3.1. Information Technology and Computing

Globalization and technological changes have accelerated in tandem over the past several years and have created a new global economy "powered by technology, fueled by information and driven by knowledge." The emergence of this new global economy has serious implications for the nature and purpose of communities, societies and organizations specifically education institutes. Information and communications technologies (ICTs) have been touted as potentially powerful enabling tools for educational changes and reform. ICTs can play an integration role with four operational missions of higher institutions (learning-teaching, research and innovation, community engagement and administrations). To address the problem of societies through well developed and managed ICT appilication and services; the main focus areas of ressearch are:

- Developing a knowledge organization, structures, systems and services
- Development and applications of statistical methods in any fields
- Development and applications of ICT services and softwares in any fields

3.2. Advanced materials Research and development:

In Ethiopia where 80% of the population lives in rural areas, the major challenge confronting the country is the traditional mode of agricultural systems that are being practiced hitherto. Energy is also scarce and the community depends mostly on fire-woods and fossil fuels for cooking, heating, lighting and cottage industry. Hence, energy problem has contributed to food shortage and curtailed economic development. Environmental pollution is another formidable challenge that hampers the socio-economic development of our country. This is attributed mainly to population growth, lack of proper waste management systems and poor urban planning and other anthropogenic factors. To address these challenges, Ethiopia needs to build institutional excellence in the area of nanotechnology. Accordingly, we suggest the topic **fabrication of advanced materials (metal oxides/chalcogenides, metal organic frame works, conducting polymers, nanocomposites/organic-inorganic hybrids)** to the following applications to be considered for a call for proposal by the coming year:

- **Agricultural applications**: development of novel nano-fertilizers, enhancing and sustaining release of nutrients, controlled release of fertilizers, reduced leaching and fixation, enhancing plant germination and growth, post harvest technology and food processing, prolonging the post-harvest life of food;
- **Application to energy**: solar cell (substitute of silicon by cheaper nano-materials), improved materials for super capacitors, batteries;
- **Application to Environment and Monitoring:** depollution/remediation/detoxification via: photocatalysis, sorption/desorption, ion exchange, photo-disinfection; sensors

3.3. Energy Resources Development and Utilization

Energy sector is the engine that drives the economic development of a country. It is the key input for technological, industrial, social and economic development of a nation. A rising energy demand, in the face of increasing oil price, natural gas and coal together with environmental concerns in terms of greenhouse gas emission and global warming; lack of alternative energy which has brought deforestation, land degradation and food insecurity in Ethiopia; all these have led to the search of a new technological way of energy utilization. There is a general acceptance for the need to diversify energy supply for confronting these challenges by developing advanced, cleaner, more efficient, and cost-effective renewable energy technologies, including superior and cleaner fossil fuel technologies. Thus researches shall focus on the following areas.

- **Solar energy:** solar & wind energy system design and development, solar photovoltaic system development, solar thermal storages, adaptive technology focusing on solar photovoltaic and wind energy
- **Bio energy:** planning of natural resources, biomass gasification; biogas generation from agricultural wastes; biodiesel production and utilization, stability of biodiesel and its blends.
- **Small hydro development:** small hydropower planning, investigations, designs, development, optimization of generation, cost optimization
- **Energy conservation:** conservation of energy in electrical network, energy auditing

3.4 Postharvest Technology, Processing and Food Analysis

The postharvest management system of the Ethiopian agriculture is in dire condition characterized by poor quality products and huge loss. The young food industry is in poor shape producing very limited number of low quality products targeted for local market. Research in the postharvest management must focus on minimization of losses, quality improvement and value addition, efficient conversion of the agricultural output to more valuable products destined for local and international markets. Researches in food science and technology must focus on import substitution and export items that meet the requirements of the competitive international market. Priority shall also be given to develop the rich and diverse cultural and traditional food processing techniques to increase their role in the national economy.

Thus researches shall focus on the following lines.

- Minimization of postharvest losses and promotion of value addition.
- Improvement of quality levels of agricultural and processed products.
- Development of new food products, processing techniques and preservation methods.
- Agricultural byproduct utilization and food waste minimization.
- Improvement of traditional food processing methods.

3.5 Civil Infrastructure, Manufacturing and Industrial Technology

Production and quality management has been recognized as an important factor in acountry's economic growth. Rapid changes in technology has posed numerous opportunities and challenges which have resulted in enhancement of manufacturing capabilities through new materials, facilities, techniques and procedures. Hence, managing a service/production system has become a major challenge in the global competitive environment. Production and quality management leads the way for organizations to achieve their goals with minimum effort. Equaly, computer aided manufacturing and control system (automation) or robotics is current global trend as it is capable of reducing cost of production, waste, hazard and increase accuracy, productivity as well as process capability in different industries. Attention shall be also given for small and medium manufacturing enterprises (SMME) as they contribute a lot in job creation and support to the national economy of a country. Currently, SMME are organized and expanding in Ethiopia on the basis of agricultural-economy to industrial-economy transformation. Hence, design and renovation of modified, cost competent and demand driven technologies in areas of crop harvesting and after harvest processing as well as construction equipment are highly required in these manufacturing enterprises and markets to gear up the economy. Accordingly, the following prioritized research areas are included:

- Different aspects of quality & production management of different industries in eastern Ethiopia: logistics, total quality management, production operation management ; continues improvement (KAIZEN);
- Reverse Engineering: focusing on biomedical engineering, mechatronics and/or robotics (Automation of systems & mechanisms);
- Adaptive Technology: focusing on agricultural machinery, construction equipments, and appropriate technologies to address local community problem.