

Theme I: Productivity and Environmental Sustainability for Food Security and Poverty Alleviation

Sub-theme 1: Animal Production and Health

In Ethiopia, animal production and productivity are very low. As a result, the country is not benefiting much from the huge animal population and genetic diversity it possesses. The low animal productivity is attributable to several constraints which include severe feed shortages, lack of appropriate breeds, lack of appropriate technologies that enhance animal productivity, unfavorable local and international market conditions, high disease burdens, poor management practices, lack of favorable policies for developing and utilizing animal resources, etc. Another problem posing challenge to animal production and productivity include, undernourishment, increase in disease incidence, emergence of new diseases, and increasing drug resistance disease. Considering the national research priority and Eastern Ethiopian condition in relation to Haramaya University research mandate area, the following priority research areas are selected to improve the livestock production and productivity of the eastern region for the 2022/23 call for proposals.

1.1 Enhancement of camel productivity and health in eastern Ethiopia.

- Identification of the major cause of calf mortality;
- Impact of invasive alien species on camel health;
- Land cover and feed resources;
- Colostrum and whole milk quality;
- Camel heard structure and mobility pattern;
- Environmental impact assessment;
- Developing starter culture for camel milk processing;
- Camel slaughtering practices and welfare;
- Camel Meat processing and quality; and
- Application of solar energy for rural camel milk preservation.

1.2 Development and generation of animal feeds and improved practices for smallholder farmers of eastern Ethiopia.

- Identification, adoption, and development of forage species suited to different agro-ecologies with their production system and agronomic practice.
- Adoption and scale-up feed treatment technologies.
- Improve forage biomass and palatability.
- Improve the seasonal variability in feed quality and quantity.
- Integrate forage development into the farming system and enhance the performance of cut-and-carry strategic feed supplementation.
- Development of economically affordable and practically feasible poultry feed.
- Strategies in utilization of non-conventional feed-stuffs,
- Improved packages for urban suited feeding strategies,
- Environmental risks and animal feed safety.

1.3 Promotion and demonstration of improved apiculture technologies in eastern Ethiopia

- Packages for enhanced hive products production and utilization;
- Challenges related to insecticide on colony and income;
- Adoption and demonstrations of innovative technologies;
- Beekeeping involvement in watershed management practices; and
- Beekeeping technologies as a tool to reduce unemployment and increase income.

Sub-theme 2: Plant Production and Health

Research on plant production and health has been conducted for several decades and encouraging results have been obtained both at regional and national scales. However, the crop production and productivity are constrained with many problems in eastern Ethiopia. Since all the problems of crop production and productivity in the region may not be addressed in a short period of time the problems that need urgent solutions have been identified as a priority area for the 2022/23 call for proposals.

2.1 Evaluation of maize and sorghum varieties/germplasms for their resistance/tolerance to fall armyworm (FAW).

- Laboratory and greenhouse screening/evaluation of maize and sorghum germplasms
- Evaluation of the resistance/tolerance germplasms among various agroecologies.
- Determine the biochemical compounds found in the plants which are responsible for resistance/tolerance.
- Incorporate the resistance/tolerance maize and sorghum germplasms in the breeding program.

2.2 Climate-smart pest management technology/ies for enhanced maize and sorghum productivity in eastern Ethiopia.

- Manage key pests in maize and sorghum.
- Reduce pest-induced crop losses and strengthen the resilience of maize and sorghum agricultural systems under climate change.
- Integrate climate-smart pest management (CSPM) technologies in the maize and sorghum cropping system.
- Facilitate large-scale adoption of proven CSPM technologies and practices by smallholder farmers.
- Improve the knowledge and capacity of farmers, farmer organizations and extension agents to effectively to implement CSPM.

2.3 Screening and characterization of common bean, cowpea, and mung bean germplasms/genotypes for abiotic stress (heat and/or drought) in eastern Ethiopia.

- Evaluation of common bean genotypes for drought tolerance in eastern Ethiopia.
- Characterization of common bean genotypes for drought associated root and shoot traits.
- Evaluation of the compatibility of native, promising and commercial biofertilizers (rhizobium strains) with recently released common bean varieties.
- Participatory varietal selection and promotion of cowpea varieties in drought-prone areas of eastern Ethiopia.

- Evaluation of the adaptability and promotion of mung bean varieties in eastern Ethiopia under contrasting moisture regimes for farmer level and large-scale commercial production.
- Advancement of segregating common bean genotypes for food and micronutrient concentration.

2.4 Establishment of breeding procedures and methodologies for resistance breeding against abiotic (e.g. drought and heat) and biotic (diseases and insect pests) stresses in groundnut.

- Equip groundnut breeders with methodologies to design new varieties to meet the standard quality requirements of the local and international markets and environment adaption and mitigation against climate change.
- Design breeding strategies for the development of groundnut cultivars with tolerance to abiotic and biotic stresses.
- Select suitable groundnut parents for use in the crossing program
- Develop groundnut populations for tolerance to abiotic and biotic stresses
- Enhance and sustain groundnut production and productivity.

2.5 Management of major diseases and insect pests of vegetable and fruit crops in eastern Ethiopia (citrus, mango, papaya, guava, and tomato).

- Identification and prioritization of horticultural pests (diseases, insect pests, nematodes, weeds) based on urgency and economic importance
- Evaluation of various pest management practices for major horticultural pests.
- Integrate climate-smart pest management approach with other methods of pest management.
- Development of sound and sustainable pest management method that best suits to the specific locality.

2.6 Introduction, evaluation, and generation of technologies for economically important vegetable crops in eastern Ethiopia (tomato-open pollinated and hybrid varieties, cabbage, and eggplant).

- Evaluation and recommendation of open pollinated and hybrid tomato varieties for high yield and disease resistance, and development of methods for quality seed extraction of open-pollinated varieties in eastern Ethiopia;
- Determination of fertilizer rates, spacing and weed management practices for tomato in eastern Ethiopia;
- Introduction, evaluation and recommendation of commercial eggplant varieties, determination of fertilizer rates, spacing, and weed management practices for high yield and fruit quality of egg plant varieties in eastern Ethiopia;
- Introduction, evaluation and recommendation of commercial cabbage varieties, determination of fertilizer rates, spacing, and weed management practices for high yield and head cabbage quality in eastern Ethiopia;

2.7 Assessment and improvement of Coffee (Harar Coffee) production and productivity in Hararghe, Ethiopia

- Characterization of Hararghe coffee and its existing production systems;
- Coffee genetic diversity, genetic conservation and utilization for productivity improvement;
- Coffee pests (diseases, insects and weeds) identification and management;
- Climate-smart production practices for boosting coffee production and productivity;
- Coffee chemistry, and biodiversity;
- Coffee pre- and post-harvest handling practices, bean quality assessment, and processing; and
- Coffee value addition, products value chain analysis and commercialization.

Sub-theme 3: Environment, Natural Resource and Climate Change

Today the world is confronted, more than ever before, with unprecedented environmental pressures that are posing extraordinary scientific, social, and economic challenges to the society. Most of the challenges are triggered by anthropogenic activities. Climate change has become a global issue due to natural and anthropogenic processes being manifested in environmental incidents including floods, drought, increasing desertification, global warming, water scarcity, unexpected precipitation, and others. Ethiopia is vulnerable to hazards caused by one of the major environmental problems, climate change. To tackle the problems, there is a need for intervention through participatory research on environment, natural resources and climate change. Therefore, the environment, natural resources and climate change related issues need to be treated as an integrated whole to address challenges. Since all the problems may not be addressed in a short period of time the problems that need urgent solution have been identified as priority research area for this call.

3.1 Development of integrated soil nutrient management for high-value vegetable crops (Haramaya I carrot, Improved Huruta Shallot and Chelenko garlic varieties)

- Determine types and rates of organic and inorganic fertilizers and make recommendations for quality and high root and bulb yield of Haramaya I carrot, Improved Huruta Shallot and Chelenko garlic varieties.
- Determine the effect of biochar on physicochemical properties of nutrient depleted soil and yield of high-value vegetable crops.
- Assess the effect of biochar, organic and inorganic fertilizers quality and shelf life of root and bulbs of Improved high-value vegetable crops varieties.
- Determine the economic benefit of biochar, organic and inorganic fertilizers rates to the production of Haramaya I carrot, Improved Huruta Shallot and Chelenko garlic varieties in East Hararghe.

3.2 Land use /land cover change and climate change in eastern Ethiopia

- Dynamics of land use/land cover change and consequences on ecosystem services
- Vegetation responses to drought and consequences on water productivity
- Modelling climate change effects on soils and productivity;
- Evaluating landscape management practices for climate change adaptation, resilience, and mitigation;
- Examining carbon sequestration/emission/mitigation/soil quality/health potentials under different land uses;
- Identifying climate-smart water resources management practices and their effectiveness;
- Examining impacts of climate change on agriculture, water, soil and ecosystem;
- Developing regional climate change models to for assessing the risk of climate change;
- Developing technologies for the production of bio-energy and other bio-products from agricultural and forest biomass.

3.3 Introduction/development and evaluation of improved water use efficiency and water budgeting for the productivity of food and cash crops at Haramaya watershed

- Analysis and quantification of irrigation water;
- Coverage of irrigation water provision and utilization;
- Identification of irrigation water-efficient engineering and management approaches;
- Monitoring and evaluation of irrigation water development techniques;
- Evaluating community-based irrigation water use by laws and regulations.

3.4 Water resources and irrigation potential for sustainable agricultural production in lowland areas of eastern Haraghe

- Assessment of groundwater potential and climate changes
- Irrigation development and engineering,
- Applications of technologies/tools for water resources development, monitoring, and management,
- Salinity management for agriculture use, etc.
- Agricultural water uses efficiency improvement, productivity, and utilization, particularly in lowland irrigated agriculture.
- Water resources availability and drainage system development.