities in Mathematical Science*
 - Create a post-graduate national center of Mathematical Science in Burundi in regional and international collaborations, specific training and research-development programs designed for that end, regularly implemented and assessed;
 - Strengthen the capacity of lectures of Mathematical Science and their applications in ICTs and other modern sciences;
 - Collaborating with Mathematical Science training institutions in the region and continent in order to strengthen the existing one (be member of AMI-net);
 - Organizing engineering and technicians training on diverse applications of Mathematical Science.

AREA 8: HUMAN AND SOCIAL SCIENCE

Challenges

- Lack of enough research centers in Human and Social Science;
- Lack of enough lecturers and researchers;
- Areas of research are not diversified and research topics are disconnected with the community concerns;
- Lack of enough national experts in Economics;
- Lack of a culture of entrepreneurship;
- No existence of a center for software training and developing in Economics;
- No valuation of existing expertise in economics;
- Lack of inter disciplinarity in the research on SHS ;
- Lack of coordination in the sector of SHS research;
- Lack of collaboration at the national, regional and international levels;
- Lack of monitoring and evaluation system of research in Human and Social Science ;
- Dependence of the researcher on the donor.

Goals

- Promoting research in diversified sections of the field of Human and Social Science in order enhance the socio-economic development of the country;
- Developing a framework of cooperation, collaboration, coordination and monitoring-evaluation of local, regional and international researchers engaged in the field of Human and Social Sciences;
- Strengthening the training institutions for entrepreneurship expertise in Economics;
- Valuing the accounting expertise;
- Providing Burundi with a legal structural framework in order to address the challenges faced by the country in terms of organization and training and supervision in the areas (i) of sporting and physical education and (ii) culture.

Priority programs, projects and activities

- *Strengthening capacities in Human and Social Sciences*
 - o Develop diversified high level training and research programs;
 - o High level training of lecturers and researchers to address the issues related to the national realities;
 - o Set in place a High Institute for Art Techniques;

- Set in place a framework of collaboration and exchange among lecturers and researchers at the national, regional and international level;
 - Create a « Rundi » Academy.
- *Promotion of expertise in Economics and Accounting*
 - Institutionalization of an information system of needs and resources;
 - Training of competitive accounting experts at the regional and international levels.
- *Promotion of the culture of entrepreneurship*
 - Training on business plan and entrepreneurship modules.
- *Promotion of sporting and recreational activity*
 - Promoting public and private centers for leisure in all the Burundi provinces;
 - Organizing sports and cultural competitions;
 - Establishing a Center of Analysis, Research and Pedagogy in Sciences and Techniques of physical and sporting activities.

VIII. IMPLEMENTATION, MONITORING AND EVALUATION OF THE PNRSIT

To make tangible progress in the sector of Science, Technology and Research, Burundi will have to base on a solid system of scientific research and technological innovation.

8.1. Institutional framework of implementation of the national policy

The national policy will be achieved in a revised legal framework adapted to the intended goals. To assure a successful implementation of the defined programs, the following structures can be integrated in a well set governance system.

8.1.1. Ministry of High Education and Scientific Research

In the Government, the Ministry of High Education and Scientific Research has got the mandate to:

- Define the national policy;
- Ensure the implementation of the National Policy on scientific research and technological innovation;
- Ensure respect of general balances;
- Animate the networks of training and research institutions;
- Coordinate the research activity of sectoral ministries, key role beside theirs exercised through the General Directorate in charge of Science, Technology and Research;
- Pilot and orient the research system.

8.1.2. General Directorate in charge of Science, Technology and Research

The missions conveyed to him are stipulated under Decree n°100/32 of February 20, 2010 governing the structure of the Ministry of High Education and Scientific Research in addition to:

- Play the key role between the Ministry in charge and other ministries involved in the area of Science, Technology and Research;
- Play the role conveyed to the Ministry consisting of coordinating the inter-Ministry mission in terms of scientific research and technological innovation;
- Collaborate with the Multi-sectoral Committee and other partners concerned with Science, Technology and Research with transparency;

- Follow and implement the general policy of the Government in terms of Science, Technology and Research;
- Centralize the research findings and orient them towards the research institutions and centers;
- Harness the research findings towards the ministries and other user institutions.

8.1.3. National Commission of Science, Technology and Research

It is an advisory body between the research actors and partners representing the production sector. It directly reports to the Ministry in charge of Science, Technology, and Research. It reinforces the legitimacy of orientation choices made by the Government. Its collaboration framework expands to other bodies such as the sectoral ministries, the UNESCO National Commission, the Multi-sectoral Technical Committee, the public sector, the private sector, the civil society, the regional and international organizations, etc.

It will notably be in charge of:

- Providing clarification to the Government through the Ministry in charge of High Education and Scientific Research on the major choices of the scientific and technological policy in what concerns:
 - o The orientation and assessment of scientific and technological activities;
 - o The preparation of the national plan for scientific and technological development;
- Proposing to the Minister in charge the goals and means defined in an integrated, rigorous and critical manner to develop Science, Technology and Research in favor of the company;
- Adopting and proposing a systematic vision of the role played by Science, Technology and Research in the socio-economic life of the country;
- Defining strengths and weaknesses of the country in terms of Science, Technology and Research;
- Advise the Minister in charge of Science, Technology and Research on the orientations, priorities of intervention and appropriate means of action;
- Formulating recommendations to the Government on the area;
- Determining the research priorities for the country;
- Undertaking the Government and other relevant actors' regular follow up to handle those views and recommendations;
- Approving the implementation of the programs proposed by the multi-sectoral technical committee;
- Valuing the research findings.

8.1.4. Multi-sectoral Technical Committee

This is a technical body comprising representatives of different Ministry departments, the production sector, private sector, the civil society, etc...in terms of science and technology and it is chosen according to the areas of specialization. It is in charge of:

- Proposing the limits of the key areas and mobilization programs;
- Verifying necessary resources proposed for the implementation of mobilization programs;
- Proposing research plans for approval by the National Commission of Science, Technology and Research;
- Assessing the general budget for research and presenting the findings of the research activities conducted in the framework of mobilization programs.

8.2. Action plan for the implementation of the National Policy for Scientific Research and Technological Innovation

Given that the national policy document is a referential document with general guidelines, it is worth accompanying it with an appendix in a form of a detailed action plan which clearly defines the following indicators, for each area:

- Scope;
- Goals ;
- Responsibilities ;
- Tentative schedule for the implementation of the national policy.

The implementation of the strategic actions will have as impact the achievement of the main goal which is defined as « developing science and technology in favor of sustainable economic development ».

To develop the action plan, science and technology should be subject of a particular governance and mobilize all competent actors. If it is up to the Ministry to define the national policy of scientific and technological research, the translation into large programs and the implementation are generally in the responsibility of agencies and research operators.

The areas of implementation of the action plan are:

- The institutional area;
- The legal and regulatory area;
- The technical area;

- The economic and financial area;
- The area of sub-regional, African and international cooperation;
- The area of capacity of human resources and research;
- The area of stakeholders' mobilization.

8.3. Monitoring-Evaluation and Dissemination

The assessment of the scientific and technological system is conducted periodically. It not only bases on the internal and external effectiveness but also on the performance of the actors and the degree of achievement of the activities. It can be done a priori (programming); in an ongoing action (follow up) or a posteriori (final).

Finally, the monitoring-evaluation will be done in collaboration with the three structures notably, the multi-sectoral technical committee (focal points), the General Directorate of Science, Technology and Research and the National Commission of Science, Technology and Research.

The dissemination of the research findings will also be jointly undertaken via the three structures.

8.3.1. Necessity of follow up of the implementation of the national policy

The monitoring and evaluation are essential to:

- Check if the implementation process is going on as initially planned;
- Assess the short, medium and long term impacts in order to determine if the actions undertaken effectively contribute for the achievement of stated goals;
- Reorganize the policy in order to correct the spreads or adapt to the new situation occurred during the implementation phase.

8.3.2. Modalities of monitoring and evaluation

To implement the new policies, Burundi is confronted with a number of challenges:

- Lack of coordination, orientation and follow up legal framework at the national level which must set up priorities, define missions and action plan of the sector;
- Lack of liaison mechanisms between STR and the socio-economic sectors;
- Lack of adequate human and material resources;
- Insufficient financial resources;
- Lack of coordination structures;
- Lack of knowledge on statistics in general.

In the framework of this new policy, the follow up will be undertaken through three periodic reports on the implementation of the National Policy of the Scientific Research and Technological Innovation which will be regularly established by the National Commission of the STR and addressed to the Minister in charge of the sector. The intended goals are mainly to :

- Assure the coordination and follow up of all the STR entities at the national level;
- Strengthen institutional and human capacities by organizing trainings and meetings for all stakeholders and other partners;
- Define the working missions and strategies;
- Design action plans per sector of intervention;
- Mobilize funds ;
- Create and promote exchange on good practices at the national, regional and international levels
- Publish and disseminate the STR findings;
- Attend regional and international STR programs;
- Produce indicators of R&D and the STR.

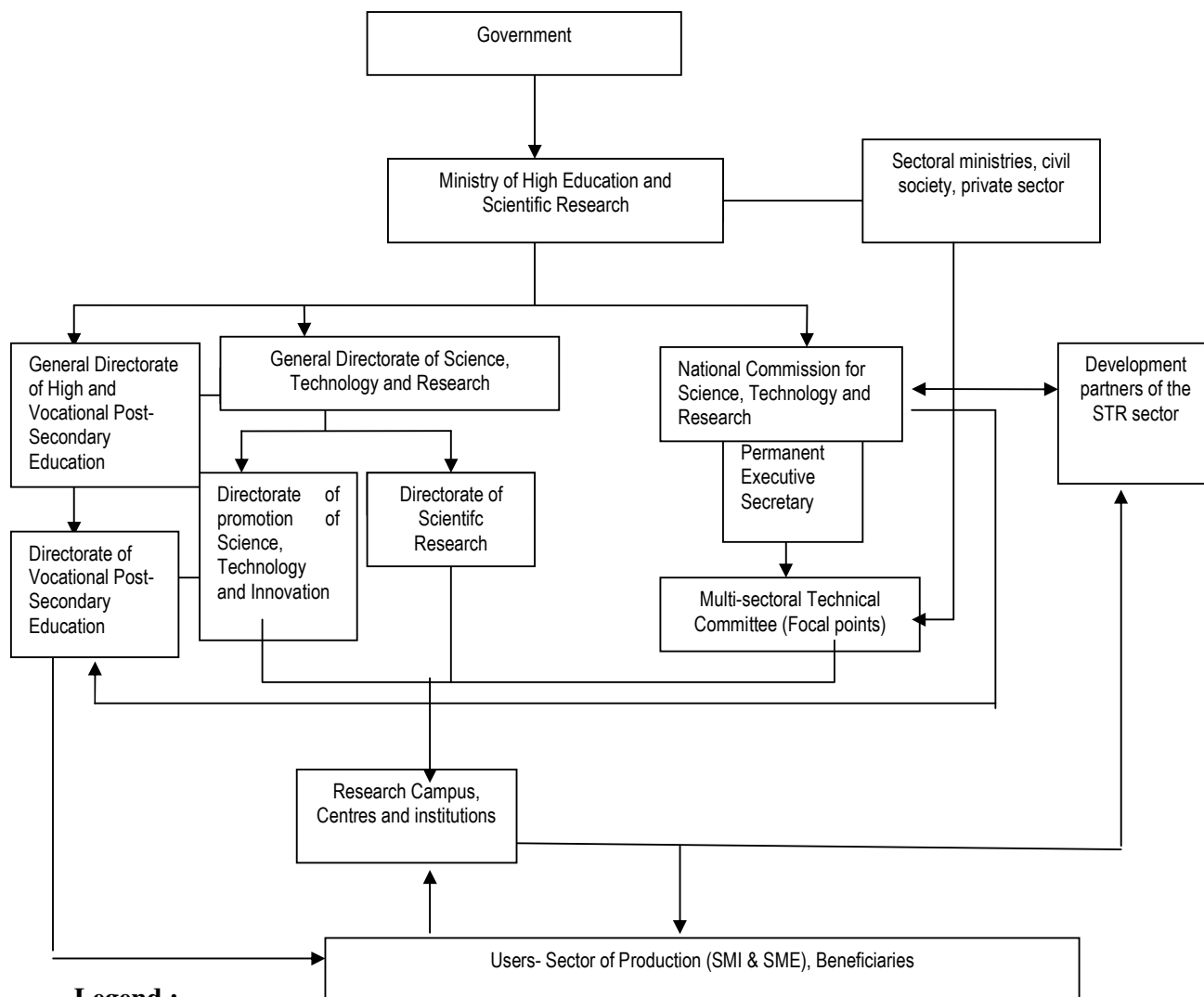
For the assessment, the approach adopted will consist of drafting an annual report on the implementation of the national policy. This annual report will allow assessing the progress of the implementation and propose corrective measures.

The three structures in charge of assessing the research will provide the research operators, ministries and other relevant partners with more independent, rigorous and homogenous data whose quality will allow improving the general performance and decide on more relevant allocation of means.

The following actions constitute the elements of the action plan to be undertaken in order to establish a good National Policy of Scientific Research and Technological Innovation:

- Design an operational legal framework of coordination and monitoring structures (missions, strategies, etc...);
- Establish those structures;
- Identifications and publication of better findings ;
- Organization of information and sensitization conferences/seminars on the participation of the public (in the design) for the implementation of the national policy of the STR;
- Design an adequate website.

Graphics 1. Organization chart of the institutional framework for the implementation of the PNSRIT



Legend :

- > : Link of dependence
- : Link of collaboration and cooperation
- >< : Link of reciprocal collaboration

8.4. Development partners and funding sources of the STR sector

The development partners of the STR sector are notably : the Government of Burundi, UNESCO, NEPAD, UNDP, African Union, TWAS, European Union, UNECA , EAC, ADB, World Bank, OMPI, ANSTI, FCE, and IFAD, local and foreign NGOs, etc.

The funding sources of STR institutions vary from institution to institution in the sector. However, they can be categorized as following:

- Public funds (Government subsidies);
- Self financed funds:
 - Fees for diverse services in High Education Institutions (registration, research paper, photocopies, diverse certificates, diplomas and transcripts, academic fees, accommodation, construction and other equipment rent income) ;
 - Sale of products in all categories of institutions, own business products;
 - Other income from studies and research works.
- External material and financial support; bilateral and cooperation or partners, and twinning;
- Diverse funds: Bank loans;
- Donations and gifts;
- Integration of **research** section in different development programs and projects and in different enterprises.

8.5. Intellectual property rights

It is worth promoting the STR at the national level by protecting the works and findings of science and technology. This allows having the right on the research and innovation findings. The intellectual property is notably presented under two aspects:

- The industrial property: inventions certified by patents, brands, logos and industrial models as well as geographic indications;
- The author's right: the literary and arts works (novels, poems, plays, movies, musical works, Art products) as well as architectural creations.

Among the above indicated structures, there is a structure in charge of protecting and arbitrating in case of dispute related to rights in addition to its mandate of delivering patents for invention and innovation.

8.6. National Academy of Science and Technology

Its mandate is to capitalize the important deposit site of resources required for scientific, technological and socio-economical development in Burundi.

Therefore, we understand the mission of advisor, scientific expertise, consultation and assistance in the context of definition and implementation of the national policy for scientific research and technological innovation. Its status and composition are provided under a Decree.

8.7. National Commission of Ethics

The organization, the functioning and mission of the National Commission of Ethics are prescribed by a Decree.

IX. GENERAL CONCLUSION

The existence of a national policy of Scientific Research and Technological Innovation in Burundi marks the beginning of a process which offers lots of opportunities to strengthen scientific and technological skills. The implementation of this policy and its programs enormously contribute for the achievement of the expectations of the Burundi people and require a well established institutional system or organization in order to achieve the Millennium development Goals. This will stimulate investments both in Research – Development and technological innovation.

In Burundi, similar to elsewhere, Science, Technology and Research constitute the backbone of a real sustainable economic and social development. For the Burundian society to make profit of this fact, we need to have a number of instruments such as the national policy for scientific research and technological innovation, the strategic plan for Science, Technology and Research (CNSTR) and the Law on Science, Technology and Research in Burundi. This would allow for a good understanding of complex and diversified processes and the sustainability of the development tool offered by Science, Technology and Research. The present document contains the following main areas of priority interventions:

1. Agri-Food Technology;
2. Medical Science ;
3. Energy, Mines and Transport
4. Water, desertification and environment ;
5. Biotechnology and indigenous knowledge ;
6. Materials Science, Engineering and Industries;
7. Information and Communication Technologies, Space Science and Mathematical Science.
8. Social and Human Sciences ;
9. Institutional Implementation Framework.

The promotion of Science, Technology and Research for social and economic development requires the involvement of everyone. It constitutes the top priority of the Government. The national policy of

scientific research and technological innovation is in line with both the Strategic Framework for Growth and Fight Against Poverty (CSLP) and the consolidated Action Plan for Africa in Science and Technologies. It will contribute for the fair, equitable and sustainable social and economic development of Burundians. This addresses the numerous concerns of the Government of Burundi formulated in its sector based development policies and programs in order to assure future economic prosperity and improvement of the citizens' living conditions.

PNRSIT bases on the following specific axes:

- Assuring a coordination of research centered in the development of Burundi by integrating all the institutions and centers involved in the STR, in the same dynamics;
- Valuing the available tools and solve the existing gaps in key areas to promote STR in Burundi;
- Orienting the STR in finding solutions to the major current and future issues faced by the Burundian population;
- Making of STR a development tool for the country and local communities.

The National Policy of scientific research and technological innovation intends to clarify decision makers and guide the scientific world, the stakeholders and relevant partners to achieve the intended socio-economic development goals. To address some challenges, the Ministry of High Education and Scientific Research considers undertaking the following actions, inter alia:

- Creation of a Central Campus for Science and Technology;
- Creation of a campus for Agri-food Technology which gathers agri-food focused Faculties, Centers and Institutes at Zege site (Gitega, central part of the country) ;
- Creation of Vocational High Institutes with departments meeting the priority needs of the Burundian Community.

Certainly, opportunities do exist, but it is important that all of the actors concerned by the STR have the same understanding of the opportunities and resolutely engage to exploit them effectively in order to achieve the intended socio-economic development goals. The principles to be adopted in order to achieve the implementation of this policy are namely: a good collaboration among actors at the national, regional and international levels, an efficient both horizontal and vertical coordination, a careful identification of real issues faced by the communities who will be considered in the research topics, and finally, an effective implementation of the research findings to address the issues faced by the Burundian population.

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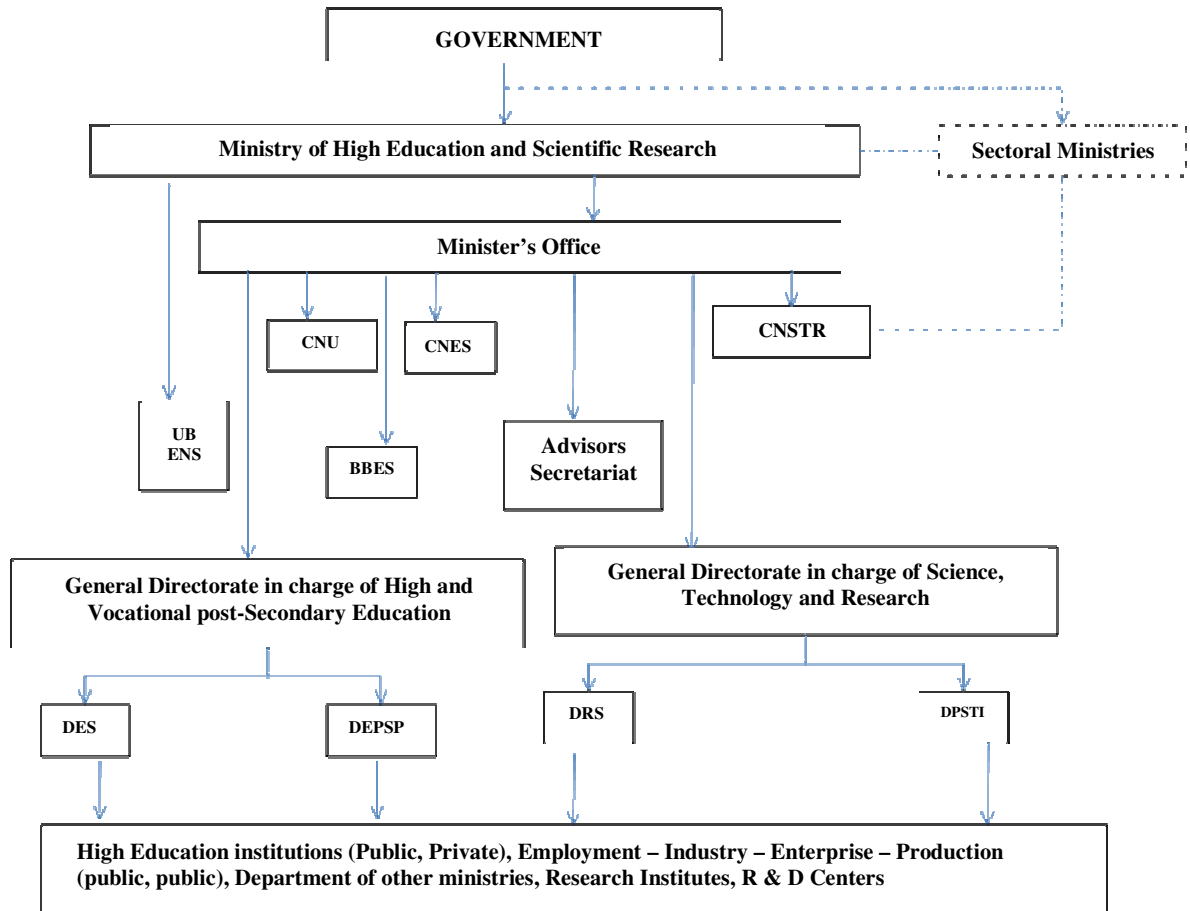
X. ANNEXES

Annex 1 : Millennium development Goals

At the early times of the new millennium (2000), the international community made a firm decision of acting in order to fight against poverty and improve the population living conditions. At the occasion of the Millennium Summit in September 2000 and for the first time, the 189 UN member states have committed, in a joint Declaration, to achieve 8 goals referred to as Millennium Development Goals (MDG) :

- | | |
|---|--|
| 1. Eradicate extreme poverty and hunger | - Halve the proportion of people whose income is less than one dollar a day |
| | - Halve the proportion of people who suffer from hunger |
| 2. Achieve universal primary education | - Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling |
| 3. Promote gender equality and empower women | - Eliminate gender disparity in primary and secondary education, preferably by 2015, and in all levels of education no later than 2015 |
| 4. Reduce child mortality | - Reduce by two-thirds the under-five mortality rate |
| 5. Improve maternal health | - Reduce by three quarters the maternal mortality ratio |
| 6. Combat HIV/AIDS, malaria and other diseases | - Have halted by 2015 and begun to reverse the spread of HIV/AIDS |
| | - Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases |
| 7. Ensure environmental sustainability | - Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources |
| | - Halve the proportion of people without sustainable access to safe drinking water |
| | - By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers |
| 8. Develop a global partnership for development | - Develop further an open, rule-based, predictable, non-discriminatory trading and financial system. |

Annex 2 : Organization chart of the Ministry of High Education and Scientific Research



Annex 3 : Timeline for the establishment of the STR Commission

Goals	Actions/activities	Period	Responsibles
Identification of priority areas in terms of STR	Set up a committee of experts to define the priority areas for intervention	January 12, 2011	Committee of experts (executives of the Ministry, Prof of UB, and of ENS)
	Draft the STR summary project	January 12 –March 7, 2011	Committee of experts
	Submission of the STR summary project to the Minister	March 8, 2011	Committee of experts
	Presentation and validation of the PNRSIT	March 23, 2011	Committee of experts
	Preparation of policy letter on STR	March 28 –April 7, 2011	Committee of experts
	Submission of the policy letter on STR	April 8, 2011	Committee of experts
	Validation day of the policy letter on STR	April 12, 2011	Committee of experts, executives of the Ministries
	Analysis and adoption of the policy letter on STR by the GoB	Week of April 25, 2011	GoB
Drafting of the STR Strategic Plan and logic framework	Consultation on the Lighthouse Programs	May 2 – 13, 2011	Committee of experts
	ToRs and set up breakout groups	May 16 – 20, 2011	Committee of experts, executives of the Ministry
	Draft the Strategic plan document	May 23 – Juin 3, 2011	Committee of experts
	Draft the law governing STR	June 6 – 10, 2011	Committee of experts
	Remise du PSSTR	June 14, 2011	Committee of experts
Adoption of the Strategic Plan and the law on STR	Validation workshop of PSSTR and the law	June 21, 2011	Committee of experts, executives of the Ministry
	Analysis and adoption by the GoB of PSSTR and the Law	Week of July 4, 2011	GoB
	Presentation and discussion in the Parliament	End of July Session 2011	Minister
	Validation, dissemination, appropriation	First half of August 2011	Committee of experts
Official launching of the STR National Commission	Creation of the institutional framework (STR National Commission)	End August 2011	Ministry, Commission
	Implementation instruments	p.m.	Commission

Annex 4 : List of the committee members and their contacts

	Name and surname	Functions	Tel / e-mail address
1	Jean Ndimubandi	Dean of Faculty of Agronomic Science – UB, <i>chairman</i>	79 476660/78 476666/22 229296/22 218743 Jean.ndimubandi@gmail.com
2	Aaron Barutwanayo	Permanent Secretary of the National Commission for UNESCO, <i>Deputy-Chairman</i>	77 756520/ 22 216940 abarutwa@yahoo.fr
3	Joseph Nduwimana	General Director of Science, Technology and Research, <i>Secretary</i>	77 735777 Ndujofsvmd@yahoo.fr
4	Bigendako Marie Josée	Professor and Director of Academic Services at UB, <i>Member</i>	79 922350/77 767424/75 922350/22 226785 jbigendako@yahoo.fr
5	Edouard Ndikumana	Professor and Head of Academic Services at ENS, <i>Member</i>	77 734618/75 734618/22 242839 ndikedo@yahoo.fr
6	Benjamin Sezibera	Director of Scientific Research, <i>Member</i>	79 948586/ 77 948586/22 276594 seziberabenjos@yahoo.fr
7	Mathias Bashahu	Professor at the Institute of Applied Pedagogy (IPA), <i>Member</i>	77 844952 bashahuma@yahoo.fr
8	Alexine Hatungimana	Director of Vocational Post-secondary Education, <i>Member</i>	79 904509/76 290077 Halexpa@rocketmail.com
9	Jovith Ngendakuriyo	Director of Promotion of Science, Technology and Innovation, <i>Member</i>	77709965/79846114/22276593 ngendakuriyovovith@yahoo.fr
10	Céline Nimbona	Director of High Education, <i>Member</i>	77 746243/ 22 222218 Nceline100@yahoo.fr