



Ethiopian Academy of Sciences

**CONSENSUS STUDY ON
NATIONAL RESEARCH COUNCIL OF ETHIOPIA:
ESTABLISHMENT AND OPERATIONAL MODALITIES**

March 2015
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About the Ethiopian Academy of Sciences

The Ethiopian Academy of Sciences (EAS) was launched in April 2010 and recognized by an Act of Parliament (Proclamation No. 783/2013) as an independent body mandated to provide, inter alia, evidence-based policy advice to the Government and other stakeholders. Its major activities include undertaking consensus studies, conducting convening activities such as public lectures, conferences, workshops and symposia on issues of national priority; as well as promoting science, technology and innovation.

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List of Commonly Used Acronyms

AAU	Addis Ababa University
AHRI	Armauer Hanson Research Institute
ASTI	Agricultural Science and Technology Indicators
ATA	Agricultural Transformation Agency
CST	Consensus Study Team
EAS	Ethiopian Academy of Sciences
EDRI	Ethiopian Development Research Institute
EEA	Ethiopian Economic Association
EIAR	Ethiopian Institute of Agricultural Research
EPHA	Ethiopian Public Health Association
EPHI	Ethiopian Public Health Institute
ESTC	Ethiopian Science and Technology Commission
FSS	Forum for Social Studies
IAR	Institute of Agricultural Research
IECAMA	Imperial Ethiopian College of Agriculture and Mechanical Arts
METEC	Metal and Engineering Corporation
MOST	Ministry of Science and Technology
NARS	National Agricultural Research System

NRC	National Research Council
NRF	National Research Facility
NSTIC	National Science, Technology and Innovation Council
OSSREA	Organization for Social Science Research in Eastern & Southern Africa
R&D	Research and Development
RARI	Regional Agricultural Research Institute
STI	Science, Technology and Innovation
USNAS	United States National Academy of Sciences

Foreword

Research Councils are seed-beds where research ideas germinate, bloom and blossom. They drive the direction of scientific endeavours in a country and advance the frontiers of knowledge. Ethiopia is working towards instituting a credible, strong and capable research council. The Ethiopian Academy of Sciences, believing the critical nature of such an institution for the advancement of scientific research, undertook this Consensus Study to contribute towards laying the foundation for a working research system in the Country.

The hallmarks of an established research council are good legal foundation, an autonomous standing, functional structure unburdened with bureaucracy, tested operational modalities and instruments, reliable resource base, and visionary leadership. By critically examining these components, we believe this Consensus Study provides insight as to how a credible National Research Council could be institutionalized and enabled. We hope the outputs of the Study would be put to good use.

The Ethiopian Academy of Sciences gratefully acknowledges the Consensus Study Team led by Prof. Tsige Gebre Mariam for a job well done, and the Swedish International Development Agency and USNAS for their support to the Consensus Study.

Masresha Fetene (Professor)
Executive Director
Ethiopian Academy of Sciences

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Executive Summary

The state of science and technology in a country is an important determinant of sustainable development. Achieving sustainable development is probably the most daunting challenge that a developing country like Ethiopia is facing today. Scientific knowledge and appropriate technologies are central to addressing the underlying economic, social and environmental issues. Research is necessary to identify and set priorities, to guide and accelerate application of knowledge to solve problems (knowledge translation), to develop new tools and strategies, and to advance basic understanding and push the frontiers of knowledge. The experience of developed countries indicates that there is a direct correlation between public investment on R&D and sustainable growth. Knowledge has been an important factor in economic growth and research-based competence plays a crucial role in advancing technology and developing innovative skills.

Research in Ethiopia is mainly carried out in universities, agriculture and health research institutes, and to some extent in a few sector ministries and industries. There is considerable mismatch between the focus of research undertakings on the one hand and the national development needs on the other. Hence, there is a strong need to align research priorities in universities and research institutes with the national development needs of the country.

Furthermore, research in Ethiopia faces many challenges and constraints, including: insufficient funding; shortage of trained personnel; lack of coordination amongst research institutions reflected by lack of national research agenda or coordinating mechanism; inadequate participation of stakeholders in setting research agenda as well as policy formulation and implementation processes (leading to discordance between research and policy formulation); lack of institutional capacity characterized by underdeveloped infrastructure, unsupportive work environment and lack of demand for research; inaccessibility of research findings to policy and decision makers. Consequently, the contribution of research to

technological innovations in the country is negligible.

The Ethiopian Government aims to make many of the national research endeavors to have direct relevance to the development of the country. Hence, it is working towards strengthening the national research system which would focus on the national technological demand, including adapting and utilizing effective technologies.

In February 2012, Ethiopia adopted a Science, Technology and Innovation (STI) policy, which stipulates that research is needed to address the resolution of major social and economic problems, to contribute to the achievement of national development objectives and to meet technology demand. It highlights the lack of relevance of research undertaking carried out by national universities and institutions, and concedes that there is no unifying organization to coordinate research activities and priorities. The STI Policy envisages the establishment of a National Research Council (NRC) that serves as a catalyst in building the country's research capacity for innovation and adaptation of appropriate technology.

It is clear, therefore, that there is an urgent need to establish a mechanism to promote, coordinate, regulate and manage research in the country. The mission of the Ethiopian Academy of Sciences (EAS) is to foster scientific culture and innovation and advance the knowledge of the sciences (including indigenous knowledge). The Strategic Plan of EAS (2011-2015) has identified provision of advice to the Government of Ethiopia 'on issues pertaining to the quality and relevance of the sciences' as one of its main objectives. In order to achieve this stated objective, it has included provision of consensus building platforms on critical national issues as one of its core programs. This in turn requires that the study be as objective and evidence-based as possible. EAS is eminently placed to assist the process of the establishment of a National Research Council in Ethiopia through a consensus study that is fortified by inputs from all stakeholders.

To help in the establishment of the NRC, the EAS formed a Consensus Study Team (CST) consisting of founding Fellows of EAS and representing various disciplines. The CST undertook the consensus study with the objectives to, inter alia, define the terms of reference of the NRC, elaborate its operation modalities, determine the scope of its mandate, workout the nature of its composition/structure, identify the various stakeholders, and propose membership and institutional linkages. In its study, the CST attempted to address the following key questions:

- What should be the legal framework for the establishment of a NRC?
- What should be the mission and objectives of a NRC?
- What should be the mandates (powers and duties) of a NRC?
- What are the major strategic objectives that should be pursued to attain its mission?
- How should a NRC be organized and be run in a cost effective and efficient manner??
- Which organizational setup is most appropriate to the socio-political and STI state of Ethiopia?
- What should be its organizational structure?
- What are the sources of funding and the modalities of disbursing funds and grants?
- What should be the nature of its relationship with key federal and regional government departments, universities, research institutes and the industry?
- What should be its relationship with other research councils, research facilities, and international research institutions?

Methodology: In the preparation of this document, the CST employed

various methods, including review of the literature, policy documents, as well as documents of national research councils of several countries (namely, Canada, Germany, India, Malaysia Nigeria, South Africa, South Korea Sweden, and the USA). Self-administered questionnaires, focus group discussions, and key informant interviews were conducted to gather information from stakeholders. Benchmarking visits were made to the National Research Foundation of South Africa and the German Research Foundation and the best practices of these renowned research foundations have been incorporated into this document.

The document presented here describes the Purpose and Mandate, Powers and Duties, Functions, and Statutory Framework of the National Research Council (NRC) of Ethiopia. It depicts its Organizational Structure and identifies Strategic Directions and Programs. It also deals with Human Resource Development, Technology Transfer, University-Research Institutes-Industry-End-user Linkage, establishment of S&T Information D-base, Research Funding, National Research Facilities, and Partnerships and International Relations.

The document is organized into 11 sections. **Section 1** gives a brief historical background of research in Ethiopia. The establishments of research institutes in agriculture and health, namely, the Institute of Agricultural Research (IAR), the Ethiopian Health Nutrition and Research Institute (now Ethiopian Public Health Institute, EPHI) and the Armauer Hanson Research Institute (AHRI) are highlighted. A brief account is given on the genesis of research in the university setting in the areas of humanities, natural sciences, social sciences engineering and technology. In the university research remained for long unabashedly academic, with no pretense at social relevance. It was largely individualized rather than collective, sporadic rather than coordinated. The first measure to coordinate and regulate research at the national level was taken with the establishment of the Ethiopian Science and Technology Commission (ESTC) in 1975. ESTC was mandated “to plan, encourage, guide, coordinate, select, approve and support research programs and projects of importance to national development”. With the change of regime in

1991, steps were taken to streamline the activities of ESTC as well as to broaden its mandate. One of the first such steps was the formulation of the country's S&T policy in 1993.

ESTC was upgraded to a ministry level with the establishment of the Ministry of Science and Technology (MOST) in 2008. The 1993 S&T policy was also modified and amplified into the Science, Technology and Innovation Policy, issued in February 2012. Among the objectives of the policy are to:

- promote research geared towards technology learning and adaptation;
- promote and commercialize useful indigenous knowledge and technologies; and
- define the national science and technology landscape and strengthen linkage among the different actors in the national innovation system.

Eleven policy directions and strategies were identified, including technology transfer, human resource development, research, financing and incentive schemes, intellectual property system, science and technology information, environmental protection and development, and international cooperation. The National Science, Technology and Innovation Council (NSTIC) was set up as the highest decision making body on STI policy, with MOST serving as the secretariat and the main implementing agency.

Section 2 presents the Ethiopian Research Landscape. An overview of the context and framework of the status of research in Ethiopia with a view to informing the operational modalities of a national research council is provided. This brief overview describes the landscape and dynamics of the research base in Ethiopia. Further, it indicates the way forward by providing a description of some critical measures that need to be taken to meet research challenges. As much as possible, efforts have been made to dwell on the general trends rather than the specific

cases. It should also be stated that, by virtue of the available data, the survey of research undertaken in the natural sciences and social sciences and humanities is largely tilted towards Addis Ababa University (AAU). This section also provides research performing organizations by sector, research funding, international research collaborations, trends in publication and patent, new agricultural release and product profiles. Further, the section states that policy relevance of research was limited. Knowledge was pursued and accumulated for its own sake, not with an idea of social utility and policy relevance. However, some outputs from research have informed policies related to environmental protection, natural resources (forest, wildlife) conservation, water and mineral resources development, as well as some mega infrastructure development.

Most institutions involved in research have not put the necessary effort to translate their research outputs into activities of their sectors. Nor have they devised mechanisms for monitoring the implementation of their research results, even in the rare cases where there are operational linkages to their particular sector. In reality, most research results get disseminated through publications that are usually located abroad or in local journals that have limited distribution to selected circles. The research gaps and challenges that have been identified include:

- Inadequate funding for research and agenda setting;
- Low capacity for research;
- Limited number of skilled researchers in many disciplines because of the low level of development of the human resources in science and technology;
- Low research support resources;
- Inefficient research administration;
- Lack of demand or social appreciation for research;
- Low incentives for researchers;
- Poor research networking; and

- Weak internal and external collaboration.

The section concludes by listing the critical measures or issues for improving the research environment and by indicating the rationale for the establishment of NRC.

Section 3 deals with the purpose, vision, mission and objectives of the NRC.

Purpose: to foster a strategic (prioritized) research agenda, both basic and applied, and advance the knowledge frontier in various fields of science and technology so as to improve the living standard of the people of Ethiopia.

Vision: to achieve research excellence in science and technology.

Mission: to build a competitive research capacity for the sustainable development of Ethiopia

The **Objectives** of the NRC are, inter alia, to

- (i) promote, co-ordinate and support R&D and innovation in line with the technological, economic, and social needs of the country;
- (ii) foster high-quality research, establish research culture, and build national scientific and technological capacities;
- (iii) promote human resource development and build the research workforce;
- (iv) ensure the dissemination of scientific knowledge;
- (v) facilitate technology transfer and ensure that research results are accessible to and reach society;
- (vi) promote the commercialization of R&D and innovation outputs into products and services; and

- (vii) contribute to the development of the knowledge economy in Ethiopia.

Section 3 also provides the core values, objectives, powers and duties, functions and core competencies of the NRC.

Section 4 proposes the Statutory Framework of the NRC; the establishment of an autonomous entity by an Act of the Parliament is proposed. The suggested mode of governance of the NRC is that it be led by a Board that is accountable to the NSTIC.

Section 5 identifies 8 strategic directions and 10 strategic programs.

The strategic directions are:

- (i) Advance research for societal benefit through the alignment of research activities with local priorities and national problems across all sectors;
- (ii) Coordinate all research activities in the country;
- (iii) Create institutional environment and capabilities that are conducive to research and foster collaboration and partnership at local, regional and global levels;
- (iv) Engage the public for better understanding and use of research outcome;
- (v) Enhance linkages between research and industry;
- (vi) Invest for outcomes that are relevant to sustainable socio-economic development;
- (vii) Facilitate and enable research institutions in the country to be committed to excellence; and
- (viii) Create Human Resources and S&T Information Database.

The strategic programs are:

- (i) Human Resource Development Program;
- (ii) High Priority Research Programs;
- (iii) Institutional Capacity Program;
- (iv) Strategic Research Infrastructure Grants;
- (v) National Research Facilities;
- (vi) National Equipment Program;
- (vii) National Equipment Database;
- (viii) Research Database;
- (ix) Dissemination and Linkage; and
- (x) Resource Mobilization.

Section 6 is about promoting research through funding, human resource development and the provision of the necessary research facilities in order to facilitate the creation of knowledge, innovation and development. Details of funding sources, principles of awarding research grants, funding research centers, promoting research careers and establishing research chairs are given.

Section 7 describes the review process of research proposal, i.e., submission, assessment, recommendations and funding decision.

Section 8 deals with Human Capacity and Research Infrastructure Development. The section summarizes the role of the NRC in developing institutional research capabilities and infrastructure parallel with the appropriate human capital to drive the R&D strategies of universities, research institutes and the industries.

Section 9 presents the national research facilities, namely, Core/Central Laboratories, Central Training Facilities, National Archives, and Natural Resource Repositories and emphasizes the importance of these facilities in research and human capacity development.

Section 10 highlights the importance of partnership among universities, national research institutes both at the federal and regional levels, the private sector, civil society, and international institutions and the coordination thereof.

1. Background: Historical Antecedents of the National Research Council

Research in the field of agriculture began in the early 1950s with the launching of the Point Four Program of the United States, leading to the establishment of the: Imperial Ethiopian College of Agriculture and Mechanical Arts (IECAMA). Research by the American staff of the College culminated in the establishment of the Institute of Agricultural Research (IAR) in 1966. Health research began about the same time with the establishment of the Ethiopian Nutrition Institute (ENI) in 1950, the Pasteur Institute of Ethiopia (now Ethiopian Public Health Institute, EPHI) in 1951 and the Armauer Hanson Research Institute (AHRI) in 1969.

In the university setting, research in the humanities (particularly language and history) initially featured more prominently than research in the natural sciences or engineering and technology. Even the social sciences, strictly defined, did not begin to come to the forefront until the 1970s. The only exception in this regard is perhaps anthropological research, which had a longer pedigree. Moreover, humanities research had its inspiration from and flourished in close interaction with research activities conducted in foreign institutions, under the general rubric of Ethiopian studies. The biennial or triennial International Conferences of Ethiopian Studies served as the main forum for the dissemination of research findings.

For much of that period, research was unabashedly academic, with no pretense at social relevance. It was largely individualized rather than collective, sporadic rather than coordinated. The first step towards socially relevant research was taken with the founding of the Institute of Development Research at Haile Sellassie I University in 1972. Likewise, the first measure to coordinate and regulate research at the national level was taken with the establishment of the Ethiopian Science and Technology Commission (ESTC) in 1975. ESTC was mandated “to plan, encourage, guide, coordinate, select, approve and support research programs and projects of importance to national development”

(National S&T Policy, TGE 1993, Mouton & Boshoff, 7).

Operationally, ESTC set out to execute its mandate through the agency of eight research councils responsible for food and agriculture, industry and technology, natural science, natural resources, health, construction, housing and urban development, education and manpower development, and science and technology popularization. Subsequently a social science research council was also established. An important activity of ESTC was the allocation of research funding, with the Swedish Agency for International Research Cooperation (SAREC) being the major external funding organization.

With the change of regime in 1991, further steps were taken to streamline the activities of ESTC as well as to broaden its mandate. One of the first such steps was the formulation of the country's S&T policy in 1993. The policy had the following triple objectives:

- “to build a national capability to generate, select, import, develop, disseminate and apply appropriate technologies for the realization of the country’s socio-economic objectives”;
- “to improve and develop the knowledge, culture and scientific and technological awareness of the people of Ethiopia”;
- “to make science and technology activities in Ethiopia more efficient and development oriented” (National S&T Policy, TGE 1993, Mouton & Boshoff, 8)

On the basis of the 1993 S&T policy, ESTC formulated the following four sectoral policies:

- National Agricultural Science and Technology Policy;
- National Industrial Science and Technology Policy;
- National Health Science and Technology Policy, and
- National Mining, Water and Geo-Information Science and Technology Policy.

In terms of governance, ESTC was also changed to the Ethiopian Science

and Technology Agency (ESTA) in 1995, with a mandate to review the 1993 S&T policy. It was further upgraded to a ministry level with the establishment of the Ministry of Science and Technology (MOST) in 2008. The 1993 S&T policy was also modified and amplified into the STI Policy, issued in February 2012. Among the objectives of the policy are to:

- promote research geared towards technology learning and adaptation;
- promote and commercialize useful indigenous knowledge and technologies; and
- define the national science and technology landscape and strengthen linkage among the different actors in the national innovation system.

Eleven policy directions and strategies were identified, including technology transfer, human resource development, research, financing and incentive schemes, intellectual property system, science and technology information, environmental protection and development, and international cooperation. The National NSTIC was set up as the highest decision making body on STI policy, with MOST serving as the secretariat and the main implementing agency (STI Policy 2012).

Among the major accomplishments of MOST are the promotion of linkages between education, training and research institutions and industries, the award of prizes for outstanding achievements in science and innovation and the conduct of a national R&D survey in 2011. The survey established that the gross expenditure on research and development (GERD) in 2010 was 0.24% of GDP. The preparation and submission for approval of the Guidelines for the Establishment of Science and Technology Research Council in 2014 is perhaps the most significant historical antecedent to the establishment of the National Research Council (NRC).

2. The Ethiopian Research Landscape: Overview and Recent Trends

2.1 Introduction

Research is a powerhouse of knowledge creation. At a time when the world has been transformed into what is widely dubbed as the knowledge society, the importance of knowledge creation has become ever more critical and ever more crucial. It is well accepted that S&T are critical not only to the economic prosperity of a country but to such matters as food security, disease control, access to clean water, and environmental sustainability.

With the aim of accelerating the conduct, output and impact of research, the Government of Ethiopia has established a national research council that is designed to coordinate, support, and regulate science and technology research within the country. As is the case in other developing countries, the research environment in Ethiopia is not highly conducive and documentation on scientific research is also scant. Therefore, this survey of the country's research landscape has been prepared to provide an overview of the context and framework of the status of research in Ethiopia with a view to informing the operational modalities of a national research council. This brief overview describes the landscape and dynamics of the research base in Ethiopia. Further, the report indicates the way forward by providing a description of some critical measures that need to be taken to meet these challenges. The document was prepared through a review of relevant literature, as well as collection of data and information from various academic and research institutions at both the federal and regional levels. The research institutions considered in this study include the Government, NGOs, as well as privately owned firms.

A caveat is in order here. It is extremely difficult, if not impossible, to do justice in such a short document to the research landscape of the country. The report is, therefore, bound to appear rather capricious. As

much as possible, efforts have been made to dwell on the general trends rather than the specific cases. It should also be stated that, by virtue of the available data, the survey of research undertaken in the natural sciences and social sciences and humanities is largely tilted towards Addis Ababa University (AAU). Note should be taken that, although many of the public and private universities are young, some have undertaken and fostered significant research in diverse areas which might not have been mentioned in this report.

2.2 Research History

It is well known that Ethiopia has a long history, at par with those in ancient Egypt, Persia, China and India. Interwoven with its ancient civilization and literate culture, Ethiopia has an old tradition of scholarship accompanied by outstanding engineering and technological attainments in building and construction, agriculture, food and beverage, metal works, minting, book binding, to mention only a few. The famous stele of Axum, which may be considered as one of the wonders of the world, the rock-hewn churches of Lalibela, considered as the finest early Christian architecture globally, the Palaces of Gondar and the Walled City of Harar, all manifest the technological know-how of Ethiopians in the past. These technological achievements, which have left their marks in the long history of our country, must have been based on some kind of study and research before they were realized.

In the field of agriculture, the beginning of the 1950s marks the birth of scientific agriculture in Ethiopia. The catalyst for the beginning of modern agriculture was the initiation of the Point Four Program of the United States in 1952 leading to the establishment of the Imperial Ethiopian College of Agriculture and Mechanical Arts (IECAMA). By the end of the 1950s and the beginning of the 1960s, the IECAMA had become fully operational with four academic departments namely, Animal Science, Plant Science, Agricultural Economics, and Agricultural Engineering. The American staff of the IECAMA initiated historically significant agricultural field experiments in Ethiopia. IECAMA soon evolved and progressively

transformed first to Alemaya College of Agriculture under AAU, then to Alemaya University of Agriculture and finally to its current state of Haramaya University. In 1966, the Institute of Agricultural Research (IAR) was established as an autonomous entity assuming the national mandate for addressing all agricultural research issues of the country. IAR was later renamed the Ethiopian Agricultural Research Organization (EARO) and is currently known as the Ethiopian Institute of Agricultural Research (EIAR).

With regards to health research, literature related to Ethiopian medicine both indigenous as well as conventional (written in Geez and Amharic) goes back to the 15th century, when a chronicler of Emperor ZeraYa'qob (1434-1468) reportedly described an outbreak of an unidentified epidemic in his capital, Debre Berhan, and the surrounding area. In the 17th century, one of the Ethiopian philosophers at the court of King Susneyos, Wolde Hiwot, was also said to have written a treatise on food, personal health and hygiene . The first Ethiopian medical practitioner was the British-educated *Hakim* Workineh (alias Dr. Charles Martin), who came to Ethiopia at the beginning of the 20th century as a member of a British medical legation

On the other hand, the history of modern health research spans only about eight decades. The Ethiopian government first officially established health research institutions in the 1950s. The institutions set up by the government (outside the academia) for accelerating research activities in the country include: 1) the Ethiopian Nutrition Institute (ENI) in 1950, now merged within the Ethiopian Public Health Institute (EPHI)); 2) Pasteur Institute of Ethiopia (now EPHI) in 1951; and 3) Armauer Hanson Research Institute (AHRI) in 1969.

The history of research in the Natural Sciences could be traced back to the establishment of the University College of Addis Ababa in 1950, the precursor of the AAU. However, although Natural Science research has evolved to be at the core of research activities of the University,

and although currently more than half of the major thematic research areas in the University are conducted at the College of Natural Sciences, AAU has not still recognized the need for a dedicated Natural Science research institute. This is despite the effort made in 2004 to re-visit the idea first proposed by the late Prof. Aklilu Lemma in 1972 to establish an Institute of Scientific and Technological Research and Development, ISTRAD. Natural Science Research has therefore been conducted within the teaching Departments and Schools of the College of Natural Sciences, the only exception being the recently established Institute of Geophysics, Space Science and Astronomy (IGSSA). This trend is mirrored in the other universities conducting natural science research, where only a few of the newly established research centers in the Universities of Adama, Bahir Dar, Gondar, Haramaya, Jimma and Mekele are dedicated to proper natural science research.

Modern technology in Ethiopia may be said to have begun in the 19th century with the starting of the foundry at Gafat (north-central Ethiopia) built by Emperor Tewodros II as well as that emperor's road-building enterprise. However, modern engineering and technology teaching and research started with the establishment of the Imperial College of Engineering in 1953 and the Ethio-Swedish Institute of Building Technology in 1954. These two institutions later became faculties within AAU. The Ethio-Swedish Institute of Building Technology, more commonly known as the Building College, became a pioneer in starting rudimentary research in the improvement and development of building materials. It was only in 1974 that the staff of the Faculty of Technology (formerly College of Engineering) started to engage in applied research.

The development of social science and humanities research in Ethiopia is embedded in its ancient civilization and literate culture. The two dominant religions – Christianity and Islam – took root in the country early on in their history and gave rise to indigenous processes of knowledge creation and dissemination. Ultimately, it is these two traditions, particularly the Christian one that inspired what we have come to call Ethiopian studies. The Germans played a conspicuous role

in its genesis. During the seventeenth century a German scholar by the name of Hiob Ludolf, in fruitful partnership with an Ethiopian monk named Abba Gorgoryos, wrote the first modern history of Ethiopia, as well as Amharic and Ge'ez dictionaries and books on Amharic and Ge'ez grammar. His pioneering works led the way to the development and expansion of Ethiopian studies in subsequent decades. As a result, scholarly investigation came to include the Cushitic and Omotic south as well as the Semitic north. In the realm of archaeology, a German team led the first major expedition at the beginning of the twentieth century uncovering the glory of Axum. These pioneering excavations were amplified by two British expeditions later in the century, the first in the 1970s and the second in the 1990s. The mushrooming of Ethiopian studies inevitably led to the launching of academic journals that served as media for the dissemination of research results. In this respect, prominent place was occupied for long by the Italian *Rassegna di studi etiopici* that started in 1941, subsequently superseded by the *Journal of Ethiopian Studies*, published by the Institute of Ethiopian Studies of AAU. Equally important developments are the increasing prominence of Ethiopian scholars in Ethiopian studies and the remarkable advance made in anthropological research in recent decades.

2.3 Research-Performing Organizations

Ethiopia offers various forms of research locations: institutions run by federal and regional authorities, universities, non-university institutes and companies. All in all, there are some 20 research institutions in the country funded by the government, plus a few research R&D centers run by industrial corporations. Basically, agricultural sciences, medical & health sciences, and engineering & technology, in that order, are the major fields of research in the government sector. A list of selected federal and regional institutions, public universities and industrial institutes actively engaged in research is provided in Appendix 1.

Ethiopia's federal ministries fund a number of R&D institutions. This sectoral research is always directly related to each ministry's field of

activity and provides the necessary scientific basis for the execution of sovereign tasks. Federal research institutions perform research in several areas: agriculture, healthcare, infrastructure, natural resources, animal protection, development, economic and legal policies. The federal regions of Ethiopia also operate several research institutes which support their respective research activities. At present, regional research institutes focus on agriculture and healthcare.

Many of the public universities in Ethiopia act as centers where research, teaching, and outreach are integrated. In these institutions, teaching, basic and applied research, and outreach activities are carried out on a wide range of themes in the agricultural, medical, engineering, natural and social sciences and humanities. Research expenditure at these institutions is borne by public (federal and regional) as well as international funding. Public funding to universities is disbursed by the Ministry of Education and the Ministry of Science and Technology.

Research undertaking by the Ethiopian industrial sector is at present negligible. Whatever limited R&D there is tends to focus on the creation or invention of new products and services or more commonly the incremental improvement of existing products and services.

2.4 Institutions Involved in Agricultural Research

Federal and regional institutions

Currently, the Ethiopian Institute of Agricultural Research (EIAR) is the umbrella federal institution with a large number of centers, sub-centers and trial sites under it. Agricultural research conducted at the federal, regional, and university levels constitutes the National Agricultural Research System (NARS). There are 15 relatively large EIAR research centers located in various parts of the country. The NARS is supported by a number of international agricultural research centers (IARCs) currently working in Ethiopia in the fields of forestry, maize and wheat, sorghums and millets, potatoes, cereals and food legumes adapted to dry-land areas, food policy and related topics, livestock and water management.

Regional agricultural research institutes (RARIs) have large numbers of centers, sub-centers and trial sites under the respective regional states. Currently, a total of 28 regional research centers are active under the four main regional states, namely Tigray, Amhara, Oromia and Southern Nations, Nationalities and Peoples Region. Four research centers are located in the regional states of Afar, Somali, Gambella, and Benishangul and Gumuz. The total number of research centers under federal and regional agricultural research institutes currently stands at 47.

Universities

Haramaya University is the pioneer institution of agricultural teaching, research and extension in Ethiopia. Over the last 50 years, the university has developed and released several improved crop varieties and many improved crop and livestock management practices. Jimma University conducts some multidisciplinary research projects of thematic nature mostly at the Colleges of Agriculture and Veterinary Medicine. Other major universities with extensive agricultural research portfolio are Hawassa, Mekele, Bahir Dar, Ambo, and Nekemte. Adama Science and Technology University (ASTU) has recently established the Artificial Insemination Institute and Asella Model Agricultural Enterprise.

2.5 Institutions Involved in Health Research

Federal research institutions

The Ethiopian Public Health Institute (EPHI), formerly the Ethiopian Health and Nutrition Research Institute (EHNRI), is the foremost government institution with long years of research experience. It conducts a number of research activities on infectious and non-infectious diseases, nutritional problems as well as on modern and traditional drugs. It is also the institution that is usually called upon in response to any disease outbreak in the country. It has recently established a Public Health Emergency Monitoring (PHEM) program through training collaboration with the School of Public Health, AAU.

The Armauer Hanson Research Institute (AHRI) is a biomedical research facility under the Federal Ministry of Health. Since 2004, it has operated as part of the All-African Leprosy Research and Training (ALERT) Center. AHRI is a cutting edge research center in the areas of basic (molecular biology, immunology), epidemiological, transitional and infectious diseases. AHRI supports research in infectious diseases in general but focuses mainly on tuberculosis, leishmaniasis, leprosy, malaria, meningitis, sexually transmitted diseases and HIV. AHRI also serves as headquarters for the Pan African Bioethics Initiative (PABIN) and runs one of the few Institutional Review Boards (IRBs) in the region that are recognized by the Strategic Initiative for Developing Ethical Review Capacity (SIDCER)/WHO.

Universities

Gondar University is the pioneer health training and research institution through its public health training program initiated in the 1950s. The thematic areas identified for research include: infectious diseases; maternal and child health; nutrition related issues; and environmental and occupational health and safety. The emphasis and strength of research has been in the fields of medicine and public health. The university has established the Dabat Research Center, which is a center of Health and Demographic Surveillance System (HDSS) and is also planning to establish a “Tropical and Infectious Diseases Research Center” in the near future.

AAU has two important centers of health research, namely, the College of Health Sciences (CHS) and Aklilu Lemma Institute of Patho-Biology (ALIPB). Research at the CHS is carried out in four major areas: biomedical, community health, clinical and pharmaceutical. There are ongoing research activities on important health areas such as nutrition, maternal and child health, eye diseases, mental health and neurological disorders. The ALIPB undertakes research in animal health and zoonoses, endod and other medicinal plants, medical parasitology, microbiology & immunology and vector biology and control. The Institute has a good

track record and great potential to develop into a center of excellence in biomedical research, in particular in being a specialized center for diagnosis and management of certain diseases such as schistosomiasis.

The pharmaceutical research focuses on phytochemical screening of traditional herbal drugs; isolation and characterization of secondary metabolites in search of active ingredients having anti-haemorrhoidal, anti-TB, anti-malarial, anti-viral and anti-fungal activities; ethnopharmacology; development of phytomedicines; development of alternative pharmaceutical excipients including starch-based nanoparticles as drug carriers; controlled drug delivery systems; bioequivalence studies of locally manufactured medicines; rational drug use; pharmacoepidemiology, and supply chain management.

At Mekele University, the College of Health Sciences is engaged in health research within thematic areas that include maternal and child health, communicable diseases, with special emphasis on tuberculosis, HIV/AIDS, malaria, leishmaniasis, healthcare service provision and quality of healthcare services, as well as non-communicable diseases, such as malnutrition, malignancies, chronic medical illnesses, and environmental and occupation health. The universities of Jimma, Haramaya, Arba Minch, Bahir Dar and Hawassa have also started health research through newly established colleges and institutes of health sciences and graduate training programs in public health and clinical subjects.

Limited health research is also undertaken by private firms and professional associations. Numerous private firms (public service contractors) have been engaged by bilateral and multi-lateral institutions to conduct studies that have operational relevance to the health sector to selected subjects such as HIV/AIDS and reproductive health. The Ethiopian Public Health Association (EPHA) is similarly involved in research projects in collaboration with other organizations. The major areas of research that EPHA is undertaking include HIV/AIDS, tuberculosis and sexually transmitted infections.

2.6 Institutions Involved in Engineering and Technology Research

Federal institutions

Federal government departments that currently undertake engineering and technology research in addition to their principal mandates include: the Ministry of Urban Development, Housing and Construction (MUDHC), the Ministry of Water, Irrigation and Energy (MoWIE) and the Ethiopian Roads Authority (ERA). In these ministries, research infrastructure, laboratory facilities and number of qualified research staff remain inadequate. Recently established governmental research institutions that carry out research activities in their respective areas include the Leather Industry Development Institute (LIDI), the Textile Industry Development Institute (TIDI), the Metal Industry Development Institute (MIDI) and the Ethiopian Kaizen Institute (EKI). These institutes have started undertaking applied research projects while challenged by scarce research budget, infrastructure and facilities and insufficient number of qualified research staff.

Universities

Universities are the major outlets of engineering and technology research in Ethiopia. AAU is the leading institution in the country in undertaking research in these fields. Within AAU, the Addis Ababa Institute of Technology (AAiT) and the Ethiopian Institute of Architecture, Building Construction and City Development (EiABC) are actively engaged in basic and applied research, mainly through MSc and PhD programs. Other universities, such as Mekele, Bahir Dar, Jimma and Hawassa have started offering post-graduate training that enhances engineering and technology research in the country. Bahir Dar University has established various research centers, including the Biotechnology Research Institute and the Blue Nile Water Institute. Moreover, the university is establishing other research centers, among which is the Institute of Geospatial Data and Technology Center.

Industries

Industry-based research in Ethiopia is very limited. Two industries, namely Metal and Engineering Corporation (METEC) and Ethio telecom are noteworthy in undertaking some research activities. In particular, METEC has sufficient and capable research staff and adequate facilities to carry out research in the fields of engineering and technology.

2.7 Institutions Involved in Natural Science Research

Universities

Though natural science is at the core of the agricultural and health-related research conducted in universities and research institutions, basic research in natural sciences is limited to teaching departments in some universities. Most of the basic natural science research is carried out as part of PhD and MSc programs. The universities of Addis Ababa, Adama, Arba Minch, Bahir Dar, Gondar, Haramaya, Jimma, and Mekele, possess the minimum infrastructure and human resources to conduct research in natural sciences. AAU has established the following three research centers related to natural sciences: the Institute of Geophysics, Space Science and Astronomy (IGSSA), the Institute of Biotechnology and the Ethiopian Water Institute. Research in the core natural science areas is currently limited to teaching departments and schools within the College of Natural Sciences (CNS). Here, a significant number of research laboratories are housed, particularly in the Departments of Chemistry, Physics, the Life Sciences, the School of Earth Sciences and the Biotechnology program. Additional research facilities are found within specialized centers/programs of post-graduate teaching and research.

Adama Science and Technology University (ASTU) has recently established the Adama Institute of Sustainable Energy and is setting up a Research Park and a Technology Innovation Center. Bahir Dar University is currently establishing the Biotechnology Research Institute and the

Blue Nile Water Institute. Gondar University has recently established a Climate Change Research Center. At Arba Minch University, a number of research projects are underway with their emphasis and relative strength in water science and technology.

2.8 Institutions Involved in Social Science and Humanities Research

Federal institutions

The Ethiopian Development Research Institute (EDRI) is a government think tank set up in 1999 under the Office of the Prime Minister with the objective of conducting social and economic research. EDRI has three major research directorates: Macro Modeling, Agriculture and Rural Development, and Poverty and Sectoral Development.

Universities

AAU has been the pioneering higher education institution (HEI) in the realm of social sciences and humanities research. The Institute of Ethiopian Studies (IES), established in 1963, has been serving as the major medium for the generation of research in the humanities as well as its dissemination through its journal, *Journal of Ethiopian Studies*, and the periodic international conferences of Ethiopian studies, first started in 1959, of which it has been the principal organizer. Beginning with history and language studies, Ethiopian studies have expanded over the years to include anthropology and social sciences.

The Institute of Development Research (IDR), established in 1972, has provided the research home base for economists, geographers, sociologists, demographers and development specialists. Over the years, it has also created centers dedicated to specialized research, such as the Centre for Research, Training and Information for Women in Development (CERTWID).

With respect to the regional universities, Bahir Dar University

is currently establishing the Abbay Culture and Development Research Center and the Institute of Pedagogical and Educational Research (IPER). It also plans to create the Tana Demographic and Field Research Centre (TDFRC) and the Institute of Economic Research. Gondar University has also established the Research Center for Social Sciences and Humanities. Unity University has recently established the Centre for Ethiopian Strategic Studies (CESS).

Think Tanks

Think tanks are largely a phenomenon of the post-1991 era. Two institutions that are worth mentioning in this respect are the Ethiopian Economic Association (EEA, set up in 1991) and the Forum for Social Studies (FSS, founded in 1998). Aside from holding annual conferences on the Ethiopian economy and issuing an Annual Report on the Ethiopian Economy, EEA established the Ethiopian Economic Policy Research Institute (EPRI) in 2000 with a view to carrying out sustained policy research in the economic sphere. Likewise, FSS has been conducting policy research and dialogue since its inception with a focus on poverty alleviation, environmental management and education. One of its most successful dialogue series was the one entitled “Intergenerational Transfer of Knowledge”, in the course of which retired civil servants and professionals shared their accumulated knowledge and experience with a view to ensuring continuity in policy-making.

The Organization for Social Science Research in Eastern and Southern Africa (OSSREA), located within AAU, is a sub-regional institution that has been playing an increasingly important role in the mainstreaming of Ethiopian social science studies into African social science research. OSSREA has been sponsoring Ethiopian social research, as well as research within the sub-region in general, through the award of

research grants to young scholars as well as, more recently, through senior scholar, post-doctoral and sabbatical research grants.

2.9 Research Funding

Funding for research in Ethiopia comes from the government and via the government from various external sources such as foreign development cooperation agencies. The research expenditure of Ethiopia, which amounts to 0.24% of GDP, is low compared to those of other Sub-Saharan African countries, e.g., Kenya (0.48%), Ghana (0.38%), Malawi (1.7%), Tanzania (0.48%) and Uganda (1.1%). South Africa invests around 0.87% of GDP or 1.7 billion USD (2010 R&D Survey).

The survey also indicates that major sources of funding for all research expenditures are government budget (56%), followed by foreign grant (26%), while the business sector and foreign loan contribute about 10.8% and 3.7%, respectively. Substantial non-government funding for research is available to several research institutions and universities. For instance, the EPHI gets significant level of funding from various international and bilateral partners. The major research funding allocation goes to the government sector (42%) and higher education sector (42%), while the share of the business sector is about 15%. The above survey also showed that basic research and experimental development account for about 20% and 21% of the total expenditure, respectively, with greater emphasis being given to applied research, which accounts for 43.5% of total expenditure. Nearly half (47.5%) of the total research expenditure goes to agricultural sciences, followed by the medical & health sciences (15.5%) and the social sciences & humanities (10%), while research in the natural sciences and engineering & technology accounted for only 6.5% and 4.7%, respectively.

The government sectoral research programs are funded by government budget (68%), foreign grant (19%), and foreign loan (about 9%). In this sector, about 88% of gross expenditure is on agricultural sciences, followed by 10.7% on medical & health sciences. Engineering &

technology account for 1.41% while natural sciences set only 0.11%. Social sciences & humanities research is only marginally funded in the government sectoral research programs.

Research programs at higher education institutions (HEIs) are funded by the government (53.4%), foreign grant (42.8%) and HEIs themselves (about 2.6%). In this sector, medical & health sciences, agricultural sciences, and social sciences & humanities are the major fields of research. Comparatively better emphasis is given to natural sciences and engineering & technology research in the HEI sector, although the expenditure on these fields is still much lower compared to the other fields of research.

2.10 International Collaboration

2.10.1 Collaboration in Agricultural Science Research

Several international organizations have played major collaborative roles with the Ethiopian NARS in the development and operation of agricultural research over almost six decades. These include:

International Agricultural Research Institutions (IARCs): The IARCs currently working in Ethiopia are CIMMYT (maize and wheat), ICRISAT (dry land cereals and legumes), CIP (potatoes), ICARDA (mainly cereals and food legumes adapted to dry land areas), CIFOR (forestry), ILRI (livestock), IWMI (water management), and IFPRI (food policy and related topics). The research activities undertaken by these IARCs have been quite comprehensive in relation to the commodities/disciplines in their respective areas. Most of them have made significant contributions in relation to crop and livestock genetic improvement, development of crop and livestock husbandry systems, animal traction and traditional farm tools and implements, socio-economics of crop and animal production in collaboration with the Ethiopian NARS. Other significant collaborative partners have been

- The United Nations Food and Agriculture Organization (FAO/ UNDP);
- The National Animal Health Diagnostic and Investigation Center (NAHDIC);
- The Tsetse and Trypanosomiasis surveillance and control technology (Blue-Black-Blue trap); and
- The Southern Tsetse Eradication Project implemented by a bilateral agreement between the Ethiopian Government and the International Atomic Energy Agency.

2.10.2 Collaboration in Engineering and Technology Research

The information given herein is limited to Addis Ababa Institute of Technology, AAU. Currently, the four schools of the Institute (Chemical and Bioengineering, Civil and Environmental Engineering, Electrical and Computer Engineering, Mechanical and Industrial Engineering) have collaborative research and PhD programs with the following institutions in Canada (University of Toronto), Finland (Aalto University), Germany (Cologne University of Applied Sciences, Stuttgart University, Technische Universitaet Muenchen), Italy (Politecnico di Torino, University of Bologna, University of Trento), Netherlands (University of Utrecht), Norway (Norwegian University of Science and Technology), Sweden (Chalmers University of Technology, KTH, Malardén University, Stockholm University), Taiwan (National Taiwan University of Science and Technology), Tanzania (University of Dar es Salaam), USA (Louisiana State University, Morgan State University, Michigan State University, Minnesota State University, New Mexico State University, University of Michigan, University of the District of Columbia).

2.10.3 Collaboration in Health Sciences Research

There are many bi-lateral, multi-lateral and non-government institutions that are actively engaged in health research, in most cases by financing the conduct of studies through universities

and public service contractors (PSC). The main multi-lateral organizations that collaborate in health research are the UN agencies (WHO, UNAIDS, UNDP and UNICEF) and the World Bank. Both provide technical assistance and direct research in areas that include: health systems, maternal and child health, HIV/AIDS, nutrition and many other areas. The bilateral institutions that are actively engaged in health research include: the Swedish International Development Agency (SIDA) through its agency for research cooperation and development with developing countries (SAREC); the USAID, through its various PSCs; the US Centres for Diseases Control and Prevention (CDC), most active in the area of HIV/AIDS-related research both directly and through PSCs; the Dutch, Irish, Austrian and Norwegian Embassies are also known for their substantial and direct support to studies linked to HIV/AIDS, tuberculosis as well as to reviews and evaluations of the implementation of the Health Sector Development Program (HSDP). There are also NGOs that are actively involved in health research, such as the Save the Children Federation which is actively engaged in research and advocacy that relate to effect user fees on health services utilization, in addition to running a longitudinal project (Young Lives Project) that looks at the livelihood and health status of children born at the beginning of the millennium in Ethiopia, India, Peru and Vietnam.

2.10.4 Collaboration in Natural Science Research

Several international agencies fund and assist the research programs at the College of Natural Sciences of AAU, most notably the Swedish SIDA/SAREC, through thematic research programs and small grants. Other funding agencies include the Netherlands Organization for International Cooperation in Higher Education (NUFFIC), Norwegian Council for Higher Education (NUFU), German Academic Exchange Service (DAAD),

Austrian Service for Academic Exchange (ÖAD), the Italian Cooperation Program, the French Government, International Atomic Energy Agency and DFID. Individual research grants are also provided by The World Academy of Sciences (TWAS), International Foundation for Science (IFS), Third World Organization for Women in Science, International Science Program (IPPS, IPICS), Organization for the Prohibition of Chemical Weapons (OPCW), the Royal Society - UK, Natural Environmental Research Council (NERC– UK), National Science Foundation (NSF-USA), German Research Foundation (DFG), the Leaky Foundation, the World Bank, USAID, McKnight Foundation, Mellon Foundation, etc.

The other universities also maintain close partnership with foreign universities and funding organizations. Bahir Dar University has worked on water conservation issues in collaboration with Cornell University and with funding from the USAID. The University of Gondar has continually maintained strong links with international organizations (including USAID, WHO, UNICEF) and foreign universities. Jimma University conducts some multidisciplinary research projects of thematic nature funded by various organizations such as VLIR-Belgium, Packard Foundation, Mellon Foundation, CIDA, NUFFIC, WHO, DANIDA, World Bank and IFS. In addition, a significant number of individual research projects are funded by the Ethiopian government as well as internal and external partners and funders.

Mekele University runs several collaborative and mostly internationally funded projects/programs including Mekele University–VLIR (Belgium) program, a 10 year multidisciplinary project, and the Mekele University–NORAD (Norway) project both aiming at strengthening the capacity of the University in education and research, with the ultimate objective of contributing to the sustainable livelihood of communities in the Northern highlands and rift valley regions of Ethiopia. Other long-term internationally funded projects in the University include the Seed Safety through Diversity Bilateral Project (supported by NUFU), Women-Learning-Women project, Women and Food Science Project, and Water Resource Planning (WAREP) project.

1.10.5 Collaboration in Social Sciences and Humanities Research

The IES and IDR, the two principal research institutes of AAU entrusted with humanities and social science research, respectively, have benefited from various international collaborative arrangements in the decades of their existence. Among these are: the decade-long collaborative project between IES and SAREC for the microfilming of foreign (British, French and Italian) archival material on Ethiopia which has made possible the launching of the PhD program in history; the collaborative research project with the University of Illinois at Urbana-Champaign on the environmental history of Ethiopia; the IDR-University of Trondheim (Norway) project entitled Peasant Production and Development in Ethiopia (PPDE), with a research station at Armania in northern Shoa.

The government think tank Ethiopian Development Research Institute (EDRI) has been the beneficiary of sustained generous funding from the African Capacity Building Foundation (ACBF) as well as the International Food Policy Research Institute (IFPRI), the Think-Tank Initiative of IDRC, and the UNDP. The non-governmental think tanks, EEA and FSS, have been sustained by funding from a consortium of donors, including DFID, the Netherlands Embassy, the Irish Embassy, the Norwegian Embassy and the Danish Embassy. More recently, this support has been institutionalized into the Civil Society Support Program (CSSP). EEA has also been the beneficiary of core funding from ACBF and the Think-Tank Initiative of IDRC.

2.11 Publications

Absolute volume of published papers is one good indicator of research activity and indirectly of research capacity. A report by AU-NEPAD (2010) indicates that the total research output in Ethiopia during the last two decades was very low, only about 2% of the total number of publications produced in all African countries. Ethiopia has also one of the lowest researcher to population ratio in the continent, with only 21 researchers per million of population (2007 data), compared to, for

instance, South Africa and Egypt, which boast 393 and 617 researchers per million inhabitants, respectively. According to UNESCO's World Science Report of 2010, Ethiopia produced under 2000 publications in the three year period (2008-2010), of which only a little more than half were international. Of the total publications during this period, more than half (55%) were from medicine & public health, nearly 15% from natural sciences, 10% from agricultural sciences and about 3% from engineering & technology. While Ethiopia is one of the top seven Sub-Saharan countries with relatively high number of publications, its contribution (6%) is very low compared with those of the top two contributors (South Africa: 62%, Nigeria: 11%).

Among the public higher education institutions, AAU, for historical reasons, takes the lead in producing significantly large number of publications in most fields of study. Though a systematic survey of publication and research profile in the country is yet to be conducted, some very fragmented surveys, focusing on limited universities or addressing a limited time period, have been conducted and could show the general trend of publication profiles in the concerned universities. However, it should be noted that such studies rely only on the responses of the surveyed targets and naturally tend to underestimate the number of publications. A recent survey of the publication profile of the AAU for the last few years showed that the number of publications (original research articles, peer-reviewed conference proceeding papers, books, book chapters, working papers, short notes & communications, textbooks, and review articles) produced show a slight upward trend, with the College of Natural Sciences, College of Health Sciences, College of Social Sciences, College of Veterinary Medicine & Agriculture in that order producing the highest number of publications, accounting for a total of nearly 75%, while the remaining 25% is produced by the other colleges and institutes. Though exact numbers are not available, Bahir Dar, Gondar, Haramaya, Jimma and Mekele universities have produced hundreds of research articles in local and international journals during the last two decades.

In addition to the universities, major health and agricultural research institutes and centers published scholarly research in various national and international outlets. In the health sciences, for instance the Armauer Hanson Research Institute (AHRI) and the Pasteur Institute of Ethiopia (now EPHI) have produced publications on clinical immunology, molecular biology, genetics, clinical diagnostics, clinical trials and epidemiology of infectious diseases nutrition and traditional medicine during the last five decades. Another survey showed that various institutions in the health sector have produced publications covering a wide range of thematic areas including biomedical and pharmaceutical sciences, communicable diseases and diseases of poverty; population, maternal and reproductive health; chronic and non-communicable disease; nutrition and child health; environmental, occupational health and safe water and sanitation; behavioral health and communication; health policy and health systems; human resources for health; and inequality and equity issues in health.

The agricultural research institutes (federal and regional), agriculture-based professional associations and colleges of agriculture in the higher learning institutions have been at the forefront of agricultural research and have produced a significant number of publications during the last decades. Among the reputable national journals in the agriculture sector are *Ethiopian Journal of Agricultural Sciences*, *SEBIL: Journal of the Crop Science Society of Ethiopia*, *Pest Management Journal of Ethiopia*, *Ethiopian Journal of Natural Resources*, *Ethiopian Journal of Agricultural Economics*, and *Ethiopian Journal of Animal Production*. Although these journals have varying degrees of continuity and existence, between them they contain the majority of the agricultural scientific articles published locally.

The reputability and sustainability of scholarly journals of universities and research institutions are other means of evaluating research capacity. The various universities publish such scholarly journals, which serve as their official research outlets and as platforms for scholarly publications by national and international researchers. The AAU houses

16 scholarly journals, some of which are internationally reputable. These include, among others, *SINET: Ethiopian Journal of Science*, *Bulletin of the Chemical Society of Ethiopia*, *Ethiopian Medical Journal*, *Ethiopian Journal of Health Development*, *Ethiopian Pharmaceutical Journal*, *Ethiopian Journal of Education*, *Ethiopian Journal of Development Research*, *Journal of Ethiopian Studies*, *Zede: Ethiopian Journal of Architecture and Engineering*. The other universities have also a similar tradition of housing scholarly journals, often in their respective field of emphasis, though the current trend is to establish journals in various fields. For instance, Arba Minch University publishes “*Water: Ethiopian Journal of Water Science and Technology*”; Gondar University publishes the “*Ethiopian Journal of Health and Biomedical Sciences*”; Jimma University publishes the “*Ethiopian Journal of Health Sciences*”; while Mekele University publishes the “*Journal of the Dry lands*”.

2.12 Patents

The total number of patents granted to individuals and companies by the Ethiopian Intellectual Property Office (EIPO) for new innovations during the period 1997- 2013 amounts to 471. Out of these, 404 (85.8%) were industry-related, 53 (11.2%) were for agriculture, while 14 (3%) were for health.

2.13 New Agricultural Releases and Products

Research on genetic improvement of crops has been very extensive and focused on the development of varieties with desirable traits such as high yield (grain and straw), maturity, disease and/or insect resistance/tolerance, quality and adaptability to the growing environment. The field crops breeding programs undertaken over the last six decades or so have resulted in the recommendation or release of a large number of improved varieties. A total of 625 new genetically improved field and horticultural crop varieties have been released until 2010.

Among the major field crops released so far include 248 varieties of

cereals, 136 varieties of food legumes and 60 varieties of oil seeds; the total number of horticultural varieties is 181, while the number of varieties released under fiber and stimulant crops is 15 and 37, respectively (Brhane Gebrekidan et al., 2013; Seme Debela, 2011)..

Regarding research on non-timber forest products, three *Boswellia*, over 17 *Commiphora*, six *Acacia*, and one *Sterculia* species have been found to be important sources of frankincense and myrrh. On the other hand, a total of 52 timber species (30 indigenous and 22 home-grown exotics) have been identified and characterized to be suitable for construction, industry and energy purposes and utilization technologies/methods.

In the area of animal health research, the eradication of rinderpest has significantly improved the production and productivity of livestock. Similarly, the control of *Tsetse* and *Trypanosomiasis* in western and southwestern parts of Ethiopia has increased the production and productivity of livestock. The protection of cattle from major trans-boundary animal diseases including rinderpest, *tsetse* and *trypanosomiasis* has enabled millions of pastoralists and small-holder farmers to attain food security, livelihood protection and better social standing.

With regards to natural resources, significant amounts of experimental data on soil fertility and fertilizers have been accumulated through an expanded network of research centers and agricultural higher learning institutions. Effects of some micro-nutrients such as zinc and manganese are being studied more intensely, particularly in some crops and soil types. Liming is also being recommended to counter the effect of soil acidity especially in waterlogged soils.

2.14 Research Policy and Policy Relevance

Research activities in most academic institutions, except agriculture, began as a purely academic enterprise with little or no regard to the policy relevance of knowledge. In these institutions, knowledge was pursued and accumulated for its own sake, not with an idea of social utility and

policy relevance. Drawing lessons from scholarly investigations and making recommendations on their basis was not common. Similarly, most research activities undertaken at the government research institutions did not focus on issues of major relevance to policies and strategies in their respective sectors, except perhaps for very limited areas of research. Exceptions to this general picture are the EPHI and EIAR. The latter, for instance, has a strong track record of conducting applied research on nationally relevant topics and issues. In general, across most sectors there is poor linkage between conducting research and policy action as research results are not readily accessible to those implementing the policy actions.

Most institutions involved in research have not put the necessary effort for translating their research outputs into activities of their sectors. Nor have they devised mechanisms for monitoring the implementation of their research results, even in the rare cases where there are operational linkages to their particular sector. In reality, most research results get disseminated through publications that are usually located abroad or in local journals that have limited distribution to selected circles. Even when there are other dissemination efforts, these usually tend to be limited to more or less the same academic community. In addition, people who are placed in positions of implementation may not have the time or the technical know-how to digest results from publications that are usually written in technical languages.

For instance, it has been pointed out that most of the research conducted at AAU and the outputs thereof (Tsige Gebre-Mariam (2011):

- are fragmented, with no or very little impact on improving life;
- fail to exceed customers' expectations;
- do not focus on customer demand and national development agenda;
- are not inventive and innovative;

- have very limited applications; and
- are poorly disseminated.

From this, it is probably fair to conclude that the policy relevance of research at AAU and probably at other institutions performing research in Ethiopia has been very limited. However, some outputs from research have informed policies related to environmental protection, natural resources (forest, wildlife) conservation, water and mineral resources development, as well as some mega infrastructure development.

This reality has begun to change perceptibly in more recent times. Here one can mention the policy relevance of recent research trends in the social sciences sector. In the field of history, the geographic shift from northern to southern Ethiopia has made it possible to have a more inclusive national history. Likewise the thematic shift from diplomatic and political history to economic and social history has made it possible for historical investigation to have greater policy relevance affecting the lives of ordinary people. Land, agriculture, the peasantry, trade and the urbanization process have given historical enquiry greater social context. The recent advances in archaeology and paleo-anthropology have also drawn global attention to the region, making it a major centre of tourist attraction as well as a hub of pre-historical research. The establishment by government proclamation of the National Archives and Libraries also constitutes a milestone in historical research, enhancing the kind of social and economic research that has great policy relevance. The broadening of linguistic research to investigate more comprehensively the Omotic and Cushitic peoples of Ethiopia has also made possible the kind of inclusive knowledge that we have seen in the historical field. Likewise, the recent focus on oral literature has broadened our knowledge of non-literate societies and cultures.

As is to be expected, social science research has had less difficulty in being policy relevant than research in the humanities. This has been particularly so in the post-1991 period, with the engagement of civil society organizations in policy research. Within the academic setting,

the IDR of AAU has been the chief generator of policy-oriented research, with a focus on rural development, including land tenure, food security and more episodic developments such as resettlement and villagization. It was also at the IDR that the first centre dedicated to gender research and training, CERTWID, got its lease of life.

But, it was outside the purely academic realm that the most sustained policy-relevant research was conducted. This was largely due to independent think tanks like the Ethiopian Economic Association and the Forum for Social Studies and the government think tank EDRI, as well as the sub-regional research network OSSREA. Not only have these think tanks managed to develop research agenda of immediate social and national relevance – such as agriculture, energy, unemployment, industrialization, poverty reduction, quality of education and intergenerational transfer of knowledge – but they have also had the edge over the strictly academic research undertakings by disseminating their research findings through policy dialogues, publication of research reports and policy briefs tailored to the needs of policy-makers.

2.15 Research Gaps and Challenges

According to the 2010 Research and Development Survey of the Ministry of Science and Technology, the major factors influencing R&D activities in Ethiopia are knowledge, cost of research, market and non-existence of Intellectual Property Policy, in descending order of significance. It has also been noted that the poor infrastructure and poor access to ICT, which otherwise would have significantly facilitated research, could be another major challenge influencing research activities. In addition to the above factors, Ethiopian research institutions and universities are confronted with a number of other difficulties in their efforts to build competitive and sustainable research capacities. The following outlines the challenges researchers based in Ethiopian research institutions and universities face when trying to conduct research and produce new knowledge.

A) Inadequate Funding for Research and Agenda Setting

Research demands a long-term commitment consistent with the larger mission of building such capability. Even though there is a commitment by the government to allocate about 2% of its GDP to research, this has not yet been translated into action. As a result, budgetary allocation to research from public funds is usually very limited. Inadequate funding has restricted the choice of researchers in terms of addressing wider and priority issues that are relevant to the different sectors. For instance, financing for agricultural research and the multiplication and dissemination of improved agricultural technologies is inadequate. At just 0.19 percent in 2011, Ethiopia's agricultural research investment as a share of AgGDP is one of the lowest in Africa (Nienke et al, 2014). The comparative percentage figures for Kenya, Uganda, and Tanzania are 1.22, 1.22, and 0.54, respectively.

A critical issue directly dictated by availability of funds is that of research agenda setting. In countries like Ethiopia where resources are limited, preferences almost always focus on applied research that attempts to address social and economic challenges. As major funders of research in the country, external development partners determine the kind, extent and scope of research. The country has limited leeway to divert funds already earmarked by funders for definitive objectives. This is aggravated by the lack of capacity and/or incentives for senior professionals to direct the research agenda setting and the formulation of research questions. Also worth mentioning is the lack of strong information system and research database that have further complicated setting of research agenda.

B) Low capacity for research

Because of the low level of development of the human resources in science and technology, the number of skilled researchers in many disciplines is limited. Assessment of many governmental research institutions revealed that research development is hindered by

unavailability of skilled and qualified persons. For example, Ethiopia's agricultural research staffing is among the least qualified in terms of postgraduate degrees and female participation (ASTI, 2010). In addition, most researchers receive relatively little training in leadership and management, advocacy, partnership development, priority-setting, impact assessment or communication, all of which are vital components of the research-for-development process.

C) Low research support resources

The research protocol review and approval mechanisms in many institutions are other major challenges facing researchers. In some cases, the research evaluation and approval mechanisms are prolonged, multi-layered, and at times redundant and unnecessary. The protracted delays in getting approvals sometimes frustrate faculty and can also make potential donors hesitant to associate with such institutions.

Within universities, research laboratories equipped with analytical facilities and research logistics with supporting technical staff are not readily available. There is inadequate support and technical staff for research laboratories. In many laboratories, it is not uncommon to find equipment that is out of order due to lack of maintenance that could easily have been handled by skilled and experienced technicians.

Limited access to a wide range of up-to-date journals and books in the various disciplines is probably one of the most critical challenges facing researchers. Although the recent introduction of the Internet is expected to help partially alleviate this problem, internet connection is not always dependable. There is also lack of proper retrieval systems and library services.

D) Inefficient research administration

The environment for administering research resources in most public institutions is highly bureaucratic and inefficient and does not encourage potential researchers to engage in the activity. The infrastructure

for administering research at public universities is particularly weak, starting from inadequate and insecure budget, inadequate equipment and supplies to lack of sufficient number of technicians and support staff. The financial system that administers research funding in these institutions is very slow to respond adequately to investigators' needs of speedy withdrawal, dispersal and accounting of research funds obtained from external sources and deposited in university accounts. Hiring personnel for research projects is also extremely bureaucratic and salaries are too low to compete with what is offered in the private sector or abroad.

E) Lack of demand or social appreciation for research

The demand for research by policy makers is usually low and hence research is considered as somewhat of a luxury activity by most of the public. This conception arises from lack of awareness about the benefits of research and the low level of scientific culture in the society. Overall, there seems to be a large gap between the needs of research and what is actually being done.

F) Low incentives for researchers

There is no systematic and regulated incentive program to motivate staff and students to go into research. On the contrary, conditions in most universities tend to serve as a disincentive to research. For instance, academic faculty members are usually paid low salaries and most of them are not paid to conduct research and to enable them devote their time exclusively to the activity. Academic staff members who are self-motivated to devote their time in research are hindered from doing so by heavy teaching loads and other administrative duties.

At the same time, many of the country's best students who take their higher degrees at universities in Europe and North America do not return. We now know that Ethiopia stands as one of the most brain-drained countries in the region. The scars of mass brain exodus are evident in many of the nation's institutions. It is also well known that the

Ethiopian Diaspora provides powerful intellectual input to the research achievements of other countries but returns less benefit to its country of birth. This is in part because of a lack of an incentive mechanism to returnees and a lack of investment in facilities for research and teaching. While we are confronted with this underlying national reality, we have yet to undertake a concerted and systematic effort to mobilize our sizeable brainpowers in the Diaspora.

G) Poor research networking

There is poor networking for research at national, regional and global levels. South-to-south collaborations are particularly very few. Weak links between the various sectors are a continuing hindrance to effective research. The working relationships of the major stakeholders in R&D leave a lot to be desired. Institutional linkages in higher education, research institutions (federal and regional), and technology dissemination are not strong (ATA, 2013). The linkage between higher educational institutions and the industries is weak. These important players do not work in unison. Dissemination of information by institutions is very weak.

H) Weak internal and external collaboration

There is a visible lack of collaboration among researchers within and across disciplines. Nowhere do the research-performing institutions pool their R&D activities in networks and clusters to work more efficiently and to benefit from a higher level of knowledge. Also, despite the collaborative arrangements outlined above, cooperation at African as well as at international level has not yet become an essential dimension of research in Ethiopia. In many universities, there is a need for greater international support for research undertakings.

Overall, conditions for research in Ethiopia, particularly in universities, have been severely compromised as manifested by the generally inadequate funding, inadequate infrastructure, poor remuneration, inability to mentor young faculty and heavy teaching loads. While the

adequacy of public funding is a crucial condition, there are a number of concrete programmatic initiatives that could be taken by the research institutions and universities themselves. These include strengthening of graduate study, improvements in the management of research, identification and concentration on “areas of strength” and pooling of resources with other institutions and promotion of inter- and multi-disciplinary research.

2.16 The Way Forward

Research is a very expensive enterprise and building such an enterprise for a country like Ethiopia is a formidable challenge. We should also emphasize that without strong research and innovative capabilities, progress and development will be very difficult to achieve. Ethiopia’s prospects for improved economic growth and competitiveness rely to a large extent on scientific research and innovation. The country’s broad developmental plans can ultimately be achieved if further steps are taken on the road to becoming a knowledge-based economy. In order for the country to succeed in meeting its scientific objectives there are a number of prerequisites that will greatly enhance research capacity. These include well trained and experienced research personnel, state-of-the-art infrastructure and research institutes and a sound National Science and Innovation policy that are linked to the global scientific community and appropriate funding agencies. In what follows, we consider the critical measures or issues for improving the research environment.

A) Funding

Considering the strategic importance of local research capacity, it is necessary to insist on the indispensable role of public intervention, direct and indirect, as well as partners’ support for the revitalization of our research institutions, and the maintenance and upgrading of local research and research capacity. Hence concrete measures are necessary to substantially increase the allocation of public and private

resources for research, in addition to fostering partnership both locally and internationally.

At the same time, a major obligation rests on the research community and the higher education institutions themselves to do more to attract support and funding for research, primarily through attracting the best scientific talents and retaining them for extended time. They have to demonstrate to their range of constituencies – from government to parents, from local communities to business firms – the relevance and importance, long-term and more immediately, of local knowledge generation. While applied research and consultancy work will be necessary, a good case should be made for more basic intellectual production and its relation to the destiny of our society, now more than ever.

B) Strategic planning

Ethiopia should constantly worry about its national competitiveness in light of emerging global realities and these concerns could only be addressed through strong institutions – those with research and innovative capabilities. While it is important to engage development partners in matters of national interest, the nation, however, has to take the driver's seat in setting its own policies and determining its own strategies to raise its national competitiveness.

It is suggested to strengthen the setting of the research agenda based on national priorities as well as giving due consideration to equity and regional/global commitments in the various sectors. At the institutional level, research needs to be guided by a strategic plan and an actual expenditure pattern, including the improvement of research infrastructure of all types, the provision of appropriate material and professional incentives. Some of the concrete programmatic initiatives for consideration through strategic planning may include: strengthening of graduate study programs, identification of institutional areas of strength in combination with a strong push for regional cooperation,

enabling institutional specialization, inter-institutional pooling of resources and facilitation of collaboration among all research efforts. Other measures include developing strong and creative mentoring programs as well as strengthening management capacity and staff development opportunities to address the special problems of the young generation of researchers.

C) Areas of strength and international cooperation

The mission of building research capacity in Ethiopia is much more important than the specific mandates of respective research institutions and universities. This requires the close engagement of other national stakeholders, including federal government ministries, regional governments, public and private universities, the private sector, regional and international organizations, NGOs and development partners.

It is critical that a nation identifies its mother institution(s) around which other new sibling institutions would be congregating. A nation like Ethiopia cannot simply afford to build numerous strong research institutions, because serious research effort is too costly to initiate and maintain at every institution. Ethiopia should thus strategize to consolidate its resources to create a premium national research zone(s) for nationally high priority topics by designating a few universities and research institutions as the nation's flagship institutions. On the other hand, as certain research enclaves and programs are already well developed across few universities, research institutions and NGOs, a much stronger national research and innovation synergy should be generated by systematically and strategically identifying the sites and the programs and coordinating them around their strength. The areas of strength hold particular promise when combined with regional cooperation arrangements. Apart from lowering of research costs and the facilitation of regional networking, regional cooperation fosters mutual strengthening of particular research areas by bringing in extra resources and contributing to the creation of a critical mass of experts in particular areas across institutions.

D) Institutional collaboration

It is suggested that collaboration and coordination of national research programs and activities should be strengthened. In particular, it is recommended to nurture inter-institutional collaboration as well as public-private partnership in research. More specifically the university-industry linkage should be fostered. It is mandatory to forge strong functional linkages among institutions to strengthen each other, minimize duplication and contribute to realizing more efficiency and productivity. The research efforts of all these entities and other stakeholders have to be coordinated and streamlined at the national level in the interest of serving the nation. Universities and non-university research institutions should seriously consider that the diversification of research centers offers considerable potential for collaboration and synergy. The potential for the pooling of talent and resources and for the productive division of labor and complementarities cannot but benefit research in general and the under-resourced institutions in particular.

E) Research management

With the increasing recourse to project research, it is suggested that research management be better organized and be more professional. Appropriate policies, systems, training schemes, and incentive structures must be devised to encourage and facilitate large project development and implementation, care being taken to preserve the core values of research institutions. Measures to be adopted include: provision of guidance to researchers on opportunities for funded research and how to access them; development of expertise in such matters as proposal and contract development; intellectual property and ethical issues; and marketing of research capacity to the appropriate public. It is further suggested that this might best be done by establishing a central research management facility within an institution and by making research management professional. In addition, it is recommended to create a national database and a coordination mechanism for research that are key elements for monitoring and evaluation of research activities,

avoiding gaps as well as controlling duplication of efforts and possible plagiarizing activities.

F) Incentive mechanisms

It is of great importance to the country to create a suitable incentive mechanism and career structure for properly rewarding and retaining researchers. Younger researchers and faculty members should be motivated and given incentives for constant self-improvement and the widening of horizons. Other measures might include their insertion into research groups led by senior scholars as well as support for conference attendance and short-term foreign attachments. For university researchers in particular, it is necessary to create conditions for a soft landing for new appointees through initially lighter teaching loads, special support services, and wherever possible, attachment to senior colleagues as mentors.

In this connection, a problem for Ethiopia that requires proper and immediate remedy is the loss of talent. The need to stop brain drain is a well-recognized issue, one that needs a great political goodwill and serious national commitment to ensure that the best do not leave home in the first place.

G) Research dissemination and intellectual property right

It is strongly recommended to improve mechanisms for the dissemination of research and its translation into practice. Ethiopia has more than a dozen well-established scholarly journals which are at different levels of standing, state, and quality. As the effort to strengthen research is moving forward, it is important to have these outlets of research strengthened and supported. Scholarly associations and societies serve as important avenues of scholarly dialogue, research communication and information dissemination. These bodies serve as advocates of their scholarly and professional interest, monitor and shape the rules of the fields, as well as framing research ethics in a national context.

On the other hand, issues of intellectual property rights and other related conflicts of interest might seem to be insignificant at present since the magnitude of research activities and publications and patents are relatively low. However, the time will not be very far when these and other ethical issues will be of paramount concern, making the need for developing proper guidelines for addressing them imminent. With the expansion of graduate training in many of the universities that require theses and dissertation as partial fulfillment, there is an urgent need for setting mechanisms for monitoring and controlling duplication of research topics as well as possible cases of plagiarism.

None of the measures outlined above could by themselves solve the wide range of challenges and transform the research scene in Ethiopia nor remove the knowledge deficit. Yet together, they will not only enhance research performance but, indeed, yield substantial immediate gains. Such gains could include institutional collaboration to ensure more vigorous national research programs; renewal of researchers and faculty through the attraction, development, and retention of younger members; and improvements in the productivity of research through more efficient management and promotion. In the longer term, these measures could build into a momentum for development that, with improvements in the macro environment, could contribute to the maintenance of a knowledge generation and application base adequate to the needs of the country in the 21st century.

H) Promotion and dissemination of Science, Technology and Innovation

Science & technology information database

Establishment of a science and technology database is of paramount importance to facilitate information on science and technology as well as for the dissemination of research findings. Such database encompasses all activities and resources related to science, technology and research that are conducted locally as well internationally on Ethiopia or have

relevance to Ethiopia. Such resources and activities would include:

- human resources – human resources locally as well as in the Diaspora that are actively involved in science, technology development and research;
- research outputs – research published locally and internationally as well as those kept within the realm of grey literature;
- resources for publications – journals and e-resources that are local as well as international that have relevance to science, technology and innovation;
- projects and programs for science and technology development – based on areas and stages of development;
- research projects and grants – including grant opportunities available for potential applicants;
- data on research gaps in various areas that need to be filled through future research;
- data on indicators for monitoring the development of science and technology and related resources in the country;
- data on research related training, including professionals available for providing technical assistance in various spheres; and
- financial resources for science and technology – based on source, pattern and areas of spending.

Creating an information database will contribute to the development, promotion, and dissemination of science, technology and innovation.

Information management system

Instituting a variety of search tools to make information on research is readily available to researchers is of paramount importance. The system will create a platform to manage and administer research across the universities, research organizations and the industry. The information management system needs to consolidate science and

technology related data from public universities, and research institutes in a data warehouse and provide aggregated reports to stakeholders. Furthermore, an information management system transforms science and technology related data that are created in databases such as the one described above in a manner that are communicated to people for creating knowledge, ideas and conclusions in order to enable them to make effective decisions in the various areas they are operating.

The components of the information management system may include: 1) office information systems (word processing, telecommunications and data automation to handle correspondence and to produce reports and technical documents); 2) data processing analysis systems (recording, classification, sorting, calculation, summarizing, and analyzing results); and 3) management reporting and decision support systems (providing information for decision support as well as monitoring and evaluation where such information is required in advance).

2.17 Rationale for the Establishment of NRC

The establishment of the NSTIC is a major step in the regulation and coordination of research to meet national needs. But, there is a need for an all-inclusive NRC that encompasses all disciplines and thus contributes to an integrated and holistic national development. NRCs are generally semi-autonomous, quasi-public institutions that mediate between governments and individuals and/or institutions conducting research. They “operate in the intermediary position between the knowledge production system and state policy, between state and academy” (Mouton et al 2013). They are important bodies to:

- ensure sustainable funding for research activities;
- foster multi- and interdisciplinary research, including that between the sciences and humanities;
- strike a perfect balance between basic and applied research;
- promote gender perspectives in research;

- ensure that ethical standards are kept in the conduct of research;
- strengthen collaboration with international researchers;
- prioritize research agenda; and
- foster linkage between the academy and society.

3 Purpose and Mandate

The purpose of the NRC is to foster a strategic (prioritized) research agenda, both basic and applied, and advance knowledge frontier in various fields of science and technology so as to improve the living standard of the people of Ethiopia.

The NRC is mandated to

- promote and support research through funding;
- institute transfer of technology programs and development in all fields of science and technology, including indigenous knowledge;
- provide researchers with access to research facilities;
- offer access to unique technologies, research methods and information, and networking opportunities and international collaboration; and
- advance human resource development.

3.1 Vision

The NRC aspires to achieve research excellence in science and technology.

3.2 Mission

To build a competitive research capacity for the sustainable development of Ethiopia

3.3 Core Values

The values of NRC are shown in Fig 1:

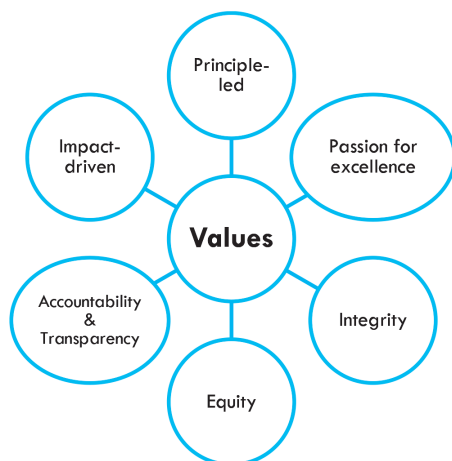


Fig 1: The core values of the National Research Council

The descriptions of the core values are given as follows:

- Principle-led - follow best practices;
- Passion for excellence - conduct business efficiently, effectively, professionally and ethically;
- Integrity - conduct business with dignity, honesty;; and with respect to colleagues and stakeholders;
- Impact-driven - sponsor long-term sustainable benefits and value-added projects;
- Equity - advance equal opportunity;
- Accountability and transparency - use resources responsibly.

3.4 Objectives

To advance its vision and mission, the objectives of the NRC are to, inter alia,

- (i) promote, co-ordinate and support R&D and innovation in line with the technological, economic, and social needs of the country;
- (ii) foster high-quality research, establish research culture, and build national scientific and technological capacities;
- (iii) promote human resource development and build the research workforce;
- (iv) ensure the dissemination of scientific knowledge;
- (v) facilitate technology transfer and ensure that research results are accessible to and reach society;
- (vi) promote the commercialization of R&D and innovation outputs into products and services; and
- (vii) contribute to the development of the knowledge economy in Ethiopia.

3.5 Powers and Duties

The NRC has overall responsibility for scientific research in Ethiopia as may be assigned to it by the NSTIC. The NRC has the following powers and duties:

- (i) advise the NSTIC on matters relating to research and the formulation of R&D programs;
- (ii) provide policy advice to the parliament, government and public institutions as well as the general public on research matters as well as scientific and technological issues;
- (iii) advise the government on the re-organization of existing public research institutes, including the creation of new ones, as are required to implement or further the efficiency of research and

- training;
- (iv) provide research leadership in the country;
 - (v) build national scientific research capacities and technological activities by increasing the level and quality of research infrastructure and facilities;
 - (vi) streamline research agenda/activities so as to raise the living standard of the people;
 - (vii) promote multi-disciplinary research and inter-disciplinarization of the sciences and humanities;
 - (viii) stimulate, promote, and support research in the field of indigenous technology;
 - (ix) promote linkage among universities, research institutes industry and end users;
 - (x) foster adoption/adaptation and transfer of technology;
 - (xi) create conducive environment for research;
 - (xii) promote the dissemination of research findings;
 - (xiii) periodically develop and disseminate a national strategy for R&D, and innovation, based on the economic, technological and social development needs of the country;
 - (xiv) establish and maintain national research chairs; and
 - (xv) initiate as and when necessary sectoral research councils.

3.6 Functions

The Council shall have such functions as are necessary or expedient to attain its objectives most effectively and shall, in particular,

- (i) identify research areas for strategic investment;
- (ii) secure and allocate funds for research and technological activities;
- (iii) review research proposals, and evaluate their relevance;

- (iv) conduct sensitization and awareness programs to attract interest in research, science, technology and innovation;
- (v) provide sustainable support to young researchers;
- (vi) initiate international research projects in selected areas;
- (vii) administer, support and monitor the operation of national research facilities;
- (viii) maintain an up-to-date record of all existing facilities for research and training and advise the government on their adequacy and efficient utilization;
- (ix) recommend the funding of centers, programs, institutions and individuals;
- (x) provide regular oversight and monitoring of research grants, and assess their outputs to ensure that they achieve their goals;
- (xi) ensure the provision of information infrastructure linking research institutions, universities and the industry to facilitate co-operation and sharing of research information and knowledge;
- (xii) establish and maintain a National Library and Documentation Centre and maintain a national registry of research projects funded and research outputs and innovations;
- (xiii) prepare periodic master plans for research training in various sectors and ensure their implementation by the appropriate research institutes, universities and other bodies;
- (xiv) initiate liaison with structures involved in the protection of intellectual property rights;
- (xv) develop mechanism for ranking research institutions and individual researchers; and
- (xvi) prepare annual budget for research programs and receive grants for allocation to institutes and individual researchers.

3.7 Core Competencies

The core competencies of the NRC are embedded in:

- capacity to catalyze local and international research cooperation;
- capacity to establish consortia, networking and partnerships;
- specialized research capacity at the national research facilities;
- research project evaluation and benchmarking practices;
- science and technology research management experience;
- strategic information accumulation and dissemination capability; and
- strong desire to excel in R&D.

4 Statutory Framework

4.1 Background

The state of science and technology in a country is an important determinant of sustainable development. Achieving sustainable development is probably the most daunting challenge that a developing country like Ethiopia is facing today. Scientific knowledge and appropriate technologies are central to addressing the underlying economic, social and environmental issues. Research is necessary to identify and set priorities, to guide and accelerate application of knowledge to solve problems (knowledge translation), to develop new tools and strategies, and to advance basic understanding and frontier of knowledge. Experiences of developed countries indicate that there is direct correlation between public investment on R&D and sustainable growth. Knowledge has been an important factor in economic growth and research-based competence plays crucial role in advancing technology and developing innovative skills.

Recognizing the profound effect of science and technology on sustainable development; realizing the vital role that science and technology can play in advancing the development of the country; mindful of the fact that science and technology are key drivers to both economic and social developments, and ultimately to improving the living standard of the people, the Federal Democratic Government of Ethiopia has recently (2013/14) established NSTIC.

The NSTIC has the following duties and responsibilities:

- Select, prioritize and recommend national STI capacity building programs;
- Monitor and evaluate the adaptation and utilization of technologies in all prioritized national programs;
- Recommend to the government the allocation of appropriate proportion of the GDP for capacity building in technology, and

when approved follow-up its implementation;

- Select and recommend training fields for producing competent human resource and follow-up the implementation; and
- Ensure the presence of integrated management in all innovation actors.

In order to integrate the current fragmented research efforts, prioritize research agenda, accelerate the conduct, output and impact of research and systematize its management, ensure effective utilization of the limited resources, the NSTIC recently endorsed the establishment of a National Research Council (NRC) under the Ministry of Science and Technology (MOST). The NRC is designed to coordinate, support, and regulate science and technology research within the country.

On the basis of the provision made in Article 22(10) of FDRE Proclamation No. 691/2003 to define the authority of its executive bodies and in accordance with the mandate given to it by the NSTIC, MOST issued a guideline on the establishment of NRC.

The objectives of the guideline are:

- to advise the NSTIC and oversee, on behalf of the latter, the research activities of the country;
- to foster problem-solving research projects;
- to ensure that research focuses mainly on national problems and that the limited resources allocated for this purpose are properly utilized; and
- to provide organized management to the research system.

Although the initiative taken by the NSTIC is commendable, the Ethiopian Academy of Sciences, based on the consensus study it conducted, strongly recommends that the NRC should be established by an Act of Parliament as an autonomous body with a mandate to provide leadership to national research programs spanning across ministries, universities, research institutes and industries as well as to enhance

human capital and research infrastructure developments.

4.2 Purpose

The followings are the major purposes of the NRC:

- (i) To establish a national research system;
- (ii) To guide and direct the national research activities;
- (iii) To draw a road-map for research;
- (iv) To organize and strengthen administration of research at the national level;
- (v) To ensure that research conducted by national research institutes and universities is relevant to the developmental needs of the country;
- (vi) To ascertain linkage between universities, research institutes and the industry and ensure coordinated management of joint research projects;
- (vii) To create and sustain conducive environment and good governance in research institutions; and ensure that they have a significant contribution in adaptation and utilization of effective foreign and indigenous technology;
- (viii) To ensure that budget and funds allotted to research are responsibly utilized and that these are proportionate to the development level of the country ;
- (ix) To enable exchange of information on national research undertakings and to avoid duplication of research activities, and to efficiently utilize the limited resources allotted for research;
- (x) To develop research culture;
- (xi) To ensure research outputs are disseminated to the relevant sectors; and
- (xii) To establish a system that would help to identify, at a central level, priority research programs; to set priorities among these

programs and to monitor their implementation.

4.3 Guiding Principles

Research activities conducted in the institutions shall be guided by the following principles:

- (i) The research activities conducted in the institutions shall be made relevant to the development needs of the country;
- (ii) Budget allotted to research shall be used mainly for priority programs;
- (iii) Government shall oversee the research activities of the country through the NSTIC;
- (iv) There shall be a system of sharing the limited resources for research; and
- (v) Research activities conducted in the institutions shall emanate from real problems and their outputs shall be useable.

4.4 Objectives of the National Research Council

The objectives of establishing the NRC are the following:

- (i) To formulate national policies, strategies as well as long- and short-term plans on Science and Technology and other research sectors and to monitor their implementation;
- (ii) To ensure research conducted by institutes and universities of the country respond to the development needs of the country;
- (iii) To coordinate and manage research conducted by all institutions ;
- (iv) To coordinate and manage joint research work and to establish linkage between universities, research institutes and the industry;
- (v) To build the capacity of institutions to conduct research aimed at learning and adapting technology;

- (vi) To ensure that research support begins with bridging previously identified gaps of priority focus areas and to enable the institutions to take ownership of their administration;
- (vii) To establish a system that will allow an equitable share of the limited resources;
- (viii) To ensure that research work conducted in the area of science, technology and other sectors are relevant and of paramount importance both locally and internationally;
- (ix) To ensure that the necessary local as well as international collaboration and support is sought and provided to research work conducted in the area of science, technology and other sectors; and
- (x) To ensure that appropriate information on science, technology and other sectors is collected and made available to the relevant bodies.

4.5 Organizational Structure of the National Research Council

The National Research Council shall be structured as follows:

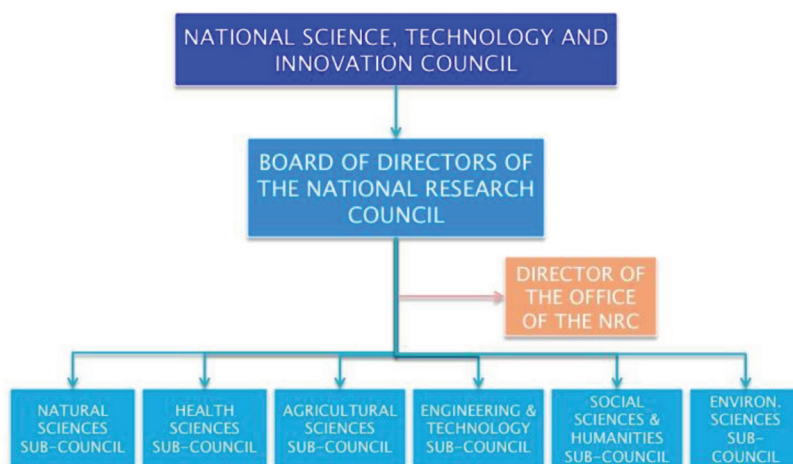


Fig 2: Organizational structure of the National Research Council

4.5.1 Board of the National Research Council

Chair and Members of the National Research Council

The NRC shall be directed by a Board of Directors accountable to the NSTIC. The Chairperson of the Board of the NRC shall be a government-appointed renowned researcher with outstanding contribution in his area of specialization and shall have a Vice Chairperson elected by the members of the Board. The members of the Board shall also be renowned researchers with outstanding contributions. The members shall be elected by a Panel set up at the national level under the directives of the Ministry of Science and Technology and shall include:

- (i) The State Minister of the Ministry of Science and Technology;
- (ii) The State Minister of the Ministry of Education;
- (iii) The State Minister of the Ministry of Finance and Economic Development;
- (iv) A representative of the Ethiopian Academy of Sciences;
- (v) A representative of public research institutes;
- (vi) A representative of the Natural Sciences Research;
- (vii) A representative of the Health Sciences Research;
- (viii) A representative of the Agricultural Sciences Research;
- (ix) A representative of the Environmental Sciences Research;
- (x) A representative of the Engineering and Technology Research;
- (xi) A representative of the Social Sciences and Humanities Research;
- (xii) A representative of civil society,
- (xiii) A representative of the private sector, and
- (xiv) The Director of the Office of the National Research Council.

Election and Mandate of the Members of the Board

- (i) Election of the members of the Board (with the exception of the State Ministers) shall be on a competitive basis.
- (ii) The term of office of a Board member shall be five years. A Board member may be re-elected for only a second mandate.

Duties and Responsibilities of the Board

The Board shall have the following duties and responsibilities:

- (i) It represents the NSTIC in directing the research work of the country;
- (ii) In consultation with the stakeholders, it drafts the research policy of the country;
- (iii) It identifies priority research programs of the country ;
- (iv) It ensures implementation of strategies related to research as stipulated in the policy of the NSTIC;
- (v) It evaluates performance of institutes in matters of research administration;
- (vi) It encourages and supports new research ideas in matters of adapting and utilization of technology generated by the institutions;
- (vii) It encourages linkage between and collaboration with different actors at local and international levels;
- (viii) It identifies activities that contribute to national economic development and ensures that they are supported by research;
- (ix) It sets up additional technical committees and sub-committees as required;
- (x) In conjunction with the National University-Industry Linkage Forum, it deliberates on matters pertaining to research work;
- (xi) It deliberates on mechanisms of producing Ethiopian

- researchers by sector and quantity and proposes to the NSTIC;
- (xii) It coordinates Ethiopian researchers living abroad to support the research undertakings of the country;
 - (xiii) It makes assessment-based proposals to the NSTIC on the establishment of new national research institutes and centers;
 - (xiv) It makes assessment-based proposals to the NSTIC on setting up national laboratories for priority focus sectors;
 - (xv) It advises the NSTIC on developing research infrastructures;
 - (xvi) It establishes a system to ensure centralized use of sophisticated and expensive research equipment;
 - (xvii) It ensures that research outputs are disseminated to the relevant sectors;
 - (xviii) It advises the NSTIC on establishing a system to produce high-level researchers in the various science and technology sectors of the country;
 - (xix) It advises the NSTIC on establishing and implementing a system to incentivize and recognize researchers;
 - (xx) It raises and allots research funds;
 - (xxi) It encourages the private industry to provide support to research work; and
 - (xxii) It organizes and coordinates activities of sub-Councils of the different sectors.

Officers of the Board

The NRC shall have a Chairperson and Vice Chairperson.

Duties and Responsibilities of the Chairperson

- (i) Presides over the Board;
- (ii) Implements the directives issued by the NSTIC;
- (iii) Represents the Board in the meetings of the NSTIC; and

- (iv) Delegates the Vice Chairperson in his absence.

Duties and Responsibilities of the Vice Chairperson

- (i) It serves the Board as a Vice Chairperson;
- (ii) Acts for the Chairperson in his absence; and
- (iii) Attends the meetings of the NSTIC when delegated by the Chairperson.

Meetings of the Board

The Board shall hold four regular meetings per year. However, the Chairperson may convene extraordinary meetings as appropriate.

4.5.2 Office of the National Research Council

The National Research Council shall have an Executive Director recruited by the Board. The Director shall carry out the following functions:

- (i) Directs the daily activities of the Office;
- (ii) Implements the instructions and policies of the Board;
- (iii) Prepares reports for the regular meetings of the Board;
- (iv) Performs any other duties as assigned by the Board; and
- (v) Takes responsibility for the recruitment of staff and contract termination of employees of the Office.

4.5.3 Sub-Councils

The Research Council shall have six Sub-Councils accountable to the Board. The Sub-Councils shall represent the following six main research areas:

- (i) Natural sciences,
- (ii) Health sciences,
- (iii) Agricultural sciences,

- (iv) Engineering and technology,
- (v) Social sciences and humanities, and
- (vi) Environmental sciences.

The Sub-Councils may form technical and *ad-hoc* committees as appropriate. Each Sub-Council shall have, as members, seven prominent scientists from the relevant research sector and the Chairperson of the Sub-Council shall represent the sector in the Board. This should be reconciled with the provisions of 4.5.1, which provides only for “representatives” of the various sectors. It might make more sense to have the chairpersons in the Board rather than go through the process of election. In which case, the provision about election should also be modified.

Duties and Responsibilities of the Sub-Councils

Each Sub-Council in its relevant sector shall:

- (i) Advise the Board on research to be conducted in the country;
- (ii) Evaluate research proposals developed by research institutes of each sector and submit these to the Board along with the budget requirements;
- (iii) Ensure that the proposed research activities are on priority areas and make recommendations to the Board;
- (iv) Prepare and submit annual research plans and draft budget proposals to the Board;
- (v) Prepare and submit study papers on strengthening institutes in their research areas;
- (vi) Identify the necessity of founding new research institutes in accordance with the development needs of the country; prepare and submit study papers to the Board. Upon endorsement by the Board, prepare founding documents;
- (vii) Identify research programs, evaluate the performance of research implementations of institutions and make

recommendations to the Board;

- (viii) Establish a system allowing for the shared use of the limited resources available for research purposes;
- (ix) Prepare and submit to the Board a framework for the management of joint research;
- (x) Deliberate on research matters/issues with university-industry clusters; and
- (xi) Organize annual conferences in collaboration with stakeholders to present research outputs and implementation of plans as appropriate.

In addition, each of the six Sub-Councils of the research sectors shall have duties and responsibilities specific to their respective areas. These duties and responsibilities shall be based on the following objectives:

- (i) To enable the development of basic and practical science;
- (ii) To encourage, support and recognize research activities;
- (iii) To establish liaison between local and international researchers;
- (iv) To enhance the relevance of the local and international importance of research work conducted in the country;
- (v) To ensure effective coordination of research conducted by research centers and universities at the federal and regional levels;
- (vi) To advise government on the usability and quality of education, training and research;
- (vii) To harness research for solving national problems;
- (viii) To create suitable conditions for appropriate dissemination and implementation of research output;
- (ix) To strengthen the role of women and the neglected social groups in research activities; and
- (x) To establish criteria for measuring the quality and relevance of research.

4.6 Obligations

All government universities and research institutes are duty bound to:

- (i) Provide the National Research Council and its Sub-Councils with required information; and
- (ii) Implement directives given by the NSTIC.

5 Strategic Directions and Programs

The NRC has eight major strategic directions and corresponding programs in which major research activities are undertaken as summarized in Figure 3.

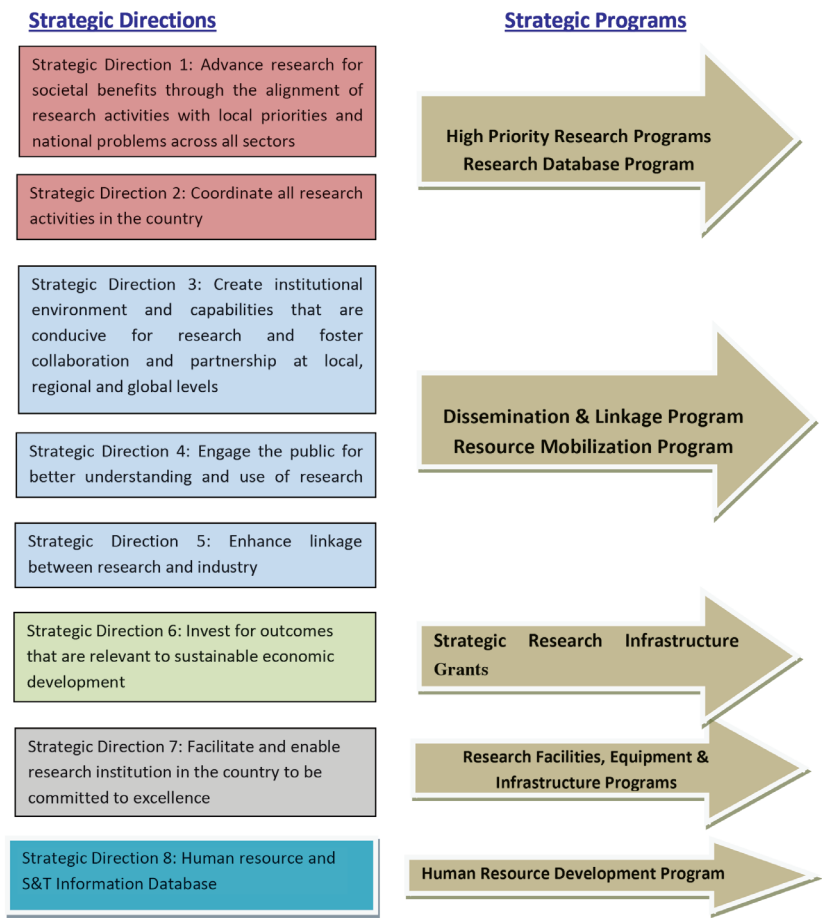


Fig 3: Strategic directions and the corresponding programs

5.1 Strategic Directions

Strategic Direction 1: Advance research for societal benefit through the alignment of research activities with local priorities and national problems across all sectors

- (i) Promoting scientific and technological advances that generate overall benefits to society;
- (ii) Identifying national needs and priorities that can be addressed through R&D within all sectors;
- (iii) Monitoring and evaluating the country's knowledge, technology and innovation and product portfolios;
- (iv) Highlighting areas of research that will provide the greatest benefit to socio-economic development;
- (v) Maintaining balance of focus between basic and applied research;
- (vi) Developing innovative solutions and advanced technologies through a balanced research portfolio for impacting overall socio-economic development; and
- (vii) Measuring the impact of research activities based on relevance to society and national priorities.

Strategic Direction 2: Coordinate all research activities in the country

- (i) Creating a database of research activities and outputs for the purpose of monitoring those activities and avoiding duplication of efforts;
- (ii) Ensuring the consistent implementation of research related policies and procedures across all institutions engaged in research;
- (iii) Ensuring commitment of all concerned to identifying and

articulating their planned contributions to the Council's mission;

- (iv) Ensuring that mechanisms for resource acquisition, allocation, utilization and maintenance are optimized within all institutions engaged in research;
- (v) Cultivating the culture of cost-effectiveness in the delivery of activities across all institutions involved in research;
- (vi) Developing a performance measurement framework that will help gauge performance in the various priority areas; and
- (vii) Monitoring performance through identifying, tracking and measuring indicators of success at every level of the organization.

Strategic Direction 3: Create institutional environment and capabilities that are conducive to research and foster collaboration and partnership at local, regional and global levels

- (i) Soliciting inputs from various experts locally and internationally;
- (ii) Taking into account the multi-disciplinary and cross cutting nature of the various sectors involved in R&D;
- (iii) Consolidating the research efforts in a manner that will minimize duplication, overlap and redundancy;
- (iv) Establishing partnerships, including innovative arrangements, with local, regional and international entities to maximize the overall success of the mission of the council;
- (v) Enhancing public-private partnership in research, including exercising oversight of consultancy-based research and activities by public service contractors;
- (vi) Providing decentralized administration and autonomy to sub-councils;
- (vii) Ensuring an effective and efficient ethical clearance system; and

- (viii) Facilitating the development and implementation of innovative financing and income generation schemes for self-sustaining activities within all institutions engaged in research.

Strategic Direction 4: Engage the public for better understanding and use of research outcomes

- (i) Promoting research literacy through engagement of formal and informal community organizations;
- (ii) Engaging the public in the Council's missions by providing new pathways for participation; and
- (iii) Informing, engaging and inspiring the public by creating forums to share the Council's missions, challenges as well as major research results of institutions.

Strategic Direction 5: Enhance linkages between research and industry

- (i) Accelerating commercial developments in areas of national priority through collaboration with the respective industries;
- (ii) Assisting industries in solving immediate technical problems through the delivery of specialized technical and advisory services (e.g. testing, calibrations, prototyping, demonstrations, scale up and various consulting);
- (iii) Sponsoring and incubating early-stage technologies through partnership between research institutions, academia and the industry in order to facilitate the transfer of technology to respective industries; and
- (iv) Supporting medium and large industries to establish research centers on technology adaptation

Strategic Direction 6: Invest for outcomes that are relevant to sustainable socio-economic development

- (i) Ensuring high returns to investment in R&D;
- (ii) Putting clients first and engaging with and managing relationships with important external audiences;

- (iii) Working towards opening and expanding international and regional networks; and
- (iv) Advancing systems to meet the challenges of climate and environmental change.

Strategic Direction 7: Facilitate and enable research institutions in the country to be committed to excellence

- (i) Ensuring that appropriate incentive mechanisms are put in place within research institutions for enhancing performance;
- (ii) Ensuring that research institutions identify, cultivate and sustain diverse groups of researchers and scientists needed to advance science and research in all sectors;
- (iii) Ensuring that all research personnel within research institutions are equipped with the requisite skills, training and knowledge;
- (iv) Ensuring the creation of appropriate career development and training opportunities, mentorship, flexibility and mobility;
- (v) Ensuring that conducive environment and job security are created within research and academic institutions;
- (vi) Creating conditions for recognizing top performers across all disciplines that can serve as role models for other researchers;
- (vii) Rewarding achievements aligned with strategic directions;
- (viii) Ensuring that research activities are preformed with the required level of ethics and professionalism; and
- (ix) Ensuring that due attention is given to issues of Intellectual Property Rights.

Strategic Direction 8: Human Resources Development and S&T Information Database

- (i) Facilitating capacity building at public and private sector S&T training institutions;
- (ii) Fostering enabling environment to support professional

associations and academia in the area of S&T;

- (iii) Fostering collaboration with local and international institutions involved in S&T training and capacity development;
- (iv) Ensuring the quality of training and curricula in the area of S&T within local and international training institutions;
- (v) Supporting and coordinating systems of incentives for excellence as well as research and development in the area of S&T; and
- (vi) Improving the quality and accessibility of scientific data, as well as promoting and sharing knowledge and information on S&T research and innovation at global scale (knowledge management) through:
 - Developing and fostering information infrastructure that enables the access, use and preservation of research outputs;
 - Partnering with research institutions at national, regional and international levels for creating archives for research activities and outputs; and
 - Enhancing collaboration to access research data globally as well as to make national research data accessible and usable for current and future generations of researchers.

5.2 Strategic Programs

NRC will have strategic programs that will focus on human resource and infrastructure development, and equipment and its support activities, including:

- ***Human Resource Development Program*** to support the training of researchers at PhD and Post-doc levels and establish research chairs.
- ***High Priority Research Programs*** to support selected applied

research projects addressing grand challenges

- ***Institutional Capacity Program*** to support and implement funding initiatives to enhance human capital development (HCD) and strengthen sustained institutional research capacity at public universities and research institutions.
- ***Strategic Research Infrastructure Grants*** to support the acquisition, upgrading and development of systems to provide state-of-the-art equipment that support prioritized areas.
- ***National Research Facilities*** to provide funds to researchers in public universities to conduct research at those facilities.
- ***National Equipment Program*** to support the acquisition and upgrading of systems to provide state-of-the-art equipment and promotion of research collaboration.
- ***National Equipment Database*** to provide all the relevant information on state-of-the-art equipment, specialized and multi-user equipment acquired through MOST and/or NRC funding and/or through other public sector investment.
- ***Research Database*** to ensure reliable, accurate and authoritative information is gathered together in one place, and to provide convenient and quick access to the information.
- ***Dissemination and Linkage*** to reach end-users of research outputs through appropriate linkages such as extension workers.
- ***Resource Mobilization*** to mobilize resources (financial, human, and material inputs) to support research programs.

6 Research Funding

The NRC aims to support and promote research through funding, human resource development and the provision of the necessary research facilities in order to facilitate the creation of knowledge, innovation and development in all fields. Soliciting research funds, awarding research grants, and rating research quality are at the core of the activities of the NRC.

6.1 Funding Sources

The sources of funding of the NRC are:

- (i) Government budget;
- (ii) Fees paid to the NRC for services rendered;
- (iii) Endowment funds;
- (iv) International funding and collaborative research funds, etc.;
- (v) Money paid to the NRC by users of the national research facilities (NRF) and their products;
- (vi) Interest on investments of the NRC; and
- (vii) Income derived from any other source.

The Funds of the NRC shall be utilized under the following conditions, with the approval of the NRC Board:

- (i) The NRC utilizes its funds to cover costs incurred in the performance of its functions;
- (ii) The NRC utilizes any donations or contributions in accordance with the conditions imposed by the donor or contributor;
- (iii) The NRC submits its financial plan and financial reports (statement of its estimated income and actual expenditure) to the Board;
- (iv) The NRC does not enter into any financial commitment beyond its approved budget and its accumulated reserves;

- (v) The NRC may, in respect of any work completed or service rendered by it, or for the use of rights consequent upon any discoveries, inventions or improvements, charge such fees or make such other financial arrangements as it may deem fit;
- (vi) The NRC recovers the full cost of the use of its facilities in respect of such work or service; and
- (vii) The NRC may invest any unexpended portion of its funds on profitable projects, and/or establish reserve funds.

6.2 Awarding Research Grants

The NRC will make grants to persons or research institutions for research, research infrastructure and the development of human resource.

The NRC awards research grants based on the following principles:

- (i) Funding on a competitive basis;
- (ii) Balance between strategy-driven and demand-driven funding;
- (iii) Merit-based and rigorous peer review;
- (iv) Geared towards postgraduate training;
- (v) Goal-oriented resource allocation;
- (vi) Fairness, transparency and accountability; and
- (vii) Transformative research and excellence.

The NRC awards research grants under the following broad categories:

- (i) **Next Generation Small Grant:** professional development (conference travel, laboratory visit grants), student support, PhD support;
- (ii) **Emerging Researchers Grant:** Post-Doctoral support, professional development;
- (iii) **Established Researchers Grant:** competitive large grants;
- (iv) **Institutional Strategic Grant:** Centers of Excellence, knowledge interchange and collaboration;

- (v) **Facility Grant:** Research Infrastructure support programs; and
- (vi) **Research Chairs.**

6.3 Research Centers

In addition to funding individual research, the NRC will provide funding to research centers established in different universities in the country. These centers are expected to conduct innovative research designed to address the developmental challenges of the country. Research Centers encourage a high degree of interdisciplinary cooperation and partnerships with other research institutes as well as private and public institutions. Collaborative research centers that bring together different universities to conduct collaborative research may also be established as required.

6.4 Promoting Research Careers

Promoting early career researchers should constitute an important element of the NRC's mission. To this effect, young talented researchers will be encouraged to develop their research careers. Researchers will be provided with adequate funding starting as student assistants in an NRC project and eventually attaining senior researcher position or professorship. Promotion of young researchers is built into the entire range of NRC funding: individual grants, research units, collaborative research centers, graduate schools, research fellowships and centers of excellence.

The NRC will provide financial support to pre-doctorate, doctorate, and post-doctorate students through a set of competitive funding categories and through grant-holder-linked bursaries. In case of the latter, researchers are able to nominate final year undergraduates, Master's and doctoral students working on their NRC-funded research projects. Postdoctoral research fellows may also be nominated for grant-holder-linked fellowships.

6.5 Research Chairs

The NRC will foster the establishment of Research Chairs in universities. Chairs will be awarded to universities through an open competitive process. Selection of universities will be on the basis of their academic and research profiles (such as having postgraduate program, adequate publications, and infrastructure in the field and commitment to support the chairs). Chairs will be recruited internationally and nationally on a competitive basis. Chairs will focus on postgraduate programs and research to enhance the creation of a critical mass of researchers. Chairs will provide research leadership and address national priority areas. The impact of the Chairs will be periodically assessed in terms of publications including those influencing policy, the number of invited lectures the Chairs received and delivered.

7 The Review Process

Procedurally, a proposal is submitted to a specific Sub-council at the NRC Office, which checks it for completeness. A proposal that complies with the required format is presented to anonymous Peer Reviewers for assessment of the quality of the project, objectives and work plan, possibilities for implementation, the budget proposed, and the qualification of the applicants. The review and the proposal are then presented to a Review Board. The Review Board examines the proposals selected by the reviewers and prioritizes them based on their comparative evaluation and the available fund. It then makes recommendations on each proposal. Finally, the initial reviews and the recommendations of the Review Board are forwarded to the NRC to make the funding decision on the basis of interdisciplinary comparison.

Proposals for Coordinated Programs are reviewed by review panels that are independent and sufficiently familiar with all research areas involved in the proposals. The panel includes at least one member of a Review Board. Proposals are assessed in terms of quality, program-specific criteria and their added value. A schematic presentation of the review process is depicted in Figure 4.

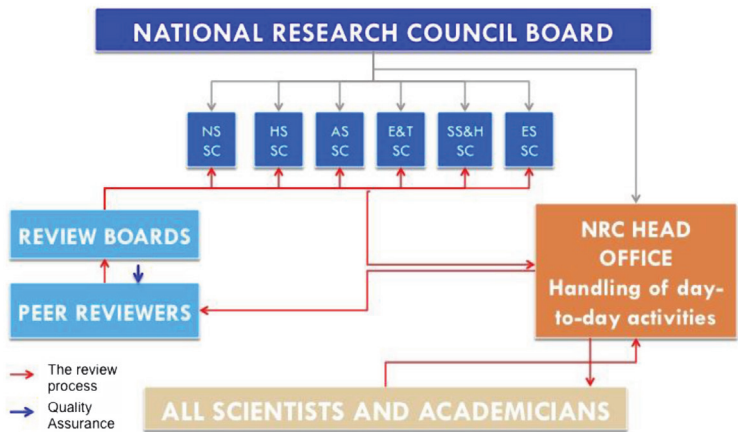


Fig 4: The review process

8 Human Capacity and Research Infrastructure Development

The objective of HCRID of the NRC is to develop institutional research capabilities through human capital development (HCD) in parallel with the appropriate research infrastructure development to drive the R&D strategies of universities, research institutes and the industries.

8.1 Human Capacity Development

To enhance the development of human capital, the NRC will foster and support the following:

- Expanding PhD programs across all disciplines by nurturing professional competence, scientific culture, and academic excellence in order to enhance Ethiopia's capacity in higher education and research;
- Instituting a system of mentoring in postgraduate and post-doctoral research;
- Identifying and nurturing young talent at both high school and undergraduate levels,
- Aligning PhD and research programs with broader institutional goals and strategic directions of the country;
- Ensuring the training of qualified technicians who are skilled in running, preventive maintenance and repair of scientific instruments and equipment
- Meeting the challenge of effecting transformation that will generate and translate existing and new knowledge into socio-economic benefits and sustainable development;
- Providing public universities and research institutions with technical advice, review and recommendations on research infrastructure;
- Fostering excellence in research in the universities and research institutes;

- Creating a conducive environment for academics and researchers; and
- Designing and implementing mechanisms for retaining staff and attracting talents.

The HCDP will provide support to the following scheme:

- ***NRC Scholarships*** to provide financial support to outstanding students at undergraduate, Master's and doctoral levels.
- ***NRC Postdoctoral Research Fellowships*** to provide financial and career support to postdoctoral research fellows in specified disciplines.
- ***Innovation Postdoctoral Fellowship Program*** to leverage innovation at universities through funding postdoctoral programs in strategic and applied research; support transformation through career growth opportunities; and attract young scientists and professionals of the highest caliber to stimulate innovation through research.
- ***Professional Development Program*** to encourage innovation and research at National Research Facilities through science, technology-related skills development; attract and retain young scientists and professionals of the highest caliber to influence the system of innovation; and support young scientists and professionals in basic and applied research to promote innovation.
- ***Research Chairs*** to establish research chairs in selected universities to address human capacity building and strategic research projects

8.2 Research Infrastructure Development

The NRC will support the development of research infrastructure in public universities, research institutes and industries. The NRC together with the Federal government and regional states will mobilize resources.

9 National Research Facilities

A National Research Facility (NRF) is defined as a facility (Core/Central Laboratory, or Central Training Facility, or National Archive, or Natural Resources Repository) with a large equipment base, or unique set of critical skills, or a large archival resource base that should be put at the disposal of the broader research community. The facility addresses a specific area of excellence considered to be of strategic importance to the country. National research facilities will support research as well as human capacity development through the provision of world-class facilities in which advanced training and specialization of students and academics can occur. The national research facilities are aligned with national research priorities outlined in the NRC objectives.

The NRC will be responsible for managing and administering a selected number of Research Facilities (Core/Central Laboratories, Central Training Facilities, National Archives, and Natural Resource Repositories), collectively known as “national research facilities”. The NRC will also have some selected supporting and affiliated institutions.

The Board of the NRC will assign a research facility as a NRF to be under the control of the NRC. Any researcher or research institution may, subject to conditions determined by the NRC, apply to utilize a NRF for research or instruction. The NRC may acquire or manage the operation of any research facility that applies to be a NRF, if it fulfills the criteria set by the NRC.

The primary objectives of the national research facilities are to:

- (i) provide and maintain fundamental research platforms for conducting research (Core/Central Laboratories and National Archives);
- (ii) develop human capital in particular key areas (Central Training Facilities);
- (iii) deliver specialized services to specific sectors of society;

- (iv) generate knowledge in all fields through cutting-edge research program (research outputs); and
- (v) generate income to fund their activities.

The mix among these various activities undertaken by NRF is determined by its staff competence and specialization, available funding, and its potential to generate income in exchange for services rendered.

Funding of the national research facilities will be from a core grant by the government based on the real costs required by individual facilities to enable them to do what is required of them in terms of research outputs, support for the country's research community, and postgraduate development. The national research facilities could also supplement their income by providing products and services, and by undertaking R&D contracts.

9.1 Central/Core Laboratory

A core facility is a shared resource, containing capabilities (tools, techniques, people, and skills) that can be shared by many users and is applicable to multiple experiments or studies. Such a laboratory is a centralized, financially self-sustained technical unit that is established to regularly provide unique laboratory or professional services to research clients. A successful core facility relies on a combination of knowledgeable staff members that understand technological advances, have the ability to educate and inform users, and have a workable system of offering a service.

The following are the major criteria used to define a core facility (Wendimamamo et al, 2012):

- (i) It is a cost-effective way to deal with limited resources, especially when dealing with technologies that employ costly equipment that require specialized expertise and maintenance;
- (ii) It enables and enhances research by providing access to technologies, services, and scientific consultation that

cultivates scientific interaction and productivity;

- (iii) It contains laboratory facilities that are not dedicated to the work of a single research group or department, but should maintain equitable access to all investigators and be open for new business;
- (iv) It has an actively involved scientific and managing director who is able to interact with researchers and laboratory staff across a range of disciplines;
- (v) It has dedicated space sufficient to provide the services identified;
- (vi) It contains high-end, specialized equipment used by multi-disciplinary sciences;
- (vii) It is centrally administered in a consistent manner to ensure accessibility, stability, reliability, cost-effectiveness, quality control, thereby enabling investigators, core and administrative staff to budget for and monitor core expenses and revenues;
- (viii) It has a sustainable business plan and is able to balance its budget;
- (ix) It is cost effective and financially self-sustaining; it delivers services as well as seek additional funding (both internal and external) to upgrade, augment or add new instrumentation to advance the capabilities of the laboratory;
- (x) It has a unique setting; the core is where the key data is produced and the whole facility is designed around the core; and
- (xi) It enhances improved quality, expanded service, standardized results, and internationally competitive research.

Based on the above criteria, the NRC Board will assign any laboratory in the country as a NRF to be under its control.

9.2 Central Training Facility

National Training Facilities are centralized centers of excellence, which could be standalone facilities or part of the Core Laboratories, delivering specialized short-term and skill training in NRC prioritized areas. The Central Training Facilities will enhance the technical capacity of researchers/research students in various fields by developing courses based on the latest pedagogical methods.

9.3 National Archives

Well-organized and archived information plays a vital role in all research activities as well as in improving education quality by advancing knowledge. Societal problems could be solved through properly gathered and archived data. In this regard, National Archives, Libraries, and Documentation Centers play an important role. The NRC will select some archives (e.g., the National Archive) to be affiliated to it based on certain criteria.

An Archive/Library affiliated to the NRC fulfills the following criteria:

- (i) It contains an important collection of resources of national and international importance for research;
- (ii) It is a repository for publications of international and national organizations as well as research institutions;
- (iii) It contains printed matter, gray literature, non-printed documents, manuscripts, historical archives and records etc.;
- (iv) It has an active program of collecting original or copy of literary documents of national importance from within and outside the country;
- (v) It regularly prepares, publishes and distributes bibliographies and periodicals index of its collections;
- (vi) It has a regular program of staff training to achieve its objectives;
- (vii) It collaborates with national and international organizations to

develop and promote professionals pertaining to archives and library affairs; and

(viii) It ensures proper handling and safety of its records.

9.4 Natural Resource Repository

Properly collected, archived and catalogued natural resources (seeds, plants, animals, minerals, rocks, fossils, etc.) support research activities and advance practical learning leading to quality education. Examples of such repositories include Natural History Museums and Gene Banks. The AAU houses three such natural history museums: the National Herbarium which has a collection of over 80,000 plant specimens, the Zoological Natural History Museum which is visited by about 50,000 visitors every year, and the Geological Museum which has a collection of Ethiopian Minerals and rocks. The premier gene bank in the country for plant genetic resources is the Ethiopian Biodiversity Institute (EBI) which contains thousands of accessions of indigenous Ethiopian crops.

The NRC can select a Natural Resources Repository to be affiliated to it if it fulfills certain criteria, including the following:

- (i) has an important collection of resources of national and international importance for research;
- (ii) has an active program of collecting additional specimens;
- (iii) conducts regular preparation, publication and distribution of index of its collections;
- (iv) is accessible to the public and researchers; and
- (v) ensures proper handling and safety of its records.

10 Partnership and Coordination

Effective and functional partnership and coordination among institutions and other stakeholders with common interest are essential for their mutual benefits as well as for the realization of the overall NRC goal. Among such institutions and stakeholders across the main interest areas of the NRC are HLIs, national research institutes both at the federal and regional levels, the private sector, civil society, and international and regional institutions. To achieve the desired national development goals, NRC has to cultivate effective partnership by involving all of these entities and playing the lead role in coordinating their activities.

10.1 Relations with Higher Learning Institutions

HLIs play a critical role in educating the human resources required for national development across a wide range of disciplines, in addition to conducting research as well as participating in the dissemination of research results to end-users. Currently, over 30 national HLIs give university level education, both at the undergraduate and graduate levels, in various fields of natural and social sciences as well as engineering. These universities conduct both applied and basic research often associated with their training mandates. Since the HLIs in Ethiopia support and strengthen the various sectors of interest to the NRC in several areas of science and technology, the NRC needs to develop effective strategies for engaging HLIs in all areas of mutual interest to the Council and the institutions. NRC can play a critically important role in forging strong partnerships between HLIs and NRC as well as among the HLIs themselves. Selected universities with strong track record of research can play the lead partnership role and serve as national centers of excellence in areas of their respective strength.

10.2 Relations with and Coordination of Federal and Regional Research Institutions

The federal governance structure of Ethiopia encourages the

establishment of sector specific institutes both at the federal and the regional levels. These institutes, both federal and regional, can play critically important roles in advancing science and technology at the national level. The NRC can benefit significantly by engaging such institutes as partners in areas of mutual interest to the Council and the institutes themselves.

In each sector of scientific research of interest to the NRC (agriculture, biological and physical sciences, engineering, environment, health, social sciences and humanities), there are often multiple entities both at the federal and regional levels conducting research on the subject. For example, in the sphere of agricultural research, the National Agricultural Research System (NARS) embraces the Ethiopian Institute of Agricultural Research (EIAR), Regional Agricultural Research Institutes (RARIs), HLIs, private research organizations and NGOs. Currently, the federal and regional agricultural research centers number about 50 distributed throughout the different agro-ecological zones of the country. The federal research centers, which number about 15, are under the EIAR, while the regional ones are under the mandates of their respective RARIs.

For over four decades, the national flagship research organization for agriculture in Ethiopia has been the federal agricultural research institute which has been renamed three different times over the years while maintaining its core mandate of conducting agricultural research of national relevance as well as coordinating all agricultural research activities at the national level. In its current designation, the EIAR appears to have difficulty in effectively coordinating the national agricultural research system. This is apparently due to the fact that the component members of the NARS have legitimate mandates to operate independently without respecting the national coordination role of the EIAR. The ineffective national coordination role of the EIAR has entailed significant challenges at the national level such as poor and uncoordinated research planning, duplication of efforts, wasteful and inequitable resource allocation and utilization, poor dissemination

of information and research results, and inadequate capacity building plans and efforts. An apex organization with sufficient budgetary authority and legal mandate at the national level appears essential to play an effective coordination role to meet these challenges.

The NRC and the sectoral National Agricultural Research Council (NARC) should play this coordination role with the necessary authority of budget allocation augmented by an effective monitoring and evaluation system. A functional coordinating unit such as the NARC is essential for developing the national agricultural research strategy and give guidance on how the federal and regional research institutes along with HLIs will share responsibilities in implementing the strategy.

In the other sectors as well, there should be a national system similar to the NARS operating at the national level in a coordinated fashion. The primary objective of the NRC should be to forge strong partnership among the various components of the sector specific systems and the Council. Inter-sector partnership in selected topics would be desirable as well. For example, the NARS and the health sector could collaborate and form rewarding partnership in the integration of nutrition into agriculture and health. Biotechnology is another topic where different sectors (agriculture, health, biology) could partner effectively for their mutual advantage. Yet another example would be partnership between NARS and the engineering sector in agricultural mechanization and other rural development technologies.

The main challenge in each sector is forging a functional NRS in that field promoting effective partnership and coordinated national research agenda. The NRC can be the primary catalyst and agent for nurturing and supporting such strong partnership.

10.3 Relations with Private Sector/Business/Civil Society

In many disciplines, there are technology multipliers and distributors. In most instances, such multipliers have private sector identity. In agriculture, examples are diverse seed enterprises both with federal

and regional focus, livestock breeding stocks multipliers and suppliers, fertilizers and agricultural chemicals manufacturers and distributors, farm implements manufacturers, etc. NGOs are also often involved in such and similar activities. Interfacing with all of these is necessary for research results to reach the farming community. The national extension system has to be an active partner in all technology multiplication and dissemination efforts. In the health and engineering sectors as well, technology multipliers and distributors belonging to the private sector and NGOs play significant roles in reaching end-users.

10.4 Technology End Users

End-users of research results and products are the final arbiters whether or not a given improved technology or product is acceptable to them. If the adoption rate of a technology over time is high this relays a positive signal to the research system that its activities are on the right track. If not, the research agenda and methodologies should be revisited and adjusted to properly respond to the demands of end-users. End-users should also play a critical role in research problem identification, prioritization, technology verification and use. The research projects and programs in the different sectors should be continuously alert to and conscious of the needs of end-users and therefore attempt to respond to all these diverse needs.

10.5 International and Regional Relations

International and regional relations with appropriate institutes or organizations are essential.

In each sector, partnership between the specific research institutes or consortia with the appropriate research institutes or organizations with international mandates should be pursued. The relevant sub-councils should play the lead role in fostering such partnerships.

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Appendix 1. List of selected research-performing organizations

Government Organizations		Principal Area of research
1	Ethiopian Agricultural Research Organization (EIAR) (15 research centers)	AS
2	Regional Agricultural Research Institutes (RARIs) (32 research centers)	AS
3	Ethiopian Public Health Institute (EPHI)	HS
4	Armauer Hanson Research Institute (AHRI)	HS
5	Ministry of Urban Development, Housing and Construction (MUDHC)	ET
6	Ministry of Mines Geological Survey of Ethiopia	NS
7	Ethiopian Mapping Agency	NS
8	Meteorological Agency of Ethiopia	NS
9	Ministry of Culture, Sports and the Young	SSH
10	National Museum of Ethiopia	SSH
11	National Archives and Libraries	SSH
12	Ethiopian Development Research Institute (EDRI)	SSH
13	Ethiopian Justice and Legal Research Institute	SSH
14	Ethiopian Economic Policy Research Institute	SSH
15	International Peace and Security Institute	SSH
Universities (considered in this study)		
1	Ababa Ababa University	HS, NS, ET, SSH
2	Jimma University	AS, HS, ET, NS
3	Bahir Dar University	HS, ET, NS, SSH
4	Haramaya University	AS, HS, NS
5	Mekele University	HS, ET, NS
6	Gondar University	HS, NS
7	Hawassa University	HS, ET
8	Arba Minch University	HS

9	Adama University	NS
10	Arba Minch University	NS
11	Unity University	SSH
Industrial Organizations		
1	Metal Industry Development Institute (MIDI)	ET
2	Leather Industry Development Institute (LIDI),	ET
3	Textile Industry Development Institute (TIDI),	ET
Societies and Foundations		
1	Ethiopian Economic Association	SSH
2	Ethiopian Public Health Association	HS
3	Forum for Social Studies	SSH
4.	Entoto Observatory and Research Center	NS

AS: Agricultural Science; ET: Engineering & Technology; HS: Health Science; NS: Natural Sciences;

SSH: Social sciences and Humanities;



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