PROMOTING ADAPTIVE CLIMATE SMART AGRICULTURAL TECHNOLOGIES FOR IMPROVED RURAL LIVELIHOODS AND FOOD SECURITY IN SIERRA LEONE

A project proposal
submitted to

NATIONAL SCIENCE TECHNOLOGY AND INNOVATION COUNCIL (NSTIC)
Ministry of Technical and Higher Education
Government of Sierra Leone

Under the
"CALL FOR FULL PROPOSALS TO FUND A PROJECT THAT PROMOTES FOOD SECURITY AND MODERN AGRICULTURE"

1. Name and Address of the Organization

Eastern Technical University of Sierra Leone
Combema Road, Kenema, Sierra Leone.

2. Duration of the Project

2 Years (2024 – 2025)

3. Total Cost of Project

USD 44,984 (Forty-Three Thousand, Nine Hundred and Eighty-Four US Dollars)

4. Name of the key person, who will be the In-Charge of implementation of the project

Apostle (Dr.) Denis M.K. Amara
Director of Research & Innovation
Eastern Technical University of Sierra Leone
mob: +232-79-905-400 / +232-88-585-680
email: dmkamara@njala.edu.sl

5. Technical Staff

Name and Qualification	Position	Task
Dr. Gelejimah A. Mokuwa PhD. Agronomy (Crops)	Team Leader (Principal Investigator)	The Team Leader and Lead Researcher will bear principal responsibility for the delivery of the project. He will lead in all aspect of project implementation, negotiations (if any) and coordination with sponsors and other relevant stakeholders. He will provide overall leadership and guidance for data quality and results delivery.
Dr. Denis M.K. Amara PhD. Soil Science Soil resource inventory and climate change modelling	Co-Investigator I (Qualitative Data Analysist)	As Co-Investigator I, he will be responsible for the design and development of tools and training materials, support data transcription, data processing, analysis and drafting of qualitative report component. Support the Team Leader in designing training programme for students, farmers, and other stakeholders.
Mr. Daniel H. Saidu MSc. Soil Science	Co-Investigator II (System Agronomist)	As Co-Investigator II, he will support the Team Leader in setting-up crop cutting experiments, monitoring, data collection, analysis and interpretation of results. He will assist in the preparation of technical reports, workshop outlines and reports

OCTOBER, 2023

1. EXECUTIVE SUMMARY

Sierra Leone is one of the poorest countries in the world with a Gross Domestic Product (GDP) of SLL 48,905,104 in 2021, GDP per capita income of $627.16 and an estimated population at mid-2021 of 7,541,641 million, with 39.4% within the age of 15-35. It has an estimated 56.17% of the population living in rural areas (World Bank, 2023). Agriculture is the most significant sector in the economy of Sierra Leone, contributing to about 57.4% of the gross domestic product (GDP) and employing about 65–70% of the population (SSL, 2022), thus making agricultural development not only important in its own right but also having positive implications for the development of other sectors of the economy. Though the sector is characterized by food production involving mostly smallholder farming for subsistence with land holding size of about 0.5–2 ha, there are opportunities such as adequate arable land, abundant water resources, favourable climate, hard-working farmers and encouraging government and donor partner support. However, the greatest challenge throughout history is for the country to feed its ever-increasing population on a permanent basis. On the side of the government, several initiatives and interventions have been pursued over the years but the yield still continues to be appalling. From the research level, several technologies have been developed by research and extension organizations to increase productivity of crop production systems in the subregion. However, the adoption of technologies to increase agricultural productivity has been extremely low and there remains very little utilization of modern varieties, agronomic improvements, inputs such as fertilizer and mechanization (e.g. planters and weeders) in Sierra Leone. This has been attributed to the lack of availability of such technologies in the country or low awareness of the farmers about the availability and performance of these technologies.

Against this backdrop, the Faculty of Development Agriculture and Natural Resources Management at the Eastern Technical University of Sierra Leone is proposing this project to increase farmers' uptake of existing innovations and increase the options from which farmers can choose. The adoption of improved crop production and management technologies, coupled with training of key value chain actors like farmers, seed companies and extension staff of the Ministry of Agriculture and Food Security (MAFS), will not only increase productivity and incomes along value chains but also offer more opportunities to women and youth farmers. The project will cover a period of two years, with a total cost of 43,225 USD.

2. BACKGROUND AND RATIONALE

Agriculture remains the backbone of the economy of Sierra Leone and is comprised of subsectors that have the potential to be key drivers of the country's economic development. The sector directly contributes to the national economy through enhancing food security, income generation, employment, wealth creation, and poverty reduction, and has the potential for industrial development and ensuring equitable distribution of resources. Its share of GDP averages between 40 to 50 percent, and it provides employment to approximately two thirds of the population. It further accounts for about 10 percent of the country's total exports.

However, major factors continue to underpin the productivity, profitability, and competitiveness of the agricultural sector including the inadequate access to effective agricultural input supply systems, resulting in the low use of necessary inputs such as fertilizers and improved seeds of optimal varieties. The main constraints limiting improvement in the livelihood system of the smallholder farmers in Sierra Leone include limited access to improved technologies (quality seeds of improved varieties and other inputs), recurrent erratic weather conditions, pests and diseases (e.g. Striga on cereals and legumes, downy mildew and head miner on pearl millet, complex of insects on cowpea, midge on sorghum, rosette on groundnut, and the recently introduced FAW), and land degradation (from flooding, erosion) that seriously limit land productivity. In the face of climate change and increasing variability in climate, agricultural innovations and technologies should be 'climate smart'. In this context, it means contributing to increased adaptation and reduced vulnerability while supporting interventions to increased agricultural productivity, to safeguard and add value to crop yields and to develop value chains that empower women and children. To achieve this impact, proven technologies and interventions must be brought to scale and there is need for continued research to develop and adapt innovations.

Apart from low human capacity and weak capacity building programmes for the sector, the heavy reliance on rain-fed agriculture has severely limited large-scale irrigation and mechanized farming. The entire value chain for agricultural products is weak and vulnerable as a result of low levels of agro-processing and limited downstream integration due to limited access to electricity and water utilities (and their high cost). There is also poor access to markets due to inadequate market information and the poor condition of feeder roads linking smallholder farmers and agribusiness activities. In addition, limited access to affordable agricultural finance (high interest rates and short grace periods) for the purchase of inputs such as fertilizers, machinery, and extension services impedes value chain development. Improving agricultural productivity is challenging, partly because of limited research and the absence of credible data. The result is that available policy options have been limited. Extension agricultural services to enhance the effective use of inputs and post-harvest technology applications have had low coverage. These challenges have resulted in limited improvement in agricultural productivity and a dependence on the importation of rice, along with low production volumes of food and cash crops and insufficient livestock management.

Research institutions in the subregion have developed high yielding varieties of maize, pearl millet, sorghum, groundnut, and cowpea, that if adopted in Sierra Leone will increase household production, nutrition and incomes. Extra early and early maturing maize varieties and hybrids of maize with tolerance to drought, resistance to S. hermonthica, and some enriched with provitamin A, have been released and are currently being cultivated in agroecologies in Mali and Nigeria that are equal to those of Sierra Leone. Their introduction and testing towards selection for cultivation will diversify the crop base to increase yields and expand domestic food production. These biofortified varieties of maize and pearl millet will benefit malnourished consumers, especially lactating and pregnant women and children below five years.

The proposed project is needed to increase farmers' uptake of existing innovations and increase the options from which farmers can choose. Adoption of improved technologies, coupled with youth and gender activities in the project, will not only increase productivity and incomes along value chains but also offer more opportunities to women and youth. Increase in economic opportunities for youth is especially expected to reduce their temptation to join crime related activities or dangerous migration attempts to urban cities.

3. PROJECT GOAL AND SPECIFIC OBJECTIVES

3.1. Development Goal

The development of this project is to enhance the adoption of climate smart agricultural technologies and innovations that improve rural livelihoods and food and nutrition security in the eastern region of Sierra Leone.

3.2. Specific Objectives

The specific objectives are:

1. Enhance farmers' adaptation to climate change.
2. Increase productivity of crop production systems.
3. Increase house-hold income and value chain efficiency.

These will occur through sustainable intensification of agricultural production, increased resilience of the production systems, more efficient value chains for key crops, and increased job opportunities for youth, women and other marginalized groups that will help rural populations to adapt better to the complex effects of climate change.

4. PROJECT METHODOLOGY/ APPROACH

4.1. Conceptual and theoretical framework

Improved crop production and management technologies have been developed by several national and international research institutions in subregional countries that share similar agro-ecological characteristics with Sierra Leone. These include, varieties of maize, pearl millet, sorghum, groundnut, and cowpea, with tolerance/resistance to multiple stresses (drought, pests, and diseases), crop management practices (e.g. optimal planting densities; fertilizers rates, types, and modes of application), crop protection products, and Integrated Pest Management (IPM) practices to improve crop yields and reduce effects of climate change.

The proposed project will take to scale proven crop production and management technologies that have been developed and tested in identical agro-ecologies in West Africa. The key proven technologies to be taken to scale include:

1. High-yielding and pest resistant varieties of maize, pearl millet, sorghum, groundnut, and cowpea, that are adapted to the agro-climatic conditions of West Africa.
2. Improved agronomic practices (optimal crop densities, combinations, arrangements, and rotations; beneficial nutrient management practices; effective pest management techniques; efficient water management including drip irrigation)
3. Micro dosing of fertilizers (direct application to plants) and use of mechanized sowing, weeding, locally produced harvesting and threshing equipment. The motorized seeder reduces seeding labor time from 12 person days/ha (manual) or 1 person day/ha (animal traction) to 0.25 person day/ha.

Major challenges to the maize, sorghum, groundnut, and cowpea value chains include a) low awareness and use by the majority of producers of proven climate smart varieties and crop management practices that can reduce vulnerability of smallholder farmers in target areas to the effects of climate change; b) inadequate and outdated agricultural advisory services to farmers and other actors across the value chains; c) weak seed production, management and delivery systems, and d) input-outputs markets for the crops with high transaction costs that reduce returns to farmers and processors. The proposed project will introduce and promote climate smart agricultural technologies and innovations to improve rural livelihoods and food security. These technologies relate to crop varieties and crop management practices. Multi-stakeholder platforms will bring together key value chain actors and will particularly focus on engagement with women and youth in the context of their role not only in productivity but also in processing and marketing.

If adopted, new climate smart practices will result in increased farm level productivity of the main crops (maize, pearl millet, sorghum, groundnut, and cowpea) leading to increased food security, income, and revenues. With more productive farms, beneficiaries can increase their overall household income and achieve a higher standard of living. This in turn will give farmers the incentive to continue to pursue productivity enhancing technologies.

Research will also be conducted to ensure a pipeline of better performing technologies to be made available for the above process to continue. The research will address both breeding, complementary agronomic practices, safe and modern pest control measures, and natural resource management. This will be mainly applied and adaptive research to test existing technologies prior to dissemination. Research and sentinel surveillance will also be conducted on emerging issues so that new problems are tackled as they arise.

If students, farmers and staff of Seed Companies are trained on how to produce and market improved seeds in target communities; and smallholder farmers and extension agents, and some of the graduate and rural youth and women are also trained on appropriate climate smart crop production and management practices; then there will be increased adoption of improved crop production and NRM practices.

4.2. Research Approach

Objective 1

Activity 1.1. Mobilize farmers using mass communication (fact sheets, radio, TV, apps, SMSs.) and field days to create public awareness of available and appropriate climate smart agricultural practices

Several technologies have been developed by research and extension organizations to increase productivity of crop production systems in the subregion. There is however, low adoption of such technologies among smallholder farmers in Sierra Leone because of lack of availability of such technologies or low awareness of the farmers about the availability and performance of these technologies. The use of mass media is an effective way of reaching many farmers in a short period. Mass media are those channels of communication which can expose large numbers of people to the same information at the same time. They include media which convey information by sound (radio, audio cassettes); moving pictures (television, film, video); and print (posters, newspapers, leaflets). The attraction of mass media to extension services is the high speed and low cost with which information can be communicated to people over a wide area. We intend to use flyers, radio programs, TV, video and video clubs, etc. to widely disseminate information about climate smart technologies that can help farmers adapt to variability in climate change and increase their productivity and income. Field days will be organized around demonstration plots in order to create public awareness of available and appropriate climate smart agricultural practices.

Activity 1.2. Facilitate farmer adoption of appropriate climate smart agricultural practices (including resilient and dual- purpose varieties, pest control, soil fertility management, and NRM practices)

Extension methods including demonstration plots and field days, are some of the major strategies for introducing the findings of modern research in agricultural practices to increase agricultural production and uplift of the rural masses in general. Field demonstrations and field days are effective means of communication to transmit knowledge and skills, and the interested may easily see, hear, and learn the things conveyed by extension workers. Demonstration plots are one of the best methods to improve technology uptake by smallholder farmers. In this project, we will work with farmers groups in the selected communities to select lead farmers to manage technology demonstration plots on their behalf. Selected best-bet technologies will be promoted in lead farmers' managed on-farm demonstration plots. Each lead farmer representing a community-based organization in his community will have two plots each measuring 400 m^2. The first plot will consist of the improved crop production and management technologies with the farmers taught to manage the crops using the supplied inputs. The second plot will serve as control where the farmer will be allowed to use his own crop varieties and crop management systems. A total of 250 demonstration sites, containing 500 plots (2 plots per site) will be established. To facilitate farmer to farmer transfer of knowledge, and create more awareness among farmers, lead farmers in selected communities will be encouraged to bring members from the CBOs they represent to demonstration fields to learn from what he/she is doing. Mid and end of season evaluations and field days will be organized periodically during the cropping season to popularize crop production and management technologies and create demand. In addition to field demonstrations and field days, the project will create awareness through radio and TV programs and through video clubs on the performance of crop production and management technologies in the target communities.

The project will also link farmer organizations to agro-dealers in the target region to enable them access to legal and effective chemicals for pest control. Pearl millet, sorghum and groundnut are all susceptible to insect pests (pearl millet head miner, sorghum midge) and diseases (groundnut rosette), which contribute to the low productivity. For pearl millet, we will mainly emphasize on the dissemination of the biological control approach (Ba et al., 2014) for controlling the pearl millet head miner, one of the most devastating insect pests. For sorghum and groundnut, we will mainly focus on dissemination of existing sorghum midge resistant varieties and groundnut rosette resistant varieties in the subregion.

Activity 1.3. Train smallholder farmers and extension agents on appropriate climate smart crop production and management practices

It is not enough to introduce and demonstrate technologies without training the stakeholders on their proper use. We propose to strengthen stakeholders at three levels. Firstly, we will train extension service providers (public sector, NGOs and private sector) in the correct use of the technologies to enable them pass on the training to the smallholder farmers. In addition, we will provide training to the lead farmers in the use of the technologies. The lead farmers will also be trained in leadership skills. Each lead farmer will be assigned about 25 farmers in a group to train in the use of the introduced crop production and management technologies.

Objective 2

Activity 2.1. Establish functional community-based seed production and train farmers, farmers' associations, women and youth groups, and extension personnel in the production and marketing of quality seeds

Many studies on the adoption of improved cultivars bred by national programs and/or international agricultural research centers (IARCs) have concluded that the major bottleneck preventing adoption by farmers is the fact that good quality seed is either difficult or impossible to access by resource-poor farmers. Some of the major difficulties associated with the production and distribution of seeds are a low seed multiplication ratio especially for legumes, the bulkiness of the seed (transportation costs), and its poor storability (because of infestation by pests and rapid loss of viability). Another constraint is the fact that only limited amounts of seed are produced and distributed locally by farmers. Moreover, public-sector institutions are unable to cope with the demand for seed, while the private sector is not well developed to meet huge demands for seeds of improved crop varieties. No single agency can produce and distribute large quantities of seed to smallholder farmers. Therefore, it is essential to produce the seed at village level by farmers themselves and avoid storage and transportation, as well as strengthen seed companies to produce and sell seeds at farmer-affordable rates. The project therefore will facilitate establishment of community seed schemes, using lead farmers to produce, process and market seeds to members of their CBOs at farmer-affordable rates. The project will also train farmers, farmers' associations/ groups, and local seed traders at community level in seed production, processing, packaging and distribution.

Activity 2.2. Sensitize and train farmers on monitoring, surveillance and scouting for the identification, early warning and appropriate control measures for Fall Army Worm (FAW)

FAW is a new emerging threat to cereal crop production in Africa. Due to its rapid spread and distinctive ability to inflict widespread damage across multiple crops, FAW poses a serious threat to the food and nutrition security and livelihoods of hundreds of millions of farming households in SSA – particularly when layered upon other drivers of food insecurity such as aberrant weather conditions. FAW has the potential to cause yield losses in maize for example, of 8.3 to 20.6 M metric tons per year, in just 12 of Africa's maize producing countries in the absence of proper control methods (CABI, 2017). In the absence of maize, FAW is reported to attack over 80 other crops including pearl millet, sorghum, and groundnut. We will demonstrate the use of "early warning" and the "available and judicious use of environment friendly agrochemical products as a short-term control measure" to manage FAW at the various experimental sites. We will also train farmers and extension service providers on monitoring, surveillance, scouting and identification for use as an early warning system, and train extension personnel and smallholder farmers on the safe handling and use of the available and legal environment- friendly agrochemical products.

Objective 3

Activity 3.1. Train staff of BBF to produce and market improved seeds in target communities

To increase the use of climate smart improved varieties and hybrids, ETU-SL will work with BBF to improve the quality and quantity of certified seed through the provision of foundation and breeder seeds. Foundation seed will be developed by ETU-SL and made available to BBF for certified seed production. Seed delivery model or seed road maps will be developed for each crop and variety for the duration of the project and will be followed for the seed production of breeder and foundation seeds. BBF will work with and private seed companies and farmers' organizations to set up a Public-Private Partnership system to produce foundation and breeder seeds, specifically in business arrangements. The technical capacities of seed companies and seed producers' cooperatives will be strengthened to improve the quality of their seed through training. The project will support ETU-SL with key infrastructure and tools as needed so that there is regular availability of clean breeder seeds of the varieties and hybrids in high demand by seed growers and farmers during the project lifespan. The project will also work with seed companies, village-based input dealers and BBF in establishing 100 farmer managed demonstration plots that will help farmers assess the value of the new varieties and hybrids directly.

Activity 3.2. Train farmers and staff in interpreting weather forecasts and using these in deciding on optimal planting and weeding times

If farmers have access to appropriate weather forecasts, they can better plan their farm activities. The farmers will be trained on the use of seasonal and short-term weather forecasts. Agronomic tests will be conducted to assess farmers' benefits of using

weather forecast under traditional and improved crop management. The project will use mobile telephones to provide weather forecast to the farmers. For this reason, one automated weather station will be installed at ETU-SL campus to generate data on meteorological parameters such as rainfall, temperature, etc.

5. ANTICIPATED OUTPUTS AND OUTCOMES

S.N.	Activity	Output(s)	Outcome(s)	Impact	Risks and Assumptions
1.1	Mobilize farmers using mass communication (fact sheets, radio, TV, apps, SMSs) and field days to create public awareness of available and appropriate climate smart agricultural practices.	Awareness of available and appropriate climate smart agricultural practices raised.	Increased adoption of available and appropriate climate smart agricultural practices.	Reduction in the use of traditional practices of crop production and management	Willingness of farmers to attend awareness raising programmes.
1.2	Facilitate farmer adoption of appropriate climate smart agricultural practices (resilient and dual-purpose varieties, soil fertility management, pest control, and NRM practices) through demonstration, evaluation and extension.	Appropriate climate smart agricultural practices demonstrated at field level	Increase in number of framers and farm size	Increased crop production and productivity	Willingness of farmers to adopt the introduced technologies.
1.3	Train smallholder farmers and extension agents on appropriate climate smart crop production and management practices.	Training in appropriate climate smart crop production and management practices conducted	Improvement in the knowledge level of famers and extension agents in appropriate climate smart crop production and management practices	Increased in climate resilient cropping systems	Willingness of farmers to adopt the introduced technologies.
2.1	Establish functional community-based seed production and train farmers, farmers' associations, women and youth groups, and extension personnel in the production and marketing of quality seeds.	Functional community-based seed production established and training in the production and marketing of quality seeds conducted.	Improved seeds available for sale for sale to members of community-based organizations	Increased access to good quality seeds and increased in yield	Willingness of farmers to adopt the introduced technologies. Availability of funds for onward production.
2.2	Sensitize and train farmers in monitoring, surveillance and scouting for the identification, early warning and appropriate control measures for the Fall Army Worm (FAW) and other pests.	Farmers sensitized and trained in monitoring, surveillance and scouting for the identification, early warning and appropriate control measures FAW	Incidence of FAW reduced in target communities	Double season cropping of maize due to control of FAW incidence	Willingness of farmers to attend sensitization programmes.

3.1	Train farmers and staff of seed companies and seed producers' organizations to produce and market improved seeds in target communities.	Farmers and staff of seed companies and seed producers' organizations trained to produce and market improved seeds in target communities.	Improved seeds available for sale in target communities	Increased seed access linkages for farmers	Willingness of farmers to adopt the introduced technologies. Willingness of farmers and seed companies to establish seed agribusinesses
3.2	Train farmers in interpreting weather forecasts and using these in deciding on optimal planting and weeding times.	Farmers trained in interpreting weather forecasts and their applications in agronomic practices	Agronomic practices such as planting, fertilizer application, weeding, etc undertaken by farmers in line with weather conditions	Minimized weather shocks	Willingness of farmers to adopt the introduced technologies.

6. KNOWLEDGE UTILIZATION AND DISSEMINATION PLAN

Communication plays a key role in the effective dissemination and adoption of innovation. The plan for communication will involve the engagement of public and private extension service providers, traditional mass media such as radio, television, newspapers; and digital agriculture involving the use of social media via channels such as telephones to disseminate information to farmers.

The bias for mass media and digital agriculture is emphasized because of their rapid and efficient means to inform audiences and their ability to reach millions of farm families in areas which are beyond the reach of extension personnel. Besides extending the reach of the extension network, communication media can play a wide range of roles in the development process. Their ability to penetrate remote rural areas and transcend the illiteracy barrier has made the media a primary vehicle for bringing new ideas and knowledge, events in government and the outside world, and possibilities for improvement to the people in the countryside. The following activities are proposed in the communication plan:

i. **Development of websites and setting up of social media platforms:** A web portal will be developed to share progress and results of the project to a wider audience. The web portal will host social media platforms of the project such as Twitter, Facebook, LinkedIn, YouTube, and TikTok.

ii. **Newsletter:** A quarterly newsletter will be produced to further share the innovations and progress being made to farmers and the wider public.

iii. **Establishment of video viewing center:** In several communities in sub–Saharan Africa, there are several private-owned video viewing centers that show football matches. The project will work with such centers to ensure that videos produced by the project on new innovations are aired before premier, champions, LaLiga, and F.A. cup matches.

iv. **Radio slots:** Radio is one of the communication channels that reaches farmers at wider scale in Africa, especially in rural areas. The project will work with radio stations to ensure that the contents generated by the project are aired periodically.

v. **Digital tools such as WhatsApp**: The use of cellphone has grown astronomically in sub-Saharan Africa. The WhatsApp platform will be used as a tool for dissemination of project information to farmers. The project will develop a WhatsApp platform to share videos and messages to farmers.

vi. **Visibility/production of other extension materials**: This includes caps, T-shirts, handbills, flyers, almanac etc. These materials will be developed and shared with farmers.

7. PROJECT GOVERNANCE

A Project Steering Committee (PSC) will be set up that will comprise of key stakeholders including the ETU-SL team (Vice Chancellor and Principal (VC&P), Director of Research and Innovation (DRI), Director of Partnership and Resource Mobilization (DPRM), Finance Director, Internal Auditor), District Agriculture Officers (DAOs), and farmers' representatives. The PSC will provide guidance to the implementation of this project. It will advise on issues and problems arising during project implementation; facilitate cooperation among project partners and collaboration between the projects and other relevant programs, projects and initiatives in the countries. The ETU-SL team through the Principal Investigator, will be responsible for

overall project management and overall coordination of activities. The DRI will be the secretary of the PSC and he shall present a quarterly report to the PSC. The DAOs will play a vital role in the selection of target communities and beneficiaries due to their long-standing experience in dealing with famers in their districts. The farmers' representatives will serve as points of contact (POC) for their FBOs. They will be responsible for organizing members of their FBOs, and facilitating communication between farmers and the technical team. The PSC will also conduct a regular monitoring and evaluation of the project in line with project outputs, indicators and activities.

8. SUITABILITY OF THE HOST INSTUTUION

The ETU-SL is a technical university that is located in the eastern region of Sierra Leone, which tends to be the bread basket of the country. The institution has campuses located at Bunumbu Campus having 615 acres in Kailahun district, Woama Campus having 317 acres in Kono district, and Kenema Campus with two locations, namely Kenema having 25 acres and Panderu having 100 acres. The region is also endowed with adequate climatic and environmental conditions that favour the growth of crops and general agricultural development.

ETU-SL has well-structured faculties and programmes that are career-driven, with qualified staff for teaching, research and community services. As a technical university, it caters for the development of the middle man power and contributes to improving the quality of life for citizens, increasing agricultural productivity, promoting the environmental wellbeing of families and conserving the natural resources. Project of such nature is well suited to the mission and development objective of the institution and could serve as a gateway to the eastern region and the country as a whole.

Lastly, the university has undertaken a series of project since its inception in collaboration and partnership with several national and international, governmental and non-governmental organizations including MAFS, MTHE, Ministry of Youth, Gola Forest, WHH, BADIA etc. The university also has standard infrastructure that could facilitate the implementation of this project.

With these potentials and experiences, the university is well positioned and capacitated to undertake such project.

9. CAPACITY BUILDING

The project will base its implementation strategy on the core principles of a livelihoods framework. This framework will guide project interventions in support of technical innovations, through a process of building human skills and improving the capacity of local institutions. Major activities will include technical innovations such as introduction of new crop varieties and improved crop management practices, and institutional strengthening. The proposed project will contribute towards individual and organizational capacity building in several ways including hands-on practical demonstration of appropriate climate smart technologies for individuals such as project staff, students, and farmers to institutional capacity building in terms of infrastructural development through the provision of relevant and appropriate science tools and training extension staff of MAFS. The project intends to offer scholarship to one Junior Lecturer in the Faculty of Development Agriculture and Natural Resource Management to pursue an MSc in Soil Science. In addition, the project will train farmers, students and extension staff of MAFS in several aspect of climate smart agriculture including appropriate climate smart crop production and management practices, production and marketing of specific value-chain crops such as maize, pearl millet, sorghum, groundnut and cowpea, integrated pest management such as monitoring, surveillance and scouting for the identification, early warning and appropriate control measures for Fall Army Worm, and interpretation of weather forecasts.

10. MONITORING AND EVALUATION STRATEGY

The proposed monitoring, evaluation and learning (MEL) plan will be designed to produce accurate, valid and timely information that would inform the key project outputs and results; to track progress and make mid-course corrective actions where necessary. The MEL plan will also provide relevant information needed to assess and report progress towards the expected project impact of improved rural livelihoods and food security. The MEL plan will also clearly identify the common indicators to be reported by partners involved in the implementation of the project. The Logframe Matrix identifies the key performance indicators and their corresponding data sources, methods of data collection and the means of verification needed to obtain and report performance data that will inform progress achieved for measuring the stated results. Baseline data for the proposed performance indicators will be collected within 3-6 months after the start of the project. This will be followed by setting of realistic targets in line with the established baseline figures. The overall MEL plan will entail use of mixed methods (quantitative and qualitative) data collection approaches.

These consist of the following:

i. **Performance monitoring:** This relates to implementation monitoring comprising of tracking of milestones and outputs by using several data collection methods such as reviewing project and training records, collecting quantitative data from beneficiaries, and conducting special studies. Some of these studies are meant to address issues not informed by routine monitoring. The special studies will also be used to inform key learning questions identified for the project, and/or testing of the critical assumptions implied in the Theory of Change (TOC).

ii. **Conduct of the baseline and other relevant Surveys**: Here, a desk survey of relevant information on production, adoption, market, household and value-chain will be conducted at the beginning of the project in project locations (interventions) and some adjacent communities (non-interventions) to determine the benchmark values of the key performance outcome indicators.

iii. **Conduct of an endline survey:** This will be done during the last quarter of the project in the same communities where baseline information was collected to allow measuring of changes in key performance indicators in both project intervention sites and non-intervention ones.

11. GENDER, ETHICS AND SUSTAINABILITY

11.1 GENDER

Gender aspects and youth issues are considered important by the project. To sustain project activities, the project will develop a gender mainstreaming strategy to reduce gender inequalities through participation in identifying relevant interventions for achieving gender equity, encouraging gender-specific activities and increased participation by women. The increased participation of women and youths in the project will help increase the benefits among households, thus leading to more investments in technologies being promoted. For this reason, both male and female will be incorporated into the project based on skills requirement. During the start of the project, baseline survey on key agricultural attributes will be conducted. Through this, the project will provide job facilities for male and female youth that will comprise of students.

11.2 ETHICAL ISSUES

The proposed project involves the deployment of technologies (improved varieties, land management practices, and cropping systems) which are well known and widely tested in similar agro-ecologies in West Africa and other subregional countries. They have been widely accepted as safe and offer a range of options for better productivity of crops combined with good resource management. They are based upon existing farming practices and farmer perceived constraints, in the context of farming systems that are evolving. In addition, participatory mechanisms of technology transfer which treat farmers as equal partners in project implementation will facilitate technology adoption. However, the efficiency of these technologies depends both on scale of production and on the organization of work. The project would pay attention to these issues to ensure that the local communities, participating in the project are aware of these factors of productivity.

This is in line with previous experience gathered from the implementation of similar projects such as the Capacity4Food project, Skills Development Fund (SDF) project, etc.

11.3 SUSTAINABILITY

Six key elements will contribute to the sustainability of this project after its lifespan. These are the development of strong partnerships, the use of participatory approaches, strengthened community-based organizations, the mainstreaming of gender, and the use of research knowledge and proven. The project will forge a partnership with relevant stakeholders to work together to deliver the outputs targeted by the project. The stakeholders will participate in the identification of the problem and work together to provide solutions through technology deployment. Farmer participation in the process will provide feedback to researchers to fine tune technologies for deployment. Working with existing groups and encouraging the formation of new ones, building their capacity through technical, organizational and leadership training will lead to the formation of common interest groups, which will evolve into farmer-owned and managed organizations that are capable providing services to members. Training will be undertaken in ways which will reinforce each other based on the principles that people learn from practical experience and better from their peers. A gender mainstreaming strategy will be developed to reduce gender inequalities through participation in identifying relevant interventions for achieving gender equity, encouraging gender-specific activities and increased participation by women. The increased participation of women and youths in the project will help increasing benefit among households leading to more investments in technologies being promoted. The strong use of research knowledge and technologies through backstopping by researchers will increase productivity of the production systems and reduce poverty. This will allow for further investments in agriculture and lead to sustainable livelihoods after the project phases out.

12. PROPOSED PROJECT TIMELINE

S.N.	Project Objective/Activity	Year 1				Year 2			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	**Enhance farmers' adaptation to climate change.**								
1.1	Mobilize farmers using mass communication (fact sheets, radio, TV, apps, SMSs) and field days to create public awareness of available and appropriate climate smart agricultural practices.								

1.2	Facilitate farmer adoption of appropriate climate smart agricultural practices (resilient and dual-purpose varieties, soil fertility management, pest control, and NRM practices) through demonstration, evaluation and extension.								
1.3	Train smallholder farmers and extension agents on appropriate climate smart crop production and management practices.								
2	**Increase productivity of crop production systems.**								
2.1	Establish functional community-based seed production and train farmers, farmers' associations, women and youth groups, and extension personnel in the production and marketing of quality seeds.								
2.2	Sensitize and train farmers in monitoring, surveillance and scouting for the identification, early warning and appropriate control measures for Fall Army Worm (FAW) and other pests.								
3	**Increase house-hold income and value chain efficiency.**								
3.1	Train farmers and staff of seed companies and seed producers' organizations to produce and market improved seeds in target communities.								
3,2	Train farmers in interpreting weather forecasts and using these in deciding on optimal planting and weeding times.								
4	**Monitoring, Evaluation & Learning (MEL)/Reporting**								

13. LITTERATURE CITED

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