CFP Assignment

A. Introduction

A1. Background and justification of the proposal

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| Temperature and frequency of rainfall and its unpredictability in Africa are expected to rise in two degree celcius by 2050, posing a threat to agricultural productivity. For instance, sub-Saharan Africa may experience a reduction of over 10% in the yield of rainfed maize (Tesfaye, 2022). Ginbo (2022) shows that the yield of major crops in Ethiopia decreases by 27% at high altitudes over 2041–2060. The type of inputs and variety utilized during production will determine the quality and quantity of output (Liliane and Charles, 2019). Thus, there is a growing concern for the production of crop varieties that can yield high in suboptimal environments which requires accessing a wide range of genes, conserve genetic resources, and effectively use them to develop crop varieties that can withstand extreme events of climate change (Heisey et al., 2015).  Seed security plays a crucial role in ensuring food security (Mwangi et al., 2020, Nabuuma et al., 2022). However, developing countries face significant challenges accessing high-quality seeds. The Ministry of Agriculture, Research Institutes, Seed Enterprises, Disaster and Risk Management Commission, Farmers’ Cooperative Union, Agricultural Transformation Institute, and Biodiversity and Conservation Authority play a crucial role in Ethiopia’s formal seed systems. The success of achieving seed security depends on the effectiveness of these organizations, as well as supportive policies and favorable socio-economic conditions. Production of top-notch seeds also requires knowledge, skills and experience in crop needs, field standards, seed processing and storage. Thus, sharing knowledge and improving professional skills is vital, and can be achieved through structured training programs. Improving seed systems through various interventions such as developing new crop varieties, enhancing the capacity of actors involved in the seed value chain, and fostering collaboration among institutions can greatly improve the seed sector.  A tracer and need assessment studies on the university graduates were conducted and results revealed areas of inadequacy, including seed testing, quality assurance, seed policies and regulations, and seed business.  To this end, Haramaya University has the capability to provide short-term training on its premises, with experienced professionals and fully equipped laboratories and facilities to bridge the existing gaps of expertise. |

A2. Objectives of the proposed short course facility

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| The objectives of the short courses are to: 1. Enhance trainees’ knowledge and skills on current ex-situ genetic resource conservation, protocols of seed exchange and quarantine, and seed herbarium management for efficient and sustainable use; 2. Raise the trainees’ expertise on the production of high-quality seeds of selected field, vegetable and forage crops, parental lines and hybrids, and principles of seed processing, conditioning, packaging and storage to improve productivity and take part in seed systems resilience;  3. Deepen trainees’ theoretical knowledge on physiological processes of seed development, dormancy, longevity, impacts of climate change and mitigation strategies, and practical applications on high-quality seed production and seed quality assessment; 4. Enhance trainees’ hands-on skills in seed physical, physiological, genetic and health tests to provide reliable information to seed producers, researchers and regulatory authorities thereby contributing to the resilience of seed systems;  5. Enhance participants’ knowledge and applications of seed standards and certification schemes to promote seed quality assessment, regulation and development of the seed sector thereby improving access to notified kind seeds of an acceptable standard; 6. Upraise participants’ understanding of the integration of institutions, policies, socio-economic scenarios of youth and female farmers, seed producers, crop/variety selection, and agronomic practices for climate-smart seed systems; and  7. Develop the knowledge and skills of trainees on seed marketing, value addition and regulatory framework to contribute to the seed sector development. |

A3. Introduction to your institute (and relevant partners if applicable)

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| Haramaya University (HU) is one of the oldest higher academic institutions in Ethiopia which has gone through more than six decades of gigantic transformations since its establishment as an Imperial Ethiopian College of Agricultural and Mechanical of Arts (IECAMA) in the early 1950s. Its foundation was necessitated with the need for modernizing and advancing Ethiopia’s agriculture through the production of trained manpower and pragmatic research and extension programs (https://www.haramaya.edu.et/). The mission of HU is to train competent graduates in diverse fields of study, undertake knowledge-generating, problem-solving and cutting-edge research, and provide demand-driven and transformative community engagement activities that contribute to sustainable local, national, regional and global development. The administration of HU is organized with one president and four vice president offices. The Vice-President for Research Affairs has five director offices and one of them is ‘Director for Seed Inspection and Certification Center’. The center provides ‘field inspection, seed quality testing, and certification service to producers and processors’ and ‘create linkage with seed value chain actors and support services for knowledge and resource exchange’ among others.  The academic wing of HU has nine colleges, two institutes, and one academy, three directorates, and one regional center named ‘Africa Center of Excellence in Climate Smart Agriculture and Biodiversity Conservation. School of Agricultural Economics and Agribusiness Management, and School of Plant Sciences are among the schools in the College of Agriculture and Environmental Sciences. Seed Science and Technology is one of the postgraduate programs in the School of Plant Sciences, and offered as a course in undergraduate program.   Besides, HU works in partnership with various institutions regionally and globally. To mention few: The Collaborative Master of Science in Agricultural and Applied Economics (CMAAE, 17 African Universities), University of Bergen (Norway), Minnesota University (USA), Norwegian Institute for Agricultural and Environmental Research, Cranfield University (UK), Bill and Malinda Gates Foundation, Christian Relief (USA), RUFORUM (Regional University Forum for Agriculture) (Africa), ITM (Institute of Tropical Medicine) (Belgium), North Western University School of Law (USA), University of Washington (USA), Stellenbosch University (South Africa) and Stichting Wageningen Research Ethiopia (SWR). |

B. Capacity demands and proposition

B1. Summary of the observed capacity demands of the Ethiopian seed sector based on the needs assessment

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| To fully maximize the potential of a crop, it is helpful to use high-quality seeds. Unfortunately, in Ethiopia, access to these types of seeds is limited. The seed sector is facing critical challenges due to weak collaboration among key actors, a significant difference between the supply and demand of high-quality seed, inefficient distribution and marketing, and an inadequate seed quality assurance system (Tekeste et al., 2022).  Since 2008/09, Haramaya University has offered a master's program in Seed Sciences and Technology. The program has successfully trained numerous graduates who have become experts in seed production, testing, certification, distribution, and marketing.  The University carried out a tracer study on its graduates and conducted a need assessment for the MSc curriculum in Seed Science and Technology. All of the graduates from the program have been successfully employed in government institutions. On average, 80% of employers have hired three graduates from this program. Out of the graduates, 78% are working in research and government seed sectors, while 14% are lecturers in various universities and 7% hold office positions.  According to graduates, the curriculum had some limitations, particularly in areas such as seed testing and quality assurance, seed policy and regulation, and seed business. Employers also noted that graduates lacked practical skills. Besides, both graduates and employers agree that short-term training is an effective solution to close the skill gaps of graduates and improve expertise. To this end, Haramaya University can provide both in-person and online short-term training programs. These courses are led by experienced professionals from diverse fields and are supported by modern facilities, including state-of-the-art laboratories. |

B2. Learning goals to be addressed by the proposed training facility

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| Two modules that include essential courses that cater to the need of graduates and employers will be prepared and delivered. This eliminates the need to take both modules and ensures that training is tailored to the priorities of trainees and employers.  **Table 1.** Learning goals to be addressed by training facility   |  |  |  | | --- | --- | --- | | **Module I: Seed Conservation and Quality Assurance for Seed Systems Resilience** | | | | **No** | **Course title** | **Learning goal addressed** | | 1 | Genetic Resource Management | Enhance trainees’ knowledge and skills on current ex-situ genetic resource conservation, protocols of seed exchange and quarantine, and Seed herbarium management. | | 2 | Seed Production and Processing of Selected Field, Vegetable and Forage Crops | Raise the trainees’ expertise on production of high quality seed of selected field, vegetable and forage crops, parental lines and hybrids, and principles of seed processing, conditioning, packaging and storage. | | 3 | Seed Development, Seed Coat Structure and Impacts of Climate Change | Deepen trainees’ knowledge on physiological processes of seed development, dormancy, longevity, and impacts of climate change and mitigation strategies. | | 4 | Seed Quality Testing | Enhance trainees’ hands-on skills on seed physical, physiological, genetic and health tests to provide reliable information and ensure seed system resilience. | |

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| **Table 1.** Learning goals to be addressed by training facility **(Continued)**   |  |  |  | | --- | --- | --- | | **No** | **Course title** | **Learning goal addressed** | | 5 | Seed Standards and Certification | Enhance participants’ knowledge and applications of seed standards and certification schemes to promote regulation of seed sector and ensure production of notified kind seeds of acceptable standard. | | 6 | Youth and Female, and Climate Smart Seed Systems | Upraise participants’ knowledge on integration of institutions, policies, socio-economic scenarios of youth and female farmers, seed producers, crop/crop variety selection, and agronomic practices for climate smart seed systems. | | 7 | Seed Marketing | - Understand how proper marketing of seed will satisfy the farmer’s demand for reliable supply of a range of improved seed varieties of assured quality at an acceptable price.  - Identify customer segments based on common characterizes such as gender, farm size, type of buyer and location.  -Explains how to develop seed marketing plan to enable small-scale enterprises to improve customer satisfaction and strengthen their competitive positions in the market. | | 8 | Seed Sector Regulatory Framework | Understand the relationship between regulatory elements and seed systems.  - Understand the strengths and limitations of the Ethiopian seed policies and regulations.  - Understand the role that development of appropriate seed policy has in ensuring farmers to get the right seed, at the right place and at the right time.  - Understand the importance of regulatory and investment policies in building a strong, vibrant, and competitive seed sector. | |

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| **Table 2.** Learning goals to be addressed by training facility   |  |  |  | | --- | --- | --- | | **Module II: Extended Seed Value Chain Analysis and Legal Frameworks for Seed System Resilience** | | | | **No** | **Course title** | **Learning goal addressed** | | 1 | Seed Value Chain Analysis | - Understand the role of building coalitions between actors in the seed supply chain (seed producers, grain producers, traders, and processors) in promoting a seed system that delivers high quality seed in an efficient and sustainable manner.  - Understand how promotion of inclusive value chain governance, and policy and regulatory environment, by establishing or strengthening multi-stakeholder platforms and inter-professional associations provide small producers and other value chain actors with information on prices and markets. | | 2 | Seed Marketing | - Understand how proper marketing of seed will satisfy the farmer’s demand for reliable supply of a range of improved seed varieties of assured quality at an acceptable price  - Identify customer segments based on common characterizes such as gender, farm size, type of buyer and location  -Explains how to develop seed marketing plan to enable small-scale enterprises to improve customer satisfaction and strengthen their competitive positions in the market | | 3 | Seed Sector Regulatory Framework | - Understand the relationship between regulatory elements and seed systems  - Understand the strengths and limitations of the Ethiopian seed policies and regulations  - Understand the role that development of appropriate seed policy has in ensuring farmers to get the right seed, at the right place and at the right time.  - Understand the importance of regulatory and investment policies in building a strong, vibrant, and competitive seed sector. | |

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| **Table 2.** Learning goals to be addressed by training facility **(Continued)**   |  |  |  | | --- | --- | --- | | **No** | **Course title** | **Learning goal addressed** | | 4 | Seed Business Management | -Understand how seed companies and crop genetics research organizations decide what to work on and how to go about executing on a plan to create products that will make farmers/customers successful.  -Understand the fundamentals of supply chain and production planning, profitability, and financials of the seed business. | | 5 | Seed Production and Processing of Selected Field, Vegetable and Forage Crops | Raise the trainees’ expertise on production of high quality seed of selected field, vegetable and forage crops, parental lines and hybrids, and principles of seed processing, conditioning, packaging and storage. | | 6 | Seed Development, Seed Coat Structure and Impacts of Climate Change | Deepen trainees’ knowledge on physiological processes of seed development, dormancy, longevity, and impacts of climate change and mitigation strategies. | | 7 | Seed Quality Testing | Enhance trainees’ hands-on skills on seed physical, physiological, genetic and health tests to provide reliable information and ensure seed system resilience. | | 6 | Seed Standards and Certification | Enhance participants’ knowledge and applications of seed standards and certification schemes to promote regulation of seed sector and ensure production of notified kind seeds of acceptable standard. | |

C. Training modalities

C1. **Course name(s)**

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| Module I and Module II are complete and independent. They include essential courses that cater to the need of graduates and employers. This eliminates the need to take both modules and ensures that training is tailored to the priorities of trainees and employers.  **Table 3**. Course names and description   |  |  |  | | --- | --- | --- | | **Module I: Seed Conservation and Quality Assurance for Seed Systems Resilience** | | | | **No** | **Core courses** | **Course description** | | 1. **Genetic Resource Management** | | | | I | Ex-situ conservation and application of biotechnology | **Theory:** Impacts of climate change on ex situ conservation; Ex situ conservation in Gene Bank field; In vitro collections and associated risks of soma-clonal variation; cryopreservation (safe and long-term ex situ conservation); ex-situ conservation for Seed physical, physiological and genetic purity conservation to high standard. | | II | Seed exchange and quarantine | **Theory:** Germplasm import and export procedures; Quarantine Procedures (Scientific, administrative and legislative fremworks); International treaty on plant genetic resources | | III | Seed herbarium (archives) establishment and management | **Theory:** Weed and crop seed collection, labeling and storage, and use of seed specimen for seed identification.  **Practical**: Weed and crop seed identification | |

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| **Table 3**. Course names and description (Continued)   |  |  |  | | --- | --- | --- | | **2. Seed Production and Processing of Selected Field, Vegetable and Forage Crops** | | | | **No** | **Core courses** | **Course description** | | I | Seed multiplication of selected field, vegetable and forage crops | **Theory:** Multiplication of self- and cross-pollinated seed of selected field, vegetable and forage seeds; Parental lines and Variety maintenance; Production of hybrid seeds; Basics in soil nutrient, water, weed and disease management in seed plot; Estimation of seed multiplication ratio.  **Practical:** Field identification and management of important weeds; and Sprayer’s calibration and herbicide application. | | II | Seed harvesting, cleaning, grading, conditioning, labelling, packaging and storage | **Theory:** Principles of seed processing; Seed processing of major field and vegetable crops; Quality improvement and the risks of deterioration; Seed conditioning and storage; and Seed processing plants.  **Practical**: Seed conditioning | | **3. Seed Development, Seed Coat Structure and Impacts of Climate Change** | | | | I | Seed development, seed coat structure, dormancy and longevity | **Theory:** Seed development and maturation; Seed dormancy; Seed coat structure, development, composition; Seed vigor and seed quality; Links between physiology, environmental and seed quality; and seed longevity in storage.  **Practical**: Examination of seed coat structures. | | II | Climatic effects on seed development and quality | **Theory:** Effects of climate change in seed development, and yield and quality attributes and mitigation strategies | |

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| **Table 3**. Course names and description (Continued)   |  |  |  | | --- | --- | --- | | **4. Seed Quality Testing** | | | | **4.1. Physical, physiological and genetic tests** | | | | I | Seed sampling, moisture, Physical purity and heterogeneity tests | **Theory:** Seed sampling, seed moisture content determination, Physical purity test and seed lot heterogeneity test  **Practical:** Seed moisture content determination and physical purity test | | II | Standard seed germination tests and Dormancy | **Theory:** Standard seed germination tests and Dormancy alleviation techniques  **Practical:** Seed germination tests and Dormancy alleviation techniques | | III | Seed Vigour tests and Genetic purity tests | **Theory:** Seed vigour tests, concept of seed ageing and deterioration, Genetic purity tests, grow-out test and application of DNA markers  **Practical:** Seed vigour tests and Genetic purity tests | | **4.2.Tests for seed-borne pathogens and storage insect pests** | | | | I | Seed-borne pathogens and their management | **Theory:** Emphasis on epidemiology, disease management in the field, seed health testing. Forecasting losses from seed borne diseases.  **Practical:** Seed health testing | | II | Seed storage pests and management | **Theory: I**nsect pests control in the field and storage; seed treatment  **Practical:** Seed insect pest diagnosis | | **5. Seed Standards and Certification** | | | | I | Seed standards and certification | **Theory:** National seed system**;** Seed standards: concept, and roles; Seed certification schemes; Certification agency. | | **6. Youth and Female, and Climate Smart Seed Systems** | | | | I | Seed Systems Resilience for climate change adaptation | **Brainstorming/ Discussions:** Roles of institutions and policies for climate smart seed systems; crop/crop varieties selection; agronomic practices; and socio –economic and norms of youth and female farmers.  - Seed sector governance: policies, administration issues, crop/crop variety selection, agronomic practices and seed use for climate smart seed systems | |

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| **Table 3**. Course names and description (Continued)   |  |  |  | | --- | --- | --- | | **7. Seed Marketing** | | | | I | Seed marketing: basic concepts, purpose and approaches, research, market segmentation, demand forecasting, plan development, costing and pricing | **Lecture:** Review of basic concepts of marketing; Purpose and approaches to seed marketing; Understanding the seed market (Market research, market segmentation and demand forecasting); Seed marketing plan development; Costing and pricing.  **Practical:** Case studies on the creation of a sustainable market for certified seeds, developing a viable commercial supply while also building the compony reationships. | | **8. Seed Sector Regulatory Framework** | | | | I | Seed system: policies and regulations, strategies, proclamations, regulations, and directives; and International experiences | **Theory:** Seed system: policies and regulations, strategies, proclamations, regulations, and directives; and International experiences; regulatory elements and seed systems; Ethiopian seed policies and regulations; development of appropriate seed policy; regulatory and investment policies.  **Practical:** Case studies on how to enhance policy and regulatory framework for an efficient seed system in a specific area. | |

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| **Table 4.** Course names and description   |  |  |  | | --- | --- | --- | | **Module II: Extended Seed Value Chain Analysis for Seed System Resilience** | | | | **No** | **Core courses** | **Course description** | | **1. Seed Value Chain Analysis** | | | | I | Value chain and value chain analysis (VCA), and elements of a seed value chain | **Theory:** Value chain and value chain analysis; Mapping a value chain; Why use the value chain approach? Approaches to value chain analysis; Elements of a seed value chain; Understand how to promote inclusive value chain governance, and policy and regulatory environment.  **Showcase:** Showcase the steps and use of various tools in the value chain development (VCD) process.  **Hands-on training:** Hands-on training or experiential training on VCA and VCD formulation of the seed value chain. | | **2. Seed Marketing** | | | | I | Seed marketing: basic concepts, purpose and approaches, research, market segmentation, demand forecasting, plan development, costing and pricing | **Theory:** Review of basic concepts of marketing; Purpose and approaches to seed marketing; Understanding the seed market (Market research, market segmentation and demand forecasting); Seed marketing plan development; costing and pricing.  **Practical:** Case studies on the creation of a sustainable market for certified seeds, developing a viable commercial supply while also building the compony reationships. | | **3. Seed Business Management** | | | | I | Strategy and strategic  management, entrepreunual and managerial skills, key success factors for seed  companies, critical thinking and financial management | **Theory:** Basic business concepts, principles and challenges, business plan preparation and contents, managing working capital and stocks, costing and pricing, selling and marketing, record keeping and managing business relationships.  **Practical:** Case studies introducing some companies’ history, organizational structure, sales history, and financials. | |

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| **Table 4.** Course names and description (Continued)   |  |  |  | | --- | --- | --- | | **No** | **Core courses** | **Course description** | | **4. Seed Sector Regulatory Framework** | | | | I | Seed system policies and regulations, strategies, proclamations, and directives; and International experiences | **Theory:** Seed system: policies and regulations, strategies, proclamations, regulations, and directives; and International experiences; regulatory elements and seed systems; Ethiopian seed policies and regulations; development of appropriate seed policy; regulatory and investment policies.  **Practical:** Case studies on how to enhance policy and regulatory framework for an efficient seed system in a specific area. | | **5. Seed Production and Processing of Selected Field, Vegetable and Forage Crops** | | | | I | Seed multiplication of selected field, vegetable and forage crops | **Theory:** Multiplication of self- and cross-pollinated seed of selected field, vegetable and forage seeds; Parental lines and Variety maintenance; Production of hybrid seeds; Seed production unit management; Basics in soil nutrient, water, weed and disease management in seed plot.  **Practical:** Field identification and management of important weeds; and Sprayer’s calibration and herbicide application. | | II | Seed harvesting, cleaning, grading, conditioning, labelling, packaging and storage | **Theory:** Principles of seed processing; Seed processing of major field and vegetable crops; Quality improvement and the risks of deterioration; Seed conditioning and storage; and Seed processing plants.  **Practical**: Seed conditioning | |

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| **Table 4.** Course names and description (Continued)   |  |  |  | | --- | --- | --- | | **No** | **Core courses** | **Course description** | | **6. Seed Development, Seed Coat Structure and Impacts of Climate Change** | | | | I | Seed development, seed coat structure, dormancy and longevity | **Theory:** Seed development and maturation; Seed dormancy; Seed coat structure, development, composition; Seed vigor and seed quality; Links between physiology, environmental and seed quality; and seed longevity in storage.  **Practical**: Examination of seed coat structures. | | II | Climatic effects on seed development and quality | Effects of climate change in seed development, and yield and quality attributes and mitigation strategies | | **7. Seed Quality Testing** | | | | **7.1. Physical, physiological and genetic tests** | | | | I | Seed sampling, moisture, Physical purity and heterogeneity tests | **Theory:** Seed sampling, seed moisture content determination, Physical purity test and seed lot heterogeneity test  **Practical:** Seed moisture content determination and physical purity test | | II | Standard seed germination tests and Dormancy | **Theory:** Standard seed germination tests and Dormancy alleviation techniques  **Practical:** Seed germination tests and Dormancy alleviation techniques | | III | Seed Vigour tests and Genetic purity tests | **Theory:** Seed vigour tests, concept of seed ageing and deterioration, Genetic purity tests, grow-out test and application of DNA markers  **Practical:** Seed vigour tests and Genetic purity tests | | **7.2. Tests for Seed-borne Pathogens and Storage Insect Pests** | | | | I | Seed-borne pathogens and their management | **Theory:** Emphasis on epidemiology, disease management in the field, seed health testing. Forecasting losses from seed borne diseases.  **Practical:** Seed health testing | | II | Seed storage pests and management | **Theory: I**nsect pests control in the field and storage; seed treatment  **Practical:** Seed insect pest diagnosis | | **8. Seed Standards and Certification** | | | | I | Seed standards and certification | **Theory:** National seed system**;** Seed standards: concept, and roles; Seed certification schemes; Certification agency. | |

C2. Target groups and enrollment eligibility criteria

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| **Module I: Seed Conservation and Quality Assurance for Seed Systems Resilience**  This program is designed for trainees from government and non-government institutions who dominantly involved in genetic resource conservation, seed production and processing, seed quality assessment, seed certification.  A short-term training program is also available for those interested in starting their own seed business and students currently enrolled in the Seed Science and Technology MSc program.  **Module II: Extended Seed Value Chain Analysis for Seed System Resilience**  This program is designed for trainees from government and non-government institutions who focus on seed business, seed development, seed regulations and policies, seed quality assessment and certification. Students pursuing an MSc in Seed Science and Technology also participate in this training program.  A short-term training program is also available for those interested in starting their own seed business and students currently enrolled in the Seed Science and Technology MSc program. |

C3. Training frequency and duration

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| **Table 5.** Training modules and their training frequency and duration   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Training modality** | **Training frequency** | **Duration** | **Number of participants** | **Focus area** | | **Module I:** Seed Conservation and Quality Assurance for Seed Systems Resilience | | | | | | Face-to-face and online training: Lecture, hands-on practical, Brainstorming, Home-take assignments | Two round per year for two consecutive years | 30 days per round training | 15 participants X 2 round per year X 2 years = 60 participants | - Genetic resource conservation;  - Seed production and processing.  - Seed quality assessment and certification  - Research in seed science | | **Module II:** Extended Seed Value Chain Analysis for Seed System Resilience | | | | | | Face-to-face and online training: Lecture, hands-on practical, Brainstorming, Home-take assignments | Two round per year for two consecutive years | 30 days per round training | 15 participants X 2 round per year X 2 years = 60 participants | - Seed business;  - Seed regulations and policies  - Seed value chain analysis  -Seed quality assessment and certification | |

C4. Instructor capacities

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| The School of Plant Sciences and School of Agricultural Economics and Agribusiness at Haramaya University have a team of experienced senior male and female staff who offer training modules. They are skilled in creating high-quality modules, teaching materials, and book chapters, and are able to provide training through different modes such as distance, continuing education, summer education, and online courses. During the training period, all core teaching and technical staff will be available to provide proposed short-term trainings.  **Table 6.** Profile of the trainers   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Name** | **Gender** | **Specialty** | **Experience**  **(in year)** | | 1 | Dr Jema Haji (Full Professor) | M | Agricultural Economics | 15 years | | 2 | Dr Yibekal Alemayehu (Associate Professor) | M | Plant Physiology | 15 years | | 3 | Amare Kebede (Associate Professor) | M | Seed Science; Plant breeding | 12 years | | 4 | Dr Fikreyohannes Gedamu (Assistant Professor) | M | Horticulture | 15 years | | 5 | Dr Seltene Abadi | M | Plant breeding | 11 years | | 6 | Dr Habtamu Tefera (Associate Professor) | M | Plant Pathology |  | | 7 | Mohammed Aman (Assistant Professor) | M | Agribusiness | 11 years | | 8 | Dr Simret Burga (Assistant Professor)) | F | Horticulture | 11 years | | 9 | Dr Muluken Goftishu (Assistant Professor) | M | Entomology | 12 years | | 10 | Three Technical Assistants (1 MSc and 2 BSc) | 2 F and 1 M | Technicians in seed, pathology and entomology laboratories, and IT technician | 6 to 17 years | | 11 | Three Laboratory attendants (Certificate) | Fe | Lab attendants in Seed , Pathology and entomology laboratories | 5-17years | |

C5. Facilities

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| Haramaya University launched an MSc program in Seed Sciences and Technology in the 2008/09 academic year under the School of Plant Sciences. Since then, close to 60 MSc graduates completed their studies and graduated from the program. Currently, graduates are working in government organizations and private seed sectors. Trainers are committed to improving the competencies of trainees and enabling them to fit the demand dynamics and self-employment.  Haramaya University owns functional biotechnology and tissue culture, agronomy, horticulture, pathology, entomology and central laboratories with essential laboratory equipment. Besides, ICT rooms, smart lecture rooms, conference rooms, internet connection, student dormitories, guesthouses, and medium to high-ranked bedrooms with meal delivery services. Besides, health centres are from medium to comprehensive specialized hospitals, and well-established protection and security directorate. |

C6. Feedback mechanisms

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| During training, formative feedback at the end of each two consecutive theory and practical sessions will be anonymously administered to make adaptive management in the course delivery. Besides, takeaways and group work will be critically evaluated to examine the achievements of the particular course goals. |

C7. Type of certificate awarded

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| --- |
| At the completion of a module, trainees will receive a certificate completion from the Academic Affairs’ vice-president of Haramaya University and Stichting Wageningen Research Ethiopia (SWR) representative at the closing ceremony.  The name of the certificate: Module I: Seed Conservation and Quality Assurance for Seed Systems Resilience; and  Module II: Extended Seed Value Chain Analysis for Seed System Resilience |

D. Indicative training programme

**Module I: Seed Conservation and Quality Assurance for Seed Systems Resilience**

**Table 7.** Module I:Topic of activities and learning goal

|  |  |  |  |
| --- | --- | --- | --- |
| **When** | **Topic of activity** | **Type of activity** | **Learning goal addressed** |
| **1.Genetic Resource Management** | | | |
| Day 1 -2 | Ex-situ conservation and application of biotechnology | Lecture & Discussion | Understand the ex-situ conservation: advantages, challenges of in-vitro collections, and applications in seed quality conservation. |
| Seed exchange and quarantine | Lecture & Discussion | Understand the seed exchange and quarantine protocols, and international treaties on plant genetic resources. |
| Seed herbarium (archives) establishment and management | Lecture | Gain knowledge and skills on weed and crop seed collection, labeling and storage, and use of seed specimens in the course of seed quality assessment. |
| **2. Seed Production and Processing of Selected Field, Vegetable and Forage Crops** | | | |
| Days 3-4 | Seed multiplication of selected field, vegetable and forage crops | Lecture | Realize the knowledge and skills of multiplication of selected self- and cross-pollinated seed crops, parental lines, and hybrid seeds. |
| Days 5-6 | Seed harvesting, cleaning, grading, conditioning, labelling, packaging and storage | Lecture and group assignment | Acquaint with principles of seed processing, labelling and storage of major field and vegetable crops; physical, physiological and genetic quality enhancement; and  -understand applications and precautions in seed treatment, and processing plant management. |

**Table 7.** Module I:Topic of activities and learning goal (Continued)

|  |  |  |  |
| --- | --- | --- | --- |
| **When** | **Topic of activity** | **Type of activity** | **Learning goal addressed** |
| **3. Seed Development, Seed Coat Structure and Impacts of Climate Change** | | | |
| Day 7-8 | Seed development, seed coat structure, dormancy and longevity | Lecture and Practical | Understand the processes of seed formation, interactions with the environment and dormancy inductions and release, and seed storage behavior and forecast of storage life. |
| Day 9 | Climatic effects on seed development and quality | Lecture | Acquire knowledge on impacts of climate change on seed quality and mitigation strategies. |
| **4. Seed Quality Testing** | | | |
| **4.1. Physical, physiological and genetic tests** | | | |
| Days 10-11 | Seed sampling, moisture, Physical purity and heterogeneity tests | Lecture and Practical | Acquire theoretical and practical skills on seed sampling, moisture content determination and Physical purity and heterogeneity tests |
| Days 12-13 | Standard seed germination tests and Dormancy | Lecture and Practical | Understand principles and practical applications of standard seed germination tests and seed Dormancy alleviation techniques. |
| Days 14-15 | Seed Vigour tests and Genetic purity tests | Lecture and Practical | Equip trainees with principles and application of seed vigour tests and conventional and molecular genetic purity tests. |
| **4.2. Tests for Seed-borne Pathogens and Storage Insect Pests** | | | |
| Days 16 | Seed-borne pathogens and their management | Lecture and Practical | Familiarize with principles and practices of seed health tests and management of important seed borne diseases. |
| Days 17 | Seed storage pests and management | Lecture and Practical | Gain knowledge and skills of examination of major seed storage insect pests and their management. |

**Table 7.** Module I:Topic of activities and learning goal (Continued)

|  |  |  |  |
| --- | --- | --- | --- |
| **When** | **Topic of activity** | **Type of activity** | **Learning goal addressed** |
| **5. Seed standards and certification for Seed Systems Resilience** | | | |
| Day 18 | Seed standards and certification | Lecture & Discussion | Familiarize with seed standards of various crops and certification schemes for resilient seed systems. |
| **6.Youth and Female, and Climate Smart Seed Systems** | | | |
| Day 19 | Seed Systems Resilience for climate change adaptation | Discussion | Brainstorm on Seed sector governance, socio-economic scenarios of youth and female farmers and agronomic practices for **climate smart seed systems.** |
| **7. Seed Marketing** | | | |
| Days 20-21 | Seed marketing: basic concepts, purpose and approaches, research, market segmentation, demand forecasting, plan development, costing and pricing | Lecture and case studies | Understand how proper marketing of seed will satisfy the farmer’s demand for reliable supply of a range of improved seed varieties of assured quality at an acceptable price  - Identify customer segments based on common characterizes such as gender, farm size, type of buyer and location  - Explains how to develop seed marketing plan to enable small-scale enterprises to improve customer satisfaction and strengthen their competitive positions in the market |

**Table 7.** Module I:Topic of activities and learning goal (Continued)

|  |  |  |  |
| --- | --- | --- | --- |
| **When** | **Topic of activity** | **Type of activity** | **Learning goal addressed** |
| **8.Seed Sector Regulatory Framework** | | | |
| Days 22-23 | Seed system: policies and regulations, strategies, proclamations, regulations, and directives; and International experiences | Lecture and case studies | - Understand the relationship between regulatory elements and seed systems  - Understand the strengths and limitations of the Ethiopian seed policies and regulations  - Understand the role that development of appropriate seed policy has in ensuring farmers to get the right seed, at the right place and at the right time.  - Understand the importance of regulatory and investment policies in building a strong, vibrant, and competitive seed sector. |

**Table 8.** Module II:Topic of activities and learning goal

|  |  |  |  |
| --- | --- | --- | --- |
| **Module II: Extended Seed Value Chain Analysis for Seed System Resilience** | | | |
| **1. Seed Value Chain Analysis** | | | |
| Days 1-2 | Value chain and value chain analysis, and Elements of a seed value chain | Lecture, show case and hand-on training | - Understand the role of building coalitions between actors in the seed supply chain (seed producers, grain producers, traders, and processors) in promoting a seed system that delivers high quality seed in an efficient and sustainable manner.  - Understand how promotion of inclusive value chain governance, and policy and regulatory environment, by establishing or strengthening multi-stakeholder platforms and inter-professional associations provide small producers and other value chain actors with information on prices and markets. |
| **2. Seed Marketing** | | | |
| Days 3-4 | Seed marketing: basic concepts, purpose and approaches, research, market segmentation, demand forecasting, plan development, costing and pricing | Lecture and case studies | - Understand how proper marketing of seed will satisfy the farmer’s demand for reliable supply of a range of improved seed varieties of assured quality at an acceptable price  - Identify customer segments based on common characterizes such as gender, farm size, type of buyer and location  - Explains how to develop seed marketing plan to enable small-scale enterprises to improve customer satisfaction and strengthen their competitive positions in the market |

**Table 8.** Module II:Topic of activities and learning goal (Continued)

|  |  |  |  |
| --- | --- | --- | --- |
| **3. Seed Business Management** | | | |
| Days 5-6 | Strategy and strategic  management, entrepreneural and managerial skills, key success factors for seed  companies, critical thinking and financial management | Lecture and case studies | -Understand how seed companies and crop genetics research organizations decide what to work on and how to go about executing on a plan to create products that will make farmers/customers successful.  -Understand the fundamentals of supply chain and production planning, profitability, and financials of the seed business. |
| **4. Seed Sector Regulatory Framework** | | | |
| Days 7-8 | Seed system: policies and regulations, strategies, proclamations, regulations, and directives; and International experiences | Lecture and case studies | - Understand the relationship between regulatory elements and seed systems  - Understand the strengths and limitations of the Ethiopian seed policies and regulations  - Understand the role that development of appropriate seed policy has in ensuring farmers to get the right seed, at the right place and at the right time.  - Understand the importance of regulatory and investment policies in building a strong, vibrant, and competitive seed sector. |
| **5. Seed Production and Processing of Selected Field, Vegetable and Forage Crops** | | | |
| Days 9 -10 | Seed multiplication of selected field, vegetable and forage crops | Lecture | Realize the knowledge and skills of multiplication of selected self- and cross-pollinated seed crops, parental lines, and hybrid seeds. |
| Day 11 | Seed harvesting, cleaning, grading, conditioning, labelling, packaging and storage | Lecture and group assignment | Acquaint with principles of seed processing, labelling and storage of major field and vegetable crops; physical, physiological and genetic quality enhancement; and  -Understand applications and precautions in seed treatment, and processing plant management. |

**Table 8.** Module II:Topic of activities and learning goal (Continued)

|  |  |  |  |
| --- | --- | --- | --- |
| **5. Seed Development, Seed Coat Structure and Impacts of Climate Change** | | | |
| Days 12-13 | Seed development, seed coat structure, dormancy and longevity | Lecture and Practical | Understand the processes of seed formation, interactions with the environment and dormancy inductions and release, and seed storage behavior and forecast of storage life. |
| Day 14 | Climatic effects on seed development and quality | Lecture | Acquire knowledge on impacts of climate change on seed quality and mitigation strategies. |
| **6. Seed Quality Testing** | | | |
| **6.1. Physical, physiological and genetic tests** | | | |
| Days 15-16 | Seed sampling, moisture, Physical purity and heterogeneity tests | Lecture and Practical | Acquire theoretical and practical skills on seed sampling, moisture content determination and Physical purity and heterogeneity tests |
| Days 17-18 | Standard seed germination tests and Dormancy | Lecture and Practical | Understand principles and practical applications of standard seed germination tests and seed Dormancy alleviation techniques. |
| Days 19-20 | Seed Vigour tests and Genetic purity tests | Lecture and Practical | Equip trainees with principles and application of seed vigour tests and conventional and molecular genetic purity tests. |
| **6.2. Tests for seed-borne pathogens and storage insect pests** | | | |
| Days 21 | Seed-borne pathogens and their management | Lecture  and Practical | Familiarize with principles and practices of seed health tests and management of important seed borne diseases. |
| Days 22 | Seed storage pests and management | Lecture and Practical | Gain knowledge and skills of examination of major seed storage insect pests and their management. |
| **7. Seed standards and certification for Seed Systems Resilience** | | | |
| Days 23-24 | Seed standards and certification | Lecture  & Discussion | Familiarize with seed standards of various crops and certification schemes for resilient seed systems. |

E. Sustainability

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| --- |
| The proposed short-term training will be maintained as one of the programs in the University after getting approval via the existing system. The University facilitates collaboration in financing and other needs with other concerned private and government institutes to run the program. Besides, the core contents of the modules will be included in being revised MSc program and undergraduate course. |

F. Budget

**Table 9.** Budget for two rounds of training in the **first year**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No** | **Description** | **No. of days/units** | **Unit Cost** | **Cost (excl.VAT)** | **Cost (excl.VAT** |
|  | Trainers fee (7) | 30 | 2000 ETB/day | 420,0000 ETB | € 7080.24 |
|  | Facilitator fee (1) | 30 | 1000 ETB/day | 30,000 ETB | € 505.73 |
|  | Communication | Lump sum |  | 4,000 ETB | € 67.43 |
|  | Lunch (60) | 30 | 450 ETB/day | 810,000 ETB | € 13,654.75 |
|  | Refreshment & coffee breaks (2\*60) | 30 | 150 ETB/day | 540,000 ETB | € 9,103.17 |
|  | Accommodation (60) | 30 | 500 ETB/day | 900,000 ETB | € 15,171.95 |
|  | Note book (60) |  | 70 ETB | 4,200 ETB | € 70.80 |
|  | Pen (60) |  | 30 ETB | 1,800 ETB | € 30.35 |
|  | Flip chart with stand (10) |  | 4000 ETB | 40,000 ETB | € 674.31 |
|  | Certificate (60) |  | 100 ETB | 6,000 ETB | € 101.15 |
|  | Banner (4) |  | 5000 ETB | 20,000 ETB | € 337.15 |
|  | Module | Lump sum |  | 100,000 ETB | € 1685.77 |
|  | Opening & closing remarks (2) | 2 | 2500 ETB | 10,000 ETB | € 168.58 |
|  | Finance administrator (2) |  | 5000 ETB | 10,000 ETB | € 168.58 |
|  | Laboratory experts (4) | 15 | 1000 ETB | 60,000 ETB | € 1011.46 |
|  | Trainees perdiem (60) | 30 | 500 ETB/day | 900,000 ETB | € 15171.95 |
|  | Trainees transport (60) | Lump sum |  | 120,000 ETB | €2,022.93 |
|  | University admin | Lump sum |  | 100,000 ETB | € 1,685.78 |
| TOTAL | | | | **4,076,000 ETB** | **€ 68,712.71** |

Note: the exchange rate used is € 1= 59.32 ETB (Ethiopian Birr)

**Table 10.** Budget for two rounds of training in the **second year**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No | Description | No. of days/units | Unit Cost | Cost (excl.VAT) | Cost (excl.VAT) |
| 1 | Trainers fee (7) | 30 | 2000 ETB/day | 420,0000 ETB | € 7080.24 |
| 2 | Facilitator fee (1) | 30 | 1000 ETB/day | 30,000 ETB | € 505.73 |
| 3 | Communication | Lump sum |  | 4,000 ETB | € 67.43 |
| 4 | Lunch (60) | 30 | 450 ETB/day | 810,000 ETB | € 13,654.75 |
| 5 | Refreshment & coffee breaks (2\*60) | 30 | 150 ETB/day | 540,000 ETB | € 9,103.17 |
| 6 | Accommodation (60) | 30 | 500 ETB/day | 900,000 ETB | € 15,171.95 |
| 7 | Note book (60) |  | 70 ETB | 4,200 ETB | € 70.80 |
| 8 | Pen (60) |  | 30 ETB | 1,800 ETB | € 30.35 |
| 9 | Flip chart with stand (10) |  | 4000 ETB | 40,000 ETB | € 674.31 |
| 10 | Certificate (60) |  | 100 ETB | 6,000 ETB | € 101.15 |
| 11 | Banner (4) |  | 5000 ETB | 20,000 ETB | € 337.15 |
| 12 | Module | Lump sum |  | 100,000 ETB | € 1685.77 |
| 13 | Opening & closing remarks (2) | 2 | 2500 ETB | 10,000 ETB | € 168.58 |
| 14 | Finance administrator (2) |  | 5000 ETB | 10,000 ETB | € 168.58 |
| 15 | Laboratory experts (4) | 15 | 1000 ETB | 60,000 ETB | € 1011.46 |
| 16 | Trainees perdiem (60) | 30 | 500 ETB/day | 900,000 ETB | € 15171.95 |
| 17 | Trainees transport (60) | Lump sum |  | 120,000 ETB | €2,022.93 |
| 18 | University admin | Lump sum |  | 100,000 ETB | € 1,685.78 |
| 19 | Contingency | Lump sum |  | 50,000 ETB | € 842.88 |
| **TOTAL** | | | | **4,126,000 ETB** | **€ 69,555.61** |

Note: the exchange rate used is € 1= 59.32 ETB (Ethiopian Birr)

G. Qualifications

G1. Organizational track record

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| Providing high-quality long-, medium-, and short-term training in diverse fields with highly qualified professionals is a long-standing tradition at Haramaya University. For instance, Seed lab operations and chain of custody for seed documentation for trainees from Regional Tree Seed Centers, Forest Research Center and private companies dealing with tree seed; Training on quantitative and qualitative data management; and greenhouse gas emission for technical staff and stakeholders; Assertiveness for females; environmental and social safeguard for laboratory and waste management workers; basic laboratory management skills for field and laboratory assistants;  climate-smart agriculture, biodiversity conservation focusing on helpful technologies, practices and policies for climate adaptation and mitigation; Scaling-up of evidence-based best practices in agricultural production; and quality seed production and postharvest handling of field and horticultural crops for zonal and district agricultural expertise and farmers. Partners: Africa Center of Excellence for Climate Smart Agriculture and Biodiversity Conservation; ICRAF/PATSPO; Regional and central government; Regional and national Research institutes; and Wageningen University Research (WUR). |

G2. Project leader

**Dr Yibekal Alemayehu (Associate Professor)**

Yibekal Alemaehu Abebe (PhD), an associate professor in Horticulture, is an academic staff in the Haramaya University (HU) with the responsibility of teaching Plant/Crop Physiology courses, supervising MSc and PhD students’ thesis research, conducting research in Crop Agronomy and Climate Change Impact and Adaptation Options, and participating in community outreach programs. He obtained both his BSc degree in Plant Sciences with distinction in August 1993 and MSc degree in Horticulture in March 1999 from HU, and he obtained his PhD degree in Horticulture in December 2009 from the University of Pretoria, South Africa. He has mentored 21 MSc and five PhD students to completion as major or co-supervisor. Currently, he is supervising a total of 22 postgraduate students in the school of Plant Sciences. He has published 24 scientific articles in peer reviewed reputable journals. He also published two textbook/module for undergraduate courses in Plant Physiology that is offered in distance delivery mode. He is serving as a reviewer for peer reviewed journals. Currently he is a co-investigator of a local ‘grand grant’ project which aims at ensuring proper and integrated soil nutrient management of major crops in Easter Ethiopia. He had supervised the implementation of a Student Information System to automate the registrar office’s activities of HU using a fund obtained from the Netherland government in 2012 through a project called Leadership and Management Capacity Development while serving as university registrar from March 2011 to March 2017. Currently, he is the head of the School of Plant Sciences at HU.

G3. Core staff

1. **Short-Bio of Professor Jema Haji**

Professor Jema Haji is a professor of Agricultural Economics and an employee of Haramaya University, Ethiopia. He studied mathematics to a master’s level at AAU, did his second MSc and a PhD in economics at SLU, Sweden. He has more than 140 articles published in peer reviewed international journals. His research expertise and academic interests span across broader issues of climate change and adaptation strategies, resilience, pastoralism versus sedentarization, impact evaluation, food insecurity, adoption and productivity analyses, marketing, *inter alia*. He has taught multiple graduate courses (economics, econometrics, mathematics and statistics for MSc and PhD students) in universities in Ethiopia and across the continent, and has supervised over 350 MSc and 50 PhD students. He also prepared teaching materials for MSc students in African universities under Collaborative Masters in Applied Agricultural Economics (CMAAE) program, for statistics distance diploma students and grade eight mathematics text book. His other professional services include active involvement as an anonymous reviewer of many articles submitted for publication in international journals. Prof. Jema has held various administrative positions such as director of students’ research, associate dean of the faculty of education and head department of mathematics at Haramaya University. Additionally, he has been actively participating in various committees of the university including member of staff discipline committee, staff promotion evaluation committee, and master’s and PhD supervisors’ incentive reviewer committee. He also won and led a number of international competitive grants from DCG Norway, Bill and Mallenda Gates Foundation and Swiss Programme for Research on Global Issues for Development.

1. **Amare Kebede (Associate Professor)**

**Short-Bio of Amare Kebede (Associate Professor)**

Amare Kebede, Associate Professor of Seed Science and Plant Breeding, has been working in the Genetics and Plant Breeding Program at Haramaya University, Ethiopia. Achievements: Released nine crop varieties (principal researcher for seven of them) via nationally accredited procedures; published 13 full research articles in highly reputable journals, a book chapter on (Agronomy Journal, Volume 158), 19 proceedings, and many newsletters and abstracts; Strengthened groundnut research program, and Established Sesame and Linseed Research of the University. Principal researcher in National Groundnut Researcher from 2011 to 2014.

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