PROMOTING ORGANIC FERTILIZER PRODUCTION AND UTILIZATION FOR IMPROVED 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 44,630 (Forty-Four Thousand, Six Hundred and Thirty US Dollars)

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

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5. Technical Staff

Name and Qualification	Position	Task
Dr. Denis M.K. Amara PhD. Soil Science Soil resource inventory and climate change modelling	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. Senesie Swaray PhD. Genetics and Breeding (Crop Science)	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. Emmanuel Alpha MSc. and MPhil. Crop 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

1. EXECUTIVE SUMMARY

Food and nutritional security refer to the ability of all people at all times to have physical and income access to sufficient, safe and nutritious food to meet their dietary needs for an active healthy life. This requires food to be available, enough, stable and accessible without which inevitably leads to malnourishment that hinders individual performance. Food and nutrition insecurity is often attributed to farmer's lack of knowledge on appropriate agricultural techniques and ability to meet the costs of seeds, fertilizers and equipment due to limited income. The effects ranges from reduced yields, crop failure, hunger and extreme poverty. Those who can manage to purchase fertilizers are either faced with buying adulterated fertilizers or loss of applied fertilizer nutrients due to leaching and other loss processes in the soil. Therefore, enhancing food security calls for sensitizing and encouraging farmers to adopt innovative techniques that focus on catering for food and nutritional security, income generation at household level and sound management of natural resources. With the high cost and environmental problems associated with the use of inorganic fertilizers, the production of organic fertilizers such as vermicompost and vermiwash will help to save money, restore soil fertility, improve yield and protect the environment.

Vermicompost is the compost prepared by using earthworms while vermiwash is the liquid extract obtained from vermicomposting beds. These are very good source of organic fertilizers with proven correlation with crop yield in many countries. Therefore, the Department of Soil Science in the Faculty of Development Agriculture and Natural Resources Management at Eastern Technical University of Sierra Leone intends to establish 100 vermicomposting plots that will serve as vermicompost fertilizer production, demonstration and training sites. The target beneficiaries are 500 farmers, 225 students, 5 junior lecturers and 20 extension staffs of the Ministry of Agriculture and Food Security (MAFS), giving a total of 750 direct beneficiaries who will be selected based on certain criteria. The development objective is to empower target beneficiaries with the requisite skills and knowledge in the production, processing and marketing of vermicompost and vermiwash fertilizers as supplementary fertilizers for crop production. The project will help to restore soil fertility, alleviate poverty, improve livelihoods, achieve food and nutrition security and build the capacity of target beneficiaries. Additional activities involve awareness raising on the dangers of conventional agriculture, training on organic farming and follow-ups to ensure proper implementation and sharing of information for sustainability.

2. BACKGROUND AND RATIONALE

About 70% of farmers in Sierra Leone are not aware of the dangers posed by the use of chemical substances especially inorganic fertilizers. In most instances, the health and fertility of soils are negatively affected to the point that the soils may not be able to fully perform their functions, which consequently causes their productive quality to reduce over time leading to poor yields and eventually subjecting households to food insecurity. Several studies have reported perfect correlation between these chemicals and adverse health effects such as disruption of the hormone, nervous and immune systems. In most conventional agriculture, the impact of these chemicals on the environment is not fully noted. As a result, severe pollution results from the use of environmentally unfriendly practices, which causes decimation of insects and other organisms' population, soil fertility decline, water, air and soil pollution. Most of these chemical materials are expensive and their use may push small-scale farmers into high debts and progressive poverty levels as majority cannot cope with the ever-rising prices of these chemical products. On the other hand, the non-application of these inorganic fertilizers may cause yield losses to alarming levels, which in most cases manifests as staggered yields. This project will therefore endeavour to address this challenge by raising awareness on the benefits of using vermicompost and vermiwash fertilizers in crop production.

The Government of Sierra Leone's Medium-Term National Development Plan 2019-2023 (also referred to as Poverty Reduction Strategy Paper 4) states that improving the productivity and commercialization of the agriculture sector, which is the main source of income and livelihood for majority of the population, and the protection of the environment are of high priority. In addition, MAFS has a National Agricultural Transformation Plan 2019-2023, which emphasizes on management of the natural resources, site-specific management for fertilizer applications, management of soil acidity, increased production and productivity of priority crops. The development of the agriculture sector from the current level of low production and productivity of food and cash crops, and the management of the soil resources, in transition from a system of bush fallow rotation in the uplands to diversified sustainable commercial farming would therefore contribute to this vision and plan. The proposed project will therefore contribute to the fulfilment of these objectives through the production of environmentally friendly fertilizer, sustainable soil resource management, improved crop productivity and enhanced human capacity.

Community waste management poses a big challenge for environment protection agencies, especially around urban centers of Sierra Leone. These centers due to large populations and industrial activities, normally produce

high quantities of wastes that take longer time to decompose by conventional composting method. As a result, these wastes become a source of environmental pollution. With vermicomposting, these wastes especially agricultural waste can be biodegraded and used as organic fertilizers. In this way, this project would also seek to address environmental pollution.

Vermicomposting is a process that utilizes special types of earthworms to produce worm castings, which are very useful organic fertilizers. Over the recent years, advocacy on the production and use of organic fertilizers has increased in many countries. Experiences from India show that vermicomposting can be done at the household level or on a larger scale. In Sierra Leone, however, organic manure production and use has so far been limited to household level. Vermicomposting business is a fast-growing business that is able to sustain itself as long as it is managed well. The worms are locally available and all the equipment needed for the construction of the vermicomposting pits are also locally available. Once started, it can become popular among farmers especially vegetable growers. The system is easy to handle and has no offensive odour.

3. PROJECT GOAL AND SPECIFIC OBJECTIVES

3.1. Development Goal

The development goal is to empower target beneficiaries with the requisite skills and knowledge in the production, processing and marketing of vermicompost and vermiwash fertilizers.

3.2. Specific objectives

1. To promote the production and marketing of environmentally friendly fertilizer.
2. To build the capacity of target beneficiaries in the production, processing and marketing of vermicompost and vermiwash fertilizers.
3. To study the performance of vermicompost and vermiwash fertilizers in improving the crop growth, soil physical and biological properties.

3.3. Research Hypotheses

1. H_o: Vermicompost and vermiwash fertilizers can improve the soil properties of Sierra Leone
2. H_o: The production, processing and marketing of vermicompost and vermiwash fertilizers can increase the income and food security levels of farmers.
3. H_o: Vermicomposting is a sustainable business for small-scale farmers of Sierra Leone.

4. PROJECT METHODOLOGY/ APPROACH

4.1. Conceptual and theoretical framework

The project will adopt a multi-dimensional approach in ensuring scalability and sustainability of the innovation to enhance successful production, processing and marketing of vermicompost and vermiwash fertilizers by farmers in the target communities. The project will be implemented through a project life-cycle approach, commencing right from its inception to the development of a post-project roadmap for continued investments in vermicompost and vermiwash fertilizer production, processing and marketing beyond the life of the project. A combination of activities comprising of training and capacity building, technology demonstrations, cost-sharing by farmers for adoption of technology, mentoring community-led institutions and micro-enterprise, outreach, and convergence with government programs will form the bedrock foundation for continued uptake and upscaling of sustainable agriculture technologies in project communities. ETU-SL will further collaborate with government and non-governmental organizations to ensure scalability and sustainability of this environmentally friendly technology in future programs.

4.2. Research Approach

The project is designed to follow a scientific inquiry and data generation. To achieve this focus, the following models will be used:

a. Hub and Spoke Model: where farmers will be the key participants of the process, with two levels; Level 1) Master farmers and Level 2) General farmers. The Master farmers will serve as promoters of the vermicomposting technology and probably marketers of the vermicompost and vermiwash fertilizers produced by the general farmers, while the general farmers are those who will be connected to the Master farmers through market linkages. The project will ensure that all selected Master and General farmers contribute a share of the cost involved to register their Farmer Based Organizations (FBOs) with relevant institutions. Several participatory activities such as farmer field visits and farmer fairs will be organized to facilitate the working of this model. The FBOs will be linked with the government's agriculture insurance scheme to help them mitigate funding shortages. The farmers will be organized into small groups of 100 members to form FBOs

and register them with relevant organizations as a way to harness resources and to create market linkages for their products. Each FBO will be facilitated to establish an executive that will serve as its coordinating body for a period of term not exceeding two years (but re-electable based on performance). Members of the executive will be trained to serve as Trainers of Trainers (TOTs) so that even after the project would have folded up, they will be able to train their members. In addition, they will also be trained and supported in project proposal writing so that they can write project proposals that would be funded by government and its development partners even after the end of this project.

b. Sustainability and scalability pathways

- **Strengthening Community Ownership:** The project will ensure to work in partnership with the farming community to encourage their willingness and active involvement in the successful implementation of the model itself. This will help to benefit the 2262 project beneficiaries beyond the life of the project. Even after the completion of the project, these groups will be able to carry out needs assessment and start income generating projects. This is an incentive to hold them together and champion other communal activities and needs. Income generating activities like selling of vermicompost and vermiwash fertilizers and harvest from crops are key to increasing individual farmer's per capita and this is in line with poverty reduction strategy that can help to commit members to uphold the projects. The proceeds will help in sustaining the intended ecologically sound projects. Moreover, there are community banks in a number of communities, which were established by Government and its development partners to give loans to farmer organizations in order to embark on agricultural projects. This mechanism can be exploited by the groups during and after the project.
- **Institutional strengthening:** The FBOs will be encouraged and motivated to embark on small-scale agricultural production such as vegetable cultivation, as a way to earn additional income. Eastern Technical University of Sierra Leone will develop a Center of Excellence in Integrated Soil Health Management, which will provide expert advice and services to farmers on various aspects of soil health and fertility management on cost recovery basis to enhance productivity of crops and increase the incomes of farmers. This center will raise awareness on the benefit of applying vermicompost and vermiwash fertilizers using radio discussions. This will create business opportunities for organic fertilizers, and create jobs for university graduates, many of whom are currently unemployed.
- **Community Contribution:** As another step towards ensuring community participation and ownership, from the very beginning, the project will ensure that all selected Master and General farmers contribute a share of the cost involved to register their FBOs with the relevant institutions.
- **Capacity Building:** Throughout the project duration, we will engage farmers in regular hands-on trainings in different formats. Apart from regular on-site trainings related to field demonstrations, farmers will also be exposed to field visits to gain additional practical knowledge related to both existing and new practices in farming. Additionally, farmer fairs will also be organized to involve a large number of farmers during which the benefits and success stories of vermicomposting technology will be highlighted to non-project farmers. The farmers will undergo Training of Trainers (TOTs) programmes that will empower to train others farmers. All these will serve as a cross-learning platform for farmers and will enable scaling out of the technology and practices to neighbouring farmers and communities. The project will specifically focus on enhancing the capacity of the FBOs, who shall in turn, be imparting awareness and knowledge to its growing membership after the end of the project.

  The knowledge and information imparted to the community is one thing that will be used to empower and encourage them to utilize the available resources in an inexhaustible way. This will let communities judiciously utilize resources during their lifetime and later handover to the future generations in first rate order. These skills will therefore make generations regard themselves as custodians of nature given resources and not consumers. The system used during knowledge transfer involves institutionalization where trained individual farmers are organized into groups and encouraged to manage their own operations. This will enable them establish formal leadership in their respective groups which is directly responsible for group's running and linkages with other developmental networks and for information sharing. The groups' members will be trained in all the skills relevant to all their undertakings to ensure building the communities' human capital. This will guarantee continuity and at the same time induce intra community knowledge and ideas transfer through schemes like Farmers Field Schools (FFS), Demonstration Plots and Exchange Visits.

c. Partnership: This pathway will ensure scaling-up of project interventions in the existing project areas (horizontal) as well as with organizations across value chains to scale-up through policy and other development

sector players to other geographic locations (vertical).

- **Horizontal:** Through this partnership model, we will provide a platform to FBOs to benefit from multiple government incentives. This will enable them to continue to have access to the project-initiated interventions. A participatory approach will be adopted to ensure smooth facilitation and promotion of collective planning and implementation among the various FBOs to enable improved management of activities and work output. To ensure the continuation of scaling-out the vermicomposting technology in the project districts, the project will developed a three-step approach: First development of community-level scaling-out plans for all project communities, second, sharing of these plans along with a FBO membership scaling-up plans with key district government stakeholders (highlighting investment required, convergence potential, interventions to implement and government schemes that can be leveraged for convergence to achieve the targeted interventions during and after project closure), and third, conducting a district-level workshop with these stakeholders to seek feedback and to encourage them to participate in this activity in the near future.
- **Vertical:** Here, we aim to ensure that the vermicomposting practices are integrated into various schemes and programs of government and non-government agencies at the district and/or state level. These may include organizations such as Ministry of Agriculture and Forestry (MAF), Agricultural Universities and locally relevant NGOs/ Local Councils. These linkages have potential for promoting the project interventions beyond the project areas.

d. Outreach: This approach highlights current communication efforts that aim at reaching out to a larger audience for sharing best practices, information, and success stories from the project. It also involves integrating learnings from the project into agricultural programmes and projects of MDAs and NGOs**.** The project will develop digital outreach and communication materials for external audiences such as a project webpage, articles, info-notes and blogs on Eastern Technical University of Sierra Leone website and publications which will be hosted on other websites. These will help to showcase the project activities to the general public and encourage further discussions on scaling-out the technology. Additionally, during the project period, the project team will make several presentations to external scientific audiences, NGOs as well as the private sector. These presentations will help to ignite interest about project interventions. Several communication materials in the form of signboards, waybill and handbill messages will be pasted at strategic locations to continuing informing farmers about the project's intervention and benefits while also providing them with information.

5. ANTICIPATED OUTPUTS AND OUTCOMES

By the end of this project, it is hoped that 200 women and youth farmers would have learnt skills to establish and manage a vermicomposting enterprise. It is expected that these project beneficiaries will apply the skills learnt to establish and manage their own vermicomposting enterprises and serve as Trainer of Trainers (ToTs) in their localities. By the end of the project, we are expecting a 25% increase in awareness on the negative effects of inorganic fertilizers, a 25% increase in the use of vermicompost and vermiwash fertilizers by farmers in project communities and its environs, and 25% increase in the number of farmers owning vermicomposting enterprises. Generally, the potential benefits are as follows:

i. ***Soil fertility improvement:*** Vermicompost contains higher percentage of both macro and micronutrients like organic carbon (9.2 – 18%), total Nitrogen (1.5 – 2.1%), total Phosphorus (1.0 – 1.5%), total Potassium (0.6%), available Sulphur (128 – 548 ppm), Calcium and Magnesium (22 – 70 me/100g), Copper (100 ppm), Iron (1800 ppm) and Zinc (50 ppm). It also contains growth promoting hormones, e.g., Auxins and Cytokinins, as well as flowering hormone known as Gebberellins, secreted by earthworms which stimulate shoot and root development. It contains some antibiotics and actinomycetes that help in increasing resistance of crop plants against pest and diseases. Vermicompost also offers high porosity, aeration, drainage and water holding capacity, which are helpful for maintenance of soil health and fertility. On the other hand, vermiwash is very useful as a foliar spray. It is a collection of excretory products and mucus secretion of earthworms along with micronutrients from soil organic molecules that can serve as fertilizer and growth promoter.

ii. ***Mitigation of environmental pollution:*** Vermicomposting is a resource-efficient technology that does not only reduces the use of harmful chemical fertilizers but also helps in reducing environmental pollution through the reuse and recycling of organic wastes in communities.

iii. ***Easy adoption of technology by farmers:*** It is a farmer-friendly technology that resource-poor farmers in Sierra Leone can adopt for restoring the health and fertility of their soils, improving crop yield and sustaining livelihood security. The technology is very simple and can be easily executed by farmers in

their backyards.

iv. ***Economically efficient:*** It is not only a cost-effective method to convert organic waste into useful nutrient rich manure. The vermicompost and vermiwash command higher prices and offers better benefit-cost ratios than the conventionally produced compost.

v. ***Increase in farmers' per capita and poverty reduction:*** Income generating activities like selling of vermicompost and vermiwash fertilizers and harvest from crops are key to increasing individual farmer's per capita and this is in line with poverty reduction strategy that can help to commit members to uphold the projects.

Below are the details of outputs and outcomes:

S.N.	Activity	Output(s)	Outcome(s)	Impact	Risks and Assumptions
1.1	Sensitizing farmers and relevant stakeholders on the importance of vermicompost and vermiwash as environmentally friendly fertilizers.	Public awareness of vermicompost and vermiwash as environmentally friendly fertilizers created.	Increased adoption of vermicompost and vermiwash fertilizers	Reduction in the use of inorganic fertilizers and less polluting	Farmers may lack the willingness to attend sensitization programmes.
1.2	Production, processing and marketing of vermicompost and vermiwash fertilizers.	Readily available vermicompost and vermiwash fertilizer for sale	Increased adoption of vermicompost and vermiwash fertilizers.	Reduction in the use of inorganic fertilizers and less polluting	Farmers may lack willingness of farmers to fully adopt the introduced technologies.
1.3	Capacity building of target beneficiaries in the production, processing and marketing of vermicompost and vermiwash fertilizers.	Training in the production, processing and marketing of vermicomposting and vermiwash fertilizers conducted	Increase in number of framers and farm size	Increased crop production and productivity	Farmers may lack the willingness to fully adopt the introduced technologies.
2.1	Assessment of vermicompost and vermiwash fertilizers for improving the crop growth, soil physical and biological properties.	Relevant data on the potential of vermicompost and vermiwash fertilizers for improving crop growth and soil properties generated	Farmers can make better decisions on nutrient management and sustainable crop yield	Enhanced crop growth and yield	Farmers may lack the willingness to fully farmers to adopt the introduced technologies.

6. KNOWLEDGE UTILIZATION AND DISSEMINATION PLAN

To capture, share and disseminate the knowledge, lessons learned, and good practices gained in the implementation of this project, we will 1) identify the lessons learned, processes and key stakeholders through which the lessons will be collected and disseminated, 2) collect the information through structured and unstructured processes such as project critiques, written forms, and meetings, 3) verify the accuracy and applicability of lessons, 4) store the information, and 5) disseminate the information. Steps 1 – 4 are intended to capture the knowledge, lessons learned, and good practices gained in the implementation of this project, while Step 5 is dissemination stage.

The project has a plan for information dissemination through:

- Holding conferences and events to reach out to and influence a wide audience. This will foster partnerships during and after the project.

- Create direct contact through face-to-face meetings, small group meetings, site visits, workshops, training, presentations, etc., as a communication tool to create personal enthusiasm, insight and more responses from stakeholders as well as target and non-target beneficiaries of the project.
- Engage the electronic and print media including radios and newspapers to create interactive forums and platforms to inform the general public about the project concept, benefits, successes and challenges.
- Well designed and illustrated success stories in the form of brochures, poster and handbills will be published. These are vital ways to give the general public a sense of longer-term value of the project.
- Visibility programmes involving printing of banners during conferences, workshops and site visits, T-shirts and caps (with inscribed topical messages) for free distribution in communities, exercise books (with annotated illustration of products) and pens for school children, can serve as valuable source of information dissemination mechanism about the project.
- Validated data will also be published in peer-reviewed academic journals as a way to share and disseminate the knowledge, lessons learned, and good practices gained through the implementation of the project.
- We also plan to use the "Third Party Information Dissemination Approach" where government Ministries, Agencies and Departments (MDAs) like the Ministry of Agriculture and Forestry, Ministry of trade and Industry would be partnered with to become ambassadors and champions of vermicompost and vermiwash fertilizer production in the country. These people work with large groups of farmers, who can be adopters of the technology.
- We plan to create a website for the project. Because of easy accessibility and possibilities of up-dating, the website can serve as a popular platform to share and disseminated the knowledge, lessons learned, and good practices gained through the implementation of the project to the general public.

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 vermicomposting 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 soil health and fertility management.

10. MONITORING AND EVALUATION STRATEGY

The monitoring of this project will start right from its inception. The project will be regularly monitored by the Project Technical Team headed by the PI and the Project Steering Committee that will comprise of various stakeholders. The PI has a wealth of experience in dealing with core project outputs, indicators and activities in previous projects. This M&E plan will serve two functions: first, periodic assessment of project implementation and performance of activities (M&E of Project Performance), and second, evaluation of vermicompost and vermiwash fertilizers in terms of its relevance, effectiveness and impact in increasing soil fertility and improving crop productivity (M&E of Project Impact). The M&E system will provide answers on the progress and impact made in achieving the project's outputs and outcomes.

- **Project Performance**: Performance evaluation, which is referred to as mid-term and final evaluation, will assess the project's success in achieving the outputs with the inputs provided and activities conducted. The project performance will be monitored on half-yearly basis and findings incorporated into the annual technical reports.
- **Project Impact**: Evaluation of the project's success in achieving its outcomes will be monitored continuously throughout the project. The impact of the project in respect of indicators and expected outcomes will be evaluated on quarterly basis through joint meetings with the project beneficiaries.

The project performance and impact will be monitored and evaluated using the following M&E Matrix / Log Frame:

Specific objective / Result chain	Indicator	Target	Means of verification	Risks / Assumptions
1. To promote environmentally friendly fertilizer production and marketing	• Less pollution • Fertile soils • High crop yield • Better living standard due to better income status • Reduction in the rate of use of inorganic fertilizer.	• 25% increase in awareness of farmers using vermicompost and vermiwash fertilizers • 25% improvement in soil fertility status by end of project • 25% increase in yield of crops grown by farmers	• Inception report • Number of target beneficiaries • Number of vermicomposting pits and sheds constructed • Photos of meeting events, vermicomposting pits and sheds, etc.	The participants will have an interest in vermicomposting technology i.e., avail themselves for the trainings, and play their duly part during training and implementation of the project in order to make a lasting impact.
2. To improve the physical and biological properties of soils and their self-life through the application of vermicompost and vermiwash fertilizers.	• Quantity of earthworms collected. • Quantity of seeds procured. • Number of equipment procured. • Quantity of yield harvested from plots treated with vermicompost and vermiwash	• 25% increase in soil health and fertility. • 25% increase in the activities of soil microorganisms. • Reduction in soil nutrient deficiency by 15% by end of 4th quarter of project implementation. • Yield of crops increased by 12.5%.	• Soil health and fertility status report. • Crop yield assessment report. • Microbial status of soils treated with vermicompost and vermiwash fertilizers.	The social-economic political and weather conditions will allow for the process of awareness, training and more importantly adoption and implementation of the ideas.

	fertilizers.			
3. To build the capacity of target beneficiaries in the production, processing and marketing of vermicompost and vermiwash fertilizers.	• Improved living standard of target beneficiaries • Increased awareness of the benefits of vermicompost and vermiwash fertilizers in restoring soil fertility and improving crop production. • Hands-on demonstration of skills acquired from the training programme.	• 500 farmers, 225 students, 5 junior lecturers and 20 extension staff trained in vermicomposting technology by the end of project. • At least 10% of trainees fully demonstrating lessons learnt by establishing vermicomposting enterprises end of project. • At least 50% of trainees serving as Trainers of Trainers (ToTs) for other students.	• Number of trainings conducted. • Number of participants attending trainings. • Copies of training modules. • Photos and videos of training sessions. • Number of self-owned vermicomposting enterprises established by trainees. • Quantity of vermicompost and vermiwash fertilizers produced.	ETU-SL will continue with its mandate without changing focus and its mission
4. Monitoring and Evaluation	• Three M&E activities completed with their reports available.	• First M&E report to be completed by June 2024. • Second M&E report by February 2025. • Final M&E report by end of project.	• First quarter M&E report. • Mid-term M&E report. • Final report.	Project implementation follows plan as indicated.

11. GENDER, ETHICS AND SUSTAINABILITY

11.1 GENDER

The primary objective of this project is to help women and youth from rural and peri-urban areas to set up vermicomposting enterprises for income generation and also to increase soil fertility and improve crop productivity through the use of vermicompost and vermiwash fertilizers. In general, youth and women's role in agriculture are dynamic and so also are their roles in any agricultural project. Specifically, women and youth in Sierra Leone are engaged in several micro-enterprises ranging from petty trading, marketing of agricultural produce to village savings and loan associations called OSUSU. The potential for women and youth to do well in business is great but the lack of basic support is mostly a limitation that militates against their successes in business ventures. Vermicomposting is emerging as a proven strategy to build economic security for rural women and youth.

In this project, women and youth are the primary target beneficiaries. Hence, they shall be fully involved in all activities ranging from project planning and design, project implementation to project monitoring and evaluation. These roles include 1) providing the land/ sites and local materials such as bush sticks and gravel stones for construction and fencing of vermicomposting beds and sheds, 2) fetching of the worms, 3) providing security, care and maintenance for the vermicomposting beds, 4) processing and marketing of vermicompost and vermiwash fertilizers, 5) undergoing training and serving as Trainers of Trainers (ToTs) for other farmers, 6) providing ownership for the project after completion, 7) providing feedback and other relevant information on the successes and challenges of the project, 8) assisting in monitoring and evaluating the project.

Indigenous persons shall be involved in the awareness and sensitization workshops that will bring all levels of stakeholders together to dialogue and discuss the benefits and challenges associated with the use of vermicompost and vermiwash fertilizers. Radio discussions will also form a part of the sessions that indigenous persons will participate in. To enhance their full participation, we will make sure that the radio discussions are held in the local languages. This will create awareness among them and send of belongingness.

11.2 ETHICAL ISSUES

There are probably no ethical issues related to this project except that at the early stage of the vermicomposting where the worms are fetched and fed into the pits, the pungent smell from their body, may be irritating to some people, which sometimes causes vomiting.

11.3 SUSTAINABILITY

The vermicomposting pits are a property of the FBOs only after the project has ended. This is because we want

them to be thoroughly trained to own and manage the vermicomposting business. So, by the end of the project, each FBO would be able to fully demonstrate this before they can be allowed to take over the vermicomposting business. In a situation where the FBOs are not capable to take over the business, ETU-SL will continue to manage the vermicomposting business. Six months into the project timeline, we believed that more people would have developed interest in the business. So, by the eight months, another set of 1000 farmers from different communities would be selected. The project will identify a suitable place at the homes of each of these farmers where the vermicomposting pits will be constructed and stacked with earthworms and residues. The best trainees from the first batch of training will be identified and these will serve as ToTs for subsequent farmers. By this way, sustainability in knowledge and information sharing is guaranteed even after the project ends. Vermicomposting business is a fast-growing business that is able to sustain itself as long as it is managed well. The worms are locally available and all the equipment needed for the construction of the vermicomposting pits are also locally available. Once started, it can become popular among farmers especially vegetable growers. The system is easy to handle and has no offensive odour.

12. PROPOSED PROJECT TIMELINE

The proposed project will follow two main phases of implementation. Initial activities (months 1-6) will be to identify 100 target beneficiaries, establish 1 demo vermicomposting enterprise, establish baseline data in the target communities using participatory diagnostic appraisal tools, and train target beneficiaries through Farmer Field School (FFS) study plots and community level demonstration sites. As from month 7 of the project, the activities will be to organize the target beneficiaries into 4 FBOs, register the FBOs with relevant institutions, and train the FBOs in managing a vermicomposting business. Each FBO will be trained through the FFS study approach and empowered to start with one vermicomposting enterprise. The FFS process is central to the community learning-by-doing process on how to establish and manage a vermicomposting enterprise. Moreover, many more community members would be encouraged to adopt the technology. The project will target 3 districts, 35 chiefdoms, 75 towns/villages, and 100 farmers.

Detailed Project Work Plan (Project Framework and Implementation Plan)

Project Objective: The development objective is to empower target beneficiaries with the requisite skills and knowledge in the production, processing and marketing of vermicompost and vermiwash fertilizers as supplementary fertilizers for crop production.			**Timing/Duration of Activity (Quarterly)**																							
			2024												**2025**											
Project Framework	**Responsible Party**	**Indicator, including means of verification**	**1st**			**2nd**			**3rd**			**4th**			**5th**			**6th**			**7th**			**8th**		
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Component 1/Output 1: Production, processing and marketing of vermicompost and vermiwash fertilizers.																										
Activity 1.1: Project inception workshop, selection of target beneficiaries and identification of sites for construction of vermicomposting pits and sheds	ETU-SL, community stakeholders and target beneficiaries	• Inception report • Number of target beneficiaries • Number of sites identified • Number of vermicomposting pits and sheds constructed • Photos of meeting events, vermicomposting pits and sheds, etc.																								
Activity 1.2: Procurement of earthworms, seeds, and equipment	ETU-SL and target beneficiaries	• Quantity of earthworms collected • Quantity of seeds procured • Number of equipment procured																								
Activity 1.3: Construction of demo vermicomposting pits and sheds and feeding of organic residues and earthworms into pits	ETU-SL and target beneficiaries	• Number of vermicomposting pits and sheds constructed																								
Activity 1.4: Maintenance of vermicomposting pits	ETU-SL and target beneficiaries	• Physical condition of vermicomposting pits and sheds																								
Activity 1.5: Processing and marketing of vermicompost and vermiwash fertilizers	ETU-SL and target beneficiaries	• Bags (kg) of vermicompost produced • Volume (liters) of vermiwash produced																								
Component 2/Output 2: Enhanced capacity building of farmers, students and MAFS staff to set-up and manage a vermicomposting business																										
Activity 2.1: Awareness raising on benefits of vermicompost and vermiwash fertilizers	ETU-SL	• Number of awareness meetings conducted • Number of radio programmes																								

		organized • Number of participants attending • Photos and videos of events																									
Activity 2.2: Training of farmers, students and MAFS staff in the production, processing and marketing of vermicompost and vermiwash fertilizers	ETU-SL	• Number of farmers, students and MAFS staff trained • Photos and videos of training sessions																									
Activity 2.3: Construction of farmer-managed vermicomposting pits and sheds, and feeding of pits with organic residues and earthworms	ETU-SL and target beneficiaries	• Number of vermicomposting pits and sheds constructed																									
Activity 2.4: Maintenance of farmer-managed vermicomposting pits	ETU-SL and target beneficiaries	• Physical condition of vermicomposting pits and sheds																									
Activity 2.5: Processing and marketing of vermicompost and vermiwash fertilizers from farmer-managed vermicomposting pits	ETU-SL and target beneficiaries	• Bags (kg) of vermicompost produced • Volume (liters) of vermiwash produced																									
Component 3/Output 3: Crop cutting experiments/trials to test the performance of vermicompost and vermiwash fertilizers/upscaling of YEAR 1 outcomes																											
Activity 3.1: Selection of farmers, sites and land preparation	ETU-SL, community stakeholders and target beneficiaries	• Number of farmers selected • Number of sites selected and their acreages																									
Activity3.2: Application of vermicompost and vermiwash fertilizers and planting of crops	ETU-SL and target beneficiaries	• Bags (kg) of vermicompost applied • Volume (liters) of vermiwash applied • Physical condition of the crops in the field																									
Activity 3.3: Agronomic practices including weeding and second application of vermicompost and vermiwash fertilizers	ETU-SL and target beneficiaries	• Physical condition of the crops in the field																									
Activity 3.4: Agronomic data collection, analysis and	ETU-SL	• Project reports containing data collected and results obtained																									

interpretation of results																											
Activity 3.5: Harvesting of crops and final yield assessment	ETU-SL and target beneficiaries	• Quantity harvested • Benefit-cost ratio																									
Activity 3.6: Production of manuals/ monographs on vermicomposting production, processing and marketing in Sierra Leone	ETU-SL	• Number of manuals/ monographs published																									
Activity 3.7: Publication of finding in referred journals	ETU-SL	• Number of articles published • Number of manuals/ monographs published																									
Activity 3.8: Award of scholarship to 1 junior staff of the Faculty of Development Agriculture & Natural Resource Management to pursue an MSc in Soil Science	ETU-SL	• Offer of admission letter • Student progress report • Degree completion certificate																									
Monitoring and Evaluation																											
a. First tranche review and reporting	ETU-SL	• Desk review report • Project inception report • First M&E report																									
b. Mid-term review and reporting	ETU-SL	• Second M&E report • Mid-term project reports																									
c. Final review and reporting	ETU-SL	• Half yearly report • Project final report																									

13. LITERATURE CITED