

INNOVATIVE TECHNOLOGY OF RETRACTABLE POLE HARVESTING FOR SUSTAINABLE PALM OIL PROCESSING 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 44,485 (Forty-Four Four Hundred and Eighty-Five 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
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5. Technical Staff

Name and Qualification	Position	Task
Dr. Gelejimah Alfred Mokuwa. PhD Agronomy (Crop Science)	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 Analyst)	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. Foday Turay M.Sc. Post Harvest Technology	Co-Investigator II (Post Harvest Technology)	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

Oil palm trees originated in the tropical region of West Africa [1]. Between the 14th and 17th century, these oil palm plants were taken to the Americas and then to the far East Indonesia, Malaysia and Thailand and to West Africa Nigeria, and to the South America Colombia are the top five producing nations of palm oil today. Oil palms are grown as a plantation crop in countries with high rainfall exhibiting tropical climates within 10 degrees of the equator [1]. There are small-scale oil palm farms which cover up to 10 hectares, medium scale farms which cover 10 to 500 hectares, and large-scale farms which cover 500 hectares or more [1]. The oil palm trees can grow up to forty feet and produce palm fruits in bunches that could weigh up to 55 lbs [1].

Palm oil is derived from the fruits of the oil palm tree. There is a need, worldwide, to develop a safer, more efficient process of harvesting these fruits. The Fresh Fruit Bundles of fruits can weigh up to 40-55 lb and can fall to the ground from about 40ft. This puts the laborer cutting these fruit bundles down at a high risk of injury. Our goal is to test the efficiency of a retractable pole harvester that can last for years in order to make it safer, improve portability, and enhance efficiency. These problems were identified when the previous year's palm harvester was assembled. When putting together the device the weight, complex assembly, and lack of stability were apparent. This tool flaws lead to our goal of upgrading the material used for the retractable pole harvester.

2. BACKGROUND AND RATIONALE

Palm oil is used in everyday products such as soaps, washing powders, margarine, and cereal. Palm oil is derived from the trees native to West Africa. The current palm fruit harvesting method is performed in a dangerous manner where workers either climb the trees with axe, cutlass or they use an elongated pole with metal attached to the end in order to remove the fruit. In such method many Sierra Leoneans have died in using the traditional method of harvesting oil palm. Both of these methods are extremely dangerous because the palm fruit bunch could strike the workers on the ground and cause injury or the worker could injure themselves by climbing a tree with a blade in hand. The goal of this research is to create a mechanism that will replace these dangerous methods and improve the previous mechanisms. To improve the harvesting of oil palm, the introduction of the retractable pole harvester and maximize danger so the worker can move from tree to tree with ease. For this mechanism will be implemented in oil palm plantations, it must be affordable, effective, and safer than current methods. Performing these improvement will minimize the risk of injury to the workers. Research has proven that with this technology one worker can harvest 2.5 ha of oil palm plantation per day with less negative effect.

This research is designed to introduce the retractable pole harvesting technology at Bunumbu in the Kailahun District, and Eastern of Sierra Leone. Furthermore, the research intends to train 100 oil palm farmers in Sierra Leone. The oil palm farmer's field will also be targeted for practical demonstration on the usage of the retractable pole harvester and the sickle. Qualitative and quantitative loss assessments in oil palm processing will also be conducted when using retractable pole harvester.

3. PROJECT GOAL AND SPECIFIC OBJECTIVES

3.1. DEVELOPMENT GOAL

The ultimate aim of this research to determine the effectiveness of the retractable pole harvesting technology for sustainable palm oil processing in Sierra Leone

3.2. SPECIFIC OBJECTIVES OF THE RESEARCH

The specific objectives of this research were:

- To couple the prototype designed retractable pole for harvesting of palm fruit.

- To determine the efficiency of the retractable pole for oil palm producers in Sierra Leone.
- To train the 100 oil palm farmers in using the tool to reduce human drudgery in oil palm harvesting in Sierra Leone.
- To determine the post harvest loss incurred in using the retractable pole in Sierra Leone.

3.3. HYPOTHESES

The hypothesis of this research are as follows:

H₀: That is no, there is no significant impact in using the retractable pole harvesters.

H_A: There is a significant impact in using the retractable pole harvesters.

H₀: There is no reduction of human drudgery in oil palm harvesting using retractable pole.

H_A: There is a reduction of human drudgery in oil palm harvesting using retractable pole.

H₀: From the experiment with the retractable pole harvester, a man cannot harvest 2.5ha of oil palm per day.

H_A: From the experiment with the retractable pole harvester, a man can harvest 2.5 ha of oil palm per day.

4. PROJECT METHODOLOGY/APPROACH

The retractable poles harvesters and the harvesting knives will be ordered from Malaysia to perform the experiment in Sierra Leone. The two implements will be coupled to conduct the experiment. The experiment will be conducted in the Oil Palm Plantation of the Eastern Technical University of Sierra Leone (ETU-SL), Kenema located at the Bunumbu Kailahun District. Also, 100 oil palm farmers will be registered and trained on how to use the tool for sustainable harvesting. The efficiency of the harvesters with the retractable pole will be determined and the post harvest losses involve in the harvesting will also be quantified.

4.1. EXPERIMENTAL DESIGN

A Randomized Complete Block Design (RCBD) will be used to determine the significant level of the retractable pole harvester at 5%.

4.2. DATA COLLECTION AND ANALYSIS

Data will be collected primarily on the time taken to harvest the palm fruits and in relation to safety precaution during the harvesting. The data will be analyzed using SAS version 9.4 to determine the level of significance using three (3) replications at 5% with retractable pole harvesters.

5. ANTICIPATED OUTPUTS AND OUTCOMES

The potential beneficiaries of this research shall be oil palm farmers in the Eastern region and Sierra Leone at large that will enhance the effective and efficient method for harvesting oil palm fruits through the use of retractable pole harvesting technology aimed at avoiding the risks of accidents incurred during traditional methods of harvesting. Against this backdrop, it is anticipated that oil palm farmers shall benefit from the adoption of the proposed retractable harvesting pole technology.

6. KNOWLEDGE UTILIZATION AND DISSEMINATION PLAN

The rationale of the choice of the proposed research is designed to promote the adoption of retractable pole harvester aimed at reducing the risks against traditional methods for harvesting oil palm fruits. The proposed research seeks to train 100 oil palm farmers and students across gender lines through demonstration sites and farmer fields. Students in particular shall be endowed with the requisite entrepreneur skills.

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 farmers 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 INSTITUTION

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

This projects seeks to equip beneficiaries (students and farmers) with the requisite knowledge in the use of retractable pole harvester technology through training. The Faculty of Engineering and Innovation of ETU-SL will train students in the fabrication of oil palm retractable pole harvester.

10. MONITORING AND EVALUATION STRATEGY

The monitoring and evaluation team will comprise of staff of Faculty of Development Agriculture and Natural Resources Management of the Eastern Technical University of Sierra Leone (ETU-SL), Ministry of Agriculture (MAF) and Donor Partners on all activities as required and/or where necessary.

11. GENDER, ETHICS AND SUSTAINABILITY

All protocols relating to individual integrity, dignity and privacy of technicians, labourers and supervisors shall be maintained during the implementation of the proposed project. The proposed methodology on data collection shall maintain existing protocols on informed consent and confidentiality

13. LITERATURE CITED

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