2024

SLARI ANNUAL REPORT

Sierra Leone Agricultural Research Institute

SIERRA LEONE AGRICULTURAL RESEARCH INSTITUTE

ANNUAL REPORT FOR 2024

VISION

The Sierra Leone Agricultural Research Institute (SLARI) guiding vision requires the institute and its stakeholders and partners to stretch their future expectations, aspirations and performance to achieve "**improved and sustainable broad-based agricultural growth**".

MISSION

The mission statement that expresses the functional purpose of SLARI is **"to enhance sustainable productivity, commercialisation and competitiveness of the agricultural sector through generation and promotion of innovative agricultural technologies and empowerment of stakeholders**".

WHO WE ARE

The Sierra Leone Agricultural Research Institute (SLARI) is a national research organisation working in partnership with the Ministry of Agriculture and Food Security (MAFS), farmers, the private sector, civil society, and other rural development stakeholders to significantly and sustainably improve the productivity and incomes of resource-poor farmers in Sierra Leone. Beyond its local partners, SLARI also works with various international partners to reduce poverty and unleash the country's agricultural potential.

The SLARI, with its partners, is committed to generating and promoting innovative agricultural technologies and empowerment of stakeholders to enhance sustainable productivity, commercialisation and competitiveness of the agricultural sector.

The core functions of SLARI include:

i. To provide information that will assist the government and other stakeholders in the development of agricultural policies for poverty alleviation, food security and improved livelihoods of the citizens of Sierra Leone.

ii. To formulate agricultural research policies and programmes taking into account the vision, mission, goals and objectives of the agricultural sector, in line with government policy, and views of stakeholders, especially those related to sustainable food security, and conservation of renewable resources of Sierra Leone.
iii. To research food and cash crops production, livestock production and health, fish production, land and water management, forestry production and conservation, food and nutrition management, technology and socioeconomics of postharvest activities, emerging technologies in agricultural science, bio-safety and environmental conservation.
iv. To establish a strong working relationship with extension agents in the public and private sectors in the transfer of technology.
v. To facilitate and provide the relevant training and manpower development to serve the agricultural needs of the country.
vi. To produce annual reports highlighting research findings, management, scientific training and financial aspects of the institute.
vii. To establish strong links with national, regional and international agricultural research institutions or agencies involved in science and technology development and transfer.
viii. To represent the country in regional and international fora.
ix. To enhance public awareness of the importance of scientific research to agricultural and economic development.
x. To disseminate knowledge on improved technologies to stakeholders.
xi. To monitor and evaluate the impact of the adoption of agricultural research on agricultural productivity.
xii. To process and forward to the government the annual estimates for funding.
xiii. To mobilise human, financial and capital resources from donors, the private sector and from within the institute to facilitate the work of SLARI.

MESSAGE FROM THE ACTING DIRECTOR GENERAL

Dear Colleagues,

I am thankfully grateful for your support accorded to me during the last year. I appreciate and commend your hard work, commitment to excellence and dedication to meeting SLARI's goals.

Last year was fraught with numerous challenges for SLARI; however, we all rose to the occasion and made sure that the institute strives to meet its objectives and commitments. This shows the resiliency of staff and the organisational culture of excellence in SLARI. Management wishes to encourage all staff to contribute their very best in ensuring that SLARI meets its goals and objectives at all times. Everyone must contribute his or her share through individual and collective resolve to improve our performance and commitment to excellence at all levels.

We continue to reposition SLARI for the task ahead by reviewing our outdated Strategic, Operational and Investment Plans and Capacity needs Assessment Report. The hired Consultant has begun work and is expected to finish the 10-year OP and SP (spanning from 2025-2034) by the end of July 2025. The documents are expected to capture emerging issues in the agricultural space, making sure that our vision of success aligns with that of the Agricultural Development Agenda of the Government of Sierra Leone through its flagship programme – Feed Salone Programme.

The focus has been on:

1. Developing a stronger organisational structure with a redefined focus on research-for-development, partnership and capacity building.
2. Strengthening the SLARI centres, revamping the Freetown Fisheries Research Centre (**FFRC**) and establishing new ones; replacing retired, deceased and staff who have resigned, as well as recruiting new scientific staff and facilitating technical assistance contracts with IITA and AfricaRice through FSRP by mentoring our young scientists to become greater scientists for new and emerging programmes and projects.
3. Upgrading the knowledge and skills of our valuable technicians and scientists through short-term attachments in international research centres and in workshops and training programmes of our international partners.
4. Aligning our research programmes with that of the Government's Agricultural Development Agenda, and **CORAF/WECARD, FARA, ECOWAS**, as well as **CAADP** principles for research for development and working more collaboratively with other scientists, centres and partners in the SLARI system.
5. Mobilising resources by tapping from traditional funding sources, and non-traditional funding sources such as FSRP, AfricaRice, EU, AGRA, NGOs, etc., to ensure that the institute is prepared to take on more challenges.
6. Building a stronger SLARI team and raising staff morale through energised efforts in striving for better conditions of service that are equivalent to or better than the universities, and striving to clear backlog salaries and benefits.
7. Building new relationships, forging and strengthening partnerships to ensure that the right technologies are developed, disseminated, and adopted by our end users.

All these will continue to result in a stronger organisation with a more relevant and focused science-based platform, responsive staff, and more effective institutional mechanisms to ensure effectiveness and efficacy in operations, proactive and more strategic relationships and networks and an increase in non-traditional resources, replacement and recruitment of more scientific staff that would facilitate the success of its research-for-development programmes.

The path ahead will continue to be fraught with challenges, but together, we will overcome them. Let us celebrate our successes, but at the same time continue to work harder together towards achieving our goals. I envision more productive years ahead and a stronger SLARI in the future.
Thus, I encourage everyone to be diligent and make sure that SLARI succeeds in its goal of being the leading national research-for-development partner in Sierra Leone in finding solutions to hunger and poverty.
On behalf of the Management and Council of SLARI, I wish every staff member good health, wealth, happiness, and another successful year 2025. I look forward to a productive Annual Review and Work planning for 2025.

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OVERVIEW

The agricultural sector in Sierra Leone is not only the means of livelihood for a significant portion of the population, but has the tremendous potential to serve as the engine for the socio-economic growth and development of the country. The performance of agriculture heavily depends on nearly all other sectors of development. If such a huge socio-economic gain is to be realised, agricultural research unarguably has a vital role to play.

Agricultural research in Sierra Leone has made significant contributions towards the improvement of agricultural productivity and rural development in the past. In order to strengthen the role of and forestry sector, agricultural research, the government established the Sierra Leone Agricultural Research Institute (SLARI) through an Act of Parliament in 2007 as the country's agricultural research and agricultural technology generating body for the benefit of the farming, fishing and forestry sectors. For its full operations, SLARI needs eight research centres spread throughout the country, of which six are currently fully operational.

Considering the developmental strides at the national, regional and international levels, SLARI is currently revising the old strategic and operational plans (2012-2021). The revised documents will strategically position SLARI to continue to contribute significantly to the development of the agriculture sector with relevant emerging issues fully captured. From the regional and global perspectives, the Strategic Plan is in line with the Comprehensive African Agricultural Development Programme (CAADP), the West and Central Council for Agricultural Research and Development (CORAF/WECARD), and the Millennium Development Goals (MDGs).

However, more than ever before, the institute is now required to go beyond research and become a vehicle for development. The SLARI guiding vision that requires the institute and its stakeholders and partners to stretch their future expectations, aspirations, and performance is to see "**Improved and sustainable broad-based agricultural growth**". The Mission statement that expresses the fundamental purpose and business of SLARI is "**To enhance sustainable**

productivity, commercialisation and competitiveness of the agricultural sector through generation and promotion of innovative agricultural technologies and empowerment of stakeholders".

Given the institutional strategic direction, SLARI has identified five result areas that are necessary and sufficient to deliver on the institutionally specific objective of generating and promoting innovative agricultural technologies and empowerment of stakeholders. Attainment of this Specific Objective will contribute to the realisation of the overall institute's General Objective of **enhancing sustainable productivity, commercialisation and competitiveness of the agricultural sector through the generation and promotion of innovative agricultural technologies and empowerment of stakeholders**. The five results that are designed to position SLARI strategically as the key driver for **enhancing sustainable productivity, commercialisation and competitiveness of the agricultural sector** include:

Result 1:	Appropriate agricultural product value chains, technologies and innovations **generated and promoted.**
Result 2:	Appropriate markets and marketing strategies for enhancing agricultural value chains **developed and promoted.**
Result 3:	Appropriate policy options for enhancing agricultural product value chains were **facilitated and advocated.**
Result 4:	Capacity for implementing agricultural product value chains research **strengthened.**
Result 5:	Appropriate mechanisms for managing, sharing and scaling up agricultural knowledge, information and technologies **established and operationalised**.

To position itself strategically as a key driver in the transformation of the agricultural sector from subsistence to a commercial and profitable business enterprise, SLARI has adopted the Agricultural Product Value Chain (APVC) approach to research for development within the framework of Integrated Agricultural Research for Development (IAR4D). the adoption of this research approach requires SLARI to shift focus from production of commodities to differentiated agricultural products including increased value addition to commodities within the rural areas and development and promotion of new products that fit the demands of the target market. This would require strengthening of capacity beyond the simple training and, therefore, a need for the development and operationalisation of an effective and efficient capacity development programme was identified during the development of the SLARI Strategic Plan. This need for strengthening of capacity for implementing APVCs research was subsequently addressed as one of the institutional-level result areas. It is against this background that the Networking Support Function Four (NSF4) of Forum for Agricultural Research in Africa (FARA), in collaboration with the other FARA Networking Support Functions, initiated the capacity assessment of SLARI and its functional relationship with the wider Sierra Leone national agricultural research system.

ACHIEVEMENTS

Development of seed roadmap for rice, maize, cassava and soybean.

Strengthened collaboration with regional research centres, including IITA, AfricaRice, Guinean Research Institute, National Agricultural Research Institute in The Gambia, and CARI, Liberia.

Over five elite varieties yielding > 8 t ha^{-1} with desired end user traits have been identified from screening of breeding lines from AfricaRice, KOPIA & KAFACI for adaptation in Sierra Leone.

Value chains for introducing salt-tolerant crops, good agronomic practices, were developed with the capacities of farmers and extension workers in salinity-prone areas built.

Developed improved and low-cost recipes involving soybean and trained various stakeholders from MAFS, NU, MoH, Research, etc.

- Expansion of cacao clonal garden and establishment of seed gardens at the Pendembu and Kpuwabu Research Station in Sierra Leone.
- Cacao, coffee, cashew, fruit crops, and agroforestry systems income generation for smallholder farmers and exports in Sierra Leone were enhanced.
- Procurement of power tiller, feed mill machine, hatchery machine, and field tools.
- One solar-powered irrigation system for the Clonal Garden at NARC was installed.
- 4.0 ha of groundnut and 2.6 ha of cowpea multiplied.
- 2.1 ha of soybeans multiplied.
- 1 ha of maize multiplied.
- 20 ha of cassava established; 10 ha in Gborwbu, 5 ha in Blama, and 5 ha in Masorie.
- 2.3 ha of high-yielding cassava varieties from IITA were multiplied.
- 50 ha of foundation seeds of rice were multiplied.
- 4 ha of cowpea foundation seeds multiplied.
- 4 ha of soya bean foundation seeds multiplied.
- 4 ha of cashew clonal garden established.
- 30 different high-quality cashew clones incorporated into the clonal garden.

- 1 ha of climate-smart cashew model farm established.
- Improved income for actors along the cashew value chain (producers, processors, marketers, etc.
- Enhanced knowledge and skills of 1,000 small-scale cashew farmers.
- Created job opportunities for 100 youths involved in cashew farming.

Capacity Building

A total of thirteen PhD students received sponsorship from the Food Systems Resilience Program (FSRP). Of which, nine are studying at Federal University of Agriculture Abeokuta (FUNAAB), Nigeria and four at Njala University (NU), Sierra Leone.

Establishment of a technology and innovation park.

With regard to the crop, animal and other value chains, the following achievements were obtained by the end of 2024.

Received 4 tons of high-quality improved maize and 6 tons of high-quality improved Soybeans. These seeds are currently being multiplied around the country, coordinated by SLARI. In partnership with AfricaRice, JICA, and KAFACI, SLARI is currently developing new varieties to replace the old varieties that are already worn out. This will be a big boost to the Feed Salone initiative.

Technicians trained on the rapid cassava multiplication technique using SAH, in collaboration with IITA.

Staff trained at NARC on cassava, soybean and maize production, in collaboration with IITA.

Trained farmers on soil and water management practices as well as in-season crop management practices.

Training for agro-dealers completed, in collaboration with IITA.

Training on good agronomic practices completed, in collaboration with IITA.

Technicians at NARC are trained on SAH technology, rapid cassava multiplication.

Rehabilitation of guesthouses at various centres.

Refurbishment of one screenhouse at NARC

Coordinated the training of MAFS Extension staff and community youth contractors on quality rice seed production techniques, in collaboration with the WFP.

Coordinated The Training of MAFS Extension Staff and Community Youth Contractors on Key Guidelines on Vegetable Production in collaboration with WFP.

Coordinated The Training of MAFS Extension Staff and Community Youth Contractors on Integrated Soil Fertility Management in collaboration with WFP.

Introduction of Improved breeds of Livestock to the Livestock Research Centre in Teko.

Introduction of Improved vegetable seeds to the Horticultural Research Centre in Kabala.

Strengthened collaboration with MAFS in data collection.

Out growers engaged in seed production.

Visibility of SLARI considerably improved, SLARI Signposts improved, media engagement enhanced, SLARI documentary production commenced, and communication strengthened.

MOU with Njala University initiated.

An MOU with OCP was signed for soil health improvement.

Mr E.G. Kamara attended a capacity building workshop towards seed value chain actors to implement ECOWAS Harmonized Seed Regulations Held in Lome, Togo on 16th-19th December, 2024.

PEOPLE AND EVENTS

The visit by OCP Africa and the OCP Foundation to SLARI marks a promising beginning for a partnership aimed at transforming agriculture in Sierra Leone through innovative solutions and community empowerment. The meeting was led by Dr. Abdul R. Conteh, the Acting Director General of SLARI, who engaged with senior staff members to discuss how both organizations could work together effectively. The key areas for collaboration identified included: sustainable agricultural practices, ecosystem restoration, capacity building and education, and support for women-led initiatives. This visit aligns with SLARI's commitment to advancing agricultural research and development, particularly through initiatives like Feed Salone, which aims to improve food security in Sierra Leone.

The visit by Seed System Group (SSG). This visit is part of a broader effort to revitalize agriculture in Sierra Leone, which has faced numerous challenges since the civil war ended in 2002. The collaboration aims not only to improve seed systems but also to address food security issues by reducing dependency on food imports. Dr. Kapran provided updates on SSG's activities since their arrival in Sierra Leone. He highlighted site visits conducted by the team to evaluate SLARI projects that have received support from SSG.

The discussions also emphasized the importance of targeted training sessions tailored specifically for farmers rather than solely for agro-dealers. Mr. Thorllie pointed out that many agro-dealers lack direct farming experience, which can hinder their understanding of farmers' needs and challenges when utilizing seeds. Dr. Conteh echoed these sentiments by stressing the necessity for a robust follow-up strategy to ensure that all implemented activities align with project objectives. He underscored the importance of effective communication among stakeholders to maintain momentum toward achieving project goals.

The meeting concluded with a consensus on fostering greater synergy between farmers and agro-dealers through enhanced training initiatives and improved communication strategies. Both SSG and SLARI expressed their commitment to collaborating further to strengthen Sierra Leone's agricultural sector sustainably.

Visit by the Chief Minister to MLWERC. On his tour to Tonkolili district and Yoni Chiefdom in particular, the Chief Minister of Sierra Leone visited MLWERC and SLeSCA at Camp Charlie Campus. He was moved by the amazing young researchers and their efforts in moving the 5 big agendas especially the Feed Salone agenda of his excellency the President of Sierra Leone. In his statement, SLARI and SLeSCA are backbone of our food security strategy in the country.

Cross section of MLWERC staff in discussion with Chief Minister

The visit by the World Bank Mission Team to FSRP/SLARI and Adaptive Research Award Ceremony. The visit of the World Bank team coincided with an adaptive research award ceremony organized by the FSRP/SLARI, Sierra Leone, which was held on the 24th January, 2025 at the Rokupr Agricultural Research Centre (RARC). The purpose of the is event was to reorganize and celebrate innovative research efforts that contribute to agricultural development and food security in Sierra Leone. The primary objectives of the World Bank mission team's visit included: (i) assessment of progress; (ii) engagement with stakeholders; and (iii) evaluation of adaptive research initiatives. During the ceremony held at RARC, several awards were presented to researchers whose proposals demonstrated exceptional contributions to adaptive research. The wards recognized projects that focused on: (i) implementing sustainable farming practices; (ii) enhancing postharvest management and nutrition techniques; and (iii) developing stress tolerant crop varieties. The event served not only as a platform for recognition, but also as an opportunity for knowledge sharing among participants regarding best practices in agriculture.

SUMMARY OF RESEARCH, TECHNOLOGY AND INNOVATION DEVELOPMENT ACTIVITIES FOR 2024

This section of the report summarizes the research, technology and innovation development activities carried out from January to December 2024 by SLARI through its research programmes at the six functional centres. The detailed research, technology and innovation development activities are found in the annual reports of the different research centres. Other vital information on our activities can be found in summaries, briefing reports, extension materials and on various social media platforms such as LinkedIn, Facebook, etc.

A. ROKUPR AGRICULTURAL RESEARCH CENTRE (RARC)

The cereal crops research programme is implemented at the RARC. The programme is aimed at addressing challenges to enhance sustainable productivity, commercialization, and competitiveness of the cereal crops.

Genomic selection of introduced upland rice breeding lines at on-farm breeding trial stage

Evaluation of breeding lines for rainfed upland and lowland areas will help identify superior breeding lines that are high yielding and adaptable to various ecologies and that will address the problem of low yield in farmers field in Sierra Leone. Consumers' demands for rice are changing suggesting that new sets of rice varieties are to be provided to meet these demands. One of the efforts of the Crop Improvement Programme of the Rokupr Agricultural Research Centre (RARC), is to develop rice varieties that are high yielding and widely adaptable to multiple biotic and abiotic stresses as well as consumer acceptability. This effort is achieved through the continuous support and collaboration with various partners including AfricaRice. Thus, the objectives of this study were (i) to identify high yielding and adaptable rice varieties, for the various lowland and upland rice agro-ecologies, that are: resistant/tolerant to biotic stresses and abiotic stresses such submergence/stagnant standing water); and (ii) to determine farmers preference of the rice breeding lines.

Rainfed upland rice trial 1: Genomic selection of introduced upland rice breeding lines at the on-farm breeding trial stage

In this study, a total of 200 breeding lines were evaluated in five districts, including Kambia District (Rokupr), Port Loko District (Lunsar), Western Rural District (Newton), Bo District (Bo) and Kenema District (Blama) in Sierra Leone. Accordingly, 10 farmers who grow over 2 ha of rice were purposively selected per district. A total of 50 on-farms were established and evaluated in the study. Each farmer evaluated a total of six genotypes comprising four breeding lines, variety NERICA 4 as a regional check and the farmers' preferred variety as a standard check. The plot size per variety was 10 m^2. AfricaRice did all agronomic practices and data collection as recommended by the standard operation protocol for upland rice production. Results showed that the seed yield of the upland on-farm genomic selection trials ranged from 2543.7-3248.4 $kgha^{-1}$. Of the 200 breeding lines evaluated, 110 breeding lines had higher seed yield compared to the standard check Rok 34.

Rainfed upland rice trial 2: Multi-environment trial rainfed upland rice trial

This trial involved the evaluation of 45 breeding lines for agronomic traits as well as reaction to biotic and abiotic stresses in the rainfed upland ecology at Rokupr. The seeds were sown on the 19th June 2024 using the dibbling method. Results showed that the seed yield of rainfed upland rice ranged from 2261.0-2620.0 $kgha^{-1}$. The 13 breeding lines selected from the MET rainfed upland trial for further evaluation in Onfarm in 2025 cropping season included AR18U027-F4-142-1-1 (2429.0 $kgha^{-1}$), AR19U002-F4-06-B (2450.0 $kgha^{-1}$), AR19U075-F4-39-B (2432.0 $kgha^{-1}$), AR18U020-F4-107-B-2 (2539.0 $kgha^{-1}$), AR19U056-F4-70-B (2455.0 $kgha^{-1}$), AR19U023-F4-32-B (2472.0 $kgha^{-1}$), ART34-88-1-2-B-1 (2.452 $kgha^{-1}$), AR19U001-F4-167-B (2402.0 $kgha^{-1}$), AR19U004-F4-55-B (2440.0 $kgha^{-1}$), AR19U001-F4-157-B (2404.0 $kgha^{-1}$), AR19U078-F4-44-B

(2433.0 $kgha^{-1}$), AR19U076-F4-130-B (2424.0 $kgha^{-1}$) and ROK 34 (2389.0 $kgha^{-1}$). These breeding lines exhibited higher dry seed yield than the mean (2388.0 $kgha^{-1}$).

Rainfed lowland rice trial 3: On-farm trial

A total of 30 on-farm trials were established in five districts in Sierra Leone. The studied areas were Rokupr in Kambia District, Port Loko in Port Loko District, Bo in Bo District, Blama in Kenema District and Newton in Western Rural District. Six farms were randomly selected in each district. The Tricot design was used, in which each farmer evaluated three breeding lines plus NERICA L 19 as a regional check and one farmer's local variety check. Results showed that nine lowland rice genotypes (ART1476-B-B-B-1-21-1, ART1573-B-B-11-2, ART309-B-51-1-7, ART1553-B-B-37-4, ART1474-B-B-B-1-31-1, ART1575-B-B-15-4, A RT309-B-174-1-5, ART1549-B-B-14-4, ART1553-B-B-37-4) with seed yield ranging from 4482.95-6739.57 $kgha^{-1}$ significantly outperformed the standard check Rok 24. These genotypes have been advanced to the National performance trial in 2025.

National performance yield trials conducted in Rokupr, Port Loko, Western Rural, Bo and Blama

Findings of the national performance of rainfed upland rice revealed seed yield stability across districts for the tested genotypes (Table A1). These five breeding lines that outperformed the check (ROK 34) are potential candidates for release for the rainfed upland ecology.

For the lowland ecology, the potential candidates that would be recommended for release are: ART 216-129-B-1, ART 84-35-1-1-B, ART 427-4-1-1-1-B, ARC-1-341-B-1, ART 143-4-B-1-B-B, ART 397-5-2-1-I, NERICA L-19 SUB 1 and WITA SUB 1.

Table A1. Seed yield (kg ha-1) of rice genotypes in the national performance trial under rainfed upland

Genotype	Rokupr	Port Loko	Western Rural	Bo	Blama
ART 34-149-D1-1	2523.34	2439.74	2673.19	2445.12	2345.91
ART 35-252-1-2-3-1	2631.62	2556.32	2671.54	2445.79	2537.14
ART 35-88-D1-1	2403.86	2321.52	2431.72	2513.23	2437.96

ART 34-113-3-2-B-1	2561.67	2435.86	2659.24	2731.34	2643.26
ART 27-190-7-3-2-4-3-1	2637.92	2763.84	3054.23	2723.61	2543.16
ROK 34	2134.45	2245.67	2314.74	2316.54	2054.35

Rainfed lowland rice trial 4: Multi-environment trial rainfed lowland rice trial

Rainfed lowland trials comprised 55 breeding lines tested together with one local check (ROK 24). Two fertiliser applications were done at transplanting and panicle initiation stages using a recommended rate of 100 kg N ha^{-1}, 40 kg P_2O_5 ha^{-1}, 40 kg K_2O ha^{-1}. Other agronomic practices were done as and when necessary. Results showed that the seed yield of lowland rice ranged from 5621.2-9147.9 kgha^{-1}. The 13 breeding lines selected from the MET rainfed lowland trial for further evaluation in Onfarm in 2025 cropping season included ART1796-B-8 (8083.0 kgha^{-1}), ART1795-B-8 (9146.8 kgha^{-1}), ART1771-B-5 (8092.2 kgha^{-1}), ART1705-B-22 (8146.3 kgha^{-1}), ART1704-B-23 (8090.3 kgha^{-1}), ART1656-B-13 (8920.4 kgha^{-1}), ART1522-B-49-1 (8024.5 kgha^{-1}), ART1793-B-1 (7963.8 kgha^{-1}), ART1715-B-1 (7769.7 kgha^{-1}), ART1705-B-9 (7679.6 kgha^{-1}), ART1715-B-1 (7769.7 kgha^{-1}), ART1769-B-10 (7814.5 kgha^{-1}). These breeding lines exhibited higher dry seed yield than the mean (7138.0 kgha^{-1}). Figure A1 shows the breeding lines at the grain ripening stage.

Figure A1. Multi-environment rainfed lowland trial

Varietal testing, release, and early generation seed production of rice in Sierra Leone (Grant No.: 2024 SL002)

Maintaining varietal purity is crucial for the government's Feed Salone agenda. A competitive formal seed sector is key to ensuring the timely availability of high-quality seed of improved and appropriate rice varieties at affordable prices for smallholder farmers. The objective of this study was to contribute to improved food, nutrition, and income security for smallholder farmers by releasing and commercialization climate-resilient and high-yielding rice varieties in Sierra Leone. Results showed significantly longer grain length, wider grain width, higher 1000 grain weight, and grain yield for the improved varieties than the four checks, except BRRI Dhan 67 for grain length and 1000 grain weight and YASMIN for grain width, which were lower than the four checks (Figure A2).

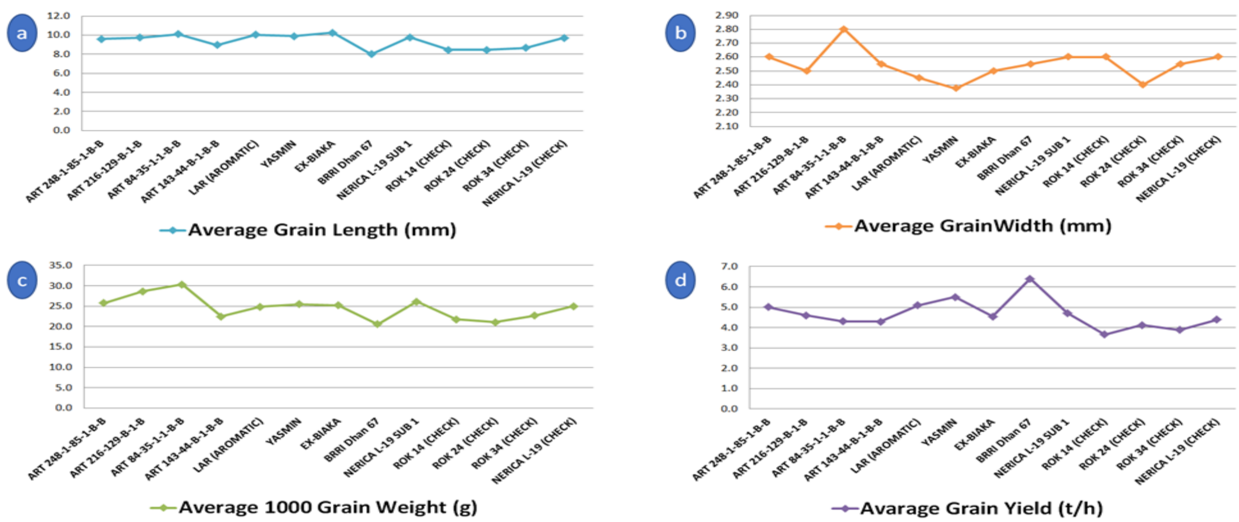


Figure A2. Grain yield and yield-related trait performance across locations. (a) Grain length. (b) Grain width. (c) 1000-grain weight. (d) Grain yield per plot.

K-Rice Belt Demonstration Plots in Sierra Leone

Rice cultivars with higher yield, resilience to stress and wider adaptability are essential to ensure production stability and food security. The objective of this study was to identify and select higher-yielding rice genotypes with stable performance and wider adaptability to climate, soil, and cultivation conditions across four regions in Sierra Leone. Results showed that the seed yield of the six K-rice varieties (ISRIZ 6, ISRIZ 7, AGYAPA, KOREA MO, AGRA and LEGON 1) had higher genetic gain (15 – 28%) relative to the local check (ROK 24) (Table A2). The K-rice varieties exhibited shorter days to maturation, plant height and panicle length than the check. Results from the farmers' field days revealed that 97.2% of the farmers preferred K-rice varieties over the local check. High yield and earliness were the main reasons for liking the preferred K-rice varieties. The shorter maturation of the K-rice varieties over local check indicates the possibility of three cropping cycles of establishments and harvests per year in irrigated areas. These superior rice varieties will be recommended for promotion and adoption to meet the growing demand for food security in Sierra Leone.

Table A2. Mean growth, yield, and yield-related trait performances of the K-rice varieties compared to ROK 24 across four locations

Variety	Days to maturity	Plant height (cm)	Number of effective tillers	Panicle length (cm)
ISRIZ-6	104	81.0	18.3	22.5
ISRIZ-7	102	86.6	16.7	22.9
AGYAPA	112	98.0	16.0	23.6
KOREA MO	120	101.4	14.4	28.1
AGRA	120	105.6	11.5	28.0
LEGON-1	120	95.8	12.7	24.6
ROK 24	140	145.2	11.7	25.6
	Seed set rate (%)	Grain yield range (tha^{-1})	Average grain yield (tha^{-1})	Genetic gain over check (%)
ISRIZ-6	84.6	6.0-7.2	6.5	+22
ISRIZ-7	88.6	5.7-6.9	6.3	+20
AGYAPA	88.8	6.8-8.5	7.4	+28
KOREA MO	90.4	5.6-8.4	6.7	+23

AGRA	88.0	5.56.8	6.1	+19
LEGON-1	86.8	5.0-7.9	5.7	+15
ROK 24	85.5	3.55.4	4.2	-

Participatory Varietal Selection (PVS)

Farmers' field day was conducted at the Blama maize site at the maturity stage, in order to seek their perception on the acceptability of the hybrid maize varieties. A total of 40 maize farmers, comprising 45% female and 55% male respondents, participated in the PVS (Figures A3). Eight enumerators conducted the perception survey. In the field, farmers were briefed on the total number of different hybrid varieties present, emphasising the need for going into hybrid maize production in Sierra Leone. results showed that 12.5% of the respondents liked SC559 very much, 8.5% liked AR2303, and then 7.5% for A2106-19, parent and M1627-8. Bigger cobs and turgid stems were the reasons for liking the variety. For not liking the variety, 15.0% dislike Toheba, 8.0% dislike Legacy 2, and then 7.5% for PVA SYN 13, Sammaz 52 and AS2301-4. The main reasons for disliking these varieties were that they exhibit smaller cobs and slender stems (Table A3).

Figure A3. Photographic display of a) PVS farmers; b) PVS Enumerators and farmers, and c) Corn leaf aphid at Komrabai

Table A3. Farmers' perception of the field day at the Blama location

Like the variety very much		Do not like the variety	
Variety	% Respondent	Variety	% Respondent

A2106-19	7.5	As2301-4	7.5
SC559	12.5	PVA SYN13	7.5
SC561	7.5	Toheba	15.0
M1627	7.5	Sammaz 52	7.7
AR2303	8.5	Legacy	8.0

Varietal testing, release, and early generation seed production of hybrid maize in Sierra Leone

The objective of this study was to contribute to improved food, nutrition, and income security for smallholder farmers by releasing and commercialising climate-resilient and high-yielding maize varieties in Sierra Leone. The trial was established at four locations, including Kambia in Kambia District, Komrabai in Port Loko District, Gborweobu in Moyamba District and Blama in Kenema District. A total of 40 maize breeding lines comprising 39 hybrids and one local check (Western Yellow) variety were used. The first weeding was done two weeks after seeding, followed by NPK 15:15:15 fertiliser application and the second weeding at six weeks, accompanied by top dressing with 46% urea using the dibbling and covering method of fertiliser application. Emacot pesticide was applied across all locations at three and six weeks after planting to combat fall armyworm and other leaf-boring insects. Results showed the hybrids had shorter maturation and higher grain yields relative to the check variety (Figure A4).

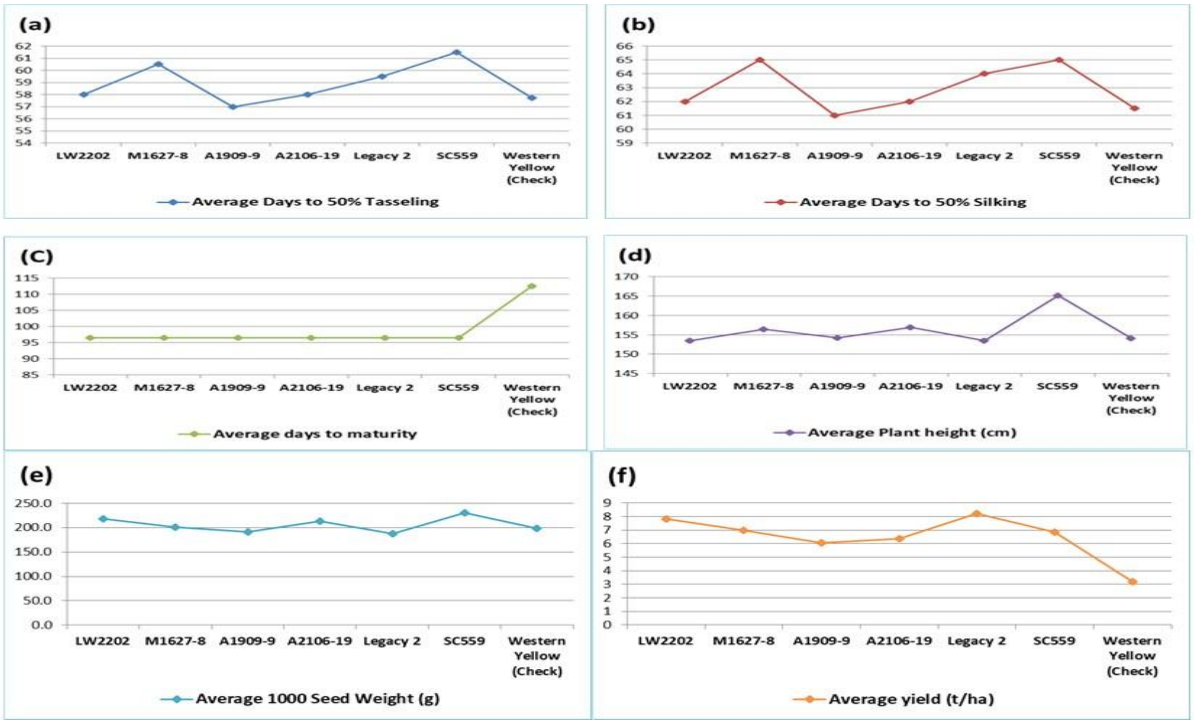


Figure A4: Performances of maize hybrids for (a) Days to 50% tasseling; (b) Days to 50% silking; (c) Days to maturity; (d) Plant height; (e) Average 1000 seed weight (g); and (f) Grain yield (tha^{-1})

The Scaling up Climate Resilient Rice Production in West Africa (RICOWAS) project aims to improve climate resilience and increase rice systems productivity of smallholder farmers across Sierra Leone using a climate-resilient rice production (CRRP) approach, for the benefit of the 13 ECOWAS countries. Achievements on activities implemented in 2024 included capacity needs assessment, Training-of-Trainer's (ToTs) on rice system intensification (SRI), CRRP, Field extension workers and researchers trained with more than 50% women; Acquisition of necessary logistics material to support field implementation, one baseline study on rice production and value-chain characteristics established, 1 private sector partner engaged (Bahsoon) with a memorandum of understanding signed (MOU).

B. NJALA AGRICULTURAL RESEARCH CENTRE (NARC)

The root, tuber and grain legume crops research programme is implemented at the NARC. The programme is aimed at addressing challenges to enhance sustainable productivity, commercialisation, and competitiveness of the root, tuber and grain legume crops.

Training of staff on cassava, soybean and maize production was done at NARC on 19^{th}-23^{rd} August, 2024. The general aim of the training was to build the capacity of NARC staff on cassava, soybean and maize production.

Collection of isolates native to Sierra Leone for the detection of biocontrol strains to constitute a biocontrol product for Sierra Leone

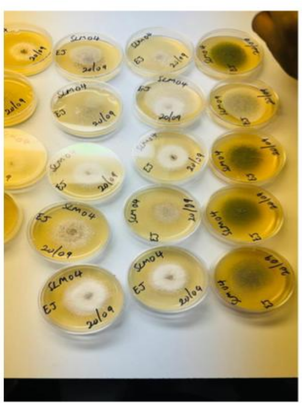
This study aimed to tackle the ongoing challenge of aflatoxin contamination in local crops in Sierra Leone. A comprehensive assessment of aflatoxin contamination levels has been conducted, with findings presented in Table B1. This evaluation not only highlights the extent of contamination but also identifies specific areas that require targeted management based on the levels detected. In parallel with this effort, an extensive collection of *Aspergillus* isolates native to Sierra Leone has been gathered, aimed at detecting biocontrol strains suitable for developing a region-specific biocontrol product (Table B1).

Moreover, this deliverable incorporates important capacity-building elements. Dr Patrick Ngegba undertook a two-month visit to IITA Ibadan, where he actively participated in these activities and received specialised training to become an expert in aflatoxin biocontrol (Figure B1). This training is essential for equipping local scientists with the knowledge and skills needed to address aflatoxin challenges effectively.

He has also acquired skills in microbiological and molecular analyses for the identification of atoxigenic strains that could serve as effective biocontrol agents at the USDA-ARS, in Tucson, Arizona. The collaboration among IITA, SLARI and USDA-ARS will pave the way for detecting the active ingredients for biocontrol solutions that enhance food safety and agricultural productivity in Sierra Leone, ultimately contributing to improved health and economic outcomes for local communities. Aflatoxin levels in several samples are high, suggesting the need for urgent aflatoxin mitigation efforts. Some samples exceeded well over 20-fold the recommended levels for human consumption (20 ppb).

Table B1. Total aflatoxin concentration (ppb) in maize, groundnut, and sesame samples collected from four major producing provinces in Sierra Leone in June 2024.

				Aflatoxin concentration (ppb)		
Crop	Province	Region	N	B Total	G Total	Total Aflatoxin
Groundnut	Northern Province	Bombali	5	1.0	0.0	1.0
		Falaba	5	151.6	18.6	170.3
		Koinadugu	5	16.4	42.7	59.1
		Tonkolili	5	235.2	0.0	235.2
		Kambia	5	573.8	211.8	785.7
	North West Province	Karene	5	0.9	0.0	0.9
		Port Loko	5	805.1	329.5	1,134.7
	Southern Province	Bo	5	30.3	40.7	71.0
		Moyamba	5	9.0	0.0	9.01
	Western Area	Western Area	2	732.5	409.3	1,141.9
Maize	Northern Province	Bombali	5	189.6	126.4	316.1
		Tonkolili	5	120.2	87.0	207.2
		Kambia	3	43.1	0.0	43.1
	North West Province	Port Loko	5	414.0	223.1	637.1



	Southern Province	Bo	5	376.5	174.6	551.2
		Moyamba	5	355.3	619.6	974.9
	Western Area	Western Area	3	199.1	200.2	399.4
Sesame	Northern Province	Bombali	1	0.0	0.0	0.0
		Tonkolili	1	0.0	0.0	0.0
		Kambia	1	0.0	0.0	0.0
	North West Province	Karene	1	7.9	0.0	7.9
		Port Loko	1	7.2	0.0	7.2
	Southern Province	Bo	1	0.0	0.0	0.0
		Moyamba	1	7.2	0.0	7.2

Figure B1. Dr Patrick Ngegba is actively participating in his two-month visit to IITA Ibadan, where he is receiving specialised training in aflatoxin biocontrol methods that include microbiological, chemical, and molecular activities.

Table B2. Densities and incidence of *Aspergillus* section Flavi maize, groundnut, and sesame samples collected from four major producing provinces in Sierra Leone in June–July 2024

Crop	Province	Region	N	CFU/g[a]	*Aspergillus* species/strain distribution (%)[b]			
					L	S	P	T
Groundnut	Northern Province	Bombali	5	4,755	78	7	7	8
		Falaba	5	7,000	92	2	0	6
		Koinadugu	5	107,972	76	3	0	21
		Tonkolili	5	6,497	91	0	0	9
		Kambia	5	6,665	93	0	0	7
	North West Province	Karene	5	181	94	1	0	5
		Port Loko	5	12,690	91	0	0	9
	Southern Province	Bo	5	28,453	95	2	0	3

		Moyamba	5	2,896	96	0	0	4
	Western Area	Western Area	2	20,214	73	0	0	28
Maize	Northern Province	Bombali	5	84,658	90	1	0	9
		Tonkolili	5	109,949	74	10	0	16
		Kambia	3	24,472	73	5	0	22
	North West Province	Port Loko	5	10,222	96	4	0	0
	Southern Province	Bo	5	24,574	72	28	0	0
		Moyamba	5	98,915	81	1	0	18
	Western Area	Western Area	3	1,154,237	73	22	0	5
Sesame	Northern Province	Bombali	1	14	95	0	0	5
		Tonkolili	1	36	60	40	0	0
	North-West Province	Kambia	1	103	70	30	0	0
		Karene	1	356	65	25	0	10
		Port Loko	1	6,375	95	5	0	0
	Southern Province	Bo	1	63	70	20	0	10
		Moyamba	1	11,714	85	0	0	15

[A] forming unit per gram of sample.

[b]L = *A. flavus* L morphotype, S = fungi with S morphology, P = *A. parasiticus*, T = *A. tamarii*.

Agronomic performances of water yam (*Dioscorea alata*) genotypes and component crops grown under sole and mixed cropping systems

Sole Yam (SY) and Yam + Maize + Pigeon Pea (Y+M+P) were grown at NARC during the 2023/2024 cropping season. The objective was to assess various spatial arrangements and yam-based cropping systems for sustainable increased production and productivity of water yam (*Dioscorea alata*) and component crops. A total of 12 treatment combinations comprising two genotypes (SLIYAM 1 and Pulli), two cropping systems (i.e. yam + maize + pigeon pea and sole yam) and three spatial arrangements (1.5 × 0.75 m, 1.0 × 1.0 m, and 1.5 × 1.0 m) were used. Results revealed that stem girth, stem number, seedling vigour index, and fresh tuber yields significantly

($p<0.05$) varied between the two cropping systems and among the three spatial arrangements. Treatment S1F2V1 significantly exhibited the highest fresh tuber yield of 20.3 t ha^{-1} in sole plots with a spatial arrangement of 1.0 m × 1.0 m, whereas treatment S1F1V2 (5.9 t ha^{-1}) had the lowest fresh tuber yield, similar to S2F2V2 (7.3 t ha^{-1}), S3F1V2 (6.8 t ha^{-1}), and S3F2V2 (6.9 t ha^{-1}). Genotype SLIYAM 1 (TDa0000194) consistently outyielded Pulli in the yam + maize + pigeon pea intercrop system across all spatial arrangements. However, in the present study, the cumulative yields from the intercropping system were higher compared to their corresponding sole plots.

The results suggest the relevance of growth and fresh tuber yield traits for selection of genotype, spatial arrangement, and cropping system that could be exploited for increased yam production. Moreover, the higher cumulative yields from the mixture relative to the sole crop plots are indicative of a higher land equivalent ratio (LER). Findings further suggest the significance of cultivation technology studies for the development, identification, and recommendation of an elite agronomic package for smallholder farmers.

Mean stem girth, leaf area index, plant height, ear height, and grain yield of maize grown in yam + maize + pigeon pea intercrop system significantly ($p<0.05$) varied among the three spatial arrangements and two water yam varieties used in the study. Treatments S3F1V1 (3.73 t ha^{-1}), S1F1V1 (3.68 t ha^{-1}), and S2F1V1 (3.37 t ha^{-1}) had the highest grain yields. Treatment S1F1V2 had the lowest stem girth of 15.90 mm, ear height of 98.7 cm and grain yield of 1.63 t ha^{-1} similar to treatments with grain yields ranging from 1.75-2.14 t ha^{-1} and those with stem girth of 16.90 mm, leaf area index ranging from 217.0-317.0, plant height ranging from 160.1 to 217.4 cm, ear height ranging from 98.7 to 120.7 cm, and grain yield ranging from 1.63 to 2.14 t ha^{-1}.

Mean plant height and grain yields of pigeon pea grown in the yam + maize + pigeon pea intercrop system significantly ($p<0.05$) varied among the three spatial arrangements and two water yam genotypes used in the study. Treatment S3F1V2 (cultivation of pigeon pea in mixture with Pulli and maize at 1.5 m × 1.0 m) had the highest pigeon pea grain yield of 2.38 t ha^{-1}, whereas S3F1V1 (cultivation of pigeon pea in mixture with TDa0000194 and maize at 1.5 m × 1.0 m) had the lowest of 0.76 t ha^{-1}. In this study, the cumulative yields from the mixture exceed those from the sole crop plots, and the land equivalent ratio (LER) has been reported to be significantly higher for mixtures.

Evaluation of these cropping systems across different spatial arrangements was performed based on several intercropping indices, including Yam Equivalent Yield (YEY), Land Equivalent Ratio (LER), Relative Crowding Coefficient (RCC or K), Actual Yield Loss (AYL), Intercropping Advantage (IA), and Monetary Advantage Index (MAI). Findings showed that treatment S2V1 (establishment of yam genotype SLIYAM 1 at 1.5 m × 0.75 m in a mixture of yam + maize + pigeon pea) significantly ($p<0.05$) exhibited the highest YEY of 14.2 t ha^{-1}, LER of 1.23, and MAI of 88078, whereas S1V2 had the lowest YEY (5.7 t ha^{-1}), LER (0.42), K of yam (0.7), AYL of yam (-0.37), IA of yam (-7396), and was among treatments with the lowest MAI (-269996) (Table B3).

Findings suggest the relevance of yield traits, competition indices and monetary advantages for the selection of elite cultivation technology that could be exploited for increased yam production and productivity. Findings further suggest the significance of cultivation technology studies for the development, identification and recommendation of an elite agronomic package for smallholder farmers. LER showed the positive influences on growth and yield of yam, maize and pigeon pea intercrops (LER > 1) in yam + maize + pigeon pea intercrops, with the greatest obtained for S2V1 (1.23) and S2V2 (1.01).

Table B3. Yam equivalent yield, land equivalent ratio, relative crowding coefficient of yam, actual yield loss of yam, intercropping advantage of yam, and monetary advantage index

Treat	Yam equivalent yield (t ha^{-1})	Land equivalent ratio	Relative crowdy coefficient of yam	Actual yield loss of yams	Intercropping the advantage of yams	Monetary advantage index
S1V1	10.7	0.58	1.4	-0.18	-3517	-264417
S1V2	5.7	0.42	0.7	-0.37	-7396	-269996
S2V1	14.2	1.23	-5.4	0.60	11954	88078
S2V2	7.9	1.01	-81.8	0.68	13506	707
S3V1	10.0	0.97	36.5	0.36	7136	-11807
S3V2	7.0	0.99	-2.4	0.59	11788	-2373
Mean	9.2	0.86	-8.5	0.28	5578	-76634
DMRT(0.05)	1.4	0.14	4.5	0.19	2882.8	20838.2
CV(%)	7.7	4.2	10.8	11.4	11.0	8.0

S1 = 1.0 m × 1.0 m, S2 = 1.5 m × 0.75 m, S3 = 1.5 m × 1.0 m, V1 = TDa0000194 (SLIYAM 1), V2 = Pulli, DMRT = Duncan's Multiple Range Test, CV = coefficient of variation

The Feed Salone Strategy: Promotion of New Innovative Agricultural Technologies Under the Food Systems Resilience Program

Findings on the incorporation of soybean into existing food products in Sierra Leone revealed that five existing recipes (*olele*, beans, *akara*, cassava leaf, groundnut soup, *amaza*) with less nutritional qualities were selected from a food/beverage, and mixed dishes developed by SLARI and IITA. With regards to the databases for food consumption and micronutrient survey, a total of 364 food/beverages and mixed dishes/recipes were listed by the Eastern Region participants, 334 listed by the North, 81 listed by the North West, 296 by the South, and 94 from the Western Region. The name of the food/beverage, description in English, local names, and likelihood of consumption were documented.

C. KENEMA FORESTRY AND TREE CROPS RESEARCH CENTRE (KFTCRC)

The forestry and tree crops research programme is implemented at the KFTCRC. The Programme is aimed at addressing challenges to enhance sustainable productivity, commercialisation, and competitiveness of the forestry and tree crops. Through the AVDP project, two SLARI staff have been trained at PhD and MSc levels. The PhD candidate (Mr Paul Musa Lahai) was admitted to Njala University during the 2020/2021 academic year and has already done his post-field presentation. His admission letter and the receipt for payment of fees will be attached to the financial returns. He is being supervised by:

i. Prof. Mohamed Alieu Bah – Deputy Vice Chancellor of Njala University, Njala Campus.
ii. Prof. Mohamed Tailu Lahai – Vice Chancellor and Principal of the Eastern Technical University of Sierra Leone.
iii. Prof. Peter Aikpokpodion – University of Calabar, Nigeria.

Through collaborations with the USDA (specifically Dr Dapeng Zhang) and contacts made by the international consultant (Prof. Peter Aikpokpodion), the USDA assisted with the DNA fingerprinting of cocoa and coffee genetic resources of Sierra Leone. The topic of the PhD student's thesis is "Evaluation of Morphological Characterisation and Genetic Diversity of *Coffea stenophylla* and Cacao (*Theobroma cacao*) Germplasm in Sierra Leone Using Single Nucleotide Polymorphism (SNP) Markers". The objectives of the study were to:

i. Evaluate the morphological characterisation among *Coffea stenophylla* and *Theobroma cacao* accessions in Sierra Leone;
ii. Determine the genetic diversity and population structure of *Coffea stenophylla* and *Theobroma cacao* in Sierra Leone using Genotyping-by-Sequencing;
iii. Determine the genetic basis of *Coffea stenophylla* germplasm in Sierra Leone using Genome Wide Association Studies (GWAS).

Highlights of key results are given below.

Phenotypic diversity of wild Sierra Leonean coffee (*Coffea stenophylla*) collected from Kenema and Moyamba districts

- The Shannon-Weaver diversity index (*H*') revealed variations among the samples for the observed 13 morphological traits, which range from 0 for both fruit colour and calyx limb persistence to 0.87 for the angle of insertion of primary branches on the main stem.
- Among the 13 morphological traits assessed, angle of insertion of primary branches on main stem (0.87), growth habit (0.78), bean size (0.75), young leaf colour (0.66), stem habit (0.66) and fruit shape (0.65) exhibited high level of diversity while seed shape (0.58), stipule shape (0.46), leaf shape (0.43), seed uniformity (0.31) and leaf apex shape (0.06) showed low levels of diversity.
- This is the first report of phenotypic diversity of *C. stenophylla* in Sierra Leone, and the study thus unravelled the existence of diversity among samples.
- It is recommended that these observed variabilities be exploited to develop better accessions that are high-yielding yet maintain the same taste.
- Additionally, genetic fingerprinting needs to be applied to provide a complementary assessment of the observed phenotypic diversity.

Unveiling the genetic diversity and demographic history of *Coffea stenophylla* in Sierra Leone using genotyping-by-sequencing

- Using 1037 novel SNP markers derived from Genotyping-by-Sequencing (GBS), three distinct natural populations (mean Fst = 0.176) of *C. stenophylla* exist in Sierra Leone.
- Evidence of recent bottlenecks and small effective population size (118–140) was found across all three populations, reflecting the impact of recent anthropogenic disturbances on this species.
- Using a model-flexible inference approach, we unveiled a strong ancient bottleneck approximately 23,000 years ago, coinciding with the last glacial maximum (LGM), followed by post-glacial expansion and divergence into distinct genetic clusters.

- A comparative analysis between ex-situ genebanks and natural populations detected a significant gap in genetic diversity, with two out of three natural populations missing from the ex-situ genebank collection.
- These findings highlight the urgent need to improve conservation practices for *C. stenophylla* in Sierra Leone.
- The novel SNP markers developed in this study provided valuable tools to support future efforts in conservation and utilisation of *C. stenophylla* genetic resources in West Africa.
- The geographic locations of the collection sites, population structure and neighbour-joining tree of *C. stenophylla* are presented in Table C1 and Figures C1and C2.

Table C1. Populations of *C. stenophylla* and their geographical locations in Sierra Leone

Population	No. of Samples	Latitude	Longitude	Elevation (masl)
Kasewe	25	8°19′11.694″N	−12°10′1.620″W	416
Kpumbu	28	7°59′23.364″N	−11°11′40.356″W	375
Ngegeru	45	7°56′50.634″N	−11°12′16.818″W	466
Bambawo, SLARI	45	8°0′31.698″N	−11°8′8.496″W	266
Total	143			

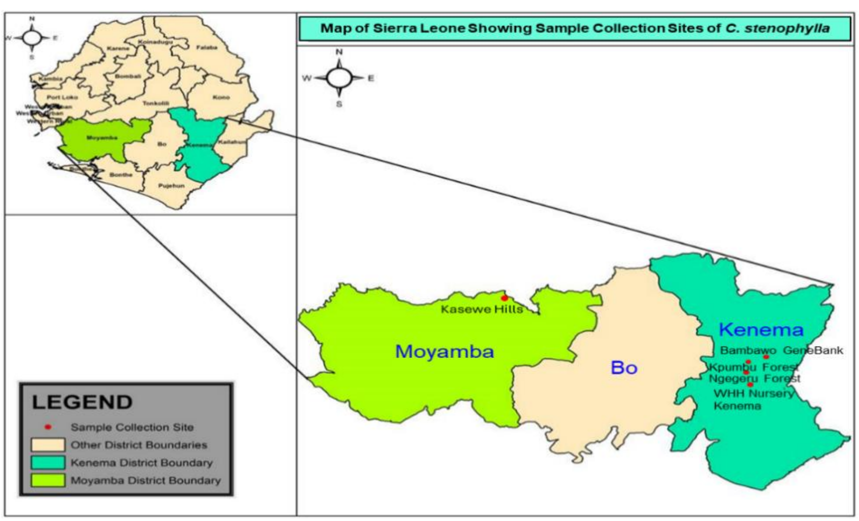


Figure C1. Geographic Locations of the four sampled *C. stenophylla* sites

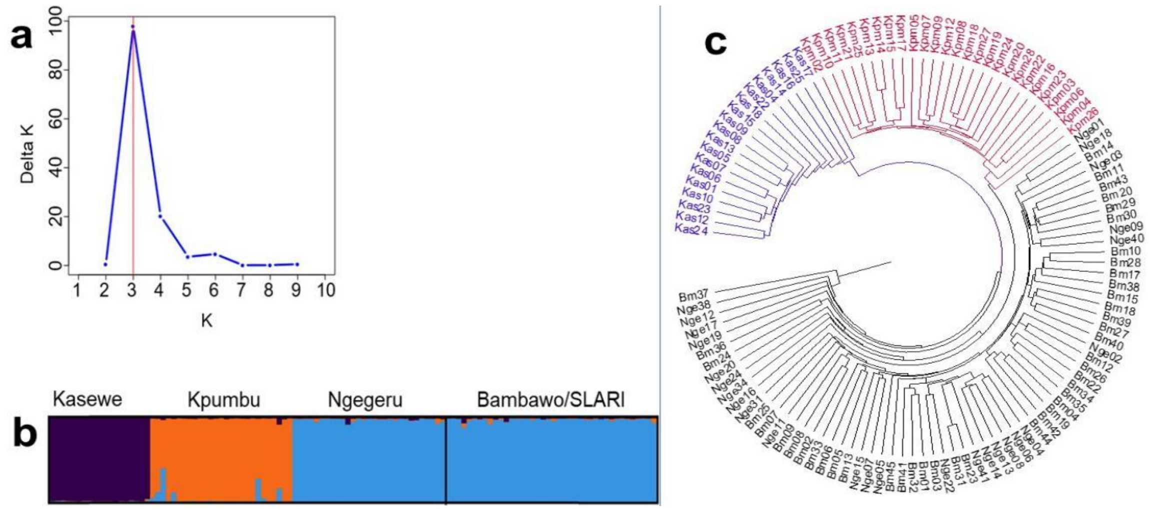


Figure C2. Display of a and b: Bayesian clustering of population structure; c: neighbour joining tree of 115 *C. stenophylla* accessions based on 1037 SNP data

Various research activities targeted at establishment, population improvement and/ or rehabilitation of cocoa, coffee, cashew, fruit crops and agroforestry have been done (Figure C3). For cocoa, 39 improved clones were introduced from Reading University Quarantine Centre (RUQ) of the Kew Garden. These clones are being maintained in the budwood garden. Hand pollination was done using parents with desired complementary traits for the generation of improved varieties. About 10,000 hybrid cocoa seedlings possessing high yielding, and pest/disease tolerance traits have been nursed at the Pendembu nursery.

Rehabilitation of cocoa has completed at the Pendembu (10 ha) and Kpuwabu (6 ha) clonal gardens. Moreover, 8 ha of 20 improved clones are being evaluated in the Pendembu budwood garden. For the coffee, a total of 10 ha comprising 5 ha each of *Coffea robusta* has been rehabilitated at Pendembu and Kpuwabu. About 5.5 ha of *C. arabica* have been established in Kenema, Kailahun and Koinadugu districts in Sierra Leone. At Pendembu, 1 ha each of *C. stenophylla* and *C. liberica* were nursed in the seedling nursery and established at permanent sites. Hands-on hybridization between these two coffee species has been initiated in the nursery.

A total of 1,100 trees of *C. stenophylla* have been established at Bambawo, while *C. liberica* and the natural hybrid cross between *C. stenophylla* and *C. liberica* were established at Pendembu. A total of 6 ha of IVM cashew seedlings were established at Pendembu (4 ha) and Kpuwabu (2 ha) in the Kenema and Kailahun districts. About 8 ha of fruit crops were established in the Pendembu seedling nursery. Six ha of seedlings were established in the agroforestry programme at Bambawo in Kenema.

Figure C3. Photographic display of a and b: pollination in cocoa, c: *C. arabica* coffee fruiting, d: cashew flowering and fruiting and e: assorted fruit crops established at Pendembu

Sustainable Fruit Trees Production for Farmers in Sierra Leone through Intercropping with Sorghum

Under-brushing of 8 ha fruit crops was accomplished (Figure C4). A sustainable innovative alternative option involving intercropping of fruit crops with sorghum aimed at minimizing the rate of overgrowth of weed in the fruit crops has been implemented. The improved pawpaw has started fruiting; however, the fruit has been discovered to be seedless. Vegetative propagation and/ or cross pollination could be utilized for cloning and variety development. Breeding of Keith, Kent, Palmer, Eldon and Irwin will commence when flowering starts.

Figure C4. ***Photographic display of a: pawpaw; b: avocado; c: mango; d: guava; e: Mangifera indica intercropped with sorghum established at Pendembu***

A 2-day training was conducted for 60 cashew women farmers in Kenema, Kono and Kailahun districts (Figure C5). This exercise was aimed at promoting rural economic growth and improving the livelihoods of rural cashew women farmers through the acquisition of skills necessary in cashew cultivation. The training contents included: floating tests- used in the selection of quality cashew seeds that have high germination potential, nursery establishment and management-raising of good rootstocks, identification of potential mother trees, selection of good scion, preservation of scion, selection of good rootstock, soft-wood grafting practical, and agronomic practices after grafting. Of the two types of grafting techniques often used in cashew, including side grafting and wedge grafting, the latter was used to train farmers because of its simplicity and ease of handling. The farmers were taught how to harvest scions/bud sticks, the size of the scion should be equal to that of the rootstocks, so that once the wedge shape is made on the scion, it can properly fit into the slit made on the rootstock; and that they should avoid scions with insect feeding marks, insect signs, and/ or disease-infected scions.

Figure C5. Photographic display of a: presentation on cashew grafting techniques; b: wedge grafting; c: grafted cashew seedlings with grafting cap; d: selection and harvesting of cashew scion at Pendembu.

D. KABALA HORTICULTURAL CROPS RESEARCH CENTRE (KHCRC)

The horticultural crops research programme is implemented at the KHCRC. The Programme is aimed at addressing challenges to enhance sustainable productivity, commercialisation, and competitiveness of the horticultural crops.

Through the EU-funded BAFS project**,** the Nigeria Horticultural Research Institute (NIHORT), the Kokopelli Foundation (KF), and the World Vegetable Centre (WVC) to boost vegetable research and production at the KHCRC, introduced nine vegetables. This partnership supports the Feed Salone initiative and strengthens our vegetable industry in the country. Four vegetable farmer-based organisations (FBOs) were selected for out-station vegetable seed multiplication in the Koinadugu and Falaba districts (Table D1; Figure D1). These groups were selected based on their experience and motivation in vegetable seed production in these districts. The groups were supported with seeds of different varieties of 8 vegetable crops (hot pepper, eggplant, garden egg, lettuce, tomato, okra, cucumber, and watermelon) to establish a total of 5 ha (1.25 ha per group).

Five vegetable producer FBOs were selected for out-station vegetable seed multiplication in the Koinadugu and Falaba districts (Table D2). These groups were selected based on their experience and motivation in vegetable seed production in the district. The groups were supported with seeds of different varieties of 8 vegetable crops (hot pepper, eggplant, garden egg, lettuce, tomato, okra, cucumber) to establish a total of 5 ha (1 ha per group).

Table D1. Details of the FBO supported for multiplying vegetable seeds.

			Membership		
District	**Location**	**Name of FBO**	**M**	**F**	**T**
Falaba	Koromasalia	Balandugu Farmers Association	12	13	25
	Musaia	Wanwod Women Vegetable Cooperative	0	25	25
Koinadugu	Mamudiakuru	Kusalako Women Vegetable Farmers' Cooperative	1	25	26
	Kompala	Kankalay Farmers Organisation	5	20	25
Total			**18**	**83**	**101**

Figure D1. Out-station vegetable multiplication sites

Table D2. Details of farmers supported with vegetable seeds for cultivation in the 2024 main cropping season

District	Location of plot	Name of FBO	Membership		
			M	**F**	**T**
Koinadugu	Mamudiakoro	Grow With Me Farmers Association	24	16	40
Koinadugu	Kompala	Kankalay Farmers Organisation	5	20	25
Koinadugu	Bendugu	Albitaya Farmers Association	10	9	19
Koinadugu	Kuranko Socrala	Alhamudilai Farmers Association	12	18	30
Koinadugu	Lankuma	Lankakuru Farmers Association	8	17	25
Total			**59**	**80**	**139**

The experimentation on existing techniques to mitigate climate change and selection of the 3 most pertinent for vulgarisation involved the preparation of the liquid organic fertiliser (LOF) in three replications, adapting the procedures of Sie Kansie (2017). The fertilisers (LOF1-LOF4) were prepared at the Soil and Plant Analytical Laboratory at NARC, Njala (Figure D2; Table D3). The LOF1 (*Gliricidia sepium* enriched with cow dung) was prepared by mixing 5 Kg of decomposed cow dung and 10 L of water in a plastic container and left to ferment for 6 weeks. The mixture was stirred at 3-day intervals. Liquid samples were analysed at the end of the six-week fermentation period to determine pH, N, P, and K content in each sample.

The LOF2 (*Gliricidia sepium*) was prepared by mixing 5 kg of the fresh leaves of *Gliricidia sepium* and 10 L of water in a plastic container with a seal and left to ferment for 6 weeks. The mixture was stirred at 3-day intervals. Liquid samples were collected at the end of the six-week fermentation period and analysed to determine pH, N, P, and K content in each sample. The LOF3 (Mexican sunflower enriched with pigeon pea manure) was prepared by mixing 5 kg of the fresh leaves of Mexican sunflower, 5 kg of pigeon pea manure, and 10 L of water in a plastic container and left to ferment for 6 weeks. The mixture was stirred at 3-day intervals. Liquid samples were collected at the end of the six-week fermentation period and analysed to determine pH, N, P, and K content in each sample.

The LOF4 (Mexican sunflower) was prepared by mixing 5 Kg of the freshly harvested leaves of Mexican sunflower and 10 L of water in a plastic container with a seal and left to ferment for 6 weeks. The mixture was stirred at 3-day intervals. Liquid samples were analysed at the end of the six-week fermentation period to determine pH, N, P, and K content in each sample using the 7-1 soil nutrient analyser.

Figure D2. Fermentation of liquid organic fertiliser: A (*Glicidia sepium*): B (*Glicidia sepium* enriched with cow-dung)

Table D3. Nutritional content of the liquid organic fertilisers

No.	Liquid organic fertiliser	Nutrient content N (mg/Kg)	P (mg/Kg)	K (mg/Kg)	pH
1	LOF1: *Gliricidia sepium* enriched with cow dung	1005	1387	1999	4.4
2	LOF2: Gliricidia sepium	1005	1387	1999	4.4
3	LOF 4: Mexican sunflower enriched with pigeon pea manure	187	240	637	4.4
4	LOF 4: Mexican sunflower	78	107	265	4.5

Evaluation of the Efficacy of Liquid Organic Fertilisers on the Productivity of OFSP

The liquid organic fertilisers (LOF1 and LOF2) will be evaluated as a climate-smart soil fertility innovation for improving crop productivity in vegetables in the 2025 cropping season. The treatments constitute no fertilizer (F0), NPK 15:15:15 fertilizer (F1), LOF2 and LOF1. The trials will be conducted at Mamudiakoro in Koinadugu district and Musaia in Falaba district, targeting five vegetable crops (pepper, eggplant, okra, garden egg and tomato). Land preparation is in progress for the trial establishment.

Transfer of technologies to farmers

Seeds of improved varieties of eight vegetable crops were distributed to four FBOs who are interested in vegetable seed production during the 2024 dry season (Table D4; Figure D3).

Table D4. Quantity of seeds distributed to FBOs for multiplication in the 2024 dry season

No	Vegetable	Variety	Quantity of seeds (g)
1	Hot pepper	Habanero	200
		Fresnso	200
2	Tomato	Cobra	100
		Munga	100
3	Eggplant	Calander	200
		Black beauty	200
4	Garden eggs	Kontobie	200
5	Sweet pepper	California Wonder	200
		Yolo Wonder	200
6	Okra	Penta green	950
		Lady's finger	950
7	Cucumber	Market more	100
8	Lettuce	Blond oak leaf	100
Total			**3,700**

Figure D3. Packaging and distribution of vegetable seeds to Kusalako Women Vegetable Farmers' Cooperative members at Mamudiakoro

Apart from seed distribution, technology transfer was also done through farmer-to-farmer exchange visits as part of the extension strategy of the project. A total of 200 farmers (42% male and 58% female) participated in farmer-to-farmer exchange visits organised in the Koinadugu (Kompala) and Falaba (Musaia) districts (Figure D4). This activity was led by the Extension Division of MAFS in Koinadugu district in collaboration with the local seed producers, supported by the project. During each visit, the OIC explained the importance of vegetable production in addressing food and nutrition security and household incomes; challenges farmers face in accessing quality seeds and the project strategy to overcome this challenge. The district Extension Officer stressed the importance of seed production and the ministry's role in ensuring that the activity is sustained after the project. He explained some of the best practices of vegetable production. The host farmers led the discussions with the visiting farmers, stressing the importance of seed production by the farmers.

Figure D4. Participants of the farmer exchanged visits

A clonal garden of pesticide plants was established and maintained at the Mamudiakoro crop site to develop biopesticides for the management of major insect pests and diseases (Figure D5).

Figure D5. Mexican sunflower

Training of scientists on mushroom spawn production

A private consultant, Mr William Atuah Darko, was contracted to train SLARI staff on mushroom spawn multiplication and technical backstopping in the procurement of mushroom materials and production of impregnated bags for distribution to beneficiaries (Figure D6). The consultant prepared and submitted to SLARI the soft copy of a manual entitled "Practical Steps on Grain Spawn Multiplication". The consultant as stipulated in his contract provided about 40 kg of the mother culture of mushroom species, comprising 30 kg of Columbus and 10 kg of Elma species.

Figure D6. Mother culture provided by the Consultant

A total of five SLARI staff have been trained on mushroom spawn multiplication. Another training session has been scheduled to train 5 private sector participants and project beneficiaries in April 2024. A PowerPoint presentation was made on the theoretical aspects of spawn production, followed by a hands-on practical demonstration of the steps on mushroom spawn multiplication as follows: (i) grain washing and cleaning; (ii) soaking of grains overnight; (iii) washing and cleaning of grains; (iv) bagging of grains for sterilization; (v) preparing the drum for sterilization; (vi) Sterilizing the grains; (vii) drying the sterilized grains; (viii) treatment and bagging/bottling of the grains; (ix) sterilization of the bagged grains; (x) cooling of the grains overnight; (xi) inoculation of the grains; and (xii) incubation of the inoculated grains (Figure D7).

A total of 120 kg of mushroom spawns was produced after the training.

Figure D7. Mushroom spawn preparation steps.

Establishment of 10 mushroom farms

This activity is being implemented in collaboration with Eat Good Organic Hub Enterprise. This is an Agribusiness enterprise that has a site at Magbontho village, via Mamamah village, that is engaged in large-scale commercial mushroom production. With spawns produced at KHCRC, this group is empowered to produce impregnated mushroom bags for sale to farmers on a cost-recovery basis (Figure D8). The group also links the mushroom farmers to the market for the sale of fresh mushrooms. With technical backstopping, a total of 6,000 mushroom bags have been inoculated with mushroom spawns in three batches (1^{st} batch = 2,400 bags, 2^{nd} batch = 2,400 bags, and 3^{rd} batch = 1,200 bags). The consultant provided supportive supervision and monitoring during compost preparation, bagging, and sterilisation of substrates, and inoculation of substrates with mushroom spawns.

Figure D8. Mushroom-impregnated bag preparation

Distribution of impregnated mushroom bags and kits to project beneficiaries

A total of 5000 impregnated mushroom bags were produced for distribution to 10 beneficiaries. However. The 5000 bags were distributed to 7 beneficiaries who were able to construct mushroom cropping houses (Table D5; Figure D9). Besides the impregnated bags, each group received 1 knapsack sprayer, 2 harvesting baskets and 1 scissors.

Table D5. Details of impregnated mushroom bags distribution

Name of beneficiary	District	Community	Contact Person	Contact Number
Faith Women Farmers Association	Western Rural	Agriculture Compound, Newton	Mariatu Conteh	076207441
Network of HIV positives in Sierra Leone	Western Rural	Matindi-Yeawa village	Brima Morie Nyoniwo	076390627
Eat Good Organic Hub	Western Rural	Grafton	Kevin S. Gborie	075050410
Tinava	Western Rural	Newton	Salamatu Conteh	074952587
Binkoloh Agro Business	Bombali	Makeni	Ishmael Bagura	076689817
MAFS Tonkolili district	Tonkolili	Magburaka	Jane Kabaseh	076771911
Organic Goodness Mushroom	Kenema	Kenema	Hon Bernadette Lahai	079038884

Figure D9. Harvesting and packaging, transportation and distribution of impregnated mushroom bags

Key challenge and recommendation

Irrigation was a major challenge for vegetable seed production during the dry season. Producing seeds during the rainy season will reduce the quality of the seeds.

To further enhance the seed production capabilities of KHCRC and the farmers during the off-season, SLARI has committed to the establishment of a 2 ha seed multiplication site along the riverbank area of Musaia. Each site should be equipped with solar-powered irrigation facilities, one 10,000 L storage tank, and water pipes and hoses for irrigating the fields.

Sie Kansie, B (2017). Preparation of liquid organic fertiliser. ECHO West Africa Note no. 1.

E. TEKO LIVESTOCK RESEARCH CENTER (TLRC)

The livestock research programme is implemented at the TLRC. The programme is aimed at addressing challenges to enhance sustainable productivity, commercialisation, and competitiveness of the livestock farming system.

Activity R3.1: Small ruminant (goat and sheep) and pig production and breed improvement

Ten (10) pigs: 8 weaner pigs (2 males and 6 females), a mature sow, 30 local sheep and 25 goats and veterinary drugs were achieved.

Activity R3.2: Poultry production and hatchery establishment

200 local breeds of chicken (normal feather type and Kebu breeds) were sourced to facilitate the breeding and multiplication program of locally adapted chickens. Hatchery and feed mill buildings have been constructed.

Activity R3.3 Epidemiology and Identification of Peste des Petits Ruminants (PPR) Virus in Small Ruminants

Conduction of a survey titled "The Epidemiology and Identification of Peste des petits Ruminant Virus of Small Ruminant in Sierra Leone**".**

Activity R3.4 Characterisation and conservation of forage resources for increasing livestock production

Nursery establishment of *Leucaena leucocephala*, *Gliricidia sepium*, *Moringa oleifera*, *Brachiaria brizantha*, *Calopogonium mucunoides* and *Centrosema pubescens*.

Activity R3.5 Enhancing small stock productivity for smallholder farmers

Rehabilitation of the Rabbit house, construction of 12 animal cages, purchase of two bulls, training of 60 farmers in animal traction, and training of replacement bull.

Activity R3.6 Animal Traction

Purchase of two bulls, training of 60 farmers in animal traction, and training of replacement bulls.

F. MAGBOSI LAND, WATER AND ENVIRONMENT RESEARCH CENTER (MLWERC)

Enhancing Soil, Water and Crop Management Practices for Improved Agricultural Productivity and Food Security in Moyamba District, Sierra Leone

The main objective of this project was to contribute to sustainable soil, water and crop management for improved agricultural productivity and food security in communities experiencing soil degradation by mining activities in Moyamba District. The specific objectives were: (i) to propose and test sustainable soil and water management practices; (ii) to propose and test efficient in-season crop management practices; (iii) to propose and test efficient harvesting and post-harvest management practices; and (iv) to build farmers' capacity on land restoration, irrigation, crop, and post-harvest management.

The project commenced with an inception workshop with the engagement of stakeholders to choose communities and FBOs, to ensure a mutual understanding of proposed activities, the method for implementation and expected outputs from the project technical team. A total of 60 participants, comprising farmers from different Farmer Based Organisations (FBO), staff from the Ministry of Agriculture, the National Farmers Federation, community leaders and development within Moyamba district, attended the two workshops that were held at Gbangbantoke.

Infrastructural Development

1. Rehabilitation of a 7 KVA solar system at MLWERC

The centre solar panels were struck by lightning in October 2023, causing an electricity shortage in the office area (Figure F1). Other components of the solar system, such as the charge controller and breakers, were also damaged. However, these solar panels and the components were changed, and the electrification of the office area was also restored.

Figure F1. Photographic display of the destruction of solar panels caused by thunder in October 2023

2. Installation of solar submersible pump and rehabilitation of the water running system at MLWERC

A solar submersible machine has been installed and pipes replaced at the centre to solve the challenge of water scarcity at both the office area and residents at the centre (Figure F2).

Figure F2. Photos of the installation of the solar submersible machine at MLWERC

3. Recruitment of security and office assistants at MLWERC

One office assistance and three securities have been recruited on causal basis following the absence of an office assistance and the death of the formal causal security officer.

Installation of 12 solar street lights at MLWERC

MLWERC is highly susceptible to theft due to the absence of a well-fenced compound, lack of electricity and a smaller number of security officers. The 12 solar street lights have been installed around the office area and residents of the staff members to combat the theft threat (Figure F3). However, more lights are required for the areas that are yet to benefit from the current installation.

Figure F3. Photos of the installation of 12 solar street lights at MLWERC

PRESENTATION OF 2025 RESEARCH AND DEVELOPMENT PROPOSALS

Kanu, S.K., Swaray, M., Kamara, A.C., Bangura, K., & Sesay, S. Varietal testing, release, and early generation seed production of rice and hybrid maize in Sierra Leone.

Kamara, N., Kanu, S.K., Swaray, M., Kamara, A.C., Conteh, R., Gbory, M., Conteh, A.M., Suma, F., & Tidankay, C.Y. Collection and characterisation of mangrove rice germplasm for breeding and genetic resource conservation along communities in the Great Scarcies River.

Suma, F., Kanu, S.K., Bangura, K., Bangura, A., Gbory, M., & Conteh, A.M.. Developing and out-scaling biochar processing and application to improve mangrove soil condition and increase rice yields.

Bangura, K., Kanu, S.K., Kamara, N., Bangura, A., Conteh, R., Conteh, A.M., & Gbory, M. Development and promotion of improved Rice Parboiling System.

Gbory, M., Mamoud, N.A., & Conteh, A.M. Gender in rice value chain: Assessing women empowerment along the rice value chain.

Mansaray, A., Kamara, E.G., Mansaray, S., Samba-Bakar, J., Mansaray, A., & Benya, M. Effect of climate change on cowpea production in southern Sierra Leone

Kobba, F. et al. Documenting and creating appropriate linkages for the dissemination and promotion of agricultural technologies.

Mansaray, et al. Assessment of postharvest losses and mitigation measures in selected roots, tubers and grain legume crops in the southern region of Sierra Leone

Samba-Barka, J., Mansaray, A., & Mansaray, S. Evaluation of sweetpotato germplasm for long shelf life, yield and other quality traits in Sierra Leone.

Yila, K.M. Innovative horticultural crop technologies to support the Feed Salone Initiative.

Turay, F. et al. Innovative technology of retractable pole harvesting for sustainable palm oil processing in Sierra Leone.

Lahai, P.M. et al. Propagation and establishment of *Coffea stenophylla* seed garden at Pendembu.

Amara, E. et al. Collection and conservation of threatened indigenous forest tree species in Sierra Leone.

TLRC team. Assessing the impact of tick-borne pathogens on livestock health and productivity: A study in Sierra Leone.

Yillah, D.S., Renner, A.B., & Kargbo, K. Enhancing productivity and phenotypic characteristics in small ruminants and poultry using locally available feed resources.

Jalloh, M.T. et al. Engineering biogas systems for converting livestock waste into energy: a sustainable solution for waste management and renewable energy production.

Koroma, S.M., & Yillah, D.S. Feeding management system for West African Dwarf (sheep and goat) in Sierra Leone.

Bebeley, H.A., Massaquoi, R., Alieu, E.V.K., Williams-Ngegba, M.S.E., Sumah, F., & Kamara, E.G.K. Application of biochar to improve soil fertility, water retention, and enhance cassava *(Manihot esculenta)* productivity on a degraded agricultural land.

Massaquoi, R., Bebeley, H.A., Alieu, E.V.K., Davowah, A., Kamara, B.O., Sesay, M.L., Kamara, A.A., & Williams-Ngegba, M.S.E. Water harvesting and irrigation technologies for sustainable rice and cassava production in savanna woodland and transitional rainforest agro-ecologies.

SUMMARY OF 2024 ANNUAL REVIEW AND PLANNING WORKSHOP RESOLUTIONS

Participants agreed on a number of important points, including needs assessments of the various value chain actors or stakeholders in order to conduct demand-driven research for development and putting research into use.

Prof. Abdulai Jalloh opined that more scientific work and presentations should be done to justify the financial support received from the government/donors. Fertiliser trials should be done to reveal site-specific fertiliser recommendations. Findings on rice genotypes that yield up to 8 t ha^{-1} and *Coffea* stenophylla should be well packaged for presentation to the President.

Aflatoxin intensity has to do with storage, shelf life, packaging, fermentation, etc., of the grains and other products. What role do storage conditions play in aflatoxin mitigation within the value chain? What technologies are available for monitoring and controlling aflatoxin in food supply chains? What are the best practices for reducing aflatoxin levels in agricultural products? How can farmers ensure compliance with phytosanitary regulations regarding aflatoxin? Some of the recommendations on the aflatoxin problem include testing of foodstuffs to determine the level of the fungus in them, raising awareness about health hazards associated with the fungus in foodstuffs.

Dr Alie Kamara (NU) was impressed with SLARI's performance in the AWP conference – showing that SLARI is alive. IVS farmers are now using weed killer; the tendency to overuse it may affect the soil.

SLARI should generate income through the production of high-quality seeds for commercialisation and other service delivery activities to fund some of their routine research activities.

That new projects developed in SLARI should include costs of vehicle lease or rent, maintenance and fuel, where the donors do not tolerate purchase of a vehicle for a particular project. This will help ease the acute mobility constraint in the institute.

Cost/ benefit analysis of all our technologies and innovations, and multi-locational trials should be done for the varieties developed before their release.

SLARI should increase its collaboration with universities such as NU, ETU, EBKUST, etc.

The Technology and Innovation Park is only established at one site. Scientists and stakeholders should write a proposal for its replication in other regions in the country.

The GAP should be properly followed. That the issues of Plant Breeders' Rights should be followed up by SLARI. And that SLARI should develop improved breeds of animals and engage in demonstration farms.

ADVOCACY, INFORMATION, DOCUMENTATION, AND COMMUNICATION

The Sierra Leone Agricultural Research Institute (SLARI), to help foster its research activities under its reviewed SLARI Act 2023, established the Communications and Knowledge Management Unit to develop all forms of knowledge and communication infrastructure and strategies. The newly introduced knowledge system provides a platform for the creation, sharing, and storage of knowledge drawn from agricultural research.

National and Community Radio Programmes

SLARI has embarked on a programme hosted by national and community radio stations. The Africa Young Voices (AYV) Radio and Television has been hosting researchers from SLARI on their programme called Green Eye. This has helped SLARI disseminate research activities and outcomes to the wider public. Then Green Eye programme hosted by AYV focuses primarily on agricultural activities with a View to sharing insights on agriculture. Several agricultural scientists from different centres in **SLARI** have been hosted by AYV on the Green Eye show. In addition to other research information, SLARI Technology and Innovation Park at Komrabai Village, Maforki Chiefdom, established in collaboration with CORAF, has been the centre of discussions on the Green Eye show. Community radio stations have been very instrumental in reporting agricultural news in some major indigenous languages to capture the audience in the different localities.

Production of Audio and Video Documentaries

Audio and video documentaries are also essential in the dissemination of research information. This, especially when done in the lingua franca, helps farmers to have a full comprehension of the research messages. The video documentaries have illustrations that can be quickly grasped by farmers. The Communication and Knowledge Unit has produced a series of documentaries for various projects. Some of the documentaries produced include a documentary on the E.U. BAF Project, CORAF /SLARI Documentary on SLARI Technology Park at Maforki Chiefdom, SLARI/Africa Rice at Rokupr, Kambia District, etc.

Print Media, Brochures, Newsletters, SLARI Website

The print media complements the audio and video documentaries. The Communications Unit of SLARI has been responsible for compiling stories for brochures, newsletters, and posters. Occasionally, stories about SLARI's research activities have been published in local newspapers, radio, and television to reach a broader audience. The design and printing of banners, stickers, and posters are vital for disseminating essential information.

Video documentaries, newsletters, brochures, and other research information can be found on the website when the website is completed. Having a running website is crucial to the establishment of a strong network for collaboration. Our partners and other stakeholders can log on to access information on SLARI research achievements. The SLARI website project is being funded by FSRP. The IT staff of SLARI should be fully involved in all processes relating to the website.

Dissemination of Internet Connectivity for the Sharing and Dissemination of Knowledge and Information on Technologies

Internet connectivity is crucial in the dissemination of knowledge and information. With support from FSRP, SLARI has got effective and strong internet connection in the headquarters, Rokupr Agricultural Research Centre (**RARC**), Teko Livestock Research Centre (**TLRC**), and Njala Agricultural Research Centre (**NARC**). This has enabled the sharing of knowledge, correspondence and other research-related issues with strong connectivity.

Participation in Agricultural Shows and Field Days

Field days and agricultural shows are essential as they bring together players in the agricultural sector. SLARI, in collaboration with partners on different projects, has organised several field days for farmers in 2024. The then Communications Unit, now Communications and Knowledge Management Unit, played a crucial role in capturing essential information during field days and agricultural shows. During agricultural shows and field days, research ideas and technologies are shared with farmers to help increase their yields.

SLARI STAFF MATTERS

There are 380 personnel on the SLARI payroll, comprising 60 at SLARI HQs, 102 (RARC), 96 (NARC), 16 (KHCRC), 43 (KFTCRC), 16 (MLWERC), and 47 (TLRC). Of the 380 staff, 70 hold an MSc and 26 hold a PhD in various fields. Moreover, the numbers of staff recruited, retired, resigned, dismissed, lost to death, promoted, staff on study leave and staff on leave of absence were 4, 20, 5, 1, 3, 38, 10 and 2, respectively.

SLARI PUBLICATIONS 2024

1. Journal Articles

Amara, V., Samura, A.E., Norman, P.E., Kanu, S.A., Karim, K.Y., Tiendrebeogo, F., Eni, A.O., & Pita, J.S. (2024). Characterisation of the cassava (Manihot esculenta) germplasm in Sierra Leone based on agro-morphological and culinary traits. *Horticulturae*, 2024, 10, 640. https:// doi.org/10.3390/horticulturae 10060640

Diakite, S., Saquee, F.S., Kavhiza, N.J., Pakina, E.N., Norman, P.E., Chudinova, E.M., Tsindeliani, A.A., & Pototskaya, I.V. (2024). Plant growth and development responses to sulfur nutrition and disease attack under climate change: Role of sulfur and management strategies for wheat and barley. In Press *Pedosphere*, ….. https://doi.org/10.1016/j.pedsph.2024.12.004

Lahai, P.M., Aikpokpodion, P.O., Bah, A.M., Lahai, M.T., Meinhardt, L.W., Lim, S., Ahn, E., Zhang, D., & Park, S. (2024). Unveiling the genetic diversity and demographic history of *Coffea stenophylla* in Sierra Leone using Genotyping-By-Sequencing. *Plants*, 14(1), 50. https://doi.org/10.3390/plants14010050

Mansaray, S., Norman, P.E., Sherman-Kamara, J., Kamanda, I., & Serry, K.N. (2024). Variation in yellow root cassava (*Manihot esculentus* Crantz) genotypes and phenotypic relationship for selected postharvest and morphological traits. *Agricultural Sciences*, 15, 993-1008. https://doi.org/10.4236/as.2024.159053

Norman, P.E., Vamboi, W.L., Norman, Y.S.G.E., & Kassoh, F.A. (2024). Assessment of early generation families of white yam (*Dioscorea rotundata*) for growth and yield parameters. *SABRAO Journal of Breeding and Genetics*, 56(6), 2284-2294. http://doi.org/10.54910/sabrao2024.56.6.10.

Norman, P.E., Kamara, L., Beah, A., Gborie, K.S., Saquee, F.S., Kanu, S.A., Kassoh, F.A., Norman, Y.S.G.E., & Kargbo, A.S. (2024). Genetic and agronomic parameter estimates of growth, yield and related traits of maize (*Zea mays* L.) under different rates of nitrogen fertilisation. *American Journal of Plant Sciences*, 15, 274-291. https://doi.org/10.4236/ajps.2024.154020

Samura, A.E., Beamah, J., Amara, V., & Norman, P.E. (2024). Efficacy of various disease management options and evaluation of farmers' fields for major diseases of rice in Sierra Leone. *Annals of Plant Sciences*, 13(3). http://dx.doi.org/10.21746/aps.2024.13.3.3

Samura, A.E., Watson, P.N., Amara, V., Norman, P.E., & Saffa, M.D. (2024). Pests, diseases, growth and yield of tomato as influenced by variety and cultivation technology. *Journal of Plant Sciences*, 12(5), 122-137. https://doi.org/10.11648/j.jps.20241205.11

Saquee, F.S., Pakina, E., Zargar, M., Norman, P.E., Vladimirovna, K.E., & Alexandrovna, T.V. (2024). Economic parameter estimates of spring wheat varieties grown under different cultivation technologies. *Biocatalysis and Agricultural Biotechnology*, 62(2024), 103454. https://doi.org/10.1016/j.bcab.2024.103454

Torto, S.J., Sundufu, A.J., Samura, A.E., Fomba, S.N., Musa, D.P., Kanu, S.A., & Norman, P.E (2024). Oviposition site preference and its effects on the subsequent development of variegated grasshopper (*Zonocerus variegatus* L.) under laboratory conditions. *Advances in Entomology*, 12(3), 143-154. https://doi.org/10.4236/ae.2024.123011

Torto, S.J., Norman, P.E., Samura, A.E., Fomba, S.N., Musa, D.P., Norman, J.E., & Kanu, S.A. (2024). Grasshopper incidence and severity of damage as influenced by cyanogenic potential in leaf tissue of cassava (*Manihot esculenta* Crantz). *Advances in Molecular Imaging*, 13(3), 23-38. doi:10.4236/ami 2024.133003.

Usman, M., Khaliq, A., Azeem, M., Swaray, S., & Kallel, M., 2024. The dynamics and behaviour of the logarithmic-type fuzzy difference equation of order two. *PloS one*, *19*(10), p.e0309198.

Williams-Ngegba, M.S.E., Onabanjo, O.O., Anthony, N.M., Alamu, E.O., Maziya-Dixon, B., & Oguntona, E.B. (2024). Variations in micronutrient concentrations and retentions in fufu made from yellow-fleshed cassava as a function of genotype and processing methods. *Frontiers in Nutrition*, *11*, 1295609.

2. Conference Proceedings

Conducted a local conference on the Research Activities of Kenema Forestry and Tree Crops Research Centre (KFTCRC)/SLARI. The programme was held at Paloma, Kenema City, on 5th November 2024, and supported by WHH.

3. Technical Reports

Kamara, N. (2024). AGRA rice catalytic grant report: varietal testing, release, and early generation seed production of rice in Sierra Leone (Grant No.: 2024 SL 002).

Samba-Barka, J. (2024). Improving seed availability of climate-resilient cowpea and groundnut varieties to enhance food and nutrition security among smallholder farmers in Sierra Leone (Grant No.: 2024 AGRA 003).

Norman, P.E. (2024). Perceived knowledge of selected stakeholders on research, technology and innovation development in Sierra Leone Agricultural Institute: A clarion call for improved roadmap strategy.

IITA (2024). The Feed Salone Strategy: Promotion of New Innovative Agricultural Technologies Under the Food Systems Resilience Program. 1st Quarterly Report, April–October 2024, 17 p.

Williams-Ngegba, M.S.E. (2024). enhancing soil, water and crop management practices for improved agricultural productivity and food security in Moyamba District, Sierra Leone. (SLE/SGP/OP7/Y3/CORE/LD/15/09/2023/59), 15 p.

SLARI COUNCIL

The institute has a council, which is the highest administrative and policy-making authority and has control and supervision of the institute. The council consists of the following members:

- Chief Dr Alfred G.O. Dixon, Chairman of SLARI Council
- Prof. Abdulai Jalloh, Chief Agriculture Officer, MAFS
- Dr Abdul Rahman Conteh, Ag. Director General, SLARI
- Rev. Dr Prince E. Norman, Deputy Director General, Research, Technology and Innovation Development, SLARI

- Dr Isata Kamanda, Deputy Director General, Commercialisation and Agribusiness Development, SLARI
- Mr Alpha Mattia, Administrative Director, SLARI
- Mr Alie Bah, Finance Director, SLARI
- Dr Augustine Mansaray, Officer in Charge, NARC
- Dr Adam Sheka Kanu, Officer in Charge, RARC
- Dr Martha S.E. Williams-Ngegba, Officer in Charge, MLWERC
- Dr Dauda S. Yillah, Officer in Charge, TLRC
- Mr Keiwoma M. Yila, Officer in Charge, KHCRC
- Mr. Pual M. Lahai, Officer in Charge, KFTCRC
- Mr Ahmed Nanoh, President of the Chamber of Commerce, Industry and Agriculture
- Mr Prince E.O. Cole, Senior Permanent Secretary, MAFS
- Prof. Jonas Abioseh Sylvanus Redwood Sawyerr, Chairman, National Science Technology and Innovation Council of Sierra Leone (NSTIC-SL); Chairman of the Sierra Leone Research and Education Network (SLREN)
- Prof. Roland Suluku, Dean of Agriculture and Food Sciences, NU
- Mr Edward P. Bendu – Chief Director – Ministry of Environment
- Mr Peter Sam-Kpakra – Development Secretary – MDEP
- Madam Alice N. James – National Coordinator – SLANGO
- The Financial Secretary – MOF
- Chairman, Parliamentary Committee on Agriculture
- Chairman, Parliamentary Committee on Finance
- Madam Yatta, President, National Federation of Farmers of Sierra Leone

FORMATION OF SLARI COUNCIL COMMITTEES

The Sierra Leone Agricultural Research Institute (SLARI) Council Committees were formed during the 19^{Th} Regular SLARI Council Meeting held on the 31^{st} July, 2024. Below are the various SLARI Council Committees and the Members as provided for in the SLARI Act of 2023.

1. The Scientific and Technical Committee

Membership:

(i) Director-General –SLARI - Chairman

(ii) Deputy Director-General, Research, Technology and Innovation Development – SLARI - **Secretary**

(iii) Deputy Director-General, Commercialisation and Agribusiness Development – SLARI

(iv) Two Directors of Research Centres on a rotational basis:

a. Dr Dauda Yillah – OIC – Teko Livestock Research Centre (TLRC)

b. Dr Augustine Mansaray – OIC – Njala Agricultural Research Centre (NARC)

(v) Chief Agricultural Officer – MAFS

(vi) The Coordinator – National Council of Science and Technology

(vii) Two Deans of the faculties of Agriculture from Public Universities:

a. Prof. Roland Suluku – Dean, Faculty of Agriculture – Njala University

b. Dean, Faculty of Agriculture – Ernest Bai Koroma University, Makeni

(viii) Two distinguished agricultural researchers or agriculturists from the private sector:

a. Hon. Dr Bernadett Lahai – Distinguished Researcher

b. Madam Sinkarie Sesay – Managing Director, Mangara Agribusiness Company

(ix) The President – National Federation of Farmers of Sierra Leone (NaFFSL)

2. The Appointments, Promotions and Performance Committee

Membership:

(i) Chief Agriculture Officer, MAFS – **Chairman**

(ii) Two other Class II members of the Council:

a. Prof. Jonas Redwood-Sawyerr – Chairman, National Council of Science and Technology of Sierra Leone

b. Ms Alice N. James, National Coordinator – SLANGO

(iii) The Director-General - SLARI

(iv) Administrative Director - SLARI – **Secretary**

(v) Finance Director – SLARI

(vi) Two Directors of Research Centres:

a. Dr Adam S. Kanu – OIC RARC

b. Dr. Dauda S. Yillah – OIC – TLRC

3. The Finance and Compliance Committee

Membership:

(i) Peter Sam-Kpakra – Development Secretary – **Chairman**

(ii) Director-General – SLARI

(iii) Finance Director - SLARI – **Secretary**

(iv) Deputy Director-General – Commercialisation and Agribusiness Development – SLARI

(v) Deputy Director-General – Research, Technology and Innovation Development – SLARI

(vi) Two Class II Members of Council:

a. Madam Alice N. James, National Coordinator – SLANGO

b. Madam Yatta Sama – President NaFFSL

(vii) Administrative Director – SLARI

(viii) Two Directors of Research Centres:

a. Dr Adam S. Kanu – OIC RARC

b. Mr. Pual M. Lahai – OIC KFTCRC

(ix) Co-opted member – The Financial Secretary – MOF

4. The Knowledge and Innovation Committee

Membership:

(i) Prof. Jonas A.S. Redwood Sawyerr – NSTIC-SL and SLREN – **Chairman**

(ii) Director-General – SLARI

(iii) Deputy Director-General – Research Technology and Innovation Development – SLARI **Secretary**

(iv) Two other Class II members of Council:

  a. Prof. Jonas Redwood-Sawyerr – Chairman, National Council of Science and Technology of Sierra Leone
  b. Mr Ahamed Nanoh – Executive Secretary – SLeCAD

(v) Two Directors of Research Centers

  a. Mr Kewoma Mark Yila – OIC KHCRC
  b. Dr Martha S. E. Williams-Ngegba – OIC MLWERC

(vi) Communications Manager – SLARI

5. Commercialization and Business Development Committee

Membership:

(i) Mr Ahamed Nanoh, Executive Secretary – SLeCAD – **Chairman**

(ii) Two Members of Council:

  a. Madam Alice N. James – National Coordinator – SLANGO
  b. Madam Yatta Sama – President – NaFFSL

(iii) Director-General – SLARI

(iv) Deputy Director-General, Commercialisation and Agribusiness Development – SLARI – **Secretary**

(v) Deputy Director-General, Research, Technology and Innovation Development – SLARI

(vi) Finance Director – SLARI

(vii) Administrative Director – SLARI

(viii) Two Directors of Research Centres

  a. Mr Keiwoma Mark Yila – OIC – KHCRC
  b. Dr Martha S. E. Williams-Ngegba – OIC MLWERC

(ix) Three private sector agribusiness development specialists (To be appointed)

6. Staff Disciplinary Committee

Membership:

(i) Director-General – SLARI – **Chairman**

(ii) Two Chass II Members of Council

a. Mr Peter Sam-Kpakra – Development Secretary – MDEP

b. Mr Edward P. Bendu – Chief Director – Ministry of Environment

(iii) Two Directors of Research Centres

a. Dr Adam S. Kanu – OIC – RARC

b. Dr Augustine Mansaray – OIC – NARC

(iv) Finance Director – SLARI

(v) Administrative Director – SLARI

(vi) Representative of the Junior Staff – SLARI

(vii) Representative of the Senior Staff – SLARI

SLARI PROGRAMMES AND LOCATIONS

Subject to the 2007 Sierra Leone Agricultural Research Institute Act, there are currently six functional research programmes as determined by the Scientific and Technical Committee. The centres are:

Root, Tuber and Grain Legume Crops Programme at the Njala Agricultural Research Centre (NARC), Njala.

Cereal Crops Programme at the Rokupr Agricultural Research Centre (RARC), Rokupr.

Horticultural Crops Programme at the Kabala Horticultural Crops Research Centre (KHCRC), Kabala.

Forestry and Tree Crops Programme at the Kenema Forestry and Tree Crops Research Centre (KFTCRC), Kenema.

Livestock Programme at the Teko Livestock Research Centre (TLRC), Makeni.

Land, Water and Environment Programme at the Magbosi Land, Water and Environmental Research Centre (MLWERC), Mile 91.

APPENDICES