Bahir Dar University

Research and Community Services

Research Thematic Areas

Bahir Dar, Ethiopia
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STATUE OF WISDOM

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Mushroom research in Bahir Dar University

An example of available laboratory equipment

1. INTRODUCTION

Bahir Dar University aspires to become one of the top ten research Universities in Africa by 2025. The first measure the University had to do to achieve that distant goal was the decision to establish a full-fledged research and community services (RCS) wing, which is led by a vice president. Three expert positions at the RCS office level (for research, community service and technology transfer) and one Coordinator at each Academic Unit and the establishment of research centers were a great start.

Although the University aspires to become such a research University, which is not the end of it, the real goal rather is contributing for the expansion of the frontiers of human knowledge. Two directions may be pursued: generating brand new/original technologies or knowledge and/or adapting available technologies and knowledge for the good of the nearby communities. The output of any research is either a technology, i.e., a hard substance that can be felt physically such as machine prototypes developed by engineers, seeds by agriculturists, and drugs by pharmaceuticals, or knowledge packages formulated by

social scientists. For the sake of simplicity, we may refer to them all as technologies.

At present, we need to be realistic and therefore gear more of our efforts towards adaptation of available technologies. Many technologies are available around the world that are still unheard of in Ethiopia. We need to speed up to tap some of the good technologies in our specific fields. As our economy improves with time as a result of adaptation, we will turn to more basic research.

Because we cannot address all at once, we need to select research themes first. Thematic areas are broad objectives an organization seeks solution for. Themes can be any intervention an organization claims a mandate for, such as research, development or services. For an organization, two types of mandates may be identified, i.e, geographic area coverage and field of intervention. Geographic area coverage may be boundless or not. Field of intervention is usually restricted. For example, an organization working on gender equality may find it useful to set themes that guide its services, such as empowering women and reducing the burden of women in running household activities. It does not entertain other issues outside of its mission, no matter how important they may be. In the same fashion way, Bahir Dar University's thematic areas may emanate from its own strategic goals and objectives. The establishment of the nine

research centers, initially five, within the University, i.e., water, biotechnology, pedagogy, energy and textile, can be considered as themes. Because the University cannot address all at once, it had to focus on selected issues.

Themes may be identified in consultation with the target beneficiaries themselves, or a group of experts in particular fields may prepare structured draft thematic areas, which are later discussed with stakeholders and finally approved.

Ours is research thematic areas in which we search *for* knowledge and technologies. Research thematic areas should not necessarily refer to fields of specialization; rather, they should be multidisciplinary. Any one problem may have to be tackled from many different angles with inputs from multiples of disciplines.

It is essential that themes be further broken down to smaller sub-themes along which particular research proposals may be prepared.

Themes emanate from societal problems, as indicated above. Because humans are generally inquisitive, particularly at this age of technological sophistication, they always try to solve societal problems through organized research. This they do because, among other things, research plays a pivotal role in solving stubborn and

noxious problems. If we agree that research can play a role to solve societal problems, how should then the research be addressed? Because of limited resources, i.e., human-ware, hardware and finance, the research effort should be designed in such a way that it will save these resources, yet, yield outstanding results. We need to give priority to the most important and researchable problems, and set aside those that do not add value, at least at the moment. The problems should also be grouped into more generic topics, under which multiples of smaller topics can be initiated and investigated.

We need to make the research more formal whereby we devise a time-framed or long-term strategy, which is explained through thematic areas. Pertinent milestones may be set for them. Themes help us frame and focus our actions around a certain area of research interest. They are, however, subject for continuous revision. Themes help us put research agendas in perspective for a limited period of time. They should be few so that we can remember them all. As it is indicated above, themes not only apply for research but also for every other thrust including community services and development activities. However, it does not mean that listing numerous research topics under broad thematic areas is prohibited. In contrast, tens or even hundreds of these smaller research topics may be listed (under certain themes, of course) and each one of them

waits until resources are available and gets picked up for research any time inputs are available. The current version, however, provides largely the broad themes.

For example, when we think of biology as a science, we can pose a question: why study biology in the first place? Any research, of course, is meant for improving the quality of life through knowledge and material gained as a result of the research. Anybody interested to conduct some biological study may ultimately address any of the following themes: human and animal health, food and feed, biodiversity conservation and environmental health, bio-energy, shelter and fiber. All these themes look too broad to accomplish by any one discipline alone. They demand multiple disciplines to be dealt with. No one field will be able to address them in their entirety. As most biological issues eventually fall within these four realms, directly or indirectly, all activities we do in biology will try to contribute for one or more of these areas. Further, under each major theme, sub-themes and eventually individual research proposals will be prepared. A social science expert may look at the above issues in a different perspective.

Improving the well-being of humankind is the ultimate goal of all education and research undertaken by all fields of study, such as the existing bands set forth by the Ethiopian Government, i.e., engineering, science, medicine,

agriculture and social science. These bands can be thought of as themes for the Government.

In Bahir Dar University, as indicated above, themes are set in the form of research centers at the University level. Because the University is a federation of a dozen colleges and faculties, which are autonomous in their internal affairs, they are expected to develop their own research thematic areas. The development of thematic areas by individual Faculty does not necessarily mean that the research will always be done alone. Each Unit or Faculty is expected to establish multidisciplinary teams for each research agenda as deemed necessary.

For ease of management, each Academic Unit was requested to develop its own research themes. Each theme should be coded and a title coined. Then afterwards, individual research proposals shall be prepared under the themes. A few of the research centers have also prepared their own themes independently.

In this booklet, we find a summary of what has so far been collected from responsible Units and centers. It has undergone a long process of evolution before it attained its present form. It is, however, by no means exhaustive and complete. Updating and improvement keeps going.

2. MDG AND GTP PERSPECTIVES

In September 2000, 189 member states of the United Nations came together at the Millennium Summit and adopted the Millennium Declaration, including commitments to poverty eradication, development, and protecting the environment. Many of these commitments were drawn from the agreements and resolutions of world conferences and summits organized by the United Nations during the preceding decade. A year later the UN Secretary General's Road Map for implementing the Millennium Declaration formally unveiled eight goals, supported by 18 quantified and time-bound targets and 48 indicators, which became known as the Millennium Development Goals (MDGs). The MDGs focus the efforts of the world community on achieving significant, measurable improvements in people's lives by the year 2015. They establish targets and yardsticks for measuring results—not just for developing countries but for the rich countries that help fund development programs and for the multilateral institutions that help countries implement them.

The eight MDGs listed below guide the efforts of virtually all organizations working in development and have been commonly accepted as a framework for measuring development progress:

1) Eradicate extreme poverty and hunger
2) Achieve universal primary education
3) Promote gender equality and empower women
4) Reduce child mortality
5) Improve maternal health
6) Combat HIV/AIDS, malaria, and other diseases
7) Ensure environmental sustainability
8) Develop a Global Partnership for Development

These Goals have become the basis for any national and sectoral policy documents to foster broad based development in a sustainable manner.

Likewise, the main development objective of the Ethiopian Government: Poverty Eradication and Ensuring Human Development and other objectives, policies and strategies in the Growth and Transformation Plan are geared towards MDGs.

According to the Growth and Transformation Plan (GTP), the Ethiopian Government strives to invest in programs that are consistent with the MDGs. The world aims to end

poverty by 2015 (MDGs). Ethiopia targets to become a middle income country by 2025 according to the GTP. Selected development targets in the GTP include: Agriculture, Industry, Infrastructure, Education and Health. As indicated above, the strategic objective of Bahir Dar University is to become one of the top ten research universities in Africa by 2025. This itself is consistent with the country's development plan. All these may be considered hierarchical as one is a subset of the other.

As usual, developments in food and agriculture, material and technology, health and medicine, energy, and environment remain global development focus. Bahir Dar University strategic plan for research and community services focuses on Education/pedagogy, Textile, Water, Energy and Biotechnology. The list is increasing and now we have nine of them, including geographic information systems, health, culture development and economics research.

It is believed that BDU strategic objectives contribute to the country's development efforts such as the GTP and beyond (MDG). MDGs and GTP target food and agriculture sector development. The university strategic policy should align with MDGs and GTP and pool resources and efforts towards contributing to the GTP and MDG.

3. THE CURRENT THEMATIC AREAS

Individual Academic Units developed their own themes. It has taken quite a long time before it took the current shape. More generic themes may be needed at the University level, which itself needs more time and effort. A whole new list of thematic areas may be instated by conducting field studies and surveys because that is the most appropriate procedure. Until then, perhaps, established Research Centers may be considered as the University-wide thematic agendas.

4. CONSTRAINTS IN RESEARCH

Among the many problems we face now as a research establishment, the first ones we put in the list include lack of research infrastructure (especially in natural sciences,

engineering departments are better off, of course), poor research ethics and poor research skill. Although it will surely be one problem in the future, finance is not of priority concern at the moment. Depending on the nature of fields of study and the presence of senior staff, there is always opportunity to raise research funds from sources other than the public funds. Currently the signs are encouraging that certain fields are observed generating millions of Birr for research and development.

5. THEMATIC AREAS

5.1 ACADEMIC UNITS

5.1.1 College of Science

1) Basic science research
2) Public health
3) Science and industry
4) Aquatic and wetland
5) Food, water and sanitation
6) Herbal and cultural medicine
7) Alternative energy forms (biodiesel, biogas, fuel cells, etc.)
8) Exploration of space technology
9) Environmental science
    a) Biodiversity
    b) Climate change and global warming
    c) Environmental degradation
    d) Environmental sustainability
    e) Restoration of native species
10) Promotion of improved technologies for the use of natural resources
11) Science education.

5.1.2 College of Medicine and Health Sciences

1. Maternal and child health
    a. Antenatal care
    b. Delivery care
    c. Postnatal care
    d. Abortion and post abortion care
    e. Family planning
    f. Maternal and child nutrition
    g. Child abuse
    h. Adolescent health

2. Epidemiology of significant diseases
    a. Communicable diseases: including TB, HIV/AIDS, malaria, schistosomiasis, typhoid, and neglected tropical diseases such as trachoma, leishmaniasis, geohelminths and elephantiasis.
    b. Non-communicable diseases: including diabetes mellitus, cardiovascular diseases, mental illnesses, oral diseases, cancer, substance abuse, and injuries

3. Accessibility, equitability and quality of health care
    a. Cultural, social and spiritual factors associated with accessibility of health care
    b. Factors affecting health care utilization quality, and equity

c. Mechanisms of developing community owner ship to health care
d. Safety, integration, and development of traditional medical practice
e. Client satisfaction and efficiency of health systems
f. Health care financing and challenges in Ethiopia
g. Primary health care and implementation modalities

4. Impact of environment and globalization on health
    a. Climate change and health
    b. Industrialization and health
    c. Urbanization and health
    d. Water and sanitation
    e. Occupational health

5.1.3 College of Agriculture and Environmental Sciences

1) Food security and livelihood
2) Natural resource management
3) Fisheries management and aquaculture
4) Disaster risk reduction

5.1.4 College of Business and Economics

1. Accounting
   a) The challenge for Ethiopia to develop an accounting standard setting body or adopt IFRS.
   b) The use of accounting information for decision making
   c) The status of record keeping in Ethiopia and the challenges ahead
   d) Tax Evasion

2. Finance
   a) Finance and development
   b) Financial Institutions

3. General Management
   a) The challenges of managing organizations
   b) BPR, BSC
   c) Entrepreneurship: Micro and Small Business
   d) Business Ethics and Corporate Governance

4. Public Administration
   a) Good Governance
   b) Decentralization
   c) Development
   d) Waste management
   e) Quality of Education

5. Marketing
   a) Pricing decision by the business community
   b) Tourism Marketing
   c) Advertising practices

6. Human Resource
   a) Employee satisfaction in the job environment

7. Economics
   a) Ethiopia's challenge to achieve the GTP
   b) Inflation dynamics
   c) Determinants of poverty
   d) Food security
   e) Climate change

8. Logistics and SCM
   a) Challenges of port and custom clearing operations.
   b) Service quality management and customer satisfaction.
   c) Procurement and materials handling and disposal related.
   d) Transportation and distribution management related.
   e) Value addition and supply chain failures of business communities (evaluative research, etc.)

5.1.5 Faculty of Educational and Behavioral Sciences

1) Early Childhood Care and Education
2) Student learning
3) Violence, Sexual Harassment, and Substance use
4) Inclusive Education
5) Early Intervention and Rehabilitation
6) Teacher Professional Development and Quality Assurance
7) Instruction and Instructional Technology
8) Curriculum Issues
9) Instructional Leadership
10) Resource Management in Education
11) Educational Leadership and Management
12) Adult Education and Learning
13) Community Development
14) Lifelong Learning
15) Professional Development in Adult Education
16) Policy, Governance and Management of Higher Education

5.1.6 Faculty of Social Science

1) Environmental issues and sustainable use of resources
    a. Resource utilization
    b. Environmental impact assessment
    c. Climate change and adaptation
    d. Land use planning

e. Watershed management)

2) Population, regional and socio-economic issues
   a. Food security
   b. Urbanization
   c. Poverty
   d. Urban and regional planning
   e. Population and reproductive health

3) Gender, culture and development
   a. Multiculturalism
   b. Gender and Foreign Aid
   c. Gender and Global Financial Crisis
   d. Gender Based Violence
   e. Women Empowerment
   f. Indigenous knowledge systems

4) Federalism
   a. Local government
   b. Conflict & conflict management
   c. Hydro-politics
   d. Human rights
   e. Corruption
   f. Good governance
   g. State, society and history

5.1.7 Faculty of Humanities

1) Media and Development
2) Quality education
   a) Language skills development
   b) Language teacher development
   c) Curriculum and material development
   d) Assessment

5.1.8 Institute of Technology

1) Sustainable energies and Applied Thermal Engineering
   a) Solar
   b) Mini-hydropower
   c) Bio-fuels
   d) Cooking stove efficiency
   e) Wind energy
   f) Solar and adsorption refrigeration

2) Chemical and Food processing
   a) Process intensification and energy utilization
   b) Green process engineering and chemistry
   c) Crop value chain and postharvest technology
   d) Milk products and packaging
   e) Upgrading indigenous technologies
   f) Sugar processing and by-product utilization

g) Waste valorization and bio-energy intensification
h) Nutrition and food processing
i) Material synthesis and characterization

3) Water Resources Management
   a) Water supply and distribution
   b) Water quality and sanitation
   c) Flood management
   d) Soil Erosion and watershed management

4) Transport systems and Construction Management
   a) Roads
   b) Railways
   c) Maritime
   d) Low cost construction Materials

5) Environment protection
   a) Solid and hazard waste management
   b) Environmental impact and life cycle assessment
   c) Water and waste water treatment
   d) Air pollution control and monitoring
   e) Environmental leveling
   f) Climate change and carbon sequestration

6) Design and Industrial Management
   a) Agricultural mechanization
   b) Engineering materials (metals and composites)

c) Machine design and optimization
d) Dynamics and vibrations of mechanical and vehicle systems
e) Railway dynamics
f) Quality and total quality management
g) Kaizen
h) Ergonomics and safety
i) Productivity improvement

5.1.9 Institute of Textile, Garment and Fashion Design

Iotex has three centres of competency (C-O-C). Thematic areas are listed for each of them.

1) Textile manufacturing
   a) Cotton production, characterization and grading
   b) Cotton ginning
   c) Spun yarn manufacturing
   d) Woven fabric manufacturing
   e) Small scale textile and apparel manufacturing
   f) Process control in textile manufacturing
   g) Technical textiles
   h) Design and fabrication of textile machines
   i) Maintenance of textile machines
   j) Cost reduction and quality assurance

2) Textile finishing
   a) Natural fibre extraction and synthesis of synthetic fibres
   b) Enhancement of processability of natural textile fibres
   c) Natural dyes: identification, characterization and application
   d) Best available techniques (BAT) in chemical processing of textiles
   e) Natural plant extracts for textile applications
   f) Synthesis of textile auxiliaries
   g) Multifunctional finishes for textiles
   h) Cleaner production techniques

3) Garment technology and fashion design
   a) Product development and design innovations
   b) Human factors and ergonomics in textile and apparel manufacturing
   c) Manufacturing and production systems for textile and apparel
   d) Quality and productivity improvement
   e) Marketing and international business development for textiles and apparels.

5.1.10 Institute of Land Administration

1) Urban and rural land administration and management issues
2) Land Law
3) Land Economics
4) GIS and Remote Sensing
5) Cadastral surveying and geodesy.

5.1.11 School of Law

1) Criminal Justice and Human rights
2) Environmental and Land Law and governance
3) Economic Laws
4) Governance and democratization

5.1.12 Academy of Sport Science

Version 1

1) Skill refinement (movement analysis): of technique and tactic
2) The influence of physical activity on human body
   a) Sport
   b) Exercise
3) Nutrition and sport (exercise)
   a) Macro nutrients
   b) Micro nutrients

   c) Water
4) Environment and sport (exercise)
   a) Humidity
   b) Temperature
   c) Altitude

Version 2

1) Expansion of mass sport
2) Implementation of physical education at schools
3) Development of sport clubs at regional and national level

5.2 RESEARCH CENTERS

5.2.1 Blue Nile Water Institute

1) Hydrology and Watershed Management Researches

   a) Erosion and Sedimentation
   b) Optimization and allocation of water resources
   c) Watershed Modeling
   d) Hydrological processes
   e) Land use/cover change
   f) Flow and transport in rivers
   g) Flood

2) Hydrogeology Researches
   a) Ground Water Assessment/Hydro-geological investigation
   b) Ground water and surface water interaction
   c) Integrated Groundwater Management
   d) Mapping of landslide and landslide prone areas
   e) Groundwater Modeling

3) Environment Researches
   a) Aquatic and Wetland Resources
   b) Water Quality

c) Pollution Management
d) Hydro-politics
e) Water supply, sanitation and hygiene
f) Invasive weeds
g) Alternative livelihood
h) Climate change and adaptation
i) Gender and water resource management
j) Water resource and tourism
k) Watershed subsystems interaction

4) Irrigation, Hydraulics and Drainage
   a) Water productivity
   b) Water use efficiency
   c) Economics of irrigation water use
   d) Irrigation water management
   e) Drainage Systems
   f) Large Rivers dynamics
   g) River Bank Erosion and River Sedimentation
   h) Design of Sustainable River Engineering Infrastructures
   i) Physical and Numerical Modeling in Hydraulic Engineering
   j) Control of Sedimentation at Intakes and Reservoirs
   k) Small Hydropower

5.2.2 Biotechnology Research Institute

1) Agricultural biotechnology research areas
   a) Animal biotechnology
   b) Plant biotechnology
   c) Agricultural product processing technology
   d) Environmental biotechnology
   e) Fisheries and aquatic biotechnology
   f) Animal and plant disease diagnostic and prevention technology
2) Biomedical biotechnology research
   a) Herbal medicine
   b) Laboratory Medicine
   c) Molecular biology/microbial genetics and it applications
   d) Stem cells and regenerative therapy
   e) Chronic diseases and aging research
   f) Infectious diseases and drug research
3) Environmental biotechnology research areas
   a) Microbial biodiversity
   b) Bioremediation
   c) Microbial enhancement
   d) Biopolymers
   e) Biosensors
   f) Fermentation and bioreactors
   g) Bio-recycling
   h) Industrial enzymes

i) Solid and liquid waste treatment and utilization
j) Pro-biotics
k) Value added biotechnological products

5.2.3 Pedagogy and Education Research Institute

Thematic areas are identified on the basis of the stakeholders:

1) Teachers Professional Development & Instructional Design
2) Early Childhood Care and Education
3) Science & Mathematics Instruction
4) Language Instruction
5) Behavioral and Community Oriented Practices
6) Quality of education
7) Curriculum issues
8) Special needs education
9) Educational leadership and current practices
10) Lifelong education

5.2.4 Energy Research Institute

1) Biomass energy
2) Solar energy
3) Wind energy and mini hydro-power
4) Energy efficient cooking

5.2.5 Abay Culture and Development Research Center

1) Social problems and their impact on quality of life
2) Researching and documenting historical, cultural, linguistic and environmental aspects of the community
3) Tourism and heritage resources and their potential for socio-economic development
4) Indigenous knowledge systems and their contribution to socio-economic development

5.2.6 Geospatial Data and Technology Center

1) Conflict hot spot mapping
2) Drought monitoring
3) Crop yield and condition assessment

4) Monitoring river hyacinth expansion on Lake Tana
5) Monitoring dust storm events for use in epidemiological decision making
6) Land cover mapping for Lake Tana sub basin
7) Soil moisture mapping for Koga irrigation using smart sensors technology
8) Mapping loss in municipal water supply systems: The case of Bahir Dar water supply service
9) Indexing Lake Tana sub watersheds for their sediment contribution
10) Mapping residual chlorine and other water quality parameters in Bahir Dar municipal water system

5.2.7 Institute of Economics Research

1) Macroeconomic (Regional) Research
   a) Regional Income Account
   b) Revenue and Expenditure
   c) Saving and Investment
   d) Inflation
   e) Marketing Chain
   f) Sectoral and Spatial Linkage

2) Livelihood and Poverty Research

3) Sector Development Research
   a. Agriculture and rural development

b. Urban and industrial development
c. Micro and small-scale enterprises development
d. Water and sanitation development
e. Human development (education and health)
f. Infrastructure development
g. Private sector development

4) Natural Resources and Environment Research

Research Incubation Center, Bahir Dar University

Main gate, Seat of the University administration