

ASSESSMENT OF AGRICULTURAL RESEARCH CAPACITIES IN SIERRA LEONE:

THE CASE OF SIERRA LEONE AGRICULTURAL RESEARCH INSTITUTE (SLARI)

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List of Acronyms

ACRE	Adaptive Crop Research and Extension Project
AgGDP	agricultural gross domestic product
ASREP	Agricultural Sector Rehabilitation Project
ASTI	Agricultural Science & Technology Indicators
CAADP	Comprehensive African Agricultural Development Program
CORAF/WECARD	West and Central African Council for Agricultural Research and Development
CTA	Technical Centre for Agricultural and Rural Cooperation
DFID	Department for International Development
FAO	Food and Agriculture Organization of the United Nations
FARA	Forum for Agricultural Research in Africa
FTE	full-time equivalent
IAEA	International Atomic Energy Agency
ICT	information technology communications
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
IMBO	Institute of Marine Biology and Oceanography
IKARI	Kenya Agricultural Research Institute
KFTCRC	Kenema Forestry and Tree Crops Research Center
M&E	monitoring and evaluation
MAFFS	Ministry of Agriculture, Forestry and Food Security
MDAs	ministries, departments, and agencies
MDGs	Millennium Development Goals
MLWRC	Magbosi Land & Water Research Center
NARC	Njala Agricultural Research Center
NARCC	National Agricultural Research Coordinating Council
NARI	National Agricultural Research Institute
NERICA	New Rice for Africa
PPP	purchasing power parity
PVS	participatory varietal selection
R&D	research and development
RARC	Rokupr Agricultural Research Center
SLARI	Sierra Leone Agricultural Research Institute
SLICASS	Sierra Leone Institute Cassava
SLINUT	Sierra Leone Institute Groundnut
SLIPEA	Sierra Leone Institute Cowpea
SLIPOT	Sierra Leone Institute Potato
TLRC	Teko Livestock Research Center
USD	United States dollars
WAAPP	West Africa Agricultural Productivity Program

INTRODUCTION

The Economic Community of West African States (ECOWAS) Regional Research Policy seeks to harmonize scientific research and create research synergies in the region. One of the main constraints the community is facing is access to up-to-date and high-quality data, on the scientific research capacity in its member countries. Given the importance of agriculture in the region, ECOWAS has requested the West and Central African Council for Agricultural Research and Development (CORAF/WECARD) to carry out an in-depth assessment of the critical issues surrounding the human, financial, and institutional capacities in West African agricultural research. Such an assessment is key to the development of national and regional policy recommendations that will ultimately feed into a regional agricultural research strategy for West Africa. To accomplish this assessment, CORAF/WECARD has solicited the support of the Agricultural Science and Technology Indicators (ASTI) program of the International Food Policy Research Institute (IFPRI).

This assessment is conducted in three phases:

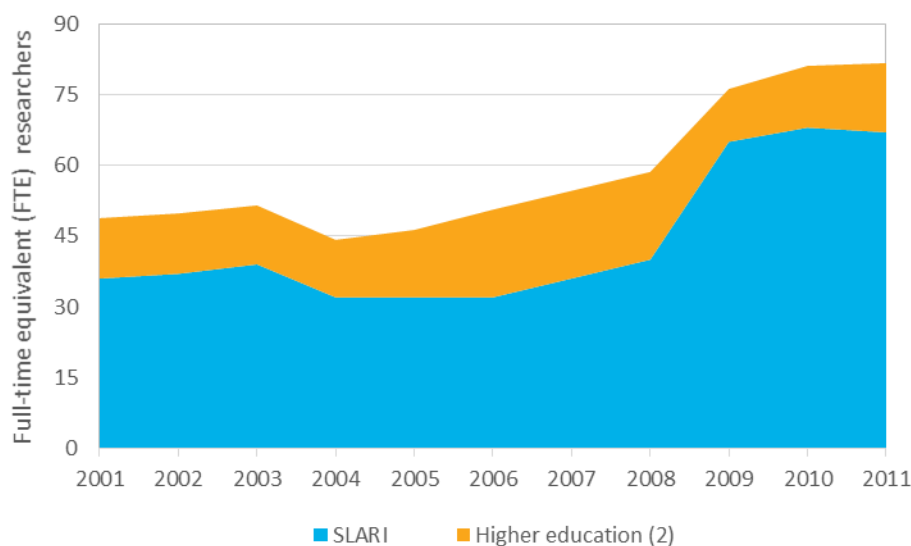
- As part of Phase I (2012–2013) ASTI/IFPRI, CORAF/WECARD, and national partners, launched a survey in 21 West and Central African countries collecting detailed staffing and financial information from a complete set of government, higher education, nonprofit, and private-sector agencies involved in agricultural research and development (R&D). The outputs of this survey can be accessed on the ASTI website: <http://www.asti.cgiar.org>.
- During Phase II (2013–2014) a more in-depth assessment of the critical issues surrounding West African agricultural R&D was conducted in six ECOWAS countries: Benin, Burkina Faso, Ghana, Senegal, Sierra Leone, and Togo. The assessment included a quantitative survey collecting information on human and financial resources, R&D infrastructure, and R&D outputs; a series of face-to-face interviews with selected research and managerial staff; and a staff motivation survey distributed to a selected group of researchers and managerial staff. The outcomes of this in-depth assessment have been summarized in a series of country reports, as well as a regional report synthesizing the critical challenges faced by West African agricultural R&D institutes.
- During Phase III (2014) the outputs of Phase II will be translated into policy recommendations that will feed into the development of the regional agricultural research policy strategy and that will be presented at various stakeholder events.

The current report is one of the outputs of Phase II. It gives an overview of the critical issues surrounding the human, financial, and institutional capacity of the Sierra Leone Agricultural Research Institute (SLARI) and provides a set of policy options that could help address some of these most pressing challenges.

OVERVIEW OF AGRICULTURAL R&D IN SIERRA LEONE

Three agencies are involved in agricultural research and development (R&D) in Sierra Leone: SLARI and its constituent research centers, Njala University School of Agriculture, and Fourah Bay College Institute of Marine Biology and Oceanography (IMBO). SLARI is the country's principal agricultural research institute, accounting for more than 80 percent of total staff and expenditures in 2011. Between 2001 and 2011, the number of FTE researchers at SLARI and the universities increase steadily (Figure 1). The total full-time-equivalent (FTE) researchers at SLARI rose from 37 in 2001 to 70 in 2011, while the number of FTE researchers at the two higher education institutions rose from 50 to 80 during the same period.

Figure 1. FTE agricultural researchers by institutional category, 2001–2011



Source: IFPRI-SLARI (2013-14).

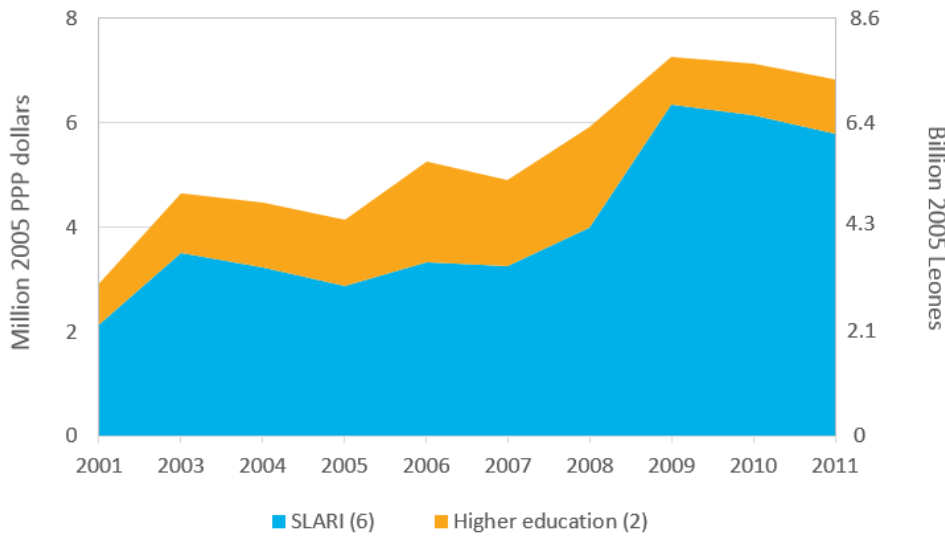
When the civil war ended in 2002, the National Agricultural Research Coordinating Council (NARCC) was grappling with recruiting researchers. When the political climate stabilized in 2008, donor funds were released to rebuild the research systems at SLARI and the higher educational institutions, which had collapsed during the war.

Upon taking office in 2009, the new Director General recruited several FTE researchers during the next few years. They had either a BSc or MSc degree. The researchers were assigned to SLARI headquarters or to one of SLARI centers.

Njala University School of Agriculture and IMBO have not been fully involved in agricultural research and development. They account for only 12 percent of the country's agricultural R&D staff and expenditures in 2011.

Sierra Leone's agricultural R&D spending increased dramatically between 2001 and 2011, as donor funds and government grants were pumped into the system (Figure 2). Spending rose from 3.1 billion Leones in 2005 prices in 2001—when the war was still raging—to 7.3 billion Leones in 2011.

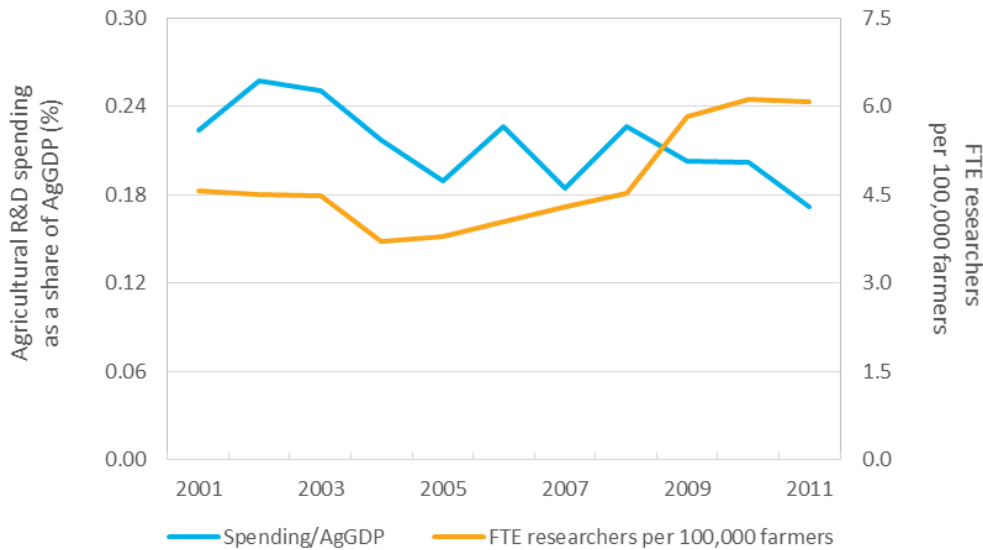
Figure 2. Long-term trends in Sierra Leone’s agricultural R&D spending by institutional category



Source: IFPRI-SLARI (2013-14).

Total spending as a percentage of agricultural gross domestic product (AgGDP) is a commonly used indicator of comparative agricultural R&D spending across countries. The intensity of agricultural research spending rose slightly from \$0.22 for every \$100 of agricultural output in 2001 to \$0.17 in 2011, indicating agricultural R&D expenditures rose less rapidly than did AgGDP (Figure 3). In contrast, the number of FTE researchers in agriculture per 100,000 farmers increased from 4.6 to 6.1 during this period. Both ratios are still very low for Sierra Leone, when compared with the averages obtained for the region. This should not be alarming to researchers in the subregion, who know that Sierra Leone is still grappling with the effects of the the country’s 10-year conflict.

Figure 3. Agricultural research intensity ratios, 2000–2011



Source: IFPRI-SLARI (2013-14).

THE STRUCTURE AND ORGANIZATION OF THE SIERRA LEONE AGRICULTURAL RESEARCH INSTITUTE

Overview

Sierra Leone has a long history of agricultural research, spanning almost 100 years. Agronomic research was conducted at Njala Experimental Station, Southern Province, which was opened in 1910. The Rice Research Station—established at Rokupr, Northern Province in 1934—was devoted to research on mangrove and swamp rice; in 1953, it was transformed into the West African Rice Research Institute. A Veterinary Research Station was set up at Teko, Makeni, in 1942, and a Livestock Research Station was established at Musaia, Kabala, in 1943, both in the Northern Province. In 1953, the oil palm research program at Njala became the West African Institute for Oil Palm Research. Beginning in 1953, forestry research was carried out at the Forestry Research Station at Bambawo, Eastern Province, and high-yielding Amazonian cocoa planting materials were propagated and distributed from Kpuwabu, also in the East. Also in 1953, Fisheries research was conducted at the West African Fisheries Research Institute at Kissy near Freetown. The variety and distribution of research facilities among the various provinces of the country, and the number of subregional research centers in Sierra Leone, attest to the quality of research being conducted across the country.

With the establishment of SLARI in 2008, most of the then defunct research stations (Pendembu and Kpuwabu Clonal Seed Gardens for tree crop research, Forestry Research Station at Bambawo, Teko Veterinary Station, and Musaia Livestock Station) have been rehabilitated by the International Fund for Agricultural Development (IFAD) through the Agricultural Sector Rehabilitation Project (ASREP).

Currently SLARI comprises five research centers:

- Njala Agricultural Research Center (NARC) conducts research on roots, tubers, and legumes;
- Rokupr Agricultural Research Center (RARC) conducts cereal research;
- Kenema Forestry and Tree Crops Research Center (KFTCRC)
- Teko Livestock Research Center (TLRC), and
- Magbosi Land & Water Research Center (MLWRC) on soils and water research.

There are plans to rehabilitate the Fisheries Research Station near Freetown to become the Freetown Fisheries Research Center in the Western region.

SLARI is governed by a council. The Chief Executive is a Director General who reports to council. The council comprises four committees that report to it: i) Scientific and Technical Committee; ii) Appointments, Promotion, and Disciplinary Committee; iii) Administrative and Finance Committee; and iv) Documentation, Data Management, and Information Committee.

Budgeting and Funding Process

Research at SLARI is coordinated by a research coordinator, who is either a principal research officer or a senior research officer. During the Work Program Conference Workshop at the beginning of the year, scientists present their reports for the previous year and also their research proposals for the coming year. The proposals are then vetted by a group of senior researchers, a statistician, and the monitoring and evaluation (M&E) officer, for approval for funding. A research proposal should meet all the standards set by SLARI before it can be funded. These include that the proposed research should be demand driven, follows a value chain approach, and has a suitable methodology. Proposals should also take an interdisciplinary approach involving other researchers. Research results should improve farmers' welfare and reduce hunger and poverty. Research priorities are set based on the needs assessment of SLARI and also on the research needs of farmers and other stakeholders. For example, areas of

specialization that are lacking are awarded scholarships for capacity building in Sierra Leone and to study overseas.

Strategic, Operational, and Investment Planning within SLARI

SLARI has strategic and operational plans, as well as an investment plan developed by an expert consultant from Kenya Agricultural Research Institute (KARI). The development of the new strategic plan has been a consultative process involving key stakeholders inside and outside SLARI. This inclusiveness ensures that the plan incorporates all constructive views and suggestions from all key stakeholders; builds on SLARI's current achievements and strengths; and contributes significantly to the development of the agricultural sector and the country, while ensuring proper alignment at the national and regional levels.

Recognizing the developments taking place at the national, regional, and international levels, SLARI has developed this strategic plan for the period 2012–2021. The plan is tailored to strategically position SLARI to contribute significantly to the development of the agricultural sector (SLARI 2011a). From regional and global perspectives, the strategic plan is in line with the Comprehensive African Agricultural Development Program (CAADP), CORAF/WECARD, and the Millennium Development Goals (MDGs).

The new SLARI strategic plan will be operationalized through two operational plans, each covering a period of 5 years. SLARI's first operational plan covers 2012–2016. Its top priority is to put in place the human resources, infrastructure and equipment, and related facilities required for the conducting research at all levels. During this first operational plan period, product value chain analysis, prioritization and development of appropriate upgrading, and promotion strategies will also be undertaken (SLARI 2011b).

Currently, SLARI has very limited human, financial, and physical resources. Therefore, only a few product value chains can be developed and promoted under each research program area of focus. In view of this, SLARI research managers and the relevant agricultural sector stakeholders will have to choose the product value chains that have the greatest potential to contribute to the national economic growth and agricultural sector development. To do this, SLARI will adopt a scoring method to identify and select the most important product value chains for development and promotion under each research program area of focus. The result of this priority-setting process will then form the basis for allocation of resources for research. Currently, only the rice and cassava products value chains are fully functional.

The investment plan was developed through an extensive consultative process involving key stakeholders inside and outside SLARI. This inclusiveness should ensure that the investment plan incorporates all the costs required for the smooth implementation of the first operational plan and, hence, the SLARI strategic plan. As with the strategic plan, the top priority of the investment plan will be to put in place the human resources, infrastructure and equipment, and related facilities required for conducting high-level research at the institute (SLARI 2012).

Technology Transfer and Participatory Research

The Ministry of Agriculture, Forestry and Food Security (MAFFS) is the supervisory body of SLARI, though SLARI has its own independent management team. For the MAFFS annual report on the agriculture sector, SLARI provides technical information on its research achievements for the year in question. However, MAFFS does not influence SLARI's setting of priorities.

Through its extension wing, MAFFS disseminates and promotes the adoption of technologies generated by SLARI to farmers within all 14 districts in Sierra Leone. MAFFS performs technology transfer using 12 innovation platforms spread across the country to help implement the West Africa

Agricultural Productivity Program (WAAPP) and share information. The multiplication of foundation seed is another program MAFFS is undertaking through WAAPP's sponsorship.

The new agricultural R&D paradigm at SLARI is placing farmers and other stakeholders at the center of research by planning, implementing, and evaluating research activities with them. Consultation with farmers before execution of research activities is a prerequisite for planning research (SLARI 2011c). In 2013, WAAPP organized a countrywide consultative survey of stakeholders with SLARI and MAFFS researchers. Such meetings will continue after every 2–3 years.

At SLARI, some projects (New Rice for Africa [NERICA], Rice Yellow Mottle Virus Project, CARE International, staple crops program on cowpea and cassava projects) have conducted participatory varietal selection (PVS) research, where farmers and scientists participated in the selection of varieties that the farmers believe have potentially good culinary qualities. The best-selected varieties were then multiplied for dissemination to farmers and were also recommended for release. PVS research has given farmers the opportunity to select the varieties and bear the onus of any choices made. Therefore, the best choice was always made in the series of PVS research activities that were carried out in the experimental fields of the farmers.

SLARI Collaboration and Partnership

SLARI takes into account external drivers, such as the European Union and the World Bank, with specific goals for achieving the MDGs.

In addition, SLARI is fully engaged with various CGIAR centers —International Institute of Tropical Agriculture (IITA), Africa Rice Center (AfricaRice), IFPRI, and the World Agroforestry Center—and CORAF/WECARD, which are strong partners, even when their priorities are outside of SLARI's strategic plan. SLARI has developed a memorandum of understanding with the University of Abeokuta in Nigeria for capacity building, training, and writing joint proposals. Currently, SLARI researchers are pursuing their MSc and PhD degrees at the university. SLARI is also closely collaborating with Njala University in Sierra Leone. Some of the lecturers at Njala University are SLARI research fellows. Also, the Council for Scientific and Industrial Research in Ghana had a proposal to train researchers at SLARI.

The International Atomic Energy Agency (IAEA) has contributed significantly by donating laboratory equipment to RARC for the tissue culture, molecular biology, soils, and biotech laboratories. However, scientists need to be trained to operate the equipment properly. The equipment at RARC can also be used in NARC and the other research centers when the need arises. In the 1980s, NARC (then known as ACRE [Adaptive Crop Research and Extension Project]) had the best soils laboratory in West Africa, with advanced soils equipment; this lab is now defunct and its equipment is outdated.

The Forum for Agricultural Research in Africa (FARA) provided funding for the consultant who drafted the strategic, operational, and investment plans for SLARI. The new research paradigm has been to move the cassava value chain from boiling and eating to processing and marketing, thereby adding value to it and also to rice. This implies that researchers, farmers, processors, marketers, service providers, and policymakers all interact on an innovation platform in order for the value chain to be successful and sustainable.

West Africa Agricultural Productivity Program

The first phase of WAAPP consists of four series: (1) WAAPP 1A, which includes Ghana, Mali, and Senegal, is at the end of its first phase; (2) WAAPP 1B, including Nigeria, Burkina Faso, and Côte d'Ivoire, was approved on September 30, 2010, by the Board of Directors of the International Development Association of the World Bank; (3) WAAPP 1C, which comprises Benin, Gambia, Guinea, Liberia, Niger,

Sierra Leone, and Togo, was approved March 24, 2011; and (4) WAAPP 1D, which includes Cape Verde and Guinea-Bissau, is under preparation.¹

WAAPP’s objective is to support the generation of technologies, and disseminate them for adoption by farmers and other stakeholders along the value chain. Only two commodities—rice and cassava—are sponsored by WAAPP 1C in Sierra Leone.

Researchers have been trained in long- and short-term courses. Disciplines that need capacity building according to SLARI’s needs assessment have been identified for training. Consultation with farmers is a prerequisite for planning research.

CORAF/WECARD is responsible for the regional coordination of WAAPP’s activities—through its Project Coordinating Unit—is responsible for coordination in Sierra Leone. A team of researchers from SLARI traveled to Ghana for a consultative meeting on WAAPP’s implementation, since Ghana was already in WAAPP’s second phase and could share its experiences.

RESEARCHER CAPACITY

Institutional Strengths and Weaknesses

In a three-day workshop funded by FARA, SLARI staff completed capacity requirement forms. SLARI’s capacity plan then noted the required number of scientists per research center and the number of scientists required to pursue master’s and PhD degrees (table 1).

Table 1. Number and level of required long-term training for SLARI’s research centers and headquarters

Research centers and headquarters	Number and level of required long-term training	
	M.Sc./M.Phil.	PhD
Njala Agricultural Research Center	1	16
Rokupr Agricultural Research Center	3	8
Kenema Forestry and Tree Crops Research Center	0	6
Teko Livestock Research Center	0	3
Freetown Fisheries Research Center	0	4
Magbosi Land & Water Research Center	5	5
Kabala Horticultural Crops Research Center	2	3
SLARI headquarters	0	2
Total	11	47

Source: Kilewe and Kirigua (2012).

The retirement of older scientists in 2013 gave way to the recruitment of younger scientists. The required number of scientists shown in Table 1 has not been achieved yet, as the research centers are struggling to acquire the required numbers. PhD training is in higher demand than MSc training, because most researchers and research assistants with BSc degrees have been given the opportunity to pursue their MSc degree training in Sierra Leone or in other African countries. There is a need to quickly develop PhD researchers, to provide leadership to research programs and assist in training supervisors and mentoring of the younger scientists.

¹ From Awareness Times Newspaper in Freetown (http://news.sl/drwebsite/publish/printer_200522545.shtml).

Most SLARI researchers have been trained in the area of crop science and horticulture, and have bachelor's and master's degrees (table 2). There is no deficiency in the number of crop scientists at SLARI, because Njala University has BSc, MSc, and PhD degree programs in this area. Other important areas of specialization where the number of researchers has increased somewhat are agricultural economics, agronomy, food science and nutrition, and soil science.

Table 2. Number of researchers by degree and discipline (specialization), July 2013

Discipline	PhD	MSc	BSc	Total
Agricultural economics	0	4	3	7
Agronomy	1	3	1	5
Animal and livestock sciences (including veterinary medicine)	1	5	3	9
Biodiversity conservation	0	1	0	1
Crop sciences (including horticulture)	3	29	17	49
Ecology	0	0	0	0
Entomology	0	3	0	3
Extension and education	0	3	16	19
Fisheries and aquatic resources	0	0	0	0
Food sciences and nutrition	0	3	6	9
Forestry and agroforestry	0	0	3	3
Molecular biology (applied to plant/animal breeding)	0	1	0	1
Natural resource management	0	1	3	4
Soil sciences	2	6	2	10
Water and irrigation management	0	3	0	3
Other (specify): Biochemistry	0	1	1	2
Other (specify): Agricultural engineering	0	0	4	4
Other (specify): Environmental chemistry	0	0	2	2

Source: Compiled by authors from ASTI/IFPRI-CORAF/WECARD-SLARI survey data.

Researchers are lacking at the research centers in the following disciplines: biochemistry, agricultural engineering, water and irrigation management, molecular biology, and environmental chemistry. WAAPP has awarded scholarships to 38 researchers to pursue MSc and PhD degrees in some of these disciplines. Additional scientists and training are also needed in markets and marketing, processing and entrepreneurship, food science and technology, policy and policy analysis, and extension and rural sociology. NARC lacks these disciplines because they are not offered at Njala University at the postgraduate level. Although animal science (livestock) and horticultural science are offered at Njala University at higher levels, an insufficient number of students pursue these courses. For continuous cropping to be possible in Sierra Leone, hydrologists should be trained in land and water management, so that irrigation schemes are properly managed.

Researcher Departures

Staff departures are uncommon at SLARI, except for retirement or temporary overseas study (table 3). The length of service is better when compared with other government jobs in Sierra Leone. Study opportunities and overseas travel are additional advantages for researchers to stay in their job. A 75 percent pay raise for senior staff effective January 2013 and a 38 percent increase in January 2014 are strong incentives for retaining SLARI's senior staff. However, promotions are very limited because SLARI

lacks the financial resources to increase staff salaries. Nevertheless, the staff benefits fund is intact and ready to pay staff members who resign or retire.

Table 3. Number of researcher departures and reasons for departure, January 2009–July 2013

Researcher categories	2009	2010	2011	2012	Jan–July 2013
Gender					
Female	0	0	1	1	2
Male	0	2	2	0	0
Total	0	2	3	1	2
Degree					
PhD	0	0	1	0	1
MSc	0	2	1	1	1
BSc	0	0	0	0	0
Age					
40 years or younger	0	0	0	0	0
41–50 years	0	0	1	0	0
51–60 years	0	0	0	0	0
61 years or older	0	2	2	1	2
Reason for departure					
	2009	2010	2011	2012	Jan–July 2013
Retirement	0	1	2	0	2
Promotion to other government department	0	0	0	0	0
Temporary transfer to other government department	0	0	0	0	0
Resignation	0	0	0	1	0
Dismissal	0	0	0	0	0
Death	0	1	0	0	0
Other (leave of absence)	0	0	1	0	0

Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

Researcher Recruitment

There has been an upsurge in the recruitment of younger researchers from 22 in 2009 to 40 in 2012, to compensate for a significant number of aging and retiring researchers (table 4). In addition, WAAPP is building the capacities of younger scientists in universities in Ghana, Nigeria, and Sierra Leone. The retirement age at SLARI is 65 years for senior staff, including researchers, and 60 for junior staff. Retired researchers may continue to work at SLARI on a contract basis, with their contracts renewable once a year. On the whole, researchers 40 years and younger were the highest recruited age group, followed by researchers 41–50 years old.

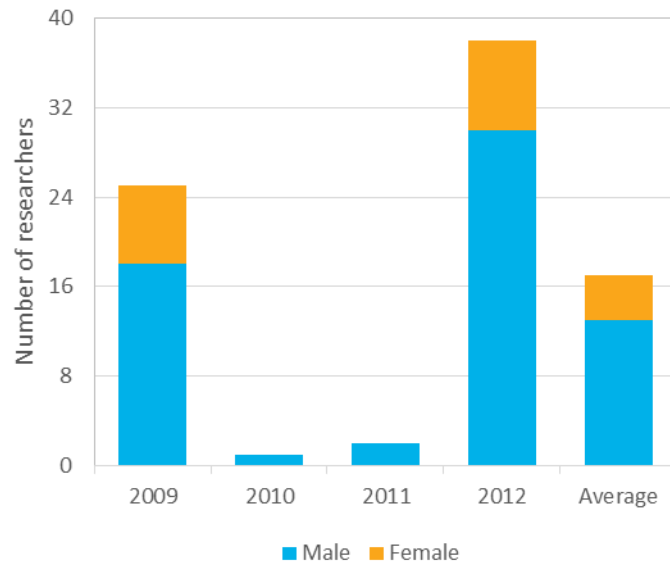
Table 4. Number of newly recruited scientists by age, 2009–2013

Age group	2009	2010	2011	2012	2013	Total
40 years or younger	22	1	1	40	13	77
41–50 years	2	0	0	8	7	17
51–60 years	4	0	0	1	4	9
61 years or older	2	0	0	0	0	2

Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

Of the total number of newly recruited researchers during 2009–2013, 20% were female (figure 4). Among the researchers with PhD degrees, none was female until 2010. After 2010, NARC’s Soil Science Department recruited one female scientist with a PhD degree, but she left shortly afterward for a more attractive position. However, in absolute numbers more female scientists were recruited in recent years, eight in 2012 and six in 2013. This increase is an encouraging step in the right direction and resulting from a greater attention to gender representation at SLARI.

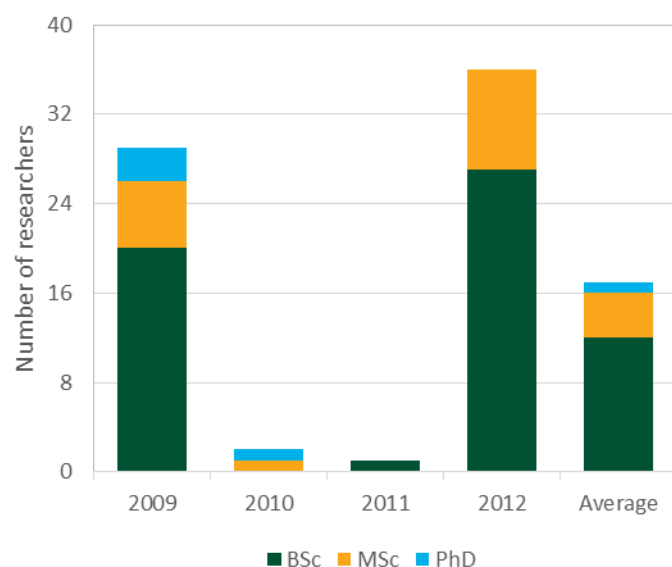
Figure 4. Number of newly recruited scientists by gender, 2009–2013



Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

SLARI’s capacity plan recommended that SLARI should have a policy of recruiting primarily at the MSc level. However, the majority of the newly recruited scientists had a BSc degree only; only 6 percent had a PhD degree and 26% a MSc degree. Because candidates with MSc degrees are lacking in the country, the practice has been to recruit good first degree graduates with a minimum of second class honors. Furthermore, most of the recruited BSc-holders have been sent on MSc training. After completion they were promoted from research assistants to level-3 research officers after receiving their degrees.

Figure 5. Number of newly recruited scientists at SLARI by degree, 2009–2013



Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

Researcher Training

At SLARI, one of the five result areas is strengthening the capacity for implementing agricultural product value chains research (SLARI 2008). Toward this end, a number of researchers received training in postgraduate and undergraduate studies during 2009–2012. Almost all BSc training took place in Sierra Leone at Njala University. Furthermore 11 researchers followed MSc training at Njala University in 2012 (11 research. In 2009 1 researcher followed BSc training and 1 followed MSc training in an other developing country, and 1 researchers MSc training in a high-income country. No researchers followed degree MSc or BSc training outside the country during 2010–2012.

Until recently, it was rare to have scholarships awarded to researchers to pursue higher degrees out of the country. In 2010, only one PhD researcher was trained in Sierra Leone, and one was trained in another developing country in 2009.

Table 5. Number of researchers who received PhD, MSc, and BSc training. 2009–2012

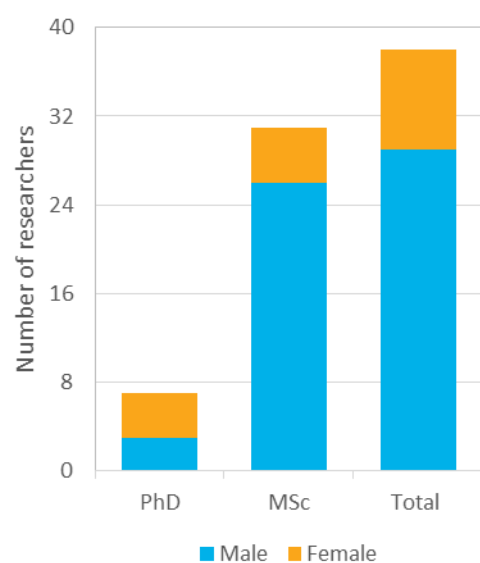
Levels and places of training	2009	2010	2011	2012	Average
PhD training					
Sierra Leone	0	1	0	0	0
Other African country	0	0	0	0	0
Other developing country	1	0	0	0	0
High-income country	0	0	0	0	0
<i>Subtotal</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>
MSc training					
Sierra Leone	3	1	0	11	4

Levels and places of training	2009	2010	2011	2012	Average
Other African country	0	0	0	0	0
Other developing country	1	0	0	0	0
High-income country	1	0	0	0	0
<i>Subtotal</i>	<i>5</i>	<i>1</i>	<i>0</i>	<i>11</i>	<i>4</i>
BSc training					
Sierra Leone	19	0	1	28	12
Other African country	0	0	0	0	0
Other developing country	1	0	0	0	0
High-income country	0	0	0	0	0
<i>Subtotal</i>	<i>20</i>	<i>0</i>	<i>1</i>	<i>28</i>	<i>12</i>

Source: Compiled by authors from ASTI/IFPRI-CORAF/WECARD-SLARI survey data.

The main training opportunities for SLARI researchers are now funded by WAAPP, which provide long- and short-term training in and out of the country. In 2013, 38 researchers were offered scholarships through WAAPP to pursue MSc and PhD degree training at Sierra Leone, Ghanaian, and Nigerian universities to fill the gaps in disciplines or specializations at SLARI (figure 6). 76 percent of these were male and 24 percent female. This has resulted in critical staff challenges for SLARI, because these researchers have not been replaced. Furthermore, the World Agroforestry Center is supporting training of three SLARI scientists to the PhD level—two male and one female researchers.

Figure 6. Number of SLARI researchers on WAAPP’s scholarship by gender and degree, 2013



Source: Compiled by authors from ASTI/IFPRI-CORAF/WECARD-SLARI survey data.

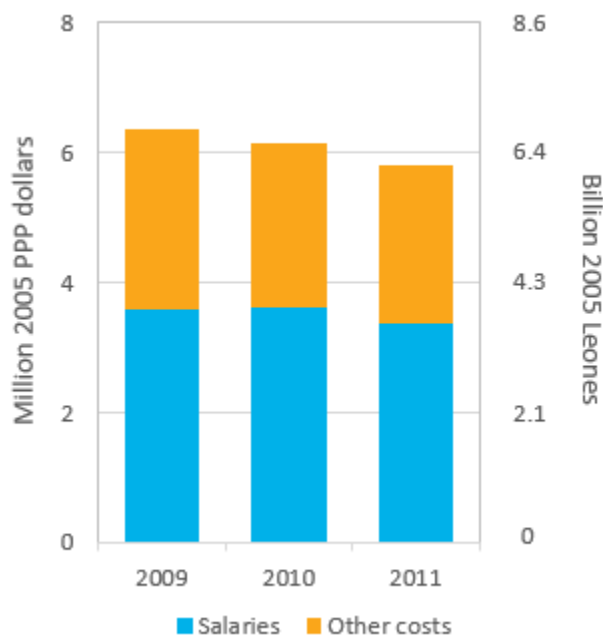
From 2010 to 2012, field technicians and superintendents took part in short-term training in South Africa, Nigeria, Benin Republic, Ghana, and Nigeria. The training was funded by FARA, CTA, CORAF (Staple Crops Program), ASREP, Department for International Development, AGRA, Africa Rice Center, and WAAPP. Areas of focus included management of agricultural research for development of innovative systems, development of extension materials and systems, M&E of a staple crops program, and a general agricultural R&D paradigm.

FINANCIAL RESOURCES AND EXPENDITURES

Expenditures

From 2009 to 2011, salaries accounted for about two-thirds of SLARI’s total expenditures, and operating and capital costs accounted for the remaining one-third (figure 7). In 2009, 4.1 billion 2005 Leones (3.7 million 2005 PPP dollars) was spent on salaries, and 2.4 billion 2005 Leones (2.5 million 2005 PPP dollars) was spent on other costs. SLARI’s expenditures were slightly lower in 2011 with salaries and other costs totaling 4.0 and 2.4 billion 2005 Leones, respectively.

Figure 7. SLARI expenditures by cost category, 2009–2011



Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

The government ministries, departments, and agencies (MDAs) submit their yearly estimated budgets to the Ministry of Finance for approval and subsequent payment.

As an indication of its high priority for agriculture, Sierra Leone has allocated 10 percent of the national budget to agriculture. Despite this high priority, not all the funds requested by the MDAs are approved or released, because the government has limited financial resources and need also to pay for infrastructural development countrywide.

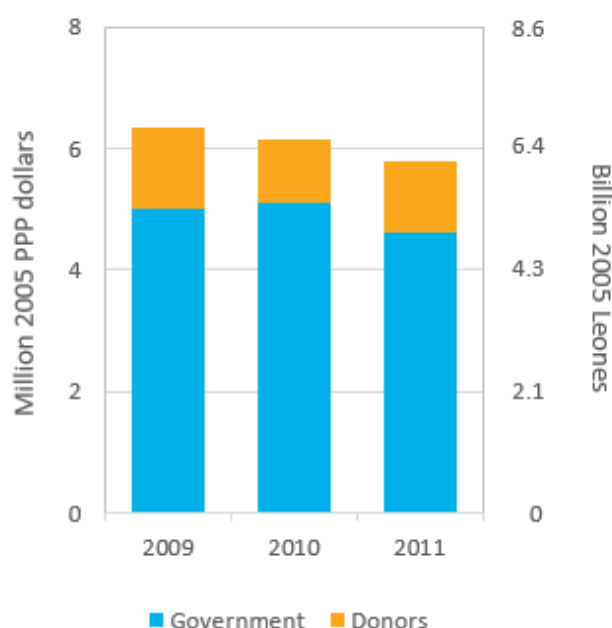
In spite of its profitable mining companies, the Sierra Leone remains a poor nation. Compounding the problem of poverty is the nationwide corruption of government officers in high places. Misplaced government priorities and wasteful spending have contributed immensely to Sierra Leone’s current economic recession, and are the reason for the discrepancies between amounts of

money approved and budgeted versus amounts actually disbursed to SLARI. In the case of large discrepancies, implementation of day-to-day activities is delayed, postponed, or even cancelled altogether.

Funding Sources

Between 2009 and 2011, SLARI received the majority of its funding from the government for payment of salaries, personnel compensation, and other charges referred to as operating costs (Figure 8). In 2009, SLARI received 5.1 billion 2005 Leones from the government and 1.4 billion 2005 Leones from donor organizations, mostly for conducting research, constructing buildings, and purchasing computers and other equipment. In 2010, government funding to SLARI increased (5.3 billion 2005 Leones), but donor funding decreased (1.1 billion 2005 Leones). The opposite occurred in 2011, with government funding decreasing (4.8 billion 2005 Leones) and donor funding increasing (1.2 billion 2005 Leones).

Figure 8. SLARI funding sources, 2009–2011



Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

WAAPP is a major contributor to SLARI’s research activities and provides financial support for training (capacity building); rehabilitation and building of infrastructure; and generation, dissemination, and adoption of modern technology for rice and cassava, which are also the government’s priority crops. Normally donors’ priorities are well aligned with the government’s priorities, but this is not always the case.

From 2009 to 2012, total government funds disbursed increased progressively, indicating Sierra Leone’s commitment to sustainable food security in the country (Table 6). However, this growth was lower than the inflation rate, resulting in the declining government contributions as indicated in figure 8. Except for 2010, donor funds also increased from year to year.

Table 6. Government funding allocations for SLARI, 2008–2012 (in millions Leones)

Budget category	2009		2010		2011		2012	
	Approved	Actual	Approved	Actual	Approved	Actual	Approved	Actual
Recurrent	2,150.0	2,150.0	2,279.0	1,886.5	2,214.2	1,857.8	2,937.0	2,668.5
Development	0		1,100.0	760.0	700.0	700.0	700.0	448.0
Personnel	5,475.2	5,475.2	6,459.0	6,459.0	7,118.1	7,118.1	7,340.0	7,340.0
Total	7,625.2	7,625.2	9,838.0	9,105.5	10,032.3	9,675.9	10,977.0	10,456.5

Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

Over the years, donor funds have been disbursed to undertake specific project activities over a given period of time, which is normally 3 years. Donor funds are spent specifically to implement donor project activities only, and may not be used for any other purpose.

The largest donor to SLARI during 2009–2012 has been the African Development Bank (AfDB), which accounted for more than one quarter of the total donor support to SLARI’s research projects (table 9). Other important donors have been Africa Rica, AGRA, CFC, the World Bank, and FAO. In addition to the general budget, the government has also been supporting specific research programs at SLARI.

Table 9. Project funding by source, 2009–2012 (in million Leones)

Donor	2009	2010	2011	2012	Total	Share total
Government	143.4	18.0	46.0	0.0	207.4	2%
World Bank	77.8	190.0	268.5	0.0	536.4	6%
Africa Rice	510.6	115.3	105.0	148.5	879.4	10%
Other CGIAR	117.1	1.0	0.0	187.2	305.3	3%
IAEA	36.7	41.5	0.0	78.5	156.7	2%
IFAD	71.0	284.9	52.4	0.0	408.3	4%
CORAF/WECARD	0	0.0	118.9	126.8	245.7	3%
FAO	0	309.3	186.6	73.3	569.2	6%
FARA	87.2	76.6	46.1	129.3	339.1	4%
IRC	0	16.7	153.2	291.4	461.3	5%
CFC	244.9	263.2	151.9	0.0	660.0	7%
AfDB	299.7	477.5	608.7	1,252.0	2,637.9	29%
AGRA	0	0.0	525.2	94.7	619.9	7%
Other	496.3	85.3	246.6	294.3	1,122.6	12%
Total	2,084.7	1,879.2	2,509.1	2,675.9	9,149.0	100%

Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

At the end of each quarter, technical and financial reports, and returns from the use of the donor funds with authentic receipts, invoices, vouchers, etc., are presented to the donors, who thoroughly scrutinize the documents. If the donors are satisfied with this documentation, they will approve the release of the next tranche of funds. Accountability and transparency play a significant role in donor funding.

Requests made by scientists to undertake project activities must pass through their program directors, the Director General, the internal auditor, and the finance officer for endorsement before funds are approved to be disbursed.

Some donors impose strict regulations on researchers, and projects are not always designed or implemented appropriately. For example during two recent multi-country projects crops had to be planted at the wrong time of the year, this to follow the planting time in other countries part of the projects. As a result the harvest failed. Donors may get better returns on their investments by being more flexible in developing protocols that are better tailored to individual countries and can be correctly adopted to undertake the research.

Financial Requirements

SLARI's strategic plan will be carried out through two 5-year operational plans. Each of the operational plans will be implemented and financed through rolling annual work plans that will specify the activities and milestones required to accomplish each strategic goal and objective. In an effort to establish the overall financing requirements for the first operational and investment plan period, the total financing requirements for research programs, human resources, physical resources, and equipment and related facilities were rationalized and consolidated (Table 7). Implementing the first operational plan over the period 2012–2017 will require a total of US\$274.1 million for SLARI's headquarters and seven research centers. Expected funding levels from government contributions, development partners, and private sector over this period was estimated at only US\$ 105.6 million, resulting in a financial gap of US\$168.4; more than 60% of the needed requirements.

Table 7. Financial requirements and expected funding levels for SLARI's first operational plan period (2012–2017)

Cost category	Five year period (million US\$)
Financial requirements	
Research programs	87.0
Human resources	81.7
Physical infrastructure	55.1
Equipment and related facilities	47.5
Research support functions	2.8
Total	274.1
Expected funding levels	
Government allocation	96.3
Secured funding	2.4
Pipeline funding	7
Total	105.6
Estimated Financial gap	168.4

Source: SLARI (2012).

RESEARCH INFRASTRUCTURE AND RESOURCES

The quality of R&D infrastructure at SLARI is poor. Laboratories at RARC and NARC are poorly equipped, and are therefore not fully functional while the other research centers have no equipment at all (table 10). Also, the major equipment currently in RARC and NARC cannot be fully utilized, because researchers need to be trained in how to use it. Hence, WAAPP has sent 38 researchers to be trained in their disciplines, so they can use the equipment in the labs accurately when they return from training.

Table 10. SLARI's physical research infrastructure

Name of research center/station	Name of laboratory	Number of satellite stations
Njala Agricultural Research Center	Tissue Culture	8
	Molecular Biology	
	Food & Nutrition Technology	
Rokupr Agricultural Research Center	Tissue Culture	7
	Molecular Biology	
	Soils	
	Biotech	
Kenema Forestry and Tree Crops Research Center	2 newly built labs but not yet equipped	3
Teko Livestock Research Center	2 newly built labs but not yet equipped	1
Magbosi Land & Water Research Center	No labs built or rehabilitated as of 2014	None

Source: Compiled by authors from ASTI/IFPRI-CORAF/WECARD-SLARI survey data.

The infrastructure at the laboratories are not been repaired, especially when the laboratories have not yet been fully utilized. At RARC and NARC, electricity supply is rationed for seven hours during the workday, and for five hours during the evening in the researchers' residential areas. Internet and water facilities are available at NARC, but not at the other research centers. Adequate vehicles are not available in the centers, and one center has only two vehicles that are roadworthy. There are some desktop computers, but not for all researchers. There are only two information technology communications (ICT) specialists in computer hardware for SLARI headquarters and its seven research centers, and they are based in the headquarters in Freetown. Some important research areas that are ignored because of lack of equipment and adequate training to operate the equipment include biotechnology, tissue culture, molecular biology, and Irrigation systems.

PERFORMANCE EVALUATION

Technologies Generated or Adapted

During 2004–2012 NARC developed various two cassava, two sweet potatoes, one groundnut and one cowpea varieties (table 11). RARC's new varieties were developed both in-house and externally. From 2004 to 2012, RARC developed two rice varieties in-house and seven varieties were externally developed. All varieties were rice interspecific hybrid and were released in 2012. None of the varieties developed at NARC or RARC were patented.

Table 11. Improved varieties developed in-house at NARC, 2004–2012

Crop Type	Cassava	Sweet potato	Groundnut	Cowpea
Released varieties	SLICASS 1 – SLICASS 6	SLIPOT 1 - SLIPOT 4	SLINUT 1	SLIPEA 1
Good Traits	High yielding with high dry matter content. Good for making gari and resistant to pest and diseases	Sweet in taste Resistant to pest & diseases	Groundnut variety is robust in size	Cowpea variety with clean seed that is palatable
Patented	No	No	No	No

Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

Note: SLICASS = Sierra Leone Institute Cassava; SLIPOT = Sierra Leone Institute Potato; SLINUT = Sierra Leone Institute Groundnut; SLIPEA = Sierra Leone Institute Cowpea.

Table 12. Improved varieties developed in-house and externally at RARC, 2004–2012

Crop Type	Rice developed in-house		Rice externally developed and tested in-house	
Released varieties	WAR 77-3-22 rice intraspecific hybrid	WAR 73-1-M2-1 rice intraspecific hybrid	NERICA 1, NERICA 15, NERICA 16	WAB 450-1-B-P-32-HB NERICA L 20 WAS 49-B-B-9-1-4-4 TOX 3817-42-3-1-2-3-2
Good traits	High yielding variety Sweet in taste Early maturing	Sweet in taste High yielding	Early maturing Sweet	Early maturing Sweet High protein content Resistant to iron toxicity
Patented	No	No	No	No

Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

Note: L = lowland rice variety; NERICA = New Rice for Africa; TOX = variety tolerant to iron toxicity; WAB = WARDA Bouake; WAR = WARDA Rokupr; WAS = WARDA Senegal.

SLARI has not yet set up a special committee or seed board to oversee the release of new varieties. To release a new variety, the breeder applies through the release committee, which tests the variety's potentials and vets other standards that would qualify the release in question. The variety is then tested in the field for 2 consecutive years to see whether the potentials discovered by the breeder are the same as those of the Sierra Leone seed-certifying agency. If the board or release committee is satisfied with the variety after it has passed through the normal procedure, then its release will be permitted. The seed board is currently in its formative stage.

Publications

On average, every researcher at SLARI publishes at least one publication a year.

Table 13. Number and types of publications by SLARI researchers, 2009–2012

Year	Number of researchers at NARC & RARC that published	Number of national publications	Number of international publications	Types of publications	Comments
2009–2012	4	12	6	Journal articles	In 2008 there were no publications, because SLARI was then in its formative stage from NARCC, and researchers reapplied.
	2	2	0	Books	
	5	9	2	Scientific articles	
	4	7	2	Papers and posters	
2013	2	0	2	Conference posters	

Source: Compiled by authors from ASTI/IFPRI–CORAF/WECARD–SLARI survey data.

CONCLUSION AND RECOMMENDATIONS

The 10-year civil war virtually destroyed Sierra Leone's agricultural R&D human and financial resources, institutional status, and infrastructure, resulting in low output of research results. Although the war finally ended in 2002, it has taken a long time to fully re-establish Sierra Leone's agricultural R&D system, rehabilitate its research infrastructure, and rebuild staff capacity. The system faces several challenges that pose serious barriers to agricultural R&D in Sierra Leone:

- Low adoption of research technologies.
- Lack of appropriate policies, standards for food products, and marketing opportunities, and limited stakeholder involvement in the rice and cassava value chains, which are SLARI's mandate crops.
- Limited infrastructure, inadequate research capacity, limited access to current and relevant scientific literature, inadequate support services, and logistics issues.
- Inadequate development, validation, and release of new technologies to the value chain players.

Nevertheless, there had been marked improvement in human and financial resources, and WAAPP and other donor agencies like ASREP and IFAD have significantly contributed to building and refurbishing the infrastructure of new and old SLARI research centers. More researchers are being trained at master's and PhD degree levels inside and outside Sierra Leone, more female researchers are employed than 2–3 years ago, and staff is capacity being built through short- and long-term training. The salaries, personnel compensation, and other allowances of researchers and other senior staff have improved greatly compared with 3–4 years ago.

With the advent of WAAPP, project proposals are being funded on rice and cassava only. Other donors, such as IAEA, AGRA, Africa Rice, IFPRI, FAO, World Bank, and CORAF, have all contributed to building SLARI's human and financial resources and the institutional and infrastructural capacity of its agricultural R&D drive.

In a bid to increase the 6 percent growth rate in agricultural development output for developing West African countries, the Government of Sierra Leone must have policies to invest tirelessly in human, financial, and infrastructure resources necessary for conducting meaningful agricultural R&D, in combination with measures that:

- Spur productivity growth, focusing on subsectors with high demand within Sierra Leone.
- Joint investments in rice research, which is the country's staple food. Development at the regional level can provide even higher returns, given the potential for transferability across borders.
- Enhance linkages between agricultural and nonagricultural sectors (the private sector).
- Exploit opportunities for greater regional cooperation and harmonization. MAFFS has recently developed an agricultural sector policy that is linked to the policy of the Economic Community of West African States.
- Addressing the need for institutional reform is necessary to strengthen agricultural R&D operations, in terms of developing the human and financial resources in the agriculture industry to effectively deliver services to the farming community for increased production. In line with government policies, the Government of Sierra Leone should adopt the following strategies:
- Review the mandates of the research centers in line with current and foreseeable demands.

- Review the existing manpower in the research centers.
- Strengthen the research-extension-farmer linkages for effective use of research results to increase production.
- Strengthen and restructure the Planning, Evaluation, Monitoring, and Statistics Division of SLARI to enable it to carry out its collection mandates.
- Potential policy measures needed to address these agricultural R&D challenges include:
 - Developing appropriate policies to promote production, processing, and consumption of agricultural products in the bakery and confectionary industry and food diversification.
 - Adopting participatory approaches to innovation platforms to technology adoption, and developing appropriate agricultural information, and ICT systems.
 - Conducting studies on policy constraints to agR&D that have inhibited the growth of research in Sierra Leone, and on any opportunities that may form the basis for advocacy for policy reform.
 - Analyzing the influence of constraints, such as the lack of protocols for release of new varieties and seed regulation, to gather sufficient data to address the current restrictions and challenges to R&D.
 - Advocating for an increase in the Government funding, full payment of actual budgets submitted, and better alignment of donor funding to SLARI.
 - Training in the use and development of improved databases and M&E systems in the NARI.
 - Investing in the overall improvement of human, financial, institutional, and infrastructural resources of the NARI to strengthen agricultural R&D.

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ABOUT THIS REPORT

This report is part of an in-depth assessment of the critical issues surrounding the human, financial, and institutional capacities in West African agricultural research that was undertaken during 2013–2014. Such an assessment is key to the development of national and regional policy recommendations that will ultimately feed into a regional agricultural research strategy for West Africa. The assessment was collaboratively conducted by the Agricultural Science and Technology Indicators (ASTI) program of the International Food Policy Research Institute (IFPRI), the West and Central African Council for Agricultural Research and Development (CORAF/WECARD), and the national agricultural research institutes of six West African countries. Other countries included in the assessment were Benin, Burkina Faso, Ghana, Senegal, and Sierra Leone.

Gert-Jan Stads and Nienke Beintema from ASTI/IFPRI and Mbène Dièye Faye from CORAF/WECARD co-managed the assessment, the outputs of which have not been peer reviewed. Any opinions are those of the author and do not necessarily reflect the policies or opinions of IFPRI, CORAF/WECARD, or SLARI.

ABOUT ASTI, IFPRI, AND CORAF/WECARD

Working through collaborative alliances with numerous national and regional R&D agencies and international institutions, ASTI is a comprehensive and trusted source of information on agricultural R&D systems across the developing world. ASTI is led by IFPRI, which—as a CGIAR member—provides evidence-based policy solutions to sustainably end hunger and malnutrition and reduce poverty. CORAF/WECARD is a nonpolitical organization of the national agricultural research systems of 23 countries in West and Central Africa. It aims to increase the efficiency of agricultural research in the region in order to facilitate economic growth, food security, and export competitiveness through productive and sustainable agriculture.

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