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FORWARD

The Njala Agricultural Research Centre (NARC) is one of the six currently operational centres of the Sierra Leone Agricultural Research Institute (SLARI). This centre has a strong research history that is intricately linked to the Njala University College and the then Adaptive Crops Research and Extension (ACRE) project whose infrastructure, based on the Njala University College campus, formed the foundation for the establishment of the Institute of Agricultural Research (IAR) in 1988 which was later transformed to the Njala Agricultural Research Centre (NARC) in 2008 when the Sierra Leone Agricultural Research Institute (SLARI) was established. This Centre thus has over 30 years of research and development experience on cowpea, groundnut, sweet potato and cassava as well as the qualified staff to support the implementation of research activities on the mandated crop value chains.

NARC has a mission to enhance sustainable productivity, commercialization and competitiveness of the root, tuber and grain legume crops through generating and promoting innovative root, tuber and grain legume crops technologies and empowerment of stakeholders. Successful implementation of the Centre’s mandate will mean a significant contribution towards the nation’s diversified food crop production initiative and contribute towards attaining the global Sustainable Development Goals of eradicating hunger and poverty (SDG 1 and 2). There has been massive efforts towards improving production and productivity of the nation’s staple crop, rice, as a way of boosting food security and reduction in the importation of this staple commodity. Our work at NARC is complementing this effort by contributing towards diversification of food crop production in Sierra Leone. Cassava, sweet potatoes, groundnuts and cowpea have made significant contributions towards improving food security in Sierra Leone.

It is already recognized that agricultural diversification helps achieve food security, improve human nutrition and increase rural employment; it can also impact favourably on soil fertility and pest incidence. There is a strong need to equip and facilitate scientists to embark on serious research on non-rice crops, assess soil condition, and advise farmers on the right direction. Diversification in Sierra Leone agriculture is key in achieving food security, improved human nutrition and increase in rural employment which are crucial to achieving Sustainable Development Goals 1 and 2 and subsequently Goals 3, 4 and 5. NARC will continue to strengthen efforts towards this direction.

A lot has been achieved by NARC, yet a lot more needs to be done to achieve the desired goal. Improved crop varieties that are higher yielding than the local varieties with desirable end-user characteristics have been developed, yet most of these varieties are struggling to reach the intended end-users. Improved management practices with respect to soil, pest and disease management have been identified and are being promoted. Market appraisals have been conducted and challenges identified. Mechanization, post-harvest processing, and value addition remain challenges. These are challenges that need to be addressed.

This report provides a summary of achievements and challenges of NARC between 2008 and present. The contents are not exhaustive, but it is hoped that they do provide an overview of what this centre has been doing since the inception of SLARI. Cassava, being the second most important food crop in Sierra Leone and the top priority crop of NARC, is given the lion’s share in this overview.

This work could not have been completed without the contribution of all staff of NARC. I will mention Mr Moses Tucker, NARC Administrative Officer; Dr Alusaine Samura, NARC Plant Pathologist; Dr Moses Moseray, NARC Legume Breeder; and Mr Emmanuel Hinckley, NARC Monitoring and Evaluation Officer, for their patience in going through the initial draft and providing useful comments. Most of the information provided in this overview has been extracted from reports submitted by various scientists at NARC over the years. We also appreciate the information provided by Dr Robert Kagbo, a private
consultant, on businesses utilizing cassava flour in Sierra Leone. Dr Robert Kagbo had been very passionate about promoting a national policy on cassava flour inclusion in bakery products.

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This being the first report of its kind for NARC, there is the possibility of deficiencies which will hopefully be addressed in subsequent overviews.
1.0 Introduction

The Njala Agricultural Research Centre (NARC), one of the six currently operational centres of the Sierra Leone Agricultural Research Institute (SLARI), is mandated to conduct research and development activities on root and tuber crops (cassava, sweet potato, yam, potato and cocoyam), grain legumes (cowpea, groundnut, soybean and pigeon pea) and other emerging crops of interest as determined by the SLARI Council.

The Mission of NARC is to enhance sustainable productivity, commercialization and competitiveness of the root, tuber and grain legume crops by generating and promoting innovative root, tuber and grain legume crops technologies and empowerment of stakeholders.

Operationally, NARC’s current activities fall under five thematic areas that apply to all crop value chains at NARC:

I. Germplasm and Seed Systems;
II. Natural Resources Management;
III. Farm Management;
IV. Socioeconomic, Policy, and Outreach;
V. Postharvest, Nutrition and Food Technology, supported by Human, Infrastructural and other Capacity Building efforts.

In line with the Mission of SLARI, the results areas for NARC are summarized as:

1. Appropriate root, tuber and grain legume crops product value chains technologies and innovations generated and promoted.
2. Appropriate markets and marketing strategies for enhancing root, tuber and grain legume crops product value chains developed and promoted.
3. Appropriate policy options for enhancing root, tuber and grain legume crops product value chains facilitated and advocated.
4. Capacity for implementing root, tuber and grain legume crops product value chains research strengthened.
5. Appropriate mechanisms for managing, sharing and up scaling root, tuber and grain legume crops knowledge, information and technologies established and operationalized.

In coordinating the Root, Tuber and Grain Legume Crops Programme of SLARI, the Njala Agricultural Research Centre (NARC) focuses on the development and promotion of nine product value chains outlined below.

(i) Cassava product value chain.
(ii) Yam product value chain.
(iii) Sweet Potato product value chain.
(iv) Potato (Irish) product value chain.
(v) Cocoyam product value chain.
(vi) Cowpea product value chain.
(vii) Soybean product value chain.
(viii) Pigeon Pea product value chain.
(ix) Groundnut product value chain.
Among the nine crop value chains, six have received considerable attention at NARC: cassava, sweet potato, yam, cowpea, pigeon pea, and groundnut. Cassava, being the second most important food crop in Sierra Leone after rice, has received the greatest attention and constitutes the bulk of research activities at NARC due to its widespread cultivation, multiple uses, industrialization potential, ease of cultivation, adaptability to all agro-ecologies, consumer demand, and attractiveness to funding agencies. Sweet potato is currently receiving the second priority at NARC especially due to growing interest in the Orange-Flesh varieties which have received funding from the Irish Aid through the Helen Keller International Foundation. These crops are followed in order of priority by groundnut, yam, cowpea, and pigeon pea. Little attention has been given to soybean and Irish potatoes. Despite the global importance of soybean and its nutrient content, processing requirement has resulted in low consumer demand for this crop in Sierra Leone. The climatic requirement for Irish potato has limited its extent of cultivation in Sierra Leone, thus the low priority in research. However, recent growing interest in Irish potato by the European Union-funded project “Boosting Agriculture and Food Security (BAFS)” has created increased attention to Irish potato research in Sierra Leone.

Cassava is the second most important food crop in Sierra Leone after rice and has mostly been a subsistence crop grown for food by small-scale farmers who occasionally sell the surplus. Cassava is a drought tolerant crop, performs well in poor soils and has limited labour requirements. Despite its popularity, cassava is affected by pests such as the cassava green mite, cassava mealy bug, grasshoppers, and diseases such as the cassava mosaic disease, cassava bacterial blight, cassava anthracnose and root rot especially in the humid zones. Cassava’s huge industrial potential has not been tapped in Sierra Leone. NARC’s attention is increasingly focusing towards industrializing cassava.

Sweet potato is a food security crop due to its ability to grow in very marginal areas. In addition, the crop is highly tolerant to weeds, allowing farmers to devote time to other crop enterprises and, therefore, be easily integrated into other farming systems. Sweet potato, therefore, has tremendous advantage for the resource poor households whose members depend on diverse livelihood strategies and especially those affected by HIV/AIDS. However, availability of planting material is limited and there are few established nurseries where farmers can easily access improved planting materials. Farmers have few alternatives for extending the shelf-life of sweet potatoes which are highly perishable and only harvested from the ground when they are needed. This predisposes them to pests and diseases attack.

Yam is a major source of food, income and also plays a vital role in the traditional culture. Consumer demand for yams in Sierra Leone is high, providing an opportunity for serving both rural and urban populations as a basic daily source of dietary energy. It is a very important food security crop due to its availability all year round and excellent storage properties. Production of yams is declining in some traditional producing areas due to declining soil fertility, inadequate quality clean planting material due to the slow rate of multiplication, increasing pest pressures and the high cost of labour for mounding, staking especially in the forest zone, weeding and harvesting.

Cowpea is one of the most important grain legume crops in Sierra Leone. Economically, the crop is an income earner, as it is a high-protein food and animal feed crop grown by many small-scale farmers who have limited access to inputs for the crop. Cowpea grain contains about 25% protein, making it extremely valuable where many people cannot afford protein foods such as meat or fish. The plant tolerates drought, performs well in a wide variety of soils, and being a legume replenishes low fertility soils when the roots are left to decay. Therefore, intercropping rice or other cereal crops with cowpeas contributes to enriching soil nutrients and in helping to break the pests and diseases cycle that occurs in continuous grain cropping. However, farmers lack suitable varieties for the various agro-ecological zones.

Pigeon pea is both a food and a forage/cover crop. The crop is drought tolerant and can be grown in areas with less than 650 mm annual rainfall. Pigeon pea is cultivated on marginal land by resource-poor farmers either as a sole crop or intercropped with cereals or legumes. Pigeon pea contains high levels of protein and contributes significantly to improving food security and nutrition. It has multiple uses as grain, fuel wood, livestock feed, field boundary markings and soil fertilizer. However, the absence of organized markets have acted as disincentive to farmers. Processing and value addition is limited
due to unavailability of appropriate technologies and poor infrastructure. As a marginal crop very little research has been done to promote its production.

Groundnut plays an important role as a high value buffer cash crop among small-scale farmers, meeting immediate cash needs of farmers between the planting seasons. The crop is an excellent rotation crop which can replace maize as it enriches the soil with nitrogen. Groundnut provides a vital source of cash income, and it is also a nutritious, high protein crop which could be used to prevent child malnutrition among vulnerable groups. The crop is considered a woman’s crop and, therefore, has a significant role to play in addressing issues of gender equity. However, groundnut is particularly susceptible to contamination during growth and storage. Poor storage by farmers has led to aflatoxin contamination which has negatively affected trade. There is limited processing and development of diversified products to enhance market access. Research efforts are, therefore, focusing on development of resistant high-yielding varieties, production, and post-harvest handling technologies to enhance productivity.

The motivation for writing this overview is a result of the desire to examine where we are to date in order to be able to effectively evaluate our accomplishment and chart our way for the future. Therefore the review examines the history of NARC as a research centre, followed by the present staff composition. The review also looks at NARC’s achievement to date, our present value chain focus, our major future focus, challenges, capacity building efforts and profiles of our scientific and key support staff.
Historical Background of Njala Agricultural Research Centre (NARC)

Located on Njala University campus with very strong historical ties between the two institutions, a historical background of Njala Agricultural Research Centre will be incomplete without some reference to the history of Njala University and the USAID-funded Adaptive Crops Research and Extension (ACRE) project, whose infrastructural facilities formed the foundation for the establishment of the Institute of Agricultural Research (IAR) in 1988 which later became the Njala Agricultural Research Centre (NARC) in 2008.

In 1910, the Njala Agricultural Experimental Station was established at Njala to conduct studies in tropical crops, piggery, plant and animal diseases and pests. In 1934, the Rice Research Station was established at Rokupr, and was devoted primarily to research on mangrove swamp rice. In 1939, the Njala Teacher Training College was established at Njala. In 1942, a veterinary station was set up at Teko, in Makeni, and in 1943, a livestock station was established at Musaia, in Kabala. In 1953, the oil palm research programme at Njala became the West African Institute for Oil Palm Research (WAIFOR) and the Rice Research Station was transformed into the West African Rice Research Institute.

In 1961, when Sierra Leone became independent, there were no facilities to train agriculturists to the Bachelor's degree level and few Sierra Leoneans were obtaining such training. With the assistance of the United States Agency for International Development (USAID), Njala University College was established in 1964 (Contract No. USAID/Afr-293). The University of Illinois was the contracting agency for the AID grant. The AID contract was a technical assistance contract, which provided few funds for physical facilities or infrastructure. These were the responsibility of the Sierra Leone government (SLG). It was to be an institution of higher learning dedicated to the education of both agriculturists and primary and secondary teachers, and was placed within the Ministry of Education. The new institution inherited the facilities of three existing institutions already located at Njala: the Teacher Training College, the Oil Palm Research Station and the Agricultural Experiment Station. In 1966, the University of Sierra Leone (USL) was established as a single institution comprising the two colleges, Fourah Bay College and Njala University College.

The original conception when NUC was established was that the SLG would provide the infrastructure needed. In the early years, generous funds were provided, but capital grants soon came to an end. This left NUC operating almost entirely with temporary structures, many of which were already old and inadequate when they were turned over to NUC by their previous users.

Research activities were supposed to provide NUC with the tools to help "modernize" agriculture in Sierra Leone - through both teaching and extension. Within the first five years NUC took its place in the center of the agricultural research arena. The rice research station at Rokupr (the oldest in West Africa) was placed under NUC, as were the Oil Palm Research Station at Njala and the Cattle Station at Musaia.

From the beginning, however, the college's research was clearly subordinate to the main mission - education - and when financial resources were restricted in the late 1960's and 1970's it was the research program which was first restricted. For example, activities at Rokupr were curtailed and when no budget was forthcoming, the Musaia cattle station was handed back to the Ministry of Agriculture. The lack of resources within the university to support research forced the staff to seek research funds elsewhere. In 2005, Njala University College ceased to exist and Njala University was established as an autonomous institution.

2.1 The Adaptive Crops Research and Extension (ACRE) Project

Prior to 1970, technology for production of non-rice food crops was limited in Sierra Leone. As a result, the activities of extension agents were limited to rice and some cash crops such as coffee, cocoa and oil palm.
In 1976, the Government of Sierra Leone requested assistance from the United States government in the area of Agricultural Extension and the improvement of Sierra Leone’s extension system. In response, the United States Agency for International Development (USAID), the Ministry of Agriculture and Forestry (MAF), and the Njala University College (NUC) carried out several analyses to determine the feasibility of undertaking an agricultural adaptive research and extension programme. This resulted in a project proposal entitled Adaptive Crop Research and Extension (ACRE) Project, which sets forth a cooperative effort to develop a food crop adaptive research and replicable delivery system responsive to the needs of small-scale farmers in Sierra Leone.

The ACRE project was coordinated by the Ministry of Agriculture, National Resources and Forestry (MANRF), Njala University College (NUC), and the United States Agency for International Development (USAID). The primary donor was USAID; the recipient of the grant was the government of Sierra Leone (GOSL), and the technical assistance contractor was Southern University – Louisiana State University consortium. The project headquarters and its infrastructural facilities were located at Njala on the campus of Njala University College from where it operated in five main implementation zones. The operational zones were identified by a circular area whose radius was 25 miles with centres at Kenema, Rokupr, Makeni, Kabala, and Njala itself.

ACRE like NUC was established as a jointly funded project by USAID and the government of Sierra Leone. Structurally, ACRE lies within the Ministry of Agriculture, and it utilizes the research personnel of NUC while maintaining a separate campus within NUC grounds.

ACRE was seen as a way of linking research and extension. However, since NUC staff were already involved in the training of extension personnel, a more coordinated funding policy on the part of USAID could have involved them in funding NUC directly, rather than in funding a separate institution. This policy would have strengthened the original institutional investment in NUC. The incorporation of ACRE within NUC might also have reduced the additional financial pressures on the GOSL, following the establishment of a separate institution with co-funding arrangements.

### 2.1.1. Research Division at ACRE

The Research Division at ACRE project carried out trials at Njala to identify improved crop varieties and improved cultural practices. Those that showed promise were tried in all the five implementation zones to determine how well they adapted in the various ecologies. Information obtained from adaptive trials were then used by the extension wing to plan and implement demonstrations in farmers’ fields.

The ACRE Project maintained strong links with international research institutions which provided improved varieties of sweet potatoes, cassava, cowpea and maize seeds. These food crops were then tested to determine their adaptability to local conditions.

There was also a modern well-equipped laboratory for agricultural research to analyze soil and plant samples for fertilizer recommendations for farmers.

### 2.1.2. Extension practices at ACRE

The ACRE project used a whole range of extension techniques to transfer the new improved technologies to the small scale farmers. The extension staff offered

- Field days and agricultural shows, where kits were distributed;
On-farm results and methods demonstrations, with full farmer participation;

- Farmer training during regular group meetings;
- Regular farm visits;
- Publicity brochures and pamphlets;
- Farmer certification ceremonies; and
- Farmer compensation.

In ACRE’s extension strategy, farmer involvement was paramount. The ACRE staff believed that combining research and extension in the same program and giving the farmer a central role to play would quickly lead to the desired technology transfer.

The ACRE Project phased out in 1987 and in its place, the Institute of Agricultural Research (IAR) was established under the Ministry of Agriculture. The IAR inherited all the infrastructure left behind by the ACRE project. The administrative, research and extension mechanisms were inherited by IAR wholesale, with minor modifications in nomenclature. Thus the Extension Department became the Outreach Department and the Extension Coordinator under ACRE became the Outreach Coordinator under IAR. However, unlike the ACRE project, the newly established IAR, with sole funding from the government of Sierra Leone, began experiencing financial challenges. Funds were either inadequate or do not arrive on time, or both. Crumbling infrastructure and other facilities left behind by the ACRE project could not be maintained. Electricity supply and mobility became major challenges. The state-of-the-art laboratory started to lose its effectiveness as consumables went short in supply and persistent electricity shortages rendered operations impossible. Outreach and zonal operations became difficult to maintain.

2.2 Selected Infrastructure established by the ACRE Project and currently used by NARC

![Figure 1: NARC Administrative Building](image)
Figure 2: Soil and Plant Analysis laboratory

Figure 3: Seed preparatory and storage centre
2.3. The Institute of Agricultural Research (IAR)

The Institute of Agricultural Research (IAR) was established by the Government of Sierra Leone in March 1988 to promote and conduct research on the improvement, processing and utilization of major food crops that are complimenting the country’s staple crop, rice. The IAR inherited all the infrastructure left behind by the ACRE project. The goal of the IAR was to develop
technologies that will increase farmer’s production and improve their welfare. Emphasis was on the improvement and management of the major Root and Tuber crops (cassava, sweet potato and yam), grain legumes (cowpea, groundnut and soybean) and the cereal maize. Research was also conducted on the economics of production of these crops, gender issues as they relate to farming, soil management, crop processing, storage, development of recipes and nutrition, particularly of the rural people.

In 1985, the National Agricultural Research Coordinating Council (NARCC) was established to coordinate research and harmonize research activities. The Mission of NARCC was to support the promotion of pro-poor sustainable growth for food security and job creation as part of Sierra Leone’s Poverty Reduction Strategy Paper. Its mandate was confined to annual crops. The two constituent institutes of NARCC were the Rice Research Institute dealing with rice, millet, sorghum, banana, plantain and vegetables, and the Institute of Agricultural Research dealing with cassava, sweet potato, yam, maize, cowpea, groundnut, soybean and sesame. The earlier research institutes became defunct. The devastation of research infrastructure during the civil war and the departure of well-trained scientists during this period brought agricultural research to a halt.

After a period of coordination of agricultural research under NARCC, the Government of Sierra Leone (GoSL) established the Sierra Leone Agricultural Research Institute (SLARI) through the SLARI Act of Parliament of 2007. SLARI is now the agricultural research and agricultural technology generating body for the benefit of the farming, fishing and forestry sectors and to provide for other related matters. At present, SLARI has six operation centres: (i) Njala Agricultural Research Centre (NARC) which was previously IAR; (ii) Rokupr Agricultural Research Centre (RARC); (iii) Kabala Horticultural Crops Research Centre (KHCRC); (iv) Teko Livestock Research Centre (TLRC); (v) Kenema Forestry and Tree Crops Research Centre (KFTCRC); and (vi) Magbosi Land and Water Research Centre (MLWRC).
3.0 Administrative matters

3.1 Structure and Composition of the Njala Agricultural Research Centre (NARC)

The Centre is headed by the Director, Dr. Abdul R. Conteh, who is answerable to the Director-General of SLARI. Research scientists, specializing in various disciplines, work in the various research programmes under the overall and direct supervision of the Director. Support staff, such as Administrative/Finance, Farm Management, Monitoring and Evaluation, Estate and Security divisions, provide administrative and other support services to the research activities undertaken by the Centre.

3.2 Areas of Operation

The Centre is located within the Njala University Campus in Southern Sierra Leone with outstations (Zones/Crop Sites) in eight districts (Moyamba, Bo, Kenema, Kailahun, Koinadugu, Bombali, Port Loko and Kambia). A new crop site is proposed for Pujehun at Zimmi, Makpelea Chiefdom, and awaits implementation. This is an important cassava growing area with a potential to support on-going trade in cassava products with neighboring Liberia. There is a need to strengthen the existing crop sites and make them more effective in their respective areas to facilitate the distribution of bulky planting material to farmers in good state and more economically.

NARC currently has 170 members of staff on its payroll with a research staff strength of 32 scientists of which 3 are currently Ph.D., 6 are M. Phil. and 23 are M. Sc. (17 research scientists, 5 Social Scientists in the Socio-economics, Policy Research and Outreach programme and 1 Assistant M&E Officer). Two of the M.Phil. Scientists have successfully defended their Ph.D. Theses and will graduate later this year. There are 3 Research Assistants (B. Sc.) attached to the various programmes.

3.3 Core Staff Distribution by March 2018

<table>
<thead>
<tr>
<th>Name</th>
<th>Qualification</th>
<th>Designation</th>
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<tbody>
<tr>
<td>Abdul R. Conteh (Dr.)</td>
<td>Ph. D.</td>
<td>Director, Soil Scientist</td>
</tr>
<tr>
<td>Moses J. Tucker</td>
<td>M. Sc.</td>
<td>Admin &amp; Communication Officer</td>
</tr>
<tr>
<td>Fatmata B. Samura (Mrs.)</td>
<td>MBA</td>
<td>Asst. Admin Officer</td>
</tr>
<tr>
<td>David M. Serry</td>
<td>-</td>
<td>Chief Security Officer</td>
</tr>
<tr>
<td>Alfreda Richards (Ms.)</td>
<td>Diploma HRM/Secretarial Studies</td>
<td>Assistant Confidential Secretary</td>
</tr>
<tr>
<td>Ms Marion Massaquoi</td>
<td>MBA (Finance)</td>
<td>Assistant Finance Officer</td>
</tr>
<tr>
<td>Francis F. Jusu</td>
<td>G. C. E. O-level</td>
<td>Stores Clerk</td>
</tr>
<tr>
<td>Danielson S. Gbolia</td>
<td>B. Sc. Accounting</td>
<td>Finance Assistant</td>
</tr>
<tr>
<td>Joseph O. Amara</td>
<td>B.Eng.</td>
<td>Assistant Estate Officer</td>
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<tr>
<td>Surname &amp; First name</td>
<td>Designation</td>
<td>Degree</td>
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<tr>
<td>ANTHONY, Nyahabeh M. (Ms.)</td>
<td>Research Officer</td>
<td>M. Sc.</td>
</tr>
<tr>
<td>BEAH, Aloysius A.</td>
<td>Research Officer</td>
<td>M. Sc.</td>
</tr>
<tr>
<td>BEBELEY, Jenneh Fatima (Ms.)</td>
<td>Research Officer</td>
<td>M. Sc.</td>
</tr>
<tr>
<td>BENYA, Michael T.</td>
<td>Senior Farm Manager</td>
<td>M. Sc.</td>
</tr>
<tr>
<td>CONTEH, Abdul R.</td>
<td>Director</td>
<td>Ph. D.</td>
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<tr>
<td>DUMBUYA, Gibrilla</td>
<td>Research Officer</td>
<td>M. Phil.</td>
</tr>
<tr>
<td>FORNAH, Alimamy</td>
<td>Research Officer</td>
<td>M. Sc.</td>
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<td>Asst. M&amp;E Officer</td>
<td>M.Sc.</td>
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<td>KABIA, Milton K.</td>
<td>Research Officer</td>
<td>M. Sc.</td>
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<tr>
<td>KAMANDA, Isata (Ms)</td>
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<td>M. Sc.</td>
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<tr>
<td>KAMARA, Ernest G.</td>
<td>Research Officer</td>
<td>M. Sc.</td>
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<tr>
<td>KAMARA, Mohamed S.</td>
<td>Research Assistant</td>
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</tr>
<tr>
<td>KARIM, Kumba Y. (Ms)</td>
<td>Research Officer</td>
<td>M. Sc.</td>
</tr>
<tr>
<td>KOBBA, Frederick</td>
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</tr>
<tr>
<td>KOROMA, Isatu (Mrs.)</td>
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<tr>
<td>KOROMA, Martin</td>
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<td>MANSARAY, Alimu</td>
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<td>MANSARAY, Augustine</td>
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<td>SAMBA-BARKA, Jebbeh A. (Ms)</td>
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<td>SAMURA, Alusaine E.</td>
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<td>SERRY, Kadiatu N. (Ms)</td>
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<td>SESAY, Janatu V. (Ms)</td>
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<td>SESAY, Lansana</td>
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<td>TARAWALI, Abdul R.</td>
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<td>WILLIAMS, Martha S. E. (Ms)</td>
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<td>YILA, Keiwoma M.</td>
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<td>M. Sc.</td>
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**Table 3: Scientific Staff by Discipline and Gender**

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<td>Tissue Culture</td>
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<td>Seed Systems</td>
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<td>Plant Pathology</td>
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<td>Entomology</td>
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<td>Plant Physiology</td>
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<td>Agric Economics</td>
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Table 4: Support Staff by Category and Gender

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4.0 On-Going Research Activities

The following projects are currently on-going at the Njala Agricultural research Centre

- Development of improved, adapted cassava genotypes for food, feed and industrial application
- Assessing farmer adoption of released cassava varieties in Sierra Leone
- Multiplication of Released SLICASS Cassava Varieties
- Improving Cassava Productivity through Sustainable Nutrient Management in the Farm
- Cassava Insect pests, diseases and weed survey
- Enhancing Productivity in Cassava Based Cropping Systems with Intercropping Technologies in Sierra Leone
- Yam And Cocoyam Improvement And Productivity Trials
- Development and deployment of improved adapted groundnut (*Arachis hypogaea* L) genotypes for increased productivity in Sierra Leone
- Production And Promotion Of Orange-fleshed Sweet Potato (OFSP) To Control Vitamin A And Antioxidants Deficiency In Sierra Leone
- Soybean And Cowpea Development
- Pigeon pea improvement program
Figure 6: Checking yellow cassava products for carotenoids

Figure 7: Training on use of cassava flour

Figure 8: Distributing improved cassava varieties to farmers

Figure 9: Measuring performance of sweet potatoes on-farm

Figure 10: Searching for High Starch cassava

Figure 11: Developing new cassava varieties by crossing
Figure 12: Evaluating Orange-Flesh Sweet Potato on farmers’ farms

Figure 13: Supporting sweet potato farmers with farm tools

Figure 14: Mosaic infested cassava

Figure 15: Purified cassava using Tissue Culture at NARC
Figure 16: Multiplication of released cassava varieties

Figure 17: Visit of Former Agriculture Minister, Prof Monty Jones, to NARC’s cassava multiplication site

Figure 18: Observing the performance of hybrid groundnut

Figure 19: Observing field performance of mutated groundnut

Figure 20: Nutritious and delicious cassava-soy drink at NARC

Figure 21: Nutritious and delicious cassava pastry at NARC
## Table 5: Recently Completed and On-going Projects at NARC

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Start Date</th>
<th>End Date</th>
<th>Status</th>
<th>Sponsor</th>
<th>Lead Scientist</th>
</tr>
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<tbody>
<tr>
<td>Putting Nitrogen fixation to work for smallholder farmers in Africa (N2Africa), Sierra Leone.</td>
<td>January 2011</td>
<td>December 2013</td>
<td>Completed</td>
<td>Bill Gates/IITA</td>
<td>Dr Fomba</td>
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<tr>
<td>Dissemination of New Agricultural Technologies in Africa (DONATA)</td>
<td>July 2008</td>
<td>December 2013</td>
<td>Completed</td>
<td>ADB/FARA/CORAF</td>
<td>Dr Fomba</td>
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<tr>
<td>Upscaling the Nigerian Flash Drying Experience for Sustainable Regional Trade and Income Generation in West Africa (UDESWA)</td>
<td>January 2013</td>
<td>October 2016</td>
<td>Partially completed</td>
<td>CORAF/WECARD</td>
<td>Dr Fomba/Jeff Momoh</td>
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<tr>
<td>Development and dissemination of high yielding cassava (Manihot esculenta Crantz) genotypes for increased adoption and productivity in Sierra Leone</td>
<td>July, 2011</td>
<td>July, 2014</td>
<td>Completed</td>
<td>AGRA</td>
<td>Mr Festus Massaquoi</td>
</tr>
<tr>
<td>Development and deployment of Improved and adapted high yielding Groundnut (Arachis hypogaea L) genotypes for increased productivity in Sierra Leone</td>
<td>June 2014</td>
<td>June 2017</td>
<td>On-going</td>
<td>AGRA</td>
<td>Mr A.R. Tarawali</td>
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<tr>
<td>Piloting the production, promotion and consumption of Orange Flesh Sweet Potatoes in sierra Leone to reduce child morbidity and mortality</td>
<td>April 2016</td>
<td>March 2017</td>
<td>On-going</td>
<td>Helen Keller</td>
<td>Mr Moses Tucker</td>
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<td>Project Title</td>
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<tr>
<td>Negative Externalities of Intensification of land cultivated in peri-urban areas: methods and tools assessment and alternative practices.</td>
<td>January 2016</td>
<td>September 2016</td>
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<td>Dr Abdul Conteh</td>
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<td>Development of improved, adapted cassava genotypes for food, feed and industrial application</td>
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<td>WAAPP</td>
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<td>Occurrence and Distribution of Major Cassava arthropod pests in Sierra Leone: A survey</td>
<td>June 2014</td>
<td>June 2016</td>
<td>Completed</td>
<td>WAAPP</td>
<td>Mr Augustine Mansaray</td>
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<td>Incidence and Severity of Major Diseases of Cassava across Districts in Sierra Leone</td>
<td>June 2014</td>
<td>June 2016</td>
<td>Completed</td>
<td>WAAPP</td>
<td>Mr Alusaine Samura</td>
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<td>Improving the Nutritional Quality of Soy-Bean Fortified Gari Products in Bo, Kenema, Bombali and Tonkolili Districts (Sierra Leone)</td>
<td>June 2014</td>
<td>June 2016</td>
<td>Completed</td>
<td>WAAPP</td>
<td>Mrs Isatu Koroma</td>
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<td>Multiplication of Released Cassava Varieties (SLICASS 4 and 6)</td>
<td>June 2014</td>
<td>July 2016</td>
<td>Completed</td>
<td>WAAPP</td>
<td>Mr Michael Benya</td>
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<td>Genetic analysis for high starch, dry matter content and yield in cassava (<em>Manihot esculenta</em> Crantz)</td>
<td>January 2014</td>
<td>December 2017</td>
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<td>WAAPP</td>
<td>Kumba Yannah Karim</td>
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<td>Genetic diversity, stability and inheritance of micronutrients (β-carotene, iron and zinc) and protein in cassava (<em>Manihot esculenta</em> Crantz) in Sierra Leone</td>
<td>January 2014</td>
<td>December 2017</td>
<td>on-going</td>
<td>WAAPP</td>
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<td>Genetic variability, inheritance and stability of dry matter production and</td>
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<td>associated traits in Cassava (<em>Manihot esculenta</em> Crantz) in Sierra Leone</td>
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<td>Enhancing Productivity In Cassava-Based Cropping Systems With Intercropping</td>
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<td>Mr Keiwoma Yila</td>
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<td>Technologies In Sierra Leone</td>
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<td>Meristem tip culture techniques and virus indexing for cleaning selected</td>
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<td>Incidence, Severity and Diversity of the Cassava Mosaic Geminivirus in</td>
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<td>Evaluation of cassava genotypes for the anthracnose resistance by leaf disc</td>
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<td>complementary foods enriched with groundnut in two regions of Sierra</td>
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<td>Leone</td>
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<td>Retentions and bioavailability of beta-carotene, iron and zinc in <em>fufu</em></td>
<td>January 2014</td>
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<td>WAAPP</td>
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<td>Strengthening cassava value chain through sustainable nutrient management in the farm</td>
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<td>Abdul Rahman Conteh</td>
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WAAPP: West African Agricultural Productivity Programme (Funded by the World Bank and the Sierra Leone Government)

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**Figure 22:** Collecting soil samples to assess soil fertility

**Figure 23:** Promoting NARC products at the World Food Day
5.0 Achievements at NARC

5.1 Technology Generation

- Fourteen (14) Cassava varieties developed and released with yield range of 25 – 40 t/ha
- Four (4) Soya beans varieties developed and released with yield range of 1.5 -1.6 t/ha
- Two (2) high-yielding varieties of cowpea developed and released
- Four (4) high-yielding sweet potatoes varieties developed and released
- One (1) groundnut variety developed and released.
- Five (5) yam varieties developed and ready to be released (mini-set multiplication in progress)

Figure 24: Multiplication of released cassava variety at NARC’s Outreach crop site
5.2 Management Practices

- Integrated Pest Management (IPM) on the prevalence and severity of insect pest have been mapped for both dry season and rain season.
- Integrated Pest Management (IPM) training module developed
- Cassava insect pest and disease identification techniques have been developed
- Four (4) recipes have been developed on cassava flour for confectionary
- The most economically-profitable intercropping system for cassava has been identified.
- Over 100 varieties of orange flesh have been introduced and evaluated. Promising varieties are presently being promoted for adoption.

6.0 Current Focus on Crop Value Chains

6.1 Sweet Potato Value Chain

Actions to develop the Sweet Potato value chain include:

1) Alleviating Vitamin A Deficiency through the development and promotion of Orange-fleshed Sweet Potato (OFSP)
2) Sweet Potato product value chain analysis, mapping and identification of constraints and opportunities.
3) Multiplication and dissemination of orange flesh varieties and other high yielding pest and disease resistant varieties
4) Training of youths Farmers-Based Organizations (FBO) in production, processing and packaging of sweet potato products
5) Partial enterprise budgeting and market analysis for OFSP production
6) Promotion of OFSP based feed for fishing communities.

6.2 Piloting the Production, Promotion and Consumption of Orange Fleshed Sweet Potatoes in Sierra Leone to Reduce Child Morbidity and Mortality

The white-fleshed sweet potato, which is low in Vitamin A, is widely consumed as a starch in Sierra Leone and its production has increased by 34% since 2007. As in other West African countries, sweet potato leaves are also widely used as greens and cooked as a traditional dish. Given the nutritional qualities of the orange flesh variety as an excellent source of energy and of Vitamin A, the replacement of the white variety for the OFSP should make a significant contribution to the increase of Vitamin A among Sierra Leoneans (particularly children and women) and will complement both the twice yearly campaign and routine supplementation of Vitamin A for children 6-59 months and the fortification of staples (oil and flour) with micronutrients.

Against this background, Helen Keller International (HKI), working in collaboration with NARC/ SLARI, embarked on a project aimed at promoting OFSP to combat Vitamin A deficiency as a food-based approach. OFSP varieties were introduced and evaluated at the NARC Research site in 2014/15 and 6 elite varieties were identified for further testing in multi-locations in 2016. Three varieties have been identified and are now being promoted.
6.3 Current Focus on Soybean Value Chain

Soybean product value chain analysis, mapping and identification of constraints and opportunities.

Multiplication and dissemination of newly released soybean varieties (SLIBEAN 1, SLIBEAN 2, SLIBEAN 3)
6.4 Current Focus on Cowpea Value Chain

Cowpea product value chain analysis, mapping and identification of constraints and opportunities.
Multiplication and dissemination of newly released varieties (SLIPEA 4 and SLIPEA 5)

Figure 29: Multiplication of released cowpea varieties at NARC

6.5 Yam and Cocoyam Value Chains

Actions will include:

- Yam product value chain analysis, mapping and identification of constraints and opportunities
- Promotion of Staking options and intercrop technology
- Multiplication and dissemination of ware and seed yam
- Economic analysis for the various staking options and research on major socioeconomic issues related with yam promotion and marketing
- Training of farmers on mini-set technique
6.6 Cassava Value Chain

- Development of value chain for starch, high quality cassava flour, and cassava-based livestock feed
- Promotion of pro-vitamin A cassava to minimize vitamin A deficiency and other micro nutrients (Iron)
- Multiplication and dissemination of SLICASS 7 to 14 and other promising genotypes
- Establishment of pests, weeds and disease surveillance system

Figure 30: Evaluating new cassava varieties on-station

- Promotion of Neem technology for the control of pests, and diseases of cassava and herbicide for the control of weeds
- Development of soil and land suitability maps and promotion of guideline for effective and efficient use of fertilizer
- Fabrication and testing of small scale production and processing tools (i.e. mechanical weeders, harvesters and cassava graters)
- Rehabilitation and support to Cassava processing center at Njala
7.0 Farm Management Activities in Support of Research and Development

The farm Management Unit provides constant support to multiple operations field operations involved in NARC’s research activities. Specifically, the Farm Management Unit:

- Allocate plots to scientists to establish experiments
- Co-ordinate the distribution of labour
- Supervise appropriate samples for exhibition of tasks
- Provide appropriate samples for exhibition on field days and training workshops
- Ensure the availability of adequate planting materials for on farm and participatory varietal selection trails
- Support research and outreach staff in establishing community multiplication plots
- Assist in training farmers involved in multiplying various NARC mandate crops.

Planting Materials Multiplied at Centre

- Yam
- Soybean
- Sweet Potato
- Cowpea
- Groundnut

Breeder seed in Store

- Cowpea (350 kg of different varieties)
- Soybean (45 kg of different varieties)
- Yam (599 kg of different genotypes)
- Aerial yam (18 kg of different genotypes)
- Chinese yam (56 kg of different genotypes)
- Elite breeding Cowpea lines (29 genotypes 16 kg)
- Elite breeding Soybean lines (39 genotypes 5 kg)

Equipment available

Tractor (3)
- 70 HP (2 but 1 faulty)
- 35 HP (1)

Power tiller (9)
- 6 in Njala (3 in store, 1 working and 2 faulty)
- 1 in Makeni Zone
- 1 in Kenema Zone
- 1 in Teko (Was supplied to Teko by NARC)
8.0 Primary Outlook: Cassava Intensification and Industrialization in Sierra Leone

**Cassava** (*Manihot esculenta* Crantz) is the second most important food crop in Sierra Leone, after rice. The tubers and leaves of cassava constitute a significant portion of the diet of Sierra Leone’s population. Cassava production in Sierra Leone is predominantly carried out by females, using hoes for cultivation, in poor, infertile soils, including marginal lands that cannot support other crops. There is virtually no mineral fertilizer use and nutrients removed at harvest are not being replaced. The Sierra Leone Agricultural Research Institute (SLARI) has produced several improved high-yielding, disease-resistant, and nutritious varieties of cassava with industrial potential. However, these varieties are still on the research stations in small quantities and need to be multiplied rapidly to get enough foundation planting materials that will be available to farmers and other stakeholders along the agricultural value chain in the country. Getting improved planting material from the research station to the hands of farmers remains a complex challenge in Sierra Leone.

Sierra Leone is the third largest cassava producer after Nigeria and Ghana in the ECOWAS region and the largest producer of cassava in the Mano River Union (Figures 31, 32 and 33). Cassava is grown in all five agro-ecological zones both as sole and mixed crop by farmers. Production has been increasing since 2010 from 3,250,044 tons to over 4,135,064 tons in 2016 (FAOSTAT, 2016; http://www.fao.org/faostat/en/#country/197).

![Figure 31: Comparative Trends for Cassava Production (tonnes) in Guinea, Liberia and Sierra Leone](image_url)
Market opportunities are currently significant for cassava, with growing demands in domestic, regional and international markets. Smallholders have not been able to respond effectively to exploit these opportunities because of a number of
structural and institutional constraints that limit market participation. Bottlenecks at one stage of the supply chain depress the incentives for investment and growth at other stages of the supply chain. Market failures caused by high transaction costs, risk and problems of contract enforcement are widespread in rural areas.

The Government of Sierra Leone views and treats cassava as a future commercial commodity in the economy, requiring dynamic development processes with focus on exploiting its full economic potential. Diversifying and expanding utilization in new growth markets like flour, starch, sweeteners, ethanol and livestock feed as substitutes for various imported items present real opportunities to exploit. Sierra Leone seeks to exploit commercial opportunities offered by the unique characteristics of cassava while contributing to the development of an effective agro-industrial cassava sector through strategic programs, processes and linkages with stakeholders across the production to consumption continuum. Using integrated primary production, processing and marketing processes will add value, generate profits through import substitution and exports, contribute to employment and income generation at the farm level for improved and sustainable livelihoods and provide linkages between the persistently impoverished rural communities with a range of products demanded in domestic, regional and continental economies.

8.1 NARC Proposed Action Plans for Cassava Industrialization in Sierra Leone

- **Enhance strong farmer linkages**
  Enhancing linkages between processors, marketers and smallholders through well-planned out grower schemes and block farmer arrangements will strengthen supply chains. In situations where they are needed, going a step further to provide or bring in tailored service providers like finance to farmers to enable access to inputs will incentivize increased production and strengthen trust and loyalty bonds with the primary processor.

- **Promotion of improved varieties**
  Promoting access to and use of improved varieties that align to the targeted final end product, for example higher poundable trait for consumption, starch and dry matter content if supplying to processors, or higher resistance to disease for higher yields, etc. will go a long way in increasing the value of harvested produce, both to the farmer and to the primary processors.

- **Access to mechanization:**
  Enhancing the availability of mechanization, especially for land preparation, to save on time spent in man-hours and labour costs will enable farmers to increase planted areas for commercial buyers at reduced costs.

- **Improved infrastructure:** Improved access to farms through building better road networks in areas where cassava is grown has the potential to substantially reduce transportation costs and can make it easier for processors and traders to access sufficient volumes of supply.

- **Better awareness of cassava’s potential:** Sustained efforts to increase awareness among all stakeholders including: to farmers on the potential benefits of farming cassava; to processors on the importance of maintaining quality and keeping production costs low; and to end-users on the various products and adoption/substitution prospects available based on a quality, supply consistency and pricing perspective.
Products promotion:
  - **HQCF**: Promote and demonstrate feasibility of HQCF substitution for different products and prove market demand and sufficient supply for commercial use. As a parallel step, develop innovative incentives that will promote adoption rather than mandating inclusion, which has proven difficult to enforce in other environments.
  - **Dried chips—For animal feed and for export**: Promote adoption of low-cost chipping machines and rack dryers among small farmers and cooperatives to enable them to produce at scale while keeping costs low.

8.2 Large-scale multiplication and dissemination of improved varieties

A number of cassava varieties (SLICASS 1 to 14), some of which are nutritious yellow-flesh varieties, have been released with yields ranging between 25 - 30 t/ha. As Sierra Leone approaches food self-sufficiency in the production of cassava, the demand for higher quality varieties that meet industrial standards has increased. The aim of the multiplication scheme is to expedite farmers’ timely access to quality planting materials of industrial grade SLICASS varieties on a sustainable basis.

This intervention will utilize rapid multiplication techniques including tissue culture and Semi-Autotrophic Hydroponics (SAH), a new rapid multiplication of virus-free cassava planting material developed at the International Institute of Tropical Agriculture (IITA) in Nigeria. This intervention will facilitate access of quality planting material of cassava, to a target of 200,000 farmers in Sierra Leone, 50% of whom will be women, to help strengthen their productive systems. It is expect that this will result in increased crop production and productivity which will create jobs, increase the income of the farming household thereby improving the livelihood for our small-scale farmers.

8.3 Promotion and adoption of Integrated Soil Fertility Management (ISFM) for Cassava

Although cassava is the second most important food crop in Sierra Leone, relatively little attention, other than the release of improved varieties, has been paid by the research and development community to better manage its productivity. This has been partly attributed to the misconception that cassava performs well under sub-optimal conditions and is unlikely to respond to inputs. Currently, cassava farmers do not seem to invest in soil fertility but look for ways of coping with ever less fertile soils, thereby degrading them to a stage where cropping becomes unprofitable. Even where improved varieties are used, potential yields of 30 t/ha have not been achieved.

This intervention will provide soil management guidelines for sustainable cassava production in Sierra Leone by identifying strategies by which appropriate soil management practices can be incorporated into cassava cropping systems to improve cassava productivity, sustain soil fertility, strengthen cassava value chain and contribute towards improving food security, income and livelihood of the cassava value chain actors in Sierra Leone. The main thrust will be to develop soil management technologies for increasing productivity in cassava-based farming systems through integrated use of mineral fertilizer and management of locally available plant nutrient sources. This intervention will shift cassava from a subsistence crop to a cash crop and hopes to increase productivity of 50,000 farm families by developing sustainable and productive cassava cropping systems and linking farmers to agro-dealers and other farm service providers.
8.4 Cassava Mechanization and Agro-Processing

One of the key constraints to cassava production in Sierra Leone is lack of mechanization or of appropriate production and processing tools. The main challenge is that market opportunities for Sierra Leone cassava are limited compared to other cassava producing regions of the world. It has been established that where cassava farmers have access to markets, they tend to adopt productivity enhancing technologies. Cassava can be a major source of feed for livestock. Studies at the International Livestock Research Institute (ILRI) have shown that High Quality Cassava Peel is comparable to maize meal in the ratio 3:2. However, the use of cassava as feedstock in the manufacturing industry, and other large-scale uses such as livestock feed requires the existence of a large number of small-scale cassava processing units.

The existing capacity for manufacturing quality cassava processing equipment in Sierra Leone is limited and unless this capacity is enhanced, it is unlikely that cassava farmers and entrepreneurs will benefit from these new market opportunities. Manufacturers in Sierra Leone can obtain prototypes from foreign manufacturers and fabricate them locally.

To address the above production challenges, NARC is proposing an intervention with the goal of enhancing the contribution of cassava production and processing technologies to sustainable improvements in cassava and livestock production, food security, incomes and livelihoods of farmers, processors, and marketers in the cassava and livestock value chain in Sierra Leone.

This intervention will develop competitive cassava commodity value chains for a reliable supply of processed products for food and non-food industrial use, by upgrading and expanding traditional planting, harvesting and processing techniques in selected districts of Sierra Leone.

The specific objectives of this intervention are to:

1. Negotiate access and transfer of cassava mechanization and agro-processing technologies for use by smallholder farmers
2. Increase cassava production through mechanization across the entire value chain and thus reduce postharvest losses and demands for intensive labour
3. Add value to the cassava industry through value addition and creation of market linkages by linking smallholder farmers with agro-processing centers
4. Build capacity of local entrepreneurs to design prototype machines, manufacture, maintain and repair the necessary equipment for cassava planting, harvesting and processing
5. Expand the utilization of safe, quality, diversified, value added cassava products and derivatives
6. Establish a project governance and management system that will assure the efficient realization of the above objectives

This intervention will target 50,000 smallholder farmers including livestock producers, agro-processors, service providers and fabricators in Sierra Leone. Cassava and livestock producers and farmers who need labour-saving cassava production and processing technologies will particularly benefit from this intervention. This will lead to increased incomes and better livelihoods for millions of cassava farmers, livestock producers, and thousands of small-scale entrepreneurs through the use of cassava as a raw material for livestock feed and manufacturing various products in Sierra Leone.
8.5 Promotion of High Quality Cassava Flour (HQCF) for Bakeries and Confectioneries

Because of their perishability, most cassava roots are usually consumed or marketed close to the centres of production. The vision for cassava in Sierra Leone is that cassava will spur rural industrial development and raise incomes for producers, processors, and traders. To achieve this vision, a demand-driven approach to promote and develop cassava-based industries. Therefore, a major challenge for Sierra Leone is to create a strategy that affects production, processing, and marketing. One potential industrial product of cassava is cassava flour. Cassava flour can be mixed with wheat flour to produce a composite flour. If cassava flour is substituted into wheat for bakeries and other confectionary products, this will not only spur productivity but will only also save the nation extra foreign currency that has been traditionally used to import wheat and wheat flour for bakeries (Tables 6 and 7). Sierra Leone can reap the benefits cassava has to offer only if we can find industrial utilization for this crop. High Quality Cassava Flour (HQCF) has been developed for this purpose for partial substitution of wheat flour for bread baking and confectioneries production.

Some of the known agro-processors and bakeries in the country have provided information on the most common wheat/cassava flour proportions they use to produce the composite bread (Table 8).

This intervention will work with selected numbers of farmers and farmers’ groups, agro-processors, and bakeries who will be provided with attractive incentives to produce 2 or more wheat/cassava flour composite types of bread acceptable to consumers. Based on these activities, recommendations will be made to the Sierra Leone government to launch a legal framework for nationwide production of various types of composite bread from wheat/cassava flour in order to conserve...
valuable foreign exchange, create employment especially for the youth, and raise incomes for cassava producers and processors.

Table 6: Total yearly wheat importation in Sierra Leone (2010 - 2014) and Possible Savings at 5 – 20% Substitution of Cassava Flour

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT</td>
<td>38,000</td>
<td>62,000</td>
<td>45,000</td>
<td>41,000</td>
<td>45,000</td>
</tr>
<tr>
<td>US$</td>
<td>9,500,000</td>
<td>15,500,000</td>
<td>11,250,000</td>
<td>10,250,000</td>
<td>11,250,000</td>
</tr>
<tr>
<td>5% substitution</td>
<td>475,000</td>
<td>775,000</td>
<td>562,500</td>
<td>512,500</td>
<td>562,500</td>
</tr>
<tr>
<td>10% Substitution</td>
<td>950,000</td>
<td>1,550,000</td>
<td>1,125,000</td>
<td>1,025,000</td>
<td>1,125,000</td>
</tr>
<tr>
<td>15% Substitution</td>
<td>1,425,000</td>
<td>2,325,000</td>
<td>1,687,500</td>
<td>1,537,500</td>
<td>1,687,500</td>
</tr>
<tr>
<td>20% Substitution</td>
<td>1,900,000</td>
<td>3,100,000</td>
<td>2,250,000</td>
<td>2,050,000</td>
<td>2,250,000</td>
</tr>
</tbody>
</table>

Table 7: Annual Wheat Flour Importations (2010 - 2014) in Sierra Leone and Potential Foreign Exchange Savings by Substituting Given Quantities of Cassava Flour

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT</td>
<td>15,000</td>
<td>25,000</td>
<td>35,000</td>
<td>45,000</td>
<td>55,000</td>
</tr>
<tr>
<td>US$</td>
<td>5,535,000</td>
<td>11,725,000</td>
<td>16,415,000</td>
<td>21,105,000</td>
<td>25,795,000</td>
</tr>
<tr>
<td>20%</td>
<td>1,107,000</td>
<td>2,345,000</td>
<td>3,283,000</td>
<td>4,221,000</td>
<td>5,159,000</td>
</tr>
<tr>
<td>30%</td>
<td>1,660,000</td>
<td>3,517,500</td>
<td>4,924,500</td>
<td>6,331,500</td>
<td>7,738,500</td>
</tr>
<tr>
<td>40%</td>
<td>2,214,000</td>
<td>4,690,000</td>
<td>6,566,000</td>
<td>8,422,000</td>
<td>10,318,000</td>
</tr>
<tr>
<td>50%</td>
<td>2,767,500</td>
<td>5,862,500</td>
<td>8,207,500</td>
<td>10,552,500</td>
<td>12,897,500</td>
</tr>
</tbody>
</table>
Table 8. Selected organizations involved in Wheat/Cassava Flour Composite Bread Making

<table>
<thead>
<tr>
<th>Enterprise</th>
<th>Wheat/Cassava Blend</th>
<th>Observations</th>
<th>Current State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barefoot Women Bakery-Micro Enterprise</td>
<td>50/50</td>
<td>Acceptable taste and quality. No problem selling the bread.</td>
<td>Have been selling 50 loaves a day for over one year in their small retail shop. Thinking of expanding the market to Freetown market.</td>
</tr>
<tr>
<td></td>
<td>100 percent cassava flour</td>
<td>Acceptable taste but flour does not rise.</td>
<td>Have customers who buy it.</td>
</tr>
<tr>
<td>Binkolo Growth Center</td>
<td>80/20 and 70/30</td>
<td>Free samples given out initially to selected groups in Makeni including money changers. Made two different test sales each Le150,000.00 and bread was sold easily. Those who tasted the bread keep asking for it but the bakery owner does not want to continue without some incentive award.</td>
<td>Bakery owner relatively new in the business and wants to concentrate on selling the regular wheat bread for now.</td>
</tr>
<tr>
<td>Pujehun Growth Center</td>
<td>70/30, 75/25 and 60/40</td>
<td>First two ratios were acceptable. But the 60/40 composite gets harder with time and was not easy to sell.</td>
<td>Few bakeries in Pujehun still selling composite bread but not sure about those trained in Bo.</td>
</tr>
</tbody>
</table>

8.6 Establishing and strengthening a pest and disease surveillance and forecasting network

Most farmers do not only lack the correct technique to managed agricultural pests efficiently, but also cannot correctly identify them. A recent diagnostic survey on cassava pests, weeds and diseases in 2014 under the West African Agricultural Productivity Programme (WAAPP) revealed that pests of significance included Grasshopper, Cassava green mite, Whitefly, Cassava mealy bug, Termite and Vertebrate pests (Grass cutter, Monkey and squirrel). Disease of importance included the cassava mosaic disease, cassava bacterial blight, and cassava anthracnose disease. Issues of tuber rot were also identified.

This intervention will determine farmers’ knowledge and perception on insect pests, weed and disease management of cassava and identify control option for the management of major biotic stresses on cassava. Major pests, disease and weeds associated with cassava will also be identified for surveillance. Training will be conducted for farmers in agribusiness centers.
on pest, disease and weed identification and surveillance. Integrated pest management, in particular, identification of oviposition spots for grasshoppers will also be conducted.

8.7 Socio-Economic Issues Related to Cassava Marketing in Sierra Leone

The lack of agricultural marketing opportunities and systems in Sierra Leone continues to keep farmers’ production levels at subsistence level, with farmers aiming only to farm for food rather than seeking profits for better livelihoods. Because of the lack of markets, farmers do not harvest all their tubers at the same time to prevent them from perishing. They only harvest based on daily consumption needs.

The primary focus of this intervention is to address relevant marketing issues affecting cassava smallholder farmers in Sierra Leone. This will generate marketing information system for the various stakeholders in cassava production to be able to deal with agricultural marketing/economics problems faced by farmers. Specifically, the intervention will examining the cassava marketing channels and their forms of operation within the country and provide recommendations for appropriate policy development.

8.8 Vision of Success

Successful implementation of this program will see cassava becoming an industrial crop in Sierra Leone, being able to sustain its own research; production, processing distribution and marketing. Effective and sustainable public-private partnerships and learning mechanisms for enhancing the cassava value chain will be developed. Beneficiaries will include all actors in the cassava value chain in Sierra Leone; Producers, Processors, Governments, and Research institutions.

9.0 NARC Publications 2008 - 2017

9.1 Refereed Journal Publication


9.2 Conference Proceedings


9.3 Consultancy Reports


8. S. N. Fomba. (2010). The Cultivation of Rice and Cassava (Bitter/Sweet Varieties) in Lokomassama and Masimera Chiefdoms, Port Loko District, Northern Sierra Leone. Quifel Agribusiness (SL) Limited, No. 44 The Loop, Wilberforce, Freetown, Sierra Leone.
9.4 Monographs/Technical Reports


9.5 Factsheet


9.6 Book Chapter


9.7 Podcasters


6. Kamara, E. G. Effects of packaging material and seed treatment on Weevil (Callosobruchus maculatus (F) Coleoptera:Bruchidae) infestation and quality of cowpea seeds (submitted to NARC )


10.0 Outreach Activities

10.1 Multiplication of groundnut lines in the IVS
The multiplication of groundnuts in the zone was done to generate more seeds for groundnut varieties that showed the potential of giving higher yield and resistance to rosette disease. We also included drought tolerant varieties. The Alliance for Green Revolution in Africa (AGR) funded the project. Two locations were used. Location 1 was at the Ministry of Agriculture (MAFFS) IVS and the other location was at Maforay Kola tick site. The performance of the groundnut at the maforay kola tick site was better than that at the MAFFS site. One reason was that the soil at MAFFS site was very moist at the time of planting which affected germination and eventual growth and development retarded.

10.2 Multiplication of Newly Released Cassava Varieties in Collaboration with Child Fund S/L/
The collaborative effort between Child Fund (Sierra Leone) and SLARI in the Makeni zone started in April, 2015 when this zone enhanced access to improve cassava planting materials to youth groups of Child fund (SL) in Bombali, Koinadugu and Kailahun Districts. The collaboration was official with a memorandum of understanding. The youth groups were given small amount of financial assistance with funds from AGRA. That was done by SLARI through the Child fund (SL) office.

10.3 Multiplication of sweet potato planting materials in the IVS
As a tradition, this zone ensures that some varieties of sweet potatoes cuttings are maintained to help needy farmers during periods of scarcity. Some farmers do not have access to Inland Valley Swamps and therefore cannot preserve the vines. Our interventions have been of great value to needy farmers as the crop is fast becoming a cash crop in Bombali District. Some work undertaken at the Binkolo Growth center, revealed that sweet potato High Quality Flour can be processed from the
tubers. But one problem we have is the black colour that comes when we prepared the flour into porridge. We need some input from a Nutritionist to help improve on the colour. The sweet potato akara came perfect and looks attractive to consumers. We are still exploring the value chain for sweet potato.

### 10.4 Maintenance of Cassava Germplasm

The WAAPP funded germplasm site at Maforay Kolatick, was established in August 2015 and has been well kept. Growth performance of the varieties is very encouraging. Most of the released varieties included in the trials will serve very useful role in resuscitating lost ones in farmers’ field. However, in a bid to safeguard the farm from fire last year, a fire belt was constructed. This year too, it will be necessary to construct fire belt.

### 10.5 Multiplication of soybean (TGX1485-1D) in the IVS

From all field assessment conducted by scientists from NARC, it is clear that soybean adoption is still very low. Some reasons for the low adoption are attributed to poor seed quality, problem of empty pods, low market demand and low knowledge on processing. Nonetheless Makeni zone has been making every effort to promote production, processing and utilization of the crop so as to increase level of its adoption.

### 10.6 Identification and registration of contact farmers for training and distribution of planting materials

This activity was done in collaboration with World Hope Sierra Leone, Child Fund Sierra Leone, MAFFS Bombali and IITA Sierra Leone. The registration of contact farmers covered a wider portion of Bombali district while the training focussed on improved agronomic practices for the following crops: cassava, sweet potato, ground nut and rice. Participants were selected on the recommendation of MAFFS Bombali. However, our training component included training women on developing new products from High Quality Cassava Flour (HQCF).

### 10.7 Collaborative IITA/SARD-SC/SLARI Multiplication of Released SLICASS Varieties

The availability of released SLICASS cassava varieties to needy farmers was grossly inadequate country wide. Farmers demand for these planting materials was far more than the supply. There have been repeated unmet requests for these SLICASS varieties from several agricultural stakeholders. After thorough assessment of existing available SLICASS varieties, it was discovered that most of the earlier released varieties were not widely adopted and only available in limited quantities. Also, SLARI was fast losing to fire the eight most recently released varieties. The proposal from IITA to establish cassava rescue site was overwhelmingly received by the Makeni zonal team. We saw the proposal as one best way to facilitate increased access to the SLICASS varieties. At the implementation planning with IITA we agreed on mechanical cultivation so that a larger area could be cultivated and be able to demonstrate the advantages of mechanization in agriculture. We demonstrated best-bet practices in relation to plant spacing and plant population. A total of twelve (12) SLICASS varieties were planted manually on ridges constructed mechanically in a land space of 10 hectares. We are now preparing to collect some data on varietal plant architecture, petiole colour, pound ability of each variety, dry matter percentage, taste and yield potential for the eight most recently released varieties. These data will aid us in distinguishing one variety from the other.
On October, 31, 2016, through funds from SARD SC/IITA, we organized the first ever cassava value chain field day. The occasion was graced by the Hon. Minister of Agriculture Forestry and Food Security Professor Jones. Over 400 participants were in attendance. It was so well graced that it became a mini agricultural show. The graduation ceremony of trainees from the cassava value chain training funded by the SARD SC project, climaxed the occasion with 49 people graduated on that day.

The SARD-SC project implemented by IITA bridged the relationship between SLARI and IITA. The reason was that most of the activities of the SARDSC project were implemented collaboratively by SLARI and IITA Sierra Leone. Dr.Yomeni’s strategies in the implementation of the project activities were highly welcomed by us at SLARI. The on-going women’s cassava multiplication project funded by SARD-SC at Masorry village is one that aims at establishing linkages between producers and processors of the cassava value chain. The women’s farm is located around the Village Hope cassava processing centre and that assures farmers about getting a readily available market for their cassava roots.

10.8 Village Hope Enterprises Limited Collaboration with SLARI at- Masorry

Village Hope works in close collaboration with SLARI in the Makeni zone to promote the cassava value chain. A true picture of cassava value chain can be found at Masorry where Village Hope is focused on the three major segments of a commodity specific value chain vis-à-vis production, processing and marketing. In addition to these, Village Hope does a lot on capacity building of resource poor persons in Masorry and the nine surrounding communities. Both male and female youths are trained in computer skills, wood work (carpentry) Business Entrepreneurship development and very soon some people will be trained in metal works. In the agriculture sector, Village Hope has established a network of cassava out-growers who were trained in modern agricultural practices including farm mechanizations. All tractor operators have been trained in tractor maintenance and operating skills. In the area of job provision, Village Hope has recruited about 10 permanent staff with a pull of casual workers who are ratedat Le15,000/00per day. As a representative of SLARI I provide technical support and as IP facilitator, I have served the project as funder and mentor and remain satisfactory with the tremendous effort of Dr. Jon Bart in promoting the cassava value chain in an innovative way.
There are numerous facilities at Village Hope to promote cassava value chain. The use of a mechanical cassava root peeler and mechanical gari roasters puts Village Hope and SLARI higher as contributors to the development of the agriculture sector in Sierra Leone. There were slight problems with the mechanical peeler but that is been looked at seriously. Marketing of cassava products from the factory was a little bit of problem until when we got a vendor that exports gari to the United Kingdom. Also, in and around Makeni some gari vendors have been identified to sell gari from Village Hope. There is now a steady flow of the cassava value chain. Transportation problems have been well taken care of with 1 brand new Hilux, two Range rover ford vehicles, three tractors with trailers. See some pictures below;

11 STAFF RECRUITMENT AND CAPACITY BUILDING

In 2008, the total scientific staff at the NARC was around ten with no female scientist among them. However, during the intervening period to date the scientific staff strength has risen to over 30 including ten female scientists in various disciplines.

11.1 Capacity Building

One of our staff, Dr. Moses T. Moseray, completed his Ph.D programme in Plant Breeding and was awarded the Ph.D degree by Njala University in May 2015. Three other staff members, Alusaine Samura, Isata Kamanda, and Kumba Karim have successfully defended their PhDs and await graduation. Another nine (9) of our staff members are currently enrolled in PhD program at various universities in Sierra Leone, India, Nigeria, Ghana, and the United States of America.

Fifteen (15) staff members were earlier sponsored and have completed their M.Phil degree programmes in various disciplines in Universities in Ghana, Nigeria, Sierra Leone and United States of America. Some of these are among those currently pursuing their PhD programs.

In addition to long-term postgraduate training, senior staff members also benefitted from attendances of short-term training courses and workshops over the intervening years, both at home and abroad. At the Junior Staff and Technical level, several of them attended short-term attachment training courses afforded to SLARI staff, including NARC in Ghana and IITA for a periods ranging from 2-3 months, funded by Agricultural Sector Rehabilitation Project (ASREP), N2Africa and WAAPP 1C-Sierra Leone.

With support from the WAAPP1C-SL, a series of in-country training courses were completed during this period, with five in-country courses held in addition to a direct participatory training in analyses and reporting processes associated with the cassava value chain study. Two of our senior staff, Milton Kabia and Janatu Sesay, also benefitted from fellowships offered by the International Atomic Energy Agency (IAEA) for a 6-month and a 4-month attachment with the Department of Nuclear Sciences and Applications, International Atomic Energy Agency, Austria, on Mutation Breeding.

11.2 Short-term in-country training courses

11.2.1. Statistics and statistical computing with SAS

Almost everyone is confronted with statistics in their day-to-day living. Members of staff need to be knowledgeable in order to evaluate published numerical facts and decide whether to accept or reject them on the basis of statistics obtained from the
sample. There is need to interpret results from surveys and experiments in a more professional manner. This course was designed to strengthen the data collecting, handling, and processing capability of research staff by dealing statistics and more. The course involved 48 participants drawn from different SLARI centers and Njala University.

The course content covered statistical computing and data management using SAS (or GENSTAT); parametric correlation and regression; categorical and generalized linear models (GLMs); multivariate analysis; basic and advanced experimental designs and layout; mixed models; sample surveys design and analysis and GGE bi-plot analysis.

At the end of the course, the participants were able to:

- Identify various types of scientific data and their collection procedures
- Design and analyze sample surveys
- Perform routine and advanced data screening and integrity checks
- Generate descriptive statistics and explore data with graphs
- Generate and interpret sample statistics using the UNIVARIATE and MEANS procedures
- Detect associations among variables
- Perform analysis of variance and apply multiple comparison techniques
- Perform linear and multiple regression and assess the assumptions
- Fit a multiple and binomial logistic regression model
- Perform multivariate analysis

11.2.2. Scientific writing for agricultural researchers in Sierra Leone

This training course equipped 25 SLARI scientists and a lecturer from Njala University with the tools to enable them to write and present well-argued and documented scientific work that is acceptable for peer-reviewed publication with results are easy for other stakeholders to comprehend and use.

Figure 36: Participants of the in-country course on scientific writing for agricultural researchers in Sierra Leone.
On completion of the course, participants were better prepared and able to:

- Write scientific papers and documents to a professional standard and in accordance with acceptable formats;
- Present information in an organized, structured way so as to achieve a specific objective of scientific communication;
- Use appropriate style and vocabulary, while displaying sensitivity to different levels of reader expertise;
- Express ideas with confidence and clarity and supporting persuasive and logical arguments;
- Adapt technical knowledge and information for a variety of a) professional audiences and b) public audiences;
- Communicate research findings effectively with peers and the wider agricultural community including different stakeholders and actors along the agricultural commodity value chains.

11.2.3. Cassava value chain analysis

A select team of scientists with different disciplines were trained and mandated to carry out data cleaning and analysis and initiate writing the Cassava Value Chain report as indicated in the expected outputs of the study as follows:

- A credible database for the cassava value chain generated
- Production, processing, and marketing structures identified
- Market and marketing opportunities for farmers, processors, and traders identified
- Major opportunity for growth, supporting organizations, and regulatory framework determined
- Sufficient information for policy formulation in creating markets (both local and international) for profitability generated
- Strategic and implementation plans for improving the cassava industry compiled

![Figure 37: Participants of the in-country course on cassava value chain analysis.](image)
Training took place between 30 May and 3 June 2016 with backstopping provided by IITA Njala, Ibadan, and Cotonou staff.

In conclusion, the IITA Technical Advisor was mandated to submit the framework of reporting and detailed introduction to the study while Mr. Bandabla was requested to redo the methodology for the study based on the actuals. A supplemental data collection on missing variables was also agreed after detailed verification of the missing data in order to have a robust report with quantitative analyses rather than a descriptive report.

![Pie chart showing the distribution of cassava selling points in Sierra Leone.](image)

**Figure 38: Selling Points of cassava produced by farmers in Sierra Leone**

![Pie chart showing various sources of cassava cuttings.](image)

**Figure 39: Farmers’ sources of cassava cuttings in Sierra Leone**
11.2.4. Electronic field data capture

The use of paper by SLARI scientists for field, laboratory, and socioeconomic data collection/capture hinders analysis and reporting by scientists. Most scientists lack the expertise to carry out electronic data capture especially in dealing with socioeconomics studies. The objectives of the course were to equip scientists with data capture skills using electronic/devices (tablets and smart phones) to ease data collection and speed up analysis; enable research scientists (breeders, agronomists, socioeconomists, field technicians, etc.,) to fully recognize the benefit associated with using electronic devices in building template, traits and collecting data; serve as a Training of Trainers platform whereby trained participants would train other scientists and technicians using acquired skills.

At the end of the training, it was expected that:

- Scientists and technicians will fully recognize benefits associated with using electronic devices instead of paper in building template, traits, and collecting data.
- Scientists and technicians will have skills in using electronic devices to capture field, laboratory, and socioeconomic data.
- Participants will be able to transfer the acquired knowledge to other SLARI scientists and technicians.

Figure 40: Participants of the in-country course on electronic field data capture.
11.2.5. Training of bakers and caterers on the use of HQCF in Sierra Leone

The course was undertaken to enhance market value, competiveness, and adoption and the use of high quality cassava flour (HQCF) with wheat in a composite for bread and other confectionary products, leading to increased food variability and security, value addition, and improved income. The program lasted for three days each time in four locations (Kenema, Bo, Makeni, and Njala) and for four days in Freetown. Sixty-two participants, 44 males and 18 females, took part in the series of training courses that took place between 23 May and 17 June 2016. Trainees were bakers and caterers from different bakeries and individual business enterprises. Attendance ranged from 10 to 15 per location. The training program centered on bread-making techniques; the inclusion of HQCF in wheat flour for making composite flour-based and whole HQCF products, education on hygienic practices in bakeries, cost:benefit analyses on the use of HQCF. It also aimed at re-orientating participants’ minds to adding value to cassava through product development. Products made with the inclusion of HQCF at each location included 10 and 20% cassava bread, 20% cassava pain au raisin and pain au chocolat, 20% cassava croissants, 20% cassava sugar bread, 20% cassava sesame seed buns, 100% cassava cookies, 100% cassava chin-chin, 100% cassava donuts and cassava titbits.

12.0 INFRASTRUCTURE, REHABILITATION AND CONSTRUCTION

Considerable efforts have been made in this regard by SLARI and MAFFS (ASREP and WAAPP projects).

Residential Site I: The three guest houses and the Canteen were rehabilitated by SLARI over the intervening period. In 2013 two class A quarters were rehabilitated by WAAPP, one of which is now being occupied by the Acting Director of NARC, Dr. A. R. Conteh while the second house, previously occupied by Dr. J.B.A. Whyte, the Consultant/Technical Adviser from IITA, is in to be used as a Guest House for High Profile visitors. The electricity was rehabilitated by SLARI and connected to the main grid of Njala University in the same year by mutual consent, but this supply has been suspended. A standby generator of 100KVA capacity was also provided by ASREP at this site. This has now been installed and is currently used to provide limited electricity to staff in Site 1. Two new quarters of class A type were constructed by the WAAPP1C, and are presently being occupied by senior staff. The water system at site 1 was completed and installed; however, some houses are still to be connected, but the entire supply system is presently out of order.

Site II: Administrative Offices, Workshops and Laboratories: The ASREP of MAFFS rehabilitated the main Administrative building, the Soils and Plant Analytical Laboratory at the site in 2013. The WAAPP continued the rehabilitation process at the site, e.g. modification of Seed Technology lab, Cold Room/Germplasm building, drying floor, and further work on the Soils and Plant Analytical Laboratory, especially the water supply system, construction of two Screen houses and an Engineering, Postharvest and Food Technology building. The water system was also completed and is working fairly well. A 100KVA generator was procured and installed by WAAPP, fully tested and is working well.

Residential Site III: Njala University Main Gate/Entrance: Almost all of the 16 houses have now been rehabilitated by MAFFS/ASREP, SLARI, and now WAAPP. One of the units is to be demolished and reconstructed by WAAPP. Wiring of the site has been completed and a ramp built for the standby generator but this has yet to be procured and installed. Connection to the Njala University grid is yet to be accomplished. The water system has also been completed but is not being utilized due to absence of electricity.
13.0 COLLABORATION/PARTNER ORGANIZATIONS

NARC collaborates actively with the following research and development partners:

- Ministry of Agriculture, Forestry and Food Security (Crops, Extension, District Agricultural Officer and Field Staff), supervising ministry and other line ministries
- Njala University (specifically with schools of Agriculture, Technology and Environmental Sciences); presently over 10 members of staff of Njala University drawn from various schools and departments are associate scientists of SLARI engaged in collaborative research activities with staff of SLARI/NARC. Some members of staff of NARC are also engaged in teaching at the University.
- International Agricultural Research Institutions (IITA, CORAF/WECARD, Africa Rice, ICRISAT, CIP, AGRA).
- Private Sector (SLECAD, Finnic, Ken Vandi Metal Works, etc.).
- Community-based Organizations (CBOs) and Farmer-based Organizations (FBOs).
- Agribusinesses (producers, marketers, processors, input dealers, etc.).
- Electronic and Print media.
- Financial Institutions (World Bank, AfDB).

14.0 CHALLENGES/CONSTRAINTS

- **Uncertain Conditions of Service:** This is perhaps the greatest challenge affecting staff performance at NARC, and SLARI as a whole. SLARI conditions of service were originally aligned with the Njala University. This is no longer the case and is a source of great disappointment to staff at SLARI. Furthermore, very few staff seem to be growing for the past ten years despite significant efforts being made by certain staff. Pay scale for ten-year staff are the same as one-year staff.
- **Utilities:** Efforts were made by WAAPP to upgrade the utilities (water and electricity) but these efforts have not produced sustainable results. The water supply system to the laboratories still need further inputs. Site 3 is still without electricity leaving senior scientists in constant darkness. The offices are only receiving three hours of electricity per day due to shortage of funds. This needs to be seriously addressed.
- **Lack of Internet:** There is no internet service in the centre. This is not good for research in this century.
- **Laboratories:** Equipment purchased by WAAPP have still not been delivered to NARC. This means there is no functional laboratory in the centre. Furthermore, the issue of trained lower and middle cadre technical staff is still to be addressed.
- **Transportation:** This has considerably improved with the recent supply of field vehicles, trucks and a bus to the Centre. However, due to critical shortage of funds, service and maintenance of these vehicles has been severely hindered leaving some of these vehicles constantly grounded.
- **Accommodation:** The situation is improving with the rehabilitation of eight quarters completed at Site 3 by WAAPP. With the departure of several for postgraduate training in Ghana and Nigeria the pressure on housing was temporarily eased. The rehabilitation and construction of new quarters is completed at Site 1 (two houses). There is a need to
fast-track this aspect of housing as the return of staff on training is imminent. Most of the original houses at Site 1 are in dire need of repairs.

- **Laptops/Computers, Printers/GPS:** These are insufficient or unavailable; WAAPP has recently procured several of these and software packages for use at the Centre. But most of these laptops came with deficiencies and are mostly out of order.

- **Funding:** Inadequate funding for research and development activities is a severe problem. Very little research work is being done due to critical shortage of funds

- **Salaries:** Salaries of Senior and Senior-Supporting Staff of SLARI/NARC are not aligned with colleagues at the Njala University. This demoralizes the affected staff and needs to be addressed soonest.

**Table 9. Vehicles at NARC with Chassis and Engine Numbers**

<table>
<thead>
<tr>
<th>REGISTRATION NO.</th>
<th>VEHICLE TYPE</th>
<th>CHASSIS</th>
<th>ENGINE</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIL – 519</td>
<td>Nissan Patrol (Director’s)</td>
<td>JN1TCSY61Z535994</td>
<td>TD42-22-6962</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>AJN – 564</td>
<td>Nissan Hard body</td>
<td>ADCJUD2Z0036869</td>
<td>0D32-323518</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>AJN – 565</td>
<td>Nissan Hard body</td>
<td>ABMTJUV2Z0036870</td>
<td>OD32/323522</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>AJN – 566</td>
<td>Nissan Hard body</td>
<td>ADNCJUD2Z008775</td>
<td>OD32/323665</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>AIC – 835</td>
<td>Ford Everest</td>
<td>MNCLS4D10BW322081</td>
<td>WL 16-2</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>AJU – 568</td>
<td>Toyota Hilux AGRA</td>
<td>AHTKK224203064</td>
<td>SL6185963</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>AJV – 220</td>
<td>Renault – 7 Ton</td>
<td>VF644BLM000001785</td>
<td>CNCJG307230009</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>AJV – 221</td>
<td>Nissan – Civilian Bus</td>
<td>JNLUBHW4120025843</td>
<td>TD42-229345</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>AJV – 445</td>
<td>Renault – 5 Ton</td>
<td>VF644AMM1EB003227</td>
<td>E288/77-</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>AKP – 583</td>
<td>Toyota Hilux – AGRA</td>
<td>MROFR22G000727355</td>
<td>2KD/FTV2494CC</td>
<td>Road Worthy</td>
</tr>
<tr>
<td>ADZ – 020</td>
<td>Toyota Land Cruiser (Old)</td>
<td>Disabled</td>
<td>2L-3493791</td>
<td>Not Road Worthy</td>
</tr>
<tr>
<td>AAG – 035</td>
<td>Suzuki (Old)</td>
<td>Disabled</td>
<td></td>
<td>Not Road Worthy</td>
</tr>
<tr>
<td>ACE – 403</td>
<td>Magirus Truck – IVECO</td>
<td>Disabled</td>
<td></td>
<td>Not Road Worthy</td>
</tr>
</tbody>
</table>

**14.1 The Opportunities/Strengths to Overcome These Constraints at NARC, Njala:**

- Some laboratory buildings already available; Seed Technology building, Engineering and Post-Harvest/Food Technology and Cold Room/Germplasm buildings either under rehabilitation, modification and/or construction. However, a Biological Sciences building to house plant breeding and crop protection units still needed.

- Personnel available for capacity building; a crop of very young and highly motivated staff is available

- On-going post-graduate studies of scientists in various universities in Sierra Leone, Ghana, Nigeria and USA.

- **Communication:** Installation and functioning of internet facilities at NARC, satisfactory.
- **Transportation:** Recent arrival three pickup vans, a saloon car for the Director and purchase of rented saloon car of the former director, one 20-seater bus, and two trucks (5 ton and 7 ton, respectively) has improved the situation considerably.
- **Working Tools and Gears:** A mobile welding unit and an auto-electrician kit has been provided; also some carpentry tools.
- **Farm/Field Equipment:** ASREP and WAAPP provided a 35 and 69 HP tractors and equipment, respectively and several power tillers. This has helped significantly in ploughing and harrowing operations at NARC.

15. **CONCLUSION**

NARC has made considerable contribution towards the mission of SLARI and agricultural research in general in Sierra Leone. There is immense potential remains greatly under-utilized. A good number of staff have been trained and most of the M.Phil staff have returned. However, the chronic shortage of funds for research and other operating activities have meant that these scientists have not been engage to their potential. Funding bodies now focus increasingly to regional centres, such as the CGIAR, for funding, leaving the national centres relying increasingly on their governments. Efforts need to be made to improve the funding of NARC.
16. Staff Profiles

Dr Abdul R Conteh, Principal Research Officer and Centre Director

Dr Conteh holds a Bachelor of Science in Chemistry Education from Njala University College (University of Sierra Leone), a Master of Science in Agriculture (Soil Chemistry) and a Doctor of Philosophy in Soil Management, both from the University of New England in Australia. Dr Conteh joined the national agricultural research system in 1988 as a Research Assistant in Soil and Plant Analysis at the then Institute of Agricultural Research at Njala before proceeding for postgraduate studies in Australia. Dr Conteh has carried out soil research extensively with the Australian Cotton and Sugarcane production systems in New South Wales and Queensland, Australia. More recently, Dr Conteh has lectured at the City University of New York and carried out collaborative research with the Rodale Research Centre in Pennsylvania, USA. Dr Conteh rejoined the national research service as a Principal Research Officer in Soils at SLARI in 2013. Since July 2014, Dr Conteh has been providing research and administrative leadership to the Njala Agricultural research Centre.

Moses J Tucker, Administrative Officer/Research Officer

Mr. Moses Tucker is the Administrative Officer at the Njala Agricultural Research Centre (NARC). Mr. Tucker graduated from the Njala University College (University of Sierra Leone) with a Bachelor of Science in Agriculture General in 1977. Mr. Tucker joined the national agricultural research system in 1979 as a Research Assistant (Agronomy) at the Rokupr Rice Research Station (RRRS) and then the Adaptive Crops Research and Extension (ACRE) project as a Research Assistant (Agronomy). In 1985, Mr. Tucker obtained a Master of Science in Crop Production and Management from the Louisiana State University, USA. Mr. Tucker has served in various capacities including Senior Agricultural Extension Officer (SAEO) in the ACRE project, Head of Training and Communications Unit and Acting Administrative Officer under the Institute of Agricultural Research (IAR). Mr. Tucker is presently the Team Leader for the Orange Fleshy Sweet Potato (OFSP) project.
Dr Moses T Moseray, Research Officer/Grain Legume Breeder

Dr Moses Moseray holds a Bachelor of Science in Agriculture from Njala University College (University of Sierra Leone), a Master of Science in Plant Breeding from the University of Nairobi and a Doctor of Philosophy degree in Crop Science from the Njala University in Sierra Leone. Dr Moseray has been with the National Agricultural Research Service since 1997, when he joined the then Institute of Agricultural Research (IAR) as a Research Officer. Since then, Dr Moseray has been working on the improvement of groundnut, cowpea, soybean, pigeon pea and sesame, and he has made significant contributions in the official release of one groundnut variety (SLINUT 1), five cowpea varieties (SLIPEA 1, SLIPEA 2, SLIPEA 3, SLIPEA 4 and SLIPEA 5) and four soybean varieties (SLIBEAN 1, SLIBEAN 2, SLIBEAN 3 and SLIBEAN 4). Dr Moseray is now focusing his research on soybean and cowpea value chains improvement.

Dr Alusaine Edward Samura, Research Officer/Plant Pathologist

Dr. Alusaine E Samura is a Research Officer in Plant Pathology and is the Acting Head of the Crops and Natural Resources Management Programme at the Njala Agricultural Research Center (NARC). Dr. Samura studied Bachelor of Science in Agriculture General at Njala University College (University of Sierra Leone) followed by a Master of Philosophy degree and a Doctor of Philosophy degree in crop protection both from the Njala University. Dr. Samura joined the National Agricultural Research System in 1999 as a Research Assistant in crop protection at the then Institute of Agricultural Research (IAR) and rose to the position of Research Officer and Head of the Crops and Natural Resource Management Programme. Dr. Samura is the Vice President of Village Hope Inc, a Non-governmental organization, Focal Person for cassava for the West Africa Agricultural Productivity programme (WAAPP), Associate Lecturer at the Njala University. Dr. Samura has carried out extensive Integrated Pest Management (IPM) research especially in the control of plant viruses in Sierra Leone.
Mrs Alfreda R Foday, Assistant Confidential Secretary


Mrs Fatmata Binta Samura, Assistant Administrative Officer

Mrs. Fatmata Binta Samura joined the national agricultural research system in 2010 as Assistant Administrative Officer (Training and out-reach) at the Njala Agricultural Research Center (NARC). Mrs Samura holds a certificate in Population Analysis and Social Statistics from the Fourah Bay College (University of Sierra Leone), a Bachelor of Science in Education (Economics Option) and a Master of Business Administration (Human Resource Management) from the Njala University. Mrs Samura provides administrative support to the Director and the Administrative Officer at NARC, and has demonstrated leadership qualities in ensuring a good working environment for staff. Mrs Samura is responsible for coordinating the administrative activities of the centre, providing reports required by management on administrative and human resource matters and collaborate with other organisations/centres on research for development activities.
Ernest G Kamara, Research Officer/Seed Systems Scientist

Mr. Ernest Gibril Kamara is a Research Officer and Acting Head of Germplasm and Seed Systems Development programme. Mr. Kamara holds a Bachelor of Science in Biological Sciences from Njala University College (University of Sierra Leone), a Master of Science in Crop Science and a Master of Science in Seed Science and Technology at Njala University and Kwame Nkrumah University of Science and Technology, Ghana respectively. Mr. Kamara joined the Institute of Agricultural Research, now Njala Agricultural Research Centre, in 2004 as a Research Assistant after teaching for a couple of years at Christ the King College, Bo. Since his return from Ghana in 2010, Mr. Kamara has participated in the development of breeding and seed projects and has worked with the Sierra Leone Seed Certification Agency (SLeSCA) in facilitating the release of new varieties. His main areas of interest are Seed production, seed system development and Quality Assurance.

Festus Bernard Massaquoi, Research Officer/Cassava Breeder

Mr. Festus Bernard Massaquoi holds a Bachelor of Science in Agriculture and a Master of Philosophy (M.Phil) degree in Crop Science from the Njala University. Mr Massaquoi joined the Institute of Agricultural Research (IAR) in 1999 as a Research Assistant and later Research Officer. Mr Massaquoi has been responsible for the formulation, design and implementation of on-station cassava trials, including Participatory Varietal Selection (PVS) trials on farmers' fields for cassava. Mr Massaquoi been the Principal Investigator of several donor-funded projects including the AGRA-funded “Development and Dissemination of High-yielding Cassava genotypes”, CORAF-funded “Dissemination of New Agricultural Technology in Africa (DONATA)”, and the AfDB-funded “Support to Agricultural Research and Development – Strategic Crops (SARD-SC / IITA)”. Mr Massaquoi has served as the Head of the Germplasm and Seed Systems Development of the Njala Agricultural Research Centre since 2007-2014.
Augustine Mansaray, Research Officer/Entomologist

Mr. Augustine Mansaray is a Research Officer at Njala Agricultural Research Centre (NARC). Mr. Mansaray holds a Bachelor of Science (Honours) in Chemistry and Zoology from Fourah Bay College (University of Sierra Leone) and a Master of Science degree in Agricultural Entomology and Pest Management from South China Agricultural University. He joined the research system in 2007 as a Research Officer in Entomology and have since conducted research on integrated insect pest management on cowpea, sweet potato and cassava. In addition, Mr. Mansaray has conducted several trainings including the management of cowpea insect pests, production of legumes, roots and tubers and cereals, training on best-bet practices in cassava production for increased cassava production and productivity. Mr. Mansaray is presently working on his PhD Thesis titled “Soil and plant health enhancement for increased crop yield through cassava –legume intercropping”.

Michael Benya, Senior Farm Manager

Mr. Michael Thomas Benya is the Senior Farm Manager at the Njala Agricultural Research Centre (NARC). Mr. Benya studied Bachelor of Science in Agricultural Education at Njala University College (University of Sierra Leone) followed by a Master of Science in Agriculture (Crop Science) from the same University. Mr. Benya joined the then Adaptive Crop Research and Extension (ACRE) Project from 1983 - 1988 as Field Assistant and continued on as Farm Manager in Training at the then Institute of Agricultural Research (I.A.R.) in 1999. Mr. Benya rose through the ranks and files from Farm Manager in Training, Assistant Farm Manager to Farm Manager from 1999 – 2008. Since 2009, Mr. Benya has been the Senior Farm Manager at the Njala Agricultural Research Centre.
Dan Quee, Research Office/Weed Scientist

Mr. Dan David Quee is a Weed Scientist at Njala Agricultural Research Centre (NARC). Mr. Quee holds a Certificate in Agriculture General, Bachelor of Science in Agriculture General and Master of Science in Crop Protection at Njala University, followed by a Master of Philosophy degree in Weed Science at Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana. Mr Quee worked as a Senior Laboratory Technician in 1999 at the then Njala University College (University of Sierra Leone). In 2010, Mr Quee joined Njala Agricultural Research Centre (NARC) as a Weed Scientist. Mr. Dan David Quee has carried out collaborative research with other scientists and he is author or co-author of several refereed publications.

Janatu V. Sesay, Research Officer/Biotechnologist

Ms Janatu Sesay is a Research Officer in Plant Botany and also Associate Lecturer in Biotechnology at the Department of Biological Science, Njala University. Miss Sesay holds a Bachelor of Science in Agriculture Education and a Master of Science in Crop Science from Njala University, followed by a Master of Philosophy in Plant Botany from the University of Ghana, Legon. Ms Sesay joined the Sierra Leone Agricultural Research Institute in 2009 as Research Assistant in Biotechnology/Tissue Culture. Ms Sesay has carried out research in plant tissue culture and molecular biology. Since 2016, she has been the Biotechnologist on the mutagenesis of cassava and rice, a project sponsored by the International Atomic Energy Agency (IAEA). Ms Sesay did newsletters for the IAEA on some mostly domesticated crop plants in Sierra Leone. Ms Sesay is presently a Doctoral student working on the biodiversity and on molecular characterization of selected cassava varieties in Sierra Leone with aim of genome profiling.
Abdul-Rahman Tarawali, Research Officer/Legume Breeder

Mr. Abdul-Rahman Tarawali is a Research Officer and Legume. Mr. Tarawali studied Bachelor of science in Agriculture general in Njala and a Master of science in Agronomy – major in cereal crop breeding – in the university of Maryland, at College park, United States of America. Mr. Tarawali joined the ACRE project (ACRE) at Njala in 1982, as a Research Assistant in crop improvement before proceeding for post graduate studies in the United States in 1984. Mr. Tarawali returned to continue work with the ACRE project in 1986 as a Research Officer attached to cassava improvement. Mr. Tarawali worked variously with the following International NGOs. With World Vision as Coordinator for the Program of accelerated crop improvement (PACI): With AFRICARE as Program Manager Southern and Northern province, and with Search for Common Ground as Manager Southern Office. Mr. Tarawali returned to SLARI in 2009 to assume work as Research officer in charge of Groundnut improvement. He has since then participated in the N2 AFRICA groundnut program and the AGRA groundnut program.

Keiwoma Yila, Research Officer/Agronomist

Mr Keiwoma Yila is a Research Officer in Agronomy. Mr. Yila holds a Bachelor of Science degree in Agricultural Education from Njala University College (University of Sierra Leone) and a Master of Science in Crop Science from Njala University. Mr Yila is presently pursuing a Master of Philosophy in Agronomy at Njala University. Mr Yila has 10 years teaching experience at the Kelly's Rural Agricultural and Vocational Secondary School, Hastings and 4 years working experience with International Non-governmental organizations implementing relief and development projects in agriculture in Northern Sierra Leone. He joined the Njala Agricultural Research Centre in 2012 as a Research Officer. Mr Yila has coordinated several research projects to identify appropriate planting date for diverse soybean genotypes in Sierra Leone and appropriate intercropping technologies for cassava. Mr Yila has vast knowledge in the design and execution of research and development projects in agriculture, electronic data capturing, data analysis and reporting. His current research interest is to restore soil quality on degraded cropland using sustainable land management practices that would improve crop productivity and mitigate climate change.
Isata Kamanda, Research Officer/Plant Breeder

Isata Kamanda is a Research Officer in plant breeding at Njala Agricultural Research Centre (NARC). Isata Kamanda studied Bachelor of Science (Hons) in Crop Science followed by a Master of Science in Crop Science at Njala University College (University of Sierra Leone). Isata joined the Sierra Leone Agricultural Research Institute in 2012 as a Research Officer before proceeding for postgraduate studies in Ghana 2014. Isata has carried out Genetic improvement of root yield and nutritional quality of cassava (*Manihot esculenta* Crantz) with the West Africa Center for Crop Improvement, Njala University and IITA in Nigeria, Ghana and Sierra Leone. More recently, a Ph.D. student in plant breeding (awaiting graduation in July, 2018) with the West Africa Center for Crop Improvement at the University of Ghana. Since January 2013, Isata has been undertaking scientific research in cassava improvement through biofortification at the Njala Agricultural research Centre.

Osman Nabay, Socioeconomist

Mr. Osman Nabay studied B.Sc. (Hons.) and M.Sc. in Agricultural Economics at Njala University, Sierra Leone. Mr Nabay’s present focus is being part of a team engaged in the fight against poverty in Africa, and particularly Sierra Leone. Since graduation, he has played leading roles in a series of research projects seeking to positively impact the lives and livelihood of the poor, where he has demonstrated leadership qualities and the ability to complete any task assigned to him. He has worked with Innovations for Poverty Action (IPA/JPAL) using rigorous research techniques like RCT (Randomize Control Trials) helping find solutions to the developing world’s most pressing problems and presently working for the Sierra Leone Agricultural Research Institute, Njala Agricultural Research Centre as Research Officer (Agricultural Economist) and the current Acting Programme Head (Socio-economic, Policy Research and Outreach Unit).
Prince E. Norman, Research Officer/Yam Breeder

Prince E. Norman holds a Bachelor of Science in Crop Science from Njala University College (University of Sierra Leone), a Master of Science in Crop Science from Njala University, and a Master of Science in Plant Breeding from the University of KwaZulu-Natal (UKZN), South Africa. Mr. Norman joined the National Agricultural Research Coordinating Council (NARCC) in April, 2004 as a Research Assistant and was assigned to work on yam at the Institute of Agricultural Research (IAR), Njala. He is currently doing his PhD at the West African Center for Crop Improvement, UG, Ghana. He has conducted a number of studies on yams, cocoyam and collaborated on maize, sweet potato and other crops. Mr Norman is currently a Research Fellow at the International Institute of Tropical Agriculture (IITA). He has mentored a number of students in their projects, served in various leadership roles including secretary, International Association of Research Scholars and Fellows (IARSAF), Symposium Committee, IITA, leader of the yam and cocoyam crops value chains, and a member of many international scientific bodies, etc.

Edward Jen Ndoko, Research Officer/Plant Physiologist

Mr Edward Jen Ndoko is a Research Officer in Plant Physiology at the Njala Agricultural Research Centre (NARC). Mr Edward Jen Ndoko studied Bachelor of Science in Crop Science at the Njala University Sierra Leone followed by a Master of Science in Plant Physiology and Crop Production at the Federal University of Agriculture in Abeokuta (FUNAAB), Nigeria. Mr Ndoko joined the Sierra Leone Agricultural Research Institute (SLARI) in the position of a Research Assistant in March 2012. In June 2012-November 2013 Mr Ndoko collaborated with senior Research Officers in the implementation of the N2 Africa Project from the International Institute of Tropical Agriculture (IITA) based in Ibadan Nigeria. Mr Edward Jen Ndoko returned from studies in September 2016 with knowledge on nutrient acquisition by the arbuscular mycorrhiza fungi (AMF) in soils to most leguminous crops.
Mrs. Isatu Koroma, Research Officer/Nutrition and Health

Mrs. Isatu Koroma (Nea Jalloh) is currently a Research Officer (Nutrition and Health) at Njala Agricultural Research Centre (NARC) since November 2013. Mrs. Koroma obtained a Bachelor of Science (Honours) in Nutrition and Dietetics in 2010 and a Master of Public Health (MPH) specializing in Environmental Health and Sanitation in 2013 both from the Njala University. Mrs. Koroma has participated in reputable professional training both at home and abroad, and has coordinated and facilitated some of these training activities with community engagement for following training: Training of Bakers and Pastry Traders in seven locations in Sierra Leone; Training for Farmers on the Production of Nutritional Fortified Soybeans and Cowpea Gari; Forum for Dialogue with Nutrition Instructors for Updates and Discussions on SLARI Nutrition Initiatives, which serves as essential vision for professional career development. In her early engagement with SLARI,

Mrs. Jebeh A. Barka, Research Officer/Plant Breeder

Mrs. Jebeh Augusta Barka is a Research Officer in Plant Breeding at the Njala Agricultural Research Centre (NARC). Mrs. Barka holds a Bachelor of Science in Agriculture and a Master of Science in Crop Science, both from the Njala University in Sierra Leone. Mrs. Barka also holds a Master of Science in Plant Breeding from the Kwame Nkrumah University of Science and Technology in Ghana. Mrs. Barka joined the Sierra Leone Agricultural Research Institute in 2009 as a Research Assistant in Plant Breeding, specifically for Sweet potato and Potato (Irish). She played a key role to revive the sweet potato research programme at the NARC since she joined SLARI. Mrs. Barka has been involved in sweet potato breeding programmes at the International Potato Centre (CIP) and the Crops Research Institute (CSIR-CRI) in Kumasi, Ghana. Mrs. Barka is presently pursuing a Doctor of Philosophy degree in Plant Breeding at the West Africa Centre for Crop Improvement (WACCI), University of Ghana.
Milton K Kabbia, Research Officer/Plant Breeder

Mr Milton Kabbia is a Research Officer and Plant Breeder at the Njala Agricultural Research Centre (NARC). Mr Kabbia holds a Higher Diploma in Agronomy and a Bachelor of Science with Honors in Crop Science, both from Njala University, and a Master of Science in Agronomy (Plant Breeding) from the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana. Mr Kabbia started his research career with the Adaptive Crops Research and Extension (ACRE) project as a Field Assistant-in-Training in 1983. Mr Kabbia has worked extensively in the field of crop research and has gone through the various cadres to his present position. Mr Kabbia has gained experience in conventional and mutation breeding from the Crops Research Institute, Ghana and from the International Atomic Energy Agency Laboratory in Vienna, Austria respectively. Mr Kabbia was part of a team that developed and released the first and only national agricultural research groundnut (SLINUT-1) in 2000.

Gibrilla Dumbuya, Research Officer/Agronomist

Gibrilla Dumbuya is a Research Officer in Agronomy at Njala Agricultural Research Centre (NARC). He holds a Bachelor of Science (honours) in Crop Science from Njala University in Sierra Leone and a Master of Philosophy in Agronomy from Kwame Nkrumah University of Science and Technology (KNUST) in Ghana. Gibrilla Dumbuya is currently a PhD student at Iwate University in Japan. He joined the Sierra Leone Agricultural Research Institute in 2013 as a Research Assistant. Gibrilla Dumbuya’s research interest is on sweet potato and cowpea. He has been a member of the research team implementing a project title: Piloting the production, promotion and consumption of orange flesh sweet potato to reduce Vitamin A deficiency in Sierra Leone. This project is aimed at increasing the production and consumption of orange flesh sweet potato to improve the Vitamin A intake and the nutritional status of children 6 months to 5 years of age. Gibrilla Dumbuya’s current PhD research is focusing mainly on climate change and agriculture with main emphases on modelling the effect of elevated soil temperature and CO2 on some root and tuber crops.
Alhaji Massaquoi, Extension Officer

Alhaji Massaquoi is an Agricultural Extension officer/Zonal Research Officer of the Njala Agricultural Research Centre (NARC) based in the eastern region. Mr Massaquoi holds a Bachelor of Science in Agriculture and a Master of Science in Agriculture in (crop science) from Njala University College (University of Sierra Leone). Mr Massaquoi joined the IAR in 2000 as a Research Assistance in Agronomy and later promoted to the rank of Zonal Research Officer attached to the eastern region (Kenema). Mr Massaquoi is a consultant for training of beneficiaries in the innovation platform system in Sierra Leone and currently engaged in the collection and compilation of research data on both the socio-economic and agronomic needs of the target beneficiaries. Mr Massaquoi is also engaged in the supervision of the activities of the Agricultural Instructors and collaborates with NGOs and the Ministry of Agriculture and Food Security in the Area of his assignment.

Lansana Sesay, Extension Officer

Lansana Sesay holds a Bachelor of Science in Agricultural Education and a Master of Science in Agricultural Extension from the Njala University College (University of Sierra Leone). Mr Sesay has been helping farmers with best-bet agronomic practices for cereals, root and tuber crops and the grain legumes for more than 17 years. Mr Sesay has organized farmers into Community-Based Organizations (CBOs), Farmer-Based Organizations (FBOs) and Cooperatives. Mr Sesay was trained in Multi-stakeholder processes in agricultural value chains in Burkina Faso and has served as a trainer of trainers. Mr Sesay works with research scientists to conduct experimental research and has facilitated the generation and dissemination of research technologies in Northern Sierra Leone. He has trained value chain actors of different commodity value chains. Mr Sesay works in close collaboration with the Ministry of Agriculture Forestry and Food Security and the private sector to enhance agricultural productivity.
Alimu Mansaray, Research Officer/Plant Pathologist

Alimu Mansaray is a Research Officer in Plant Pathology at the Sierra Leone Agricultural Research Institute (SLARI) attached at Njala Agricultural Research Centre (NARC). Alimu Mansaray studied Bachelor of Science with honours in Crop Protection at Njala University followed by a Master of Philosophy (M.Phil.) in Crop Protection (Plant Pathology) from Kwame Nkrumah University of Science and Technology in Kumasi, Ghana. Alimu Mansaray joined the national agricultural research system in 2012 as a Research Assistant in Crop Protection and later promoted to Research Officer.

Frederick Kobba, Extension Officer

Frederick Kobba is a Research Officer II in Socioeconomics, Policy and Outreach Programme of the Njala Agricultural Research Centre (NARC). Frederick Kobba studied Bachelor of Science in Agricultural Extension followed by a Master of Science in Sociology both from Njala University and a Master of Science degree in Agriculture (Extension Education) at Dr. BSKKV Agricultural University, Maharashtra State, India in 2015. Frederick Kobba is presently pursuing a Doctorate degree at the Indian Agricultural Research Institute, New Delhi, India. Frederick Kobba started his career as an Area Agricultural Extension Officer at BRAC Sierra Leone where he conducted training for Branch Agricultural Officers as well as farmers and provided extension services in Port Loko District. He later joined the Sierra Leone Agricultural Research Institute as a Research Assistant in 2009 and worked for three years at the Institute Headquarters in Freetown and later transferred to the Njala Agricultural Research Centre (NARC) in 2012. Frederick Kobba has actively been involved in Socioeconomics research and outreach programmes of the centre until 20016 when he joined the Indian Agricultural Research Institute to pursue a Doctorate Programme.
Emmanuel Hinckley, Assistant Monitoring and Evaluation Officer

Emmanuel Sahr Hinckley is an Assistant Monitoring and Evaluation Officer at the Njala Agricultural Research Center (NARC). Mr. Hinckley studied Bachelor of Science in Agriculture at Njala University College (University of Sierra Leone). Upon graduation he entered the teaching field where he taught for 10 years. He also obtained a Master’s degree in Extension and Rural Sociology at Njala University and a postgraduate diploma in Education (FBC) with distinction in Teaching Practice and Theory. Mr. Hinckley joined the Sierra Leone Agricultural Research Institute in 2013 as Research Officer in Monitoring and Evaluation of research and other project activities undertaken at Njala Agriculture Research Center. He has obtained wealth of experience in M&E through training and workshop within and outside Sierra Leone. Mr. Hinckley has also been extensively involved in Socio-economic research and outreach programs within the agricultural research domain. He is presently pursuing Master of Philosophy in Extension and Rural Sociology at Njala University.

Martin Koroma, Extension Officer

Martin Koroma is a research officer in Agricultural Extension and Rural Sociology. Martin Koroma studied Bachelor of Science in Agricultural Extension and Rural sociology at Njala followed by a Master of Science in Agricultural Extension and Rural Sociology from the same university. Martin Koroma joined the Sierra Leone Agricultural Research Institute (SLARI) in 2012 as Research Assistant in Agricultural Extension attached at the head quarter tower hill Freetown under the project development and management office (PDMO). He was later transferred to the Njala Agricultural Research Centre on 2015.
Marion Ortray Massaquoi, Assistant Finance Officer

Ms Marion Massaquoi is the Assistant Finance Officer at NARC. Marion holds a Bachelor of Science (Hons) in Banking and Finance, and a Master of Business Administration (Finance Major) from Njala University in Sierra Leone. Marion has been working at SLARI since 2012, with experience in Teko Livestock Research Centre, Kabala Horticultural Crops Research Centre, and at SLARI Headquarter in Freetown. Marion attended the St Joseph's Secondary School in Freetown.

Joseph Ojian Amara, Assistant Estate Officer

Joseph Ojian Amara is a Civil Engineer and current Assistant Estate Officer at NARC. He studied Bachelor of Engineering (B.Eng. Hons.) at Fourah Bay College, University of Sierra Leone. Between 2008 and 2011, Mr Amara served as Site Supervisor, CAMEEL Construction Company, Mountain cut, Freetown. He has worked as Site Supervisor with Angelique International Construction and Procurement Company (S.L., Ltd), 1 sheriff Drive Lungi, in collaboration with S.A.L.WA.CO from 2011 – 1st April 2013. During this period, he coordinated all departmental programs and activities related to the transmission, storage and distribution of water systems and presented to management periodic reports on progress of assigned capital projects. Since 1st April 2013, Engineer Joseph Ojian Amara has been providing administrative leadership in the Estate Department at NARC.
Kadiatu Nana Serry, Research Assistant/Tissue Culture

Kadiatu Nannah Serry is a Research Assistant in Plant Tissue Culture at Njala Agricultural Research Centre (NARC). Kadiatu Serry holds a Bachelor of Science in Agriculture and a Master of Science in Crop Science at Njala University. Kadiatu joined NARC in 2007 as a Lab Technician in Plant Tissue Culture. Kadiatu has carried out research on seasonal variation and effects of green manure on Weevil population in sweet potato production and also supervised field workers to collect data, input data and analyzed data. Kadiatu has undergone several trainings on yam and cassava Micro-propagation techniques at the IITA in Ibadan, Nigeria, biotechnology and Bio-safety training (Kumasi Ghana), Data Capturing, Project Writing and data Analysis.

Danielson Samuel Gbolia, Finance Assistant

Mr Danielson Gbolia holds a Technician Diploma in Accounting, an Applied Accounting Diploma, and a Bachelor of Science in Accounting, all obtained from the Institute of Public Administration and Management (IPAM), University of Sierra Leone. Mr Gbolia is presently a Finance Assistant at NARC.
Mr. Mohamed Saimah Kamara, Research Assistant/Soils

Mr. Mohamed Saimah Kamara is a Research Assistant in Soils at the Njala Agricultural Research Centre (NARC), Sierra Leone Agricultural Research Institute (SLARI). Mr. Kamara studied Bachelor of Science with Honours in Soil Science followed by Master of Science in Soil Science, both at Njala University. Mr. Kamara is currently on a two-year study leave (August, 2017-July, 2019) pursuing a Master of Philosophy in Soil Science at the University of Ghana. Mr. Kamara was employed at SALRI in May 2015 and has been in charge of Soil and Plant analysis in the Analytical Laboratory at NARC. He has also been assisting in Soils-related research and community services including soil suitability mapping. Mr. Kamara's research interests are on Soil Fertility and Plant Nutrition and Soil Biochemistry.

Suffian Mansaray, Research Assistant/Postharvest Engineering

Mr. Suffian Mansaray is a Research Assistant in Postharvest Engineering at the Njala Agricultural Research Centre (NARC). Suffian Mansaray studied Bachelor of Science in Agricultural Engineering at Njala University and presently pursuing his M.Sc in postharvest technology at Njala University. Suffian Mansaray joined the Sierra Leone Agricultural Research Institute (SLARI) in April, 2016 and was assigned at the Postharvest Engineering and Nutrition Unit. Before joining SLARI, Suffian Mansaray has also volunteered for six months as an Agricultural Engineer in soil and land development in the engineering division at the Ministry of Agriculture Forestry and Food Security (MAFFS).
Other Staff Members on Study-Leave pursuing their Ph.D. Programmes

Ms Jenneh Bebeley  
Research Officer/Legume Breeder

Jenneh is a Research Officer in Agronomy, currently doing her Ph.D. in Cropping Systems at the Bayero University of Kano in Nigeria. Before her departure Jenneh had handled the Pigeon Pea component of our Grain Legume Programme. Jenneh had carried out extensive characterization of the pigeon pea varieties available in this country and their growth characteristics.

Mrs Kumba Koroma (Karim)  
Research Officer/Cassava Breeder  
PhD – (Plant Breeding)

Kumba is Research Officer in the Cassava Breeding program. Kumba has completed her Ph.D. programme at the University of Ghana and is expected to graduate soon. Kumba’s research is designed to identified and select cassava cultivars with high starch content, high dry matter content and root yield and identify DNA markers to facilitate breeding for starch, dry matter and root yield in cassava.

Ms Martha Williams  
Research Officer/Nutritionist

Ms Martha Williams is a Research Officer in the Nutrition programme. Martha is expected to complete her Ph.D. in 2018 at the Federal university of Nigeria in Abeokuta. Martha’s work is looking at the Retentions and Bioavailability of Beta-Carotene, Iron and Zinc in Fufu produced from Yellow Fleshed Cassava in Sierra Leone. This will provide information on the retentions of total carotenoids and micronutrients in fufu to develop training manuals for processing bio-fortified cassava into fufu.
Mrs Nyahabeh Siaffa (Anthony)
Research Officer/Nutritionist

Nyahabeh is a Research Officer in Nutrition on the verge of completing her Ph.D. at the Federal University of Nigeria in Abeokuta. Nyahabeh’s research is evaluating the nutritional quality and bioavailability of micronutrients for common complementary foods supplemented with groundnut in two regions of Sierra Leone. Her work will determine the nutritional and anti-nutritional content of the standardized complementary foods.

Alimamy Fornah
Research Officer/Natural Resources

Alimamy Fornah is a Research Officer in Natural Resources Management, presently pursuing a Ph.D. at the Oklahoma State University, USA. Alimamy is currently looking at management practices aimed at improving nutrient-use efficiency in cropping systems.

Aloysius Beah
Research Officer/Soil Scientist

Aloysius Beah is Research Officer in Soil Management, presently working on his Ph.D at the Bayero University of Kano in Nigeria. Aloysius is presently examining models to evaluate the response of crops to nutrients under climate change scenarios. The aim of Aloysius’ study is to quantify yield responses to N fertilizer application on contrasting soil types and assess potential impact of climate change on such crop yield responses.
Key Support Staff

Mr Amadu Jalloh is the current Mechanical Superintendent at NARC. Mr Jalloh has been with the National Agricultural Research System for a period spanning over 30 years. Mr Jalloh has worked for the ACRE Project, the IAR and now NARC/SLARI. Mr Jalloh’s expertise covers most vehicles and field machines used for regular operations in the centre.

Mr Francis Kabba is the current Field Superintendent at NARC. Mr Kabba holds a Higher Diploma in Agronomy from the then National Agriculture Training Centre, now part of the School of Agriculture, Njala University. Mr Kabba joined the research system as a Field Assistant in 1988. He has since moved to Principal Field Assistant at IAR to his current position at NARC. Mr Kabba has expertise in all issues related to setting up Field Experiments. He deputizes the Senior Farm Manager whenever the situation arises.