Comprehensive assessment of national agricultural research and extension systems with a special focus on institutional linkages between various actors in Liberia

Analysis and guidelines
Liberia case study
Comprehensive assessment of national agricultural research and extension systems with a special focus on institutional linkages between various actors in Liberia

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Executive summary

Agricultural research provides the foundation for innovation and system’s change and is therefore a key driver of economic growth and development. The National Agricultural Research Systems (NARS) in Liberia are facing, and will continue to face, multiple-interlinked challenges due to the dynamic nature of the drivers of changes and the complexity of institutional structure and linkages. To ensure effective delivery of national research outputs, it is vitally important to constantly assess the Agricultural Research for Development (AR4D) potential to ensure its continued ability to respond to the evolving and dynamic needs of an ever-expanding population. To this effect, an assessment study of AR4D and NARS actors’ linkages was conducted to explore their current status and potential areas for improvement. This case study aimed to support research for development efforts by NARS through development of an integrated and coherent approach for research and dissemination of proven technologies and practices.

The study included assessment methodology and guidelines to assess different aspects involved in AR4D to draw lessons, key-recommendations, policy brief and supporting guidelines and criteria to improve the implementation of AR4D projects, thus enhance the impact on targeted groups. The methodology of this study was built on existing documentation on the subject matter at hand, and strived to collect new information through Key Informant Interviews (KIIs) and focus group discussions (FGDs) to capture the systemic changes overtime (both drivers and solutions) and understand the resilience of the system to deal with upcoming development challenges. In this methodology, up to 96 individuals, including key experts, researchers, extension officers and farmers were interviewed either individually or in groups to better understand the arrangements and challenges in implementing AR4D programs in Liberia. It also evaluated the performance of the NARS and the institutional coordination between the various organizations that constitute the NARS, with the goal of developing a guideline to help strengthening the linkages between various NARS actors in the country.

This report discuss the different phases of the study including desk review analysis, envelopment of methodology guidelines for the assessment, compensative analysis of the obtained results from participatory discussions and key informants interviews, assessment of institutional linkages between different NARS actors. The lessons learned and supportive technical guidelines will be discussed in the upcoming related publication.

Several interviews were held with various experts who were familiar with the NARS and its research impact on agricultural development in Liberia. The individual experts were of diverse professional backgrounds and selected from different
national, regional, and international organizations associated with AR4D activities in the country. Thematic focus group discussions (FGD) associated with both the NARS and the extension and advisory services (EAS) in Liberia were conducted. The FGDs were organized with researchers, academia, extensionists, relevant community-based organizations (CBOs) and farmer groups within the country. The objective of these combinations and discussions was to obtain further knowledge and insights on the performance of the NARS to identify the shortcomings and possible solutions to facilitate implementation of AR4D activities in the country and thereby enhance their impact on economic growth and food security and nutrition.

The results of the assessment showed that the technical, administrative, and financial support from the government to the main AR4D institution in the country, the Central Agricultural Research Institute (CARI), was limited and collaboration among the various NARS institutions and linkages with the extension and advisory services (EAS) were weak and ineffective. A majority of all the respondents thought that most of the AR4D projects implemented in the country over the past ten years were linked to the national priorities of the country; however, the majority of the farmers and extension workers interviewed indicated that they had little or no opportunities to participate in AR4D processes, including decision-making during research planning and project implementation. Additionally, even though the lessons learned from project implantation were reportedly used to inform policy and decision-making at the national level, the need for an effective accountability mechanism was highlighted to ensure proper implementation of projects with good financial governance. Decision makers, researchers, project managers, farmers, extension workers, local communities and input suppliers were cited by both farmers and extension workers as facing challenges that limited end-users from benefiting from the results of AR4D in Liberia. The need to improve research and extension staff capacity, assure enough funding for AR4D and to fully revitalize the NARS with emphasis on CARI were consequently highlighted as the key areas for improvement of the AR4D program in Liberia.

The study also revealed that the NARS still lacks the requisite organizational frameworks or institutional mechanisms to encourage cost-effective utilization of finance and inter-agency partnerships in research. To enable the NARS to contribute effectively to the growth and development of agriculture in Liberia, appropriate steps should be considered to facilitate collaborations among these agencies. This should help to fully integrate and better utilize the scarce scientific and financial resources of the country. As an initial step, organizations conducting research on agriculture related issues should adopt the nature of networking and collaboration between and among themselves. This can be accomplished by reaching out to others on every matter of common purpose. In this context, CARI could take the lead in coordinating the AR4D activities of the NARS in Liberia, but in order to do this, the present institutional governance issues faced by CARI should be addressed. CARI could organize and form various research clusters and alliances among and with groups of other NARS organizations, wherein each cluster would jointly develop proposals and seek competitive grant funding. CARI could also establish an Agricultural Research Coordination Committee (ARCC) with the initial chief mandate of bringing all NARS organizations together on a quarterly basis to exchange ideas and review progress.
CHAPTER 1
Introduction

The agriculture sector is a strategic and key pillar of the economy of Liberia, as it is the most viable, sustainable, and renewable source of national income. Approximately 70 percent of the population depends on agriculture for their livelihood and over the past ten years, the sector has contributed at least 24 percent of real GDP annually to the Liberian economy (CBL, 2012; 2014; 2016; 2018; 2019; 2020). In 2018 and 2019, the agriculture sector employed around 43 percent of the working age population, making it the second most important job market in the country (World Bank, 2021). Despite the importance of the sector the level of investments in research, which is critical to driving its growth and development, has been very low over the years (MFDP, 2017; 2019; IFPRI 2014; 2021).

In Liberia, agricultural research is carried out by both public and private sector organizations, including the Central Agricultural Research Institute (CARI), agriculture departments at various institutions of higher education, private agriculture companies, and some non-governmental, civil society and some international AR4D organizations. Together, these organizations form the NARS of the country. The NARS organizations have a deeper understanding of the challenges both at farm and system levels and they need technical and financial support to increase their efficiency to sustainably enhance the impacts of research for development projects (R4D) and achieve national food and nutrition security. Building the capacities of these institutions and expanding and strengthening their abilities to respond to the growing challenges facing the country is critically important for achieving national food and nutrition security for the country. Technical support, in the form of national guidelines can provide NARS with essential tools to streamline their efforts, increase their efficiency, and achieve better outcomes and impacts.

Additionally, it has been observed that agricultural research is normally supported by government institutions such as the Ministry of Agriculture. In addition to these core institutions, NARS collaborate with various other national and international research and development-based organizations. The assessment of NARS performance and their intuitional linkages amongst themselves and other relevant institutions is essential for identifying potentials for collaboration to strengthen their capacities, and to expand and strengthen their abilities to respond to growing challenges. A good understanding of the systemic problems and gaps is also key to the development of guidelines and methodologies that can be used to enhance their performance and overall impact on the ground.
As part of the efforts of the Food and Agriculture Organization (FAO) to support and strengthen NARS' research impacts and their links to extension service systems, the present assessment was conducted in Liberia to establish deeper insight into these challenges and opportunities. The results presented here can be used to support the development and adoption of guidelines for use by the NARS. Direct outputs of these tasks include:

(i) clear understanding on the organizational & management of NARS in Liberia;
(ii) developed guideline that can be followed to effectively help AR4D implement strategies such as assessing problem identification, research needs, demonstration and out-scaling of proven agricultural technologies;
(iii) assessment of the institutional linkages and collaborations within and between NARS actors and extension systems;
(iv) a policy brief that offers specific recommendations to ensure efficient adoption of proposed methodologies for enhanced impact of NARS R4D efforts.

The deliverables of the assessment were:
1. Develop a guideline for assessment of impacts of AR4D projects based on literature reviews and participatory discussions.
2. Prepare a case study report based on the comprehensive analysis of AR4D projects in Liberia.
3. Develop a policy brief to support NARS for better implementation of AR4D projects by engagement of various actors including beneficiaries/farmers.
4. Analyse the institutional linkages among national agricultural research systems and institutions, including universities and relevant stakeholders with particular focus on research-extension-farmers’ pathways and linkages.
5. Develop criteria and check lists to ensure better research and development linkages for sustainable agriculture and food security.
6. Organize virtual training programs at country level focusing on AR4D with emphasis on participatory research.
7. Draw lessons learned and prepare key-recommendations for further improvement of AR4D.

The present study was undertaken to assess the implementation of AR4D in Liberia and the key actors involved to better understand the performance and the intuitional linkages amongst them and other relevant institutions to help identify potentials for fulfilling the agricultural research for development needs of the country with the over-arching goal of supporting small-scale farmers.
National Agricultural Research Systems (NARS) in Liberia play a very critical role in sustainable agricultural development. Therefore they need the necessary technical and financial support to better perform and deliver AR4D programs and achieve national food and nutrition security. Technical support, in the form of national guidelines can provide NARS with essential tools to streamline their efforts, increase their efficiency, and achieve better outcomes and impacts. This assessment was conducted as part of the efforts of the Food and Agriculture Organization (FAO) to support and strengthen NARS’ research impact and their links to extension service systems.

The guidelines, methodologies and policy brief were based on a good understanding of the challenges, opportunities, weakness and strengths related to agricultural research and their organizational development. The case study was used to document relevant examples that can be adopted for other similar systems. Such approaches will ensure that the guideline and policy brief are context-sensitive, address key bottlenecks and provide the needed direction and means for sustainable and improved implementation of AR4D. These should enhance the capacity and empower the NARS to better inform and influence policies and ease institutional changes required in the agricultural sector.

1. Assessment approach

The assessment utilized various methods based on different information sources and approaches. The assessment consisted of two sub-assessments:

1) Assessing the current overall methodology used in undertaking AR4D for sustainable impact in developing countries as a case study. There is greater diversity of NARS in developing countries and each institution has its own mandate and research agenda, which leads to a diversity of implementation modalities of AR4D. To develop an applicable guideline for NARS in AR4D for developing countries, the present status of AR4D implementation has to be carefully assessed.
2) Within the same country, NARS’s institutional setup of the agricultural research organizations’ vision, mandates, priorities, policies, governance, funding and investment portfolio vary from institution to institution, which make the integration, and collaboration at the national level a complex and challenging process. Therefore, assessing the current institutional linkages & collaboration between key-NARS and extension systems in the country is very important to develop multi criteria checklists to improve the linkages between NARS actors.

The assessment methodology included several steps:

1) Identification and interviews with key individual experts to get an overview of the AR4D efforts in the country through open-ended questions.

2) Identify key NARS for an in-depth understanding of their roles, responsibilities and institutional linkages.

3) Assessment of project design, inception, implementation, monitoring & evaluation procedures, impact, and sustainability plans. This was done through extensive desk reviews, interviews with key project stakeholders and focus group discussions.

4) In-depth and comprehensive desk review analysis of documents that establish the modalities for institutional linkages within and between NARS and extension services.

5) Draw-out key lessons learned through systematic analysis of challenges and opportunities in AR4D efforts implemented by NARS, including institutional linkages in order to explore gaps for further improvement.

6) Develop guideline that will support NARS to improve the efficiency in delivering sustainable impact of AR4D efforts.

7) Organize a validation workshop to present, discuss and validate the outputs and get feedback from relevant stakeholders.

The assessment included two phases:

1. **Implementation phase:** This assessment commenced with a comprehensive desk review study to understand the function and performance of current national research systems to identify the potential opportunities for improvement and to address the gaps in AR4D implementation relevant to the country’s context. Afterwards, the data collection activities through FGDs and KIIs were carried out to complete the required data for the systematic analysis.

2. **Validation phase:** After completing the analysis, the lessons learned and developed guidelines, and other outputs were shared with relevant stakeholders and decision makers for consultation and feedback before validation in order to finalize and formulate the final version of the guideline. Afterwards, the revised
guidelines were formulated and widely shared with stakeholders in Liberia with possible scaling out to other countries with similar conditions.

1.1 Data collection procedure

Data required to achieve the objectives of the current project were collected through desk reviews of secondary data, focus group discussions with key stakeholders and KIs held with selected individual experts or persons within key agricultural positions.

a) Desk review

The consultant gained a good understanding of the national AR4D strategy and its impact on food security at the national level through the collection of available secondary data and information related to the performance of national agricultural research actors and their institutional linkages, as well as the relation between research and extension authorities. The source of information were project documents, progress reports, fact sheets, technical reports, evaluation reports, published manuscripts, etc.

b) Focus group discussion (FGDs)

FGDs were held with researchers, academia, extensionists, relevant community-based organizations (CBOs) and farmers groups. Discussions included gender-based questions to generate concise and precise data. Individual bias was avoided to ensure the quality of responses of individuals within the group discussion. To facilitate the focus group discussion and individual research staff interview, a set of questions were asked as shown in Annex 1. The FGD was conducted in three sessions (AR4D, EAS, linkages between NARS actors) each group consisted of ten participants.

c) Key-Informant Interviews (KII)

Key informant interviews were held with selected individual experts who have extensive knowledge or insights into the NARS performance and its research for development impact on agricultural development. The key individuals were from different national, regional and international research organizations. Responses were obtained to provide different insights on shortcomings and solutions for removing the potential bottlenecks in research to policy and actions. The Questionnaire in Annex 2 was used to facilitate the key-informant interviews with necessary adjustment as needed. The KII was conducted for different level of experts, which included national, regional, and international experts.
Both focus groups and individual experts or key-informants were asked open-ended questions. The following key-questions offer an example of questions that were used to solicit required information:

- what do you think about the importance of the NARS roles in food security in the country?
- how and to what extent do NARS identify their research agenda and priorities?
- how do priorities link with national and international research agendas?
- how and on what basis do researchers design AR4D projects?
- what are the modalities of implementing the AR4D?
- how much influence do AR4D projects have in agricultural policy and decision-making processes at national level?
- what are the available resources and facilities (updated or upgraded) that NARS depend on in their research?
- how is research within NARS organized? Is it a commodity-based or system-based approach with integrated multi-disciplinary research agendas?
- how effective are the national extension systems in delivering advisory services? How are they linked to research organizations at national level?
- what is your opinion of the NARS performance? Are you satisfied with their efforts on implementing AR4D and why?
- what are the key weakness and opportunities of NARS in AR4D?
- how do you assess Intra/Inter-institutional coordination, integration and collaboration between NARS actors in the country?
- what accountability mechanisms for deliverables are in place (if any)? Who is held responsible for the efficiency in resource use and value for money?
- what are the key areas for improvement in AR4D?
- are there other recommendations that you have, or suggestions you would like to mention?

1.2 Data analysis and reporting

Preliminary analysis of the data took place parallel to the data collection process. The final analysis was made immediately after all required data was completed. After data analysis was completed, qualitative description and interpretation were carried out to guide the development the NARS assessment guidelines and policy briefs.
1.3 Consultation and validation of the developed guideline

The draft documents were shared through consultation with key-stakeholders and decision makers prior to its validation through a roundtable discussion and dialogue, and before globally publishing the developed guidelines and the key-findings of the assessment. Experts from a variety of disciplines were invited for the roundtable discussion. The assessment component and its results, the developed guidelines and the case study report were presented to the audiences, followed by facilitated group discussions to gather their feedback.
COMPREHENSIVE ASSESSMENT OF NATIONAL AGRICULTURAL RESEARCH AND EXTENSION SYSTEMS WITH A SPECIAL FOCUS ON INSTITUTIONAL LINKAGES BETWEEN VARIOUS ACTORS IN LIBERIA

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1. Introduction

Research in agriculture is critical for its continued growth and development on a National scale. Without research there would be no innovation and without innovation there would be no positive change. In Liberia, agriculture is the second most important contributor to the national economy and it has contributed between 24 and 30 percent of GDP over the past ten years (CBL, 2012; 2014; 2016; 2018; 2019; 2020). By ILO standards (latest data for 2016–2020), agriculture employs around 43 percent of the total work age population, with women in the sector constituting 41 percent of all female employment positions in the country (World Bank, 2021). In addition, about 80 percent of the workforce engaged in agriculture are of women (FAO and ECOWAS Commission, 2018).

Generally, commercial investment in the agriculture sector of Liberia has been very limited, except for the rubber and oil palm plantation estates that were established in the country by some international and national investors. The sector is largely dominated by traditional subsistence farming systems on upland landscapes that are characterized by labor intensive and shifting cultivation, low technology adoption, and use of rudimentary inputs which result in low productivity (MOA 2007a; 2007b). The main staple food crops for the country are rice and cassava, but the rice annually produced in the country has been barely sufficient to feed people in the country. The major export crops are rubber, oil palm, and cocoa. The livestock sub-sector is largely underdeveloped, with cattle, pigs, goat, sheep, and poultry as the main sources of local farm produced meat in the country. The aquaculture sub-sector is similarly underdeveloped; however, it is presently attracting increased attention and therefore has a good potential for growth.

Agriculture is closely linked to rural development and has long been a core priority of successive government administrations. There have been several presidential initiatives aimed at promoting and investing in agriculture. The government of President William V.S. Tubman, for example, employed “Operation Production” to encourage large-scale commercial production; President William R. Tolbert launched his “Self-sufficiency” drive in the 1970s to enhance staple food production, while the government of President Samuel K. Doe championed the “Green Revolution” in the 1980s by striving to direct more public resources to the agriculture sector. In recent years, however, public expenditure on agriculture development have been low, with the government spending, on average, less
than 3 percent of its annual budgets on agriculture since 2006 (FAO, 2021; MFDP, 2016; 2018; 2020).

In the coming few years, the agricultural sector could face many challenges in achieving food security. These challenges are tied to rapid population growth, poor road infrastructure and high cost of transport, climate change, low adoption of technical innovations and the high interest rates on loan for agricultural purchases. These challenges will lead to a significant decrease in farm productivity and incomes, subsequently leading to a decline in the agricultural sector's contribution to the GDP. Therefore, investing in agricultural research is one of the fastest possible ways to overcome these challenges ensuring an enhanced food production system and to protect vulnerable communities and ecosystems.

Agricultural research encompasses different activities that develop and generate the technologies and information that are needed and demanded by farmers and others along food and feed value chains to enable them to know about and make informed decisions regarding agricultural practices that improve their livelihood and well-being. Defined by Taylor (1991) as a nexus of institutions and mechanisms that combine and manage physical, human, financial and information resources to address the problems of agriculture by generating outputs to improve the production and productivity of commodities and resource bases, the National Agricultural Research System (NARS) provides the basic framework within which agricultural research for development (AR4D) takes on a core responsibility in a country. The NARS comprise all institutions carrying out agricultural research in the public, private, governmental, non-government, university, parastatal, and other national and international agencies. These organizations play a very important role in advancing research on sustainable agricultural productivity.

The structure and organization of the research system provides a framework within which the research processes of identifying and solving real life problems unfold. The processes involve assessing knowledge sources of improved technologies, mobilizing resources (human, physical, financial and information) to conduct trials, testing, and communicating findings and conclusions. It is therefore important to review the past and current structure of the NARS to evaluate the capacity of the system to effectively respond to the AR4D needs of the country. This review aims to develop an understanding of the current situation of AR4D in Liberia by looking into the organization, structure, coordination (linkages) and management of the NARS organizations to identify the causes and course of their evolution, assess their strengths and weaknesses, and indicate areas in which their strengths can be developed or reformed to enable them to contribute effectively to agricultural development in Liberia.
2. Agricultural research in Liberia

2.1 Early development and structure

Agricultural research is the oldest and most basic form of organized research in Liberia. Its aim has been to develop, promote and disseminate improved agricultural technologies, including high-yielding varieties of crops and livestock, improve farming and soil management practices and innovations, to increase food and fiber production, alleviate poverty and enhance economic growth in the country.

2.1.1 Historical background

Formal agricultural research in Liberia began in 1952, under the auspices of the Ministry of Agriculture (MOA), at the Central Agricultural Experiment Station (CAES), established in Suakoko, Bong County, with assistance from the United States of America (USAID, 1990). The early focus of the station was to conduct adaptive studies on field crops, rubber, and livestock.

By the late 1970s, it was determined that besides having poor physical facilities, research activities at the station suffered from the lack of funding, direction, and coordination (World Bank, 1977). This necessitated a reorganization of the agricultural research apparatus of the country, thereby leading to the transformation of the CAES into the Central Agricultural Research Institute (CARI) by August 1980. CARI was established as a semi-autonomous department under the MOA. The resulting organizational structure of the institute consisted of an oversight body (the Agricultural Research Council (ARC)), a technical research committee, and other administrative support structures (Figure 1). The research programs of the institute were also organized into seven technical areas or departments: 1. Crop Sciences and Propagation, 2. Land and Water Resources Management, 3. Animal Science and Production, 4. Plant Protection, 5. Food Technology 6. Engineering and Appropriate Technology and 7. Fisheries.

Accordingly, the MOA was directly responsible for the agricultural research policy of the country and depended on the ARC, which was chaired by the Minister of Agriculture, to recommend actions and general areas of funding (Richards et al., 1983). The function of the technical committee was to examine all proposals for research in agriculture and advice the ARC accordingly. The director answered to the MOA through the Deputy Minister for Technical Services and was responsible for research strategy, budgets, personnel, physical facilities and linkages with other institutions and the extension services.

As a result of the reorganization, the management of the institute gained relative autonomy and flexibility with minimum interference from the MOA, which allowed it to eventually develop into a reputable center of excellence for agricultural
research in the West African subregion (MOA, 2007a). The institute was, however, impacted by the devastating civil war, which began in December 1989. This led to the destruction of its laboratories, research field installations, offices, and other critical infrastructure and assets.

With the restoration of peace and civil administration in the country, the revitalization of CARI became a key national priority. Eventually, through a legislative enactment in December 2014, CARI became autonomous from the MOA and adopted a new vision and a strategic plan covering the period 2015–2025 (CARI, 2014).

2.1.2 Key actors and AR4D efforts

Agricultural research in Liberia have been traditionally aimed at conducting adaptive and applied research for the promotion and dissemination of new and improved technologies to farmers, with the goal of increasing agricultural productivity, enhancing economic growth, and improving the income and livelihood of farmers. Research activities have mainly centered around the acquisition and testing of germplasm of various food and fiber crops (rice, cassava, corn, legumes, vegetables, rubber, oil palm, cocoa, etc), breeding and developing improved varieties of rice and cassava, and the multiplication and dissemination of seeds of improved crop varieties and breeds of livestock and fish.

Essentially, agricultural research in Liberia has been carried out predominantly by the
national agricultural research institute (CARI). However, several other organizations - both public and private - have been involved in various aspects of agricultural research over the years. The key five historical actors have been two public institutions (CARI and the College of Agriculture and Forestry at the University of Liberia (UL-CAF) and three private organizations (Firestone Plantation Company, the Liberia Agricultural Company (LAC) and the College of Agriculture and Natural Resources at Cuttington University).

Past research efforts at CARI have been mainly focused on developing the capacity of the institute to conduct adaptive research with crops, soils, livestock, fish, agricultural economics, food and feed technology (Richards et al., 1983; USAID, 1990). A summary of some of the key research activities carried out by CARI during this period are presented in Table 1.

Table 1. Some of the major pre-war (1980–1990) AR4D efforts at CARI

<table>
<thead>
<tr>
<th>Research program / department</th>
<th>Research activities / achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop science &amp; propagation</td>
<td>At least 35 elite upland and lowland rice varieties, that exceeded LAC 23 in coordinated yield trials, identified; Interdisciplinary research on iron toxicity, fertilizer response and plant protection (green spider mite, cassava mosaic virus, cassava bacterial blight, rice blast) advanced; Improved varieties of cassava, sweet potato, maize, and vegetables (hot pepper, bitter ball, eggplant and okra) released; Propagation of tree crops (citrus, oil palm, cocoa and coffee).</td>
</tr>
<tr>
<td>Food technology</td>
<td>Introduced and promoted village level parboiling methods that enhanced the milling recovery of rice; Introduction and promotion of improved storage methods (wooden and metal storage bins for farm use) to eliminate rodent and insect pest damages; Introduction and promotion of improved harvesting and threshing methods that reduced rice postharvest losses by at least 10%.</td>
</tr>
<tr>
<td>Land and water resource management</td>
<td>Soil fertility and fertilizer recommendations for various crops and soil survey activities.</td>
</tr>
<tr>
<td>Plant protection</td>
<td>Diagnosis of insect pests and diseases of various crops in Liberia; Evaluation of pesticides and cultural control methods for the management of economic insect pests (rice case worms, termites, etc.) and diseases of rice, cassava and other crops, including vegetables (e.g. leaf spotting of bitter ball, stunting of okra, bacterial wilt in egg plants, viruses on hot pepper, etc.).</td>
</tr>
<tr>
<td>Fisheries</td>
<td>Production, promotion and dissemination of fingerlings of five main species of freshwater fish.</td>
</tr>
<tr>
<td>Animal science and production</td>
<td>Evaluation of beef cattle, sheep, goats and pigs for improved traits under the prevailing climatic conditions of Liberia; Mitigation of economic constraints limiting livestock production in Liberia; Characterization of livestock diseases in Liberia; Diagnosis and treatment of diseases and parasites occurring in animals and extension of veterinarian services to farmers around the research station; Formulation of animal feed using locally available ingredients.</td>
</tr>
</tbody>
</table>
The Firestone Plantation Company, which is mainly involved in rubber production, has led research in clonal rubber development and smallholder plantation management under its Botanical Research Department. LAC had in the past had major programs in rice research and livestock, which led to the selection of the famous upland rice variety LAC 23. The College of Agriculture and Forestry mainly carried out applied research on forestry and wood utilization, with some experimental work in annual crops. Additionally, the Africa Rice Center (AfricaRice), formerly the West Africa Rice Development Association (WARDA), has been actively involved in coordinating and overseeing rice varietal and fertilizer trials in the Liberia in collaboration with CARI and its predecessor, the CAES. Highlights of the activities of other private and civil society organizations involved in agricultural research, over the years in Liberia are reported in the CAAS-Lib Sub-sector Report (MOA, 2007b). Several socio-economic research programs, such as developing vulnerability assessment maps (VAMs), conducting food security assessment studies, and developing participatory forestry management methodologies have also been carried out, mainly by NGOs in the country (MOA, 2007a; 2007b).

Overall, the lack of an effective mechanism for coordination of the agricultural research activities in Liberia remained a serious issue of concern to many stakeholders. Also, access to funding, especially from the government, for operations and the development of critical infrastructure to enhance research outputs was one of the key challenges faced by the national agricultural research system of Liberia (USAID, 1990).

### 2.2 Recent structure and development

With the inauguration of an elected government in 2006, following years of devastating civil wars, Liberia gradually embarked on a path of peace and security through rebuilding vital institutions, revitalizing the economy, rehabilitating infrastructure, and delivering on basic services. Since then, there have been numerous actors involved in various aspects of the development, promotion, and dissemination of improved agricultural technologies in the country. The various players and their respective roles during this period are highlighted in this section.

#### 2.2.1. Current structure of the NARS in Liberia

The Central Agricultural Research Institute (CARI) has remained the only dedicated agricultural research institute in Liberia. Although agricultural research activities in the country are not limited to CARI, there is very little or no record of other national agricultural research institutes that are presently carrying out
agricultural research activities, except for few institutions of higher education in the country. Amongst the institutions of higher education (Table 2), the UL-CAF and the College of Agriculture and Sustainable Development at Cuttington University (CU-CASD) are the most widely known for their involvement in agricultural research for development activities in Liberia. The Liberia Rubber Development Fund (formerly Liberia Rubber Development Authority (LRDA)), the Agricultural Commodities Regulatory Authority (LACRA), and the National Fisheries and Aquaculture Authority (NaFAA) also have some mandates to engage in, approve, arrange and facilitate research on matters within the scope of the laws which established them as autonomous agencies of the Government of Liberia (GOL). These organizations have not established any center for agricultural research in the country.

Regardless of the status of their research programs and activities these organizations (the institutions of higher education, the Liberia Rubber Development Fund, LACRA and NaFAA), together with CARI constitute the present structure of the NARS of Liberia. It is important to mention that unlike CARI, some of these NARS organizations do not appear to have any clearly defined or well-structured programs for agricultural research. Additionally, previous desk reviews on the NARS in Liberia reported some research activities by other organizations, such as civil society groups, non-governmental organizations (NGOs) and some private entities. The synthesis report of the comprehensive assessment study of the agriculture sector in 2006 (MOA, 2007a; 2007b), the Food and Agriculture Policy and Strategy document (FAPS, 2008), and Kiazolu and Tucker (2008) named the Forest Development Authority (FDA), the Liberia Rubber Research Institute (LRRI), and the Department of Fisheries at the MOA (now NAAFA) as other public sector organizations that have carried out agricultural research activities in the country in recent years. The documents also alluded to the private sector and NGOs as playing some role in the implementation of agricultural research in Liberia. Sigman and Davis (2017) indicated the operation of a rubber research program by Firestone and the occurrence of research activities by the Sime Darby and Golden Veroleum companies were both aimed at improving the oil palm value industry. The faith-based Liberia Entrepreneurial and Asset Development (LEAD) NGO has been involved in micro-finance and business development in the agriculture sector and was identified by these authors as one NGO that began a small research farm to experiment with new agricultural technologies, including conservation farming and site-specific adapted technologies. This was in support of the training programs they offered to their loan recipients. A full listing of the known and potential AR4D organizations are presented in Table 2.
## Table 2. Status of Agricultural Research for Development (AR4D) organizations in Liberia in 2020

<table>
<thead>
<tr>
<th>Organization</th>
<th>Type</th>
<th>Status / station(s)</th>
<th>Mandate / key AR4D activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Agricultural Research Institute (CARI)</td>
<td>NARI - Public</td>
<td>Suakoko, Bong County (only active station)</td>
<td>Broad-based research on food and cash crops, livestock, fish, land and water management, natural resource management, forestry and agroforestry, technology and socioeconomics, emerging technologies in agricultural science, biosafety and the environment</td>
</tr>
<tr>
<td>Liberia Rubber Research Institute (LRRI)</td>
<td>NARI - Public</td>
<td>unknown</td>
<td>Local rubber industry development</td>
</tr>
<tr>
<td>National Fishery &amp; Aquaculture Authority (NaFAA)</td>
<td>Regulatory - Public</td>
<td>Monrovia, Montserrado County</td>
<td>Inland and marine fishery development</td>
</tr>
<tr>
<td>AfricaRice</td>
<td>Regional AR4D - Public</td>
<td>Suakoko, Bong County</td>
<td>Rice value chain development</td>
</tr>
<tr>
<td>University of Liberia - William R. Tolbert College of Agriculture and Forestry (UL-CAF)</td>
<td>Higher Education - Public</td>
<td>Louisiana (Fendell), Montserrado County</td>
<td>Offers four-year bachelor’s in mainly general agriculture, General Forestry, Wood Science, and Agronomy (with specialization in either Crop Production, Plant Protection or Soil Science); Faculty members undertake research in related discipline(s) and supervise agronomic research projects for 4th year Agronomy students</td>
</tr>
<tr>
<td>Cuttington University - College of Agriculture and Sustainable Development (CU-CASD)</td>
<td>Higher Education - Private</td>
<td>Suakoko, Bong County</td>
<td>Offers four-year bachelor’s in plant and soil science, animal science, natural resource management; Faculty members undertake research and supervise required research projects undertaken by 4th year students</td>
</tr>
<tr>
<td>Cuttington Junior College, Department of Science and Agriculture</td>
<td>Higher Education - Private</td>
<td>Kakata, Margibi County</td>
<td>Offers two-year Associate Preparation for mid-level agricultural technicians including extension agents</td>
</tr>
<tr>
<td>William V.S. Tubman University - College of Agriculture and Food Science (TU-CAFS)</td>
<td>Higher Education - Public</td>
<td>Harper, Maryland County</td>
<td>Offers four-year degree programs in crop, animal, and food sciences along with nutrition</td>
</tr>
<tr>
<td>Bong County Technical College</td>
<td>Higher Education - Public</td>
<td>Gbarnag, Bong County</td>
<td>Offering undergraduate degree in Agricultural Technology; currently establishing a facility for aquaculture research</td>
</tr>
</tbody>
</table>
2.2.2. Recent developments in AR4D

As part of the efforts to rehabilitate the agriculture sector of Liberia, rebuilding the national research and development (R&D) system is considered a key priority to strengthen demand for services, improve quality of service and ensure the sustainability of the sector. This goal was clearly highlighted as part of the food and agriculture policy and strategy (Box 1) of the MOA in 2008 and the Liberia agriculture sector Investment Program (GOL, 2010). Subsequently, several initiatives and efforts were pursued to ensure the revitalization of CARI (the ASRP,
WAAPP, SAPEC projects). This culminated in the achievement of the full autonomy for CARI from the MOA and the adoption of the first ever strategic plan by the institute for agricultural research in the country.

As an initial activity to foster linkages amongst various stakeholders (including the NARS, the extension services, farmers, and donors) CARI successfully hosted the First Annual Agricultural Research Review Workshop in March 2017 (Sigman and Davis, 2017). During this event, the stakeholders discussed and provided their input on several research proposals that were presented by researchers in the various programs at CARI, and commitments were made by stakeholders to help mobilize the necessary funding for approved projects. Unfortunately, that has been the last of any such event and the linkage between research and extension and collaboration between the NARS organizations are yet to improve significantly.

### Box 1. Agricultural research policy goal of the Government of Liberia
(Source: FAPS (2008))

- A revitalized functioning and participatory research system that recognizes the need for the integration of research with extension, education, and activities of farmers and nongovernmental organizations to make visible and measurable contributions to the transformation of the agricultural sector; and
- Ensuring that research programs are innovative and solve real problems of food security and nutrition and contribute to sustainable use of agricultural resources.

### 3. Institutional capacity for agricultural research in Liberia

Agricultural research development is a critical instrument for improving agricultural productivity and sustainability. Increasing the level of capacity for implementing AR4D programs in a country can have significant implications for food security and nutrition. This section highlights the status of the basic technical and organizational capacities for agricultural research development in Liberia.

#### 3.1 Human resource capacity

Human resources are perhaps the most vital technical resource in any organization. With the right quantity and quality of manpower, complemented with other required resources, the performance of the system can be enhanced to meet overall goals and objectives of these development initiatives. Rehabilitating CARI and establishing a national agricultural innovation system were key pillars of the GOL’s strategy for agricultural research in the country. Following the development of its agriculture policy and strategy in 2008, the government embarked on the task of developing
the human resource capacities through the facilitation and provision of scholarship opportunities for its citizens to study in various agriculture and related disciplines abroad. As a result, the number of full-time equivalent (FTE) agricultural researchers have significantly increased over the last ten years, from 45.1 in 2011 to 194 in 2020 (Figure 2). Over one-half of all FTE researchers had a minimum MSc. qualification in 2020, compared to less than 36 percent in 2011. This increase in trained agricultural students highlights the success of the human resources capacity building programs that were funded by the government and its development partners between 2011 and 2020 (Stads and Beintema, 2017). The number of female researchers at CARI also increased by around 16 percentage points, between 2011 and 2020 (Figure 3).
3.2 Research facilities and infrastructure

As mentioned earlier, the basic agricultural research infrastructure and facilities in the country were severely vandalized and destroyed during the civil conflict, and the government, since 2006, decided to make the revitalization of the system a key priority for the agriculture sector. As a result, the rehabilitation of CARI and other NARS organizations, particularly the institutions of higher education and agricultural vocational training facilities, were gradually rebuilt. Several critical facilities are, however, still lacking in the country. Currently there is no reliable laboratory for soil and plant tissue analyses. Also, research fields at CARI are in poor condition and basic equipment for field operations are either dysfunctional or totally lacking. Institutions of higher education, both private and public, are experiencing similar situations.

The lack of critical infrastructure and facilities for research at the various NARS organizations limits their capacity to perform and deliver their mandates accordingly. Hence, the GOL should make it a top priority to increase funding allocations for the upgrading and maintenance of the research facilities within the NARS. Recently, two buildings have been newly renovated on the premises of CARI to house various laboratories for crop science and soil analyses. It will be important for the GOL to equip these buildings as soon as possible with the necessary instruments and equipment to prevent them from rapidly deteriorating due to disuse. When fully equipped, the laboratories can be used to provide much needed analytical and advisory services required to not only facilitate the implementation of AR4D, but also to improve productivity in farmers’ fields. Such improvements can help alleviate poverty, improve the food security and livelihood of smallholder farmers and increase national income and economic growth in Liberia.

3.3. Institutional structure, governance and management of NARS

Most of the institutions of higher education, which constitute the majority of the NARS organizations in Liberia are functioning as departments within their larger organizational bodies, with very little or no autonomy. Unlike theses other institutions, CARI is managed by a Board of Directors (BOD) designated by the government (President of the Republic). The role of the board is largely restricted to policy management, direction and guidance regarding finances, personnel, program priorities and general development (GOL, 2015). The detailed planning and execution of programs and the day-to-day affairs of the institute are directly under the Director General (DG), who serves as the chief executive officer of the institute and secretary to the BOD.

The members of the BOD, including the DG, are appointed by President of the Republic. The CARI Autonomy Act gives responsibility to the BOD for approving the appointment of a competitively recruited DG (GOL, 2015) and for appointing
the Deputy Director for Research and other senior management officers of the institute; however, since 2016 the institute has been operating with only a fraction of the designated positions duly filled by candidates with the requisite background and qualifications. Details of the administrative structure and governance of CARI are described in the strategic plan (CARI, 2014) and the act which created the institute as an autonomous agency of the government of Liberia (GOL, 2015).

Over the last three years, CARI has been encumbered with some serious governance and administrative problems. Firstly, the BOD has not met as regularly as needed to ensure the smooth governance of the institute. The board had convened only once in the last three years and there has not been much coordination between the board and management of the institute over this time-frame. The main cause of this anomaly seems to be the fact that since 2018 the BOD has not been able to leverage much authority over the management of the affairs of the institute, perhaps due to political reasons. Consequently, the research programs of the institute have lacked proper coordination and management to function effectively during this period. There is a need for the national government to pay more attention to the institute to enable it to effectively fulfill its mandate to the nation. Secondly, the administrative and financial management of the institute has not been encouraging. Compliance audits conducted by the government for the last five fiscal periods (2015/2016, 2016/2017, 2017/2018, 2018/2019 and 2019/2020) identified multiple accountability issues and negative reports for each of the audit periods (GAC, 2020a; 2020b; 2020c; 2020d).

4. Coordination and institutional linkages between the NARS actors

4.1 National coordination of agricultural research and linkages with local organizations

Before the establishment of CARI in 2014 as the apex body for agricultural research in Liberia, the responsibility for coordinating agricultural research activities in the country rested fully upon the MOA. An Agriculture Research Committee (ARC), headed by the Minister of Agriculture, was consequently established to guide policies, and decide priorities to enhance the effectiveness of the system (MOA, 2007a; 2007b). The Minister of Agriculture was the head of ARC, which was intended to independently decide and approve policies for all agricultural research. At CARI a Technical Committee (TC), headed by the Deputy Agriculture Minister for Technical Services, was instituted to provide direction for its research programs. This committee also served as the link between the ARC and the research institute. There was also an Advisory Committee put in place to provide advisory services to the TC. Despite this setup and organization, it was observed that the system failed to function efficiently, as those
committees hardly convened to discuss technical research and policy matters (MOA, 2007a). The net result was that the council did very little to directly influence the growth and performance of the NARS. The need to address these administrative and management shortcomings was strongly recommended by MOA (2007b) to enhance coordination and the conduct of agricultural research in Liberia.

According to the act that created CARI as a public autonomous agency of the GOL, one of the overall objectives of the institute is to “guide, coordinate and provide general oversight to all aspects of agricultural research in Liberia” (GOL, 2015). Even though this effectively designated CARI as the coordinating body for agricultural research, there is no evidence of any established protocols aimed at helping CARI achieve these objectives. Hence, agricultural research still does not seem to be well coordinated, as the various NARS actors are not collaborating with each other to enhance the impact of research on agriculture. This lack of organizational frameworks or institutional mechanisms to encourage cost effectiveness and inter-agency partnerships in research was previously cited as one of the critical issues and constraints facing the agricultural research system (FAPS, 2008). Approaches to facilitate and enhance collaboration among the various NARS organizations to fully integrate and better utilize the scarce scientific resources of the country are needed to enable the NARS to contribute effectively to the growth and development of agricultural research in Liberia.

**Box 2. Current responsibility for the coordination of agricultural research in Liberia**

(Source: GOL (2015); section 6, p. 10)

CARI’s overall objective, as the apex public agriculture research institute and with reference to its new vision and mission, is:

To guide, coordinate, and provide general oversight to all aspects of agricultural research in Liberia.

**4.2. Linkages with international institutions and organizations**

Despite the weak linkages and coordination between the local NARS organizations, CARI in the past developed fruitful research linkages through memoranda of understanding with various international partners, including the FAO, IITA, AfricaRice (formerly WARDA), AVRDC and IDRC. These linkages enabled CARI to rapidly advance research and development in the country through various germplasm exchanges, methodologies, equipment, personnel, and other assistance packages provided by these and other international organizations. Most of these linkages have continued up to present and certainly need to be sustained. Linkages with several donor-funded projects in recent years have also provided opportunities
not only for the training of scientists, but also for the advancement of several areas of research at the institute.

5. Research priorities, strategy and current AR4D efforts

The broad objectives of the agriculture sector in Liberia are (i) attainment and maintenance of domestic supplies of main food items; (ii) production of raw materials for industries; (iii) creation of gainful employment and increase in incomes of those involved in production; and (iv) conservation of natural resources (GOL, 2010). The key national policy objective for agricultural research conducted in Liberia is to ensure that research programs are innovative and solve real problems of food security and nutrition and contribute to the sustainable use of natural resources (FAPS, 2008). Accordingly, the new vision and direction for CARI was crafted to align with these national development priorities. To ensure that AR4D plans and efforts led by CARI contribute to wider regional goals, the current strategic plan (2015–2025) of the institute was structured based on the international AR4D framework, which encourages the creation of synergy among various research organizations at the national, sub-regional, and regional levels (CARI, 2014).

The Central Agricultural Research Institute was established as an autonomous agency of the Government of Liberia with the intent of serving as the apex body for executing the agricultural research priorities of the country. As part of the start-up process for the new CARI, five key priority areas of research were consequently identified covering the period of 2015-2025 and presented in the institute’s strategic plan document (CARI, 2014). Consistent with the national policies and programs of the GOL (the Liberia agriculture sector Investment Program (LASIP) (GOL, 2010); the National Food Security and Nutrition Strategy (MOA, 2008)), the strategic plan of CARI was meant to provide a framework for the institute by clearly setting out the direction, structure, research priorities, implementation timeframe, capacity development and other related activities. The five key research priorities for CARI are:

2. Development and promotion of markets and marketing strategies for agricultural product value chains.
3. Advocacy and facilitation of policy options for enhancing demand-driven agricultural product value chains.
4. Strengthening capacity for implementing agricultural product value chains research; and
5. Enhancing the availability of knowledge, information and technologies on agricultural product value chains research.
In line with the strategic plan, the research activities of CARI were reorganized into seven thematic areas or broad programs:

1. Crops development
2. Livestock and fisheries [aquaculture]
3. Natural resource management
4. Agricultural biotechnology and laboratory services
5. Mechanization and irrigation
6. Socioeconomics and applied statistics and
7. Post-harvest and food processing

Each of these thematic areas of focus were intended to pursue each of these priority research areas. Full descriptions of the various research strategy (thematic) areas are presented in the strategic plan document (CARI, 2014).

6. AR4D investment and funding

Agricultural research is critical for the national development of Liberia, as it provides the basic information, tools and packages required to increase productivity, enhance food security and nutrition, and alleviate poverty. Hence, adequate funding and investment in research is vital to pursuing the development objectives of the government and people of the country. Available data on funding and agricultural research spending are scant due to the lack of pertinent research information in the country. In addition, except for CARI which is autonomous, many of the NARS organizations in Liberia function as departments or units of a larger corporate or public body that secondarily pursue agricultural research, thereby rendering it difficult for external parties to readily track their spending and investment on AR4D activities.

6.1 Investment in AR4D

Over the last ten years, the agriculture sector has been the second most significant contributor to the national income of Liberia (Figure 4), earning on average 270 million US dollars (26.8 percent of real GDP) per annum. In spite of this, national budget support towards the growth and development of the agricultural sector has been extremely low, averaging less than 2 percent over the past five years (Figure 5). Despite efforts to rebuild the agricultural research system after years of civil strife and a focus on CARI, the research sector still appears unable to fulfil the research needs of the country, as investments in the sector remain very low. In 2011, investments in agricultural research as a share of agriculture GDP was only 0.51 percent (ASTI, 2021).
6.2 Funding

CARI is an autonomous agency of the GOL. Although the institute does not fund itself, it is considered autonomous because it is neither an arm nor a subsidiary of any other agency, commission, or ministry of the government. CARI is funded through direct annual budgetary allocations from the government, grants-in-aid, gifts, donations and other sources. The institute is also allowed by law to raise funds through fees, rentals, and revenue from the sales of produce and services.

**Figure 4. Economic sector contribution to real GDP. Each year calculated at 1992 constant prices, except for 2019, which calculated at 2018 constant prices.**

**Figure 5. Agriculture and research (CARI's) share of the actual National Budget of the Republic of Liberia over the period 2015–2020.**
The Director General (Chief Executive Officer) is the reporting officer to the BOD and GOL and is responsible for the financial management of the institute.

Generally, there is a lack of any consolidated fund for agricultural research financing in the country. Over the past five years direct spending by the GOL on agricultural research was as follows:

- 2010-2011: 0.90 million USD
- 2011-2012: 1.05 million USD
- 2012-2013: 1.01 million USD
- 2013-2014: 0.73 million USD
- 2014-2015: 0.96 million USD
- 2015-2016: 1.07 million USD
- 2016-2017: *1.77 million USD
- 2017-2018: 1.88 million USD
- 2018-2019: 1.90 million USD
- 2019-2020: *1.24 million USD

*Includes revenues generated internally at CARI from the sale of assorted agricultural produce and planting materials.


agricultural research was less than 0.4 percent of its total expenditures (Figure 5). Overall, spending on agricultural research over the last ten years has been erratic, with a low of 0.73 million USD in 2013/2014 to a high of 1.90 million USD in fiscal year 2018/2019 (Figure 6). Most of the expenditure (77-92 percent) over this period were committed to salaries and benefits of employees, with very little left to pay for inputs, equipment and logistics for field and laboratory activities (Figure 7).

7. Conclusion

Besides CARI, AfricaRice, UL-CAF and CU-CASD the involvement of other organizations, including civil society, private sector firms and NGOs are not well known. It will be important for all organizations involved in agricultural research in Liberia to develop structured programs and enhance their visibility to attract potential partners for collaboration.

The NARS still lacks the requisite organizational frameworks or institutional mechanisms to encourage cost effectiveness and inter-agency partnerships in research. To enable the NARS to contribute effectively to the growth and development of agriculture, appropriate steps should be considered to facilitate collaboration among the various organizations with an interest in agricultural research and development. This should help to fully integrate and better utilize the scarce scientific resources of the country. As an initial step, organizations conducting research on agriculture related issues, particularly for the good of the public, should adopt the culture of networking and collaboration between and among themselves, by seeking to reach out to others on every matter of common purpose.

CARI should take the lead in coordinating the activities of the NARS in Liberia, but to do this, the present institutional governance and fiscal issues faced by the institute must be resolved completely. Through established MoUs, research activities can be organized such that universities and other institutions of higher learning can replicate experiments on research project activities or experiments at their respective facilities in a coordinated manner. CARI could organize and form various research clusters with groups of other NARS organizations, wherein each cluster would jointly develop proposals and seek competitive grant funding. Also, CARI should establish an Agricultural Research Coordination Committee (ARCC), with the chief mandate of bringing all NARS organizations together on a quarterly basis to exchange ideas and review progress. Once established, the ARCC should create and convene an annual research congress and publish the proceedings accordingly. By so doing, the already scarce scientific resources of the country can be mobilized and better coordinated to maximize output for the benefit of the agriculture sector and the larger economy of Liberia.
8. References


**GAC (General Auditing Commission).** 2020c. *Auditor General’s Report on the Compliance Audit of the Central Agricultural Research Institute (CARI) for the fiscal year ended June 30, 2018.* Monrovia, Liberia: GAC.


**GAC (General Auditing Commission).** 2020e. *Auditor General’s Report on the Compliance Audit of the Central Agricultural Research Institute (CARI) for the fiscal year ended June 30, 2020.* Monrovia, Liberia: GAC.


1. Characterization of respondents (KIs, FGD thematic groups, FGD individual respondents)

A total of 96 individuals, representing key informants, focus group participants (Table 3) and individual researchers, extension workers and farmers contributed to the current results by providing their responses to the enquiries listed in the comprehensive questionnaires specifically designed for the study (Annexes 1, 2 and 3). The gender breakdown of the respondents and participants (Table 4) shows that in total three times more males than females were involved in the study. High representations of women researchers were noted among both the AR4D focus group participants and individual researcher respondents, thus indicating an encouraging development in the NARS of Liberia.

Table 3. Focus group participants and themes

<table>
<thead>
<tr>
<th>Focus group</th>
<th>Theme discussed</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus group 1</td>
<td>Research for development</td>
<td>Researchers (10)</td>
</tr>
<tr>
<td>Focus group 2</td>
<td>Extension and advisory services</td>
<td>Extensionists (5); CBO representative (1); Farmer group representatives (4)</td>
</tr>
<tr>
<td>Focus group 3</td>
<td>Linkage between NARS actors</td>
<td>Heads of research programs at CARI (5); Academics &amp; heads of agriculture departments of higher learning institutions (5)</td>
</tr>
</tbody>
</table>

The assessment process also utilized an extensive mix of national and international expertise from a wide range of disciplines (Figure 8). Contributions were also received from lead farmers with little or no formal education. Of the farmers interviewed, 35 percent were illiterate representing 7 percent of the total respondents and participants interviewed. In general, researchers, extension workers and farmers interviewed individually were of a diverse age group, education backgrounds and / or experience (Table 5). Unfortunately, none of the PhD researchers at CARI was available to contribute to the study.
### Table 4. Disaggregation of interview respondents by gender (N = number of respondents)

<table>
<thead>
<tr>
<th>Group</th>
<th>Category</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key informants</strong></td>
<td>National experts</td>
<td>93</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Regional / International experts</td>
<td>67</td>
<td>33</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>88</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td><strong>Individual</strong></td>
<td>Researchers</td>
<td>55</td>
<td>45</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Extension workers</td>
<td>83</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Farmers</td>
<td>65</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>69</td>
<td>31</td>
<td>49</td>
</tr>
<tr>
<td><strong>Focus group</strong></td>
<td>Research for development</td>
<td>50</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Extension &amp; advisory services</td>
<td>70</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Linkage between NARS actors</td>
<td>90</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>70</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td></td>
<td>76</td>
<td>24</td>
<td>96</td>
</tr>
</tbody>
</table>

**Figure 8. Fields of expertise of individual experts, researchers and extension workers interviewed**

- Postharvest engineering
- Irrigation
- Entomology
- Business management
- Biotechnology
- Animal nutrition
- Horticulture
- General forestry
- Seed science & technology
- Aquaculture
- Animal breeding & genetics
- Agricultural economics
- Agricultural engineering
- Plant pathology
- Development studies
- Soil science
- Plant breeding
- Agricultural extension & rural sociology
- General agriculture
- Agronomy
Table 5. Description of age, levels of education and experience of individual researchers, extension workers and farmers interviewed

<table>
<thead>
<tr>
<th>Item</th>
<th>Category</th>
<th>Researchers (%)</th>
<th>Extension workers (%)</th>
<th>Farmers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>&lt; 30</td>
<td>-</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>30 - 39</td>
<td>43</td>
<td>17</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>40 - 49</td>
<td>29</td>
<td>28</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>50 - 59</td>
<td>29</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>60 and above</td>
<td>-</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>Educational level</td>
<td>Illiterate</td>
<td>-</td>
<td>-</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>literate</td>
<td>-</td>
<td>-</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>BSc</td>
<td>-</td>
<td>67</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>MSc</td>
<td>100</td>
<td>17</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>PhD</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Other (associate degree)</td>
<td>-</td>
<td>17</td>
<td>-</td>
</tr>
<tr>
<td>Experience (years)</td>
<td>&lt; 5</td>
<td>9</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>5 - 10 years</td>
<td>64</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>11 - 20 years</td>
<td>27</td>
<td>63</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>&gt; 20 years</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

2. Research for development

The key experts, focus group discussion participants, and other respondents were asked several broad questions to better understand the circumstances surrounding the implementation of AR4D in Liberia. Specific questions were posed to each category of respondents to understand their roles and experiences in aspects regarding research arrangement and capacity to implement AR4D, the implementation mechanisms and monitoring and evaluation of AR4D, including its impact and the challenges involved.

2.1 Research arrangement and capacity to implement AR4D

Organization and structure are a vital part of the research system, as it provides the framework and enabling environment within which all the processes relating to the implementation of research activities take place. Hence, it was important to investigate the stakeholders’ experiences of the existing organizational set-ups, arrangement of research activities within the NARS, decisions on the selection of research topics and the technical, administrative, and financial support from the government.
2.1.1 Institutional set-up of NARS and AES in Liberia

CARI was regarded by most of the key informants as the primary entry point for all government linked agricultural research activities in Liberia. All the participants of the focus groups on the AR4D and NARS linkage themes and the four key informants who were asked about the institutional set-up of the various NARS organizations affirmed that except for CARI, most of the local NARS organizations in Liberia are mainly based within the larger academic programs of various institutions of higher learning in the country. It was revealed that the institutional frameworks for the operations, functions, and other setups in place at CARI were adequate but not functioning well and a call for assistance from development partners was needed to strengthen the institute. Further steps would be needed to continue to develop CARI in the future. It was further indicated by at least 70 percent of the focus group participants that the set-up of the various NARS institutions in country may not be adequate to enable them to fully fulfill the AR4D needs of every part or region of the country. For instance, there are no sub-stations for regional testing of agricultural technologies around the country. This suggests that there is a need to expand the reach of the NARS by creating research sub-stations in other parts of the country. This was highlighted by one of the informants as a key area that should be considered for future improvement of AR4D implementation. Collaboration between CARI and institutions providing higher education in agriculture around the country could be harnessed to enable some of these institutions to serve as sub-stations for CARI to more efficiently utilize sparse scientific resources.

For the EAS, about 63 percent of the extension workers interviewed individually indicated that the institutional set-up, involving government ministries and agencies, non-governmental organizations and private businesses, is similarly adequate but needs to be supported to enable it to function properly. Two of the key informants suggested that the national AR4D system, including the extension services should be driven more by private entities. They recognized that even though it will have direct cost implications for the end-users, the likelihood of farmers benefiting from what they paid for would be significantly high. This, according to one, is important because for farmers to truly progress and prosper from their farming activities, they should outgrow the tendency of relying on free goods (inputs) and services from the government and donor agencies. They concluded that privatizing the EAS would be the best way to move forward, as continuously relying on the government, which is not even allocating the recommended minimum 10 percent of GDP to its agriculture sector, will continue to delay progress.

Admittedly, promoting greater private-sector involvement in agricultural research and extension service delivery would be a good effort to help drive the AR4D system towards the creation and dissemination of more demand-driven technologies and services, it will certainly be impossible if agricultural production in the country is not sufficiently exploited for commercialization. As
farmers in Liberia are largely resource-poor, it will be better to focus on making the current set-up of the AR4D mechanism more effective for the farmers by completely rejuvenating the NARS and EAS, ensuring that they are properly governed, resourced and monitored.

2.1.2 Decisions made on AR4D

Investigation of the research-planning process revealed that all the major players (researchers, extension workers and farmers) did not contribute equally to decision making on research topics (Table 6). The constant involvement of all researchers in decision making at the national or institutional level was less than 50 percent, while about one-third of them occasionally contributed. The results indicate that none of the farmers interviewed were ever involved in the selection of research topics; however, nearly two-thirds of the extension officers interviewed indicated that they contributed more or less often, including up to 38 percent who usually participated.

Table 6. Frequency of contribution to decision making on research topic by key AR4D players

<table>
<thead>
<tr>
<th>Answer</th>
<th>Researchers (%)</th>
<th>Extension workers (%)</th>
<th>Farmers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=11</td>
<td>N = 8</td>
<td>N = 20</td>
</tr>
<tr>
<td>Always</td>
<td>46</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>Usually</td>
<td>27</td>
<td>38</td>
<td>-</td>
</tr>
<tr>
<td>Rarely</td>
<td>27</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>Never</td>
<td>-</td>
<td>38</td>
<td>100</td>
</tr>
</tbody>
</table>

From their perspective, 55 percent of the researchers interviewed indicated that they believed that the decisions made on AR4D at the national level were driven by community or national strategy demand (Figure 9). The explanations provided for their position, however, were not clear. The primary focus of the national agricultural research institute in Liberia has been to carry out adaptive research. The involvement of end-users in research priority setting in the country is not well documented. Traditionally the improved technologies have been developed as public goods and supplied to farmers by the government through the MOA and its development partners, and the only times farmers seemed to have some say were when they had to provide feedback on the impact of the introduced technology. The technologies are often decided at the central level and delivered to the farmers in a top-down fashion. This top-down approach seems more like a supply-driven approach than a demand-driven one, as confirmed by almost one-third of respondents, while 18 percent of participants were unable to assess whether the AR4D projects were supply or demand driven. This result indicates that there is a need to highlight this issue in the training sessions as well as in the AR4D implementation guideline.
2.1.3 Support to the research institute

In terms of governmental support, the response of the researchers was unanimous: The technical, administrative, and financial support to CARI from the government has been poor and limited to the point that several researchers and members of staff have had to use their personal resources to finance their research activities and other functions of the institute, including expenses for work-related travels and the repair and maintenance of institutional vehicles and other assets. The poor government funding to CARI and other public AR4D organizations in the country was also echoed by every key informant interviewed on the subject. The current funding predicament of the Liberian NARS is extremely precarious, given the limited annual budget allocated to the research institute by the GOL (MFDP, 2016; 2017; 2018; 2019; 2021), coupled with the lack of funding assistance from external donors.

In recent years, international donors, such as the European Union have channelled funding assistance for AR4D activities to Liberia through international organizations such as FAO and AfricaRice, and this funding mechanization has not seemed to benefit the national system in any substantial way. Instead, these international organizations have often applied the funding to finance their own upkeep to the neglect of the target NARS organizations in Liberia. Funding assistance intended to help the national system to function properly and develop should be provided directly to the national system, rather than through middleman-like arrangements, as have been observed.

2.2 Challenges facing AR4D

Research in least developed countries is facing a multitude of challenges. From the individual questionnaires administered to the researchers at CARI, the lack of financial resources, weak linkage between research and extension, the lack of tools...
and equipment, the lack of coordination, and low staff capacity were identified as the main challenges facing AR4D at the institute. The levels of consensus among the researchers on the existence of these challenges are outlined in Figure 10. The lack of financial resources and weak linkage between research and extension were cited by a majority of the researchers (90 percent-100 percent) as the most important challenges. About 55-64 percent of the researchers thought that the lack of coordination and the lack of equipment and tools were key challenges, followed by low staff capacity, which was cited by 36 percent of the researchers.

That all the interviewees squarely identified the lack of financial resources as a major challenge facing AR4D at the institute, this highlights the need for national decision makers and external influencers of GOL policies to rethink their actions of limiting national funding support to the institute. There is also a need for the GOL and its development partners to back their quest of improving the national economy by investing appreciably in agricultural research, which is vitally important for developing innovations that spur economic growth and development.

The challenge with equipment and instruments can certainly be addressed when enough financial resources are available to enhance research functions. However, issues of coordination and low staff capacity are equally important as funding is to optimize the performance and output of the research system. It will be important, therefore, to promote awareness and training for researchers to help enhance coordination of research activities within and between NARS organizations and to improve the capacity of the research staff to conduct research more effectively. A more comprehensive assessment of staff capacity will also be necessary to determine the extent of the existing gaps to inform policy and plan for improvement.

Figure 10. Level of consensus among researchers on various challenges facing the research institute (CARI)
2.2.1 Challenges affecting the performance of key AR4D players

Agricultural AR4D typically involves decision makers, researchers, project managers, farmers, and extension workers as key players that should work together to enhance the development, promotion, and dissemination of improved agricultural technologies. The role of each of these players (highlighted in Figure 11) in AR4D cannot be overemphasized. The performance of each player can have important consequences for AR4D. To further understand the arrangement of AR4D in the country, individual researchers were asked to indicate the challenges faced by each player. Accordingly, the respondents listed various challenges, which are summarized and presented in Table 7.

Most of the researchers thought that the performances of decision makers were mainly affected by their inability to consult, communicate and network properly with other stakeholders, including farmers or end-users. They thought that challenges relating to low funding, limited staff capacity and equipment mainly affected the performance of researchers, while the performance of project managers was mainly challenged by poor institutional support, bad financial management practices and delays they experienced in accessing funding to implement project activities. The researchers believed that the challenges which affected the performance of farmers were related to the limited support availed to them by the extension services, the restricted flow of information and technologies from research, the high cost of inputs and the unwillingness of most farmers to readily adopt new technologies. Additionally, most of the researchers thought that limited access to logistics for mobility, poor road infrastructure and weak linkages between research and extension were the main challenges affecting the performance of extension workers. Insufficient awareness, skepticism among community dwellers and the exclusion of local community members from decision-making were cited by most of the researchers as the main challenges that affected the performance of the local communities.

The various factors outlined by the researchers as the main challenges affecting the performance of the key AR4D players should not be dismissed for any reason. Rather, there is a need for the GOL and its development partners to find sustainable ways of addressing these problems to enhance the impact of AR4D projects implemented in the country. Also, the NARS, together with the EAS should ensure, as part of their standard operating procedures, that all stakeholders are properly consulted when decisions are considered for implementing AR4D. Activities such as effective arrangements for regular meetings, regular research and extension review conferences enhancing the linkage between research and extension should also be elaborated in the guidelines that will be developed through this current study.
2.2.1.1 Major challenges faced by researchers in the implementation of AR4D

Both the AR4D focus group participants and individual researchers unanimously listed the lack of funding, the lack of research facilities, including competent laboratories and instruments for both field and laboratory data collections, equipment for field operations, the lack of proper storage for crop genetic resources, and the limitation of labor and personnel to assist with field work activities as the key challenges they have faced in the implementation of AR4D activities. Most of the researchers mentioned that they frequently lacked basic inputs, such as pesticides, fertilizers, and tools to support routine research activities at the institute.

Specifically, most of the AR4D focus group participants complained that limited governmental funding seldom filters down from the Ministry of Finance and Development Planning (MFDP) to the institute and that there was a lack of transparency and accountability on how these funds were managed. They further mentioned low salaries, which over the past three years have been reduced by as much as 60 percent by the government, and the lack of basic incentives for researchers and their assistants as one of the key challenges.

Challenges highlighted by the researchers were obvious, as funding for agriculture and AR4D in Liberia has been inherently low and limited (Ana and d’Orey, 2020). It will be important for the researchers and administration of the NARS to explore alternative sources of funding to supplement the meager resources annually allocated by the GOL. The issue of transparency and accountability could be more appropriately addressed by the governing board of the research institute and/or existing anti-graft institutions, such as the Liberia Anti-Corruption Commission (LACC) and the General Auditing Commission (GAC). Appropriate remediation of relevant accountability and transparency issues will also be important for maintaining confidence and attracting partners and donors. Authorities of the MFDP should strive to buttress the GOL’s support for AR4D in the country by ensuring that every dollar allocated for the operations of the NARS are allotted and disbursed appropriately, as this would help alleviate the precarious funding situation reported by researchers.

2.2.1.2 Major challenges highlighted by extension workers and farmers

From the individual interviews, a majority of farmers indicated that the main challenges in implementing AR4D centered around the number of participants included in the process, and the availability of both financial resources and basic agricultural inputs required to enable the end-users to adopt the promoted technologies. Farmers believed that the number of farmers selected to participate in AR4D programs were often small and that accessing financial resources and basic farm inputs was difficult. Other farmers indicated that the selection of project participants or beneficiaries was the main challenge involved in implementing AR4D,
as they thought that project leaders were often partial in the selection of farmer participants or beneficiaries.

Most of the extension workers interviewed indicated that the lack of means to travel, low ratio of extension workers to farmers (1:30,000) and limited motorway access to remote farming communities were major challenges involved in the implementation of AR4D. Others cited the breakdown of the linkage between research and extension, the limitation of training for extension staff and the delays experienced in providing funding and logistics for AR4D project, and poor coordination between project focal points and extension workers as the main challenges that have negatively affected the implementation of AR4D.

In developing countries, the goal of AR4D is to increase productivity and improve the resilience, livelihoods, and food security of small-scale farmers in rural communities, particularly youth and women, through scientific research (IFAD, 2021). It is therefore important to ensure that the EAS entities are sufficiently empowered to extend improved technologies to every farmer in all parts of the country where the technologies may be applicable. Admittedly, it may not be possible to include every farmer as a direct participant in an AR4D project. However, conscious steps should be taken by researchers or project leaders to demonstrate transparency in the selection of project participants and beneficiaries to minimize suspicions of partiality. This could be achieved, perhaps, by adopting procedures that afford every eligible participant an equal chance to be selected to participate or benefit.

In addition, increasing farmers’ access to agricultural inputs and financial resources will be important to facilitate their adoption of improved technologies promoted by AR4D. The GOL has already taken significant steps to make fertilizers, pesticides, implements, seeds, and other agricultural inputs more affordable and accessible by suspending import tariffs on essential agricultural goods and equipment (MOA, 2021). Earlier this year, the GOL revealed that funding will be made available through the commercial banks to provide loans to farmers at a reasonable interest rate (Kollie, 2021). Such efforts should be sustained until a sizeable impact on the output and livelihood of smallholder farmers is realized on the ground.

2.2.2 Challenges highlighted by key informants

Several of the key informants observed that the foremost challenges affecting the implementation of AR4D were reflected in the present situation of CARI. It was highlighted that the CARI Autonomy Act and its first strategic plan have not been followed since 2015, and that has generated frustration and wariness form traditional donors and supporters of the system. It was further highlighted that scientists at the national institute were not given the working environment
nor provided the space to freely operate, which is an impediment to the advancement of research in the country. It was also noted that International AR4D institutions based in the country were not working in full concert with the national research institute, thereby limiting opportunities for progress in AR4D implementation.

These results show each category of players in the AR4D system faced unique challenges that negatively influenced their performance and the ultimate output of the system. These challenges certainly need to be addressed on a case-by-case basis to provide the proper tools to allow each player to adequately fulfil their roles and responsibilities within the NARS. Decision makers need to be thoroughly briefed and convinced to better appreciate the significance of AR4D to the enhancement of not only agricultural productivity, but also to poverty alleviation, economic growth and national development. The roles of local communities (end-users) could be enhanced by creating more awareness among the target beneficiaries and local inhabitants.

*Figure 11. Key AR4D players*
Table 7. Summary of major challenges affecting the performance of key AR4D players within the NARS of Liberia

<table>
<thead>
<tr>
<th>Decision makers</th>
<th>Researchers</th>
<th>Project managers</th>
<th>Farmers</th>
<th>Extension officers</th>
<th>Local communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of coordination &amp; team spirit in decision making</td>
<td>Low financial support</td>
<td>Poor institutional support</td>
<td>Limited support from extension</td>
<td>Limited logistics for mobility</td>
<td>Limited awareness from MOA</td>
</tr>
<tr>
<td>Decisions are often top-down approaches;</td>
<td>Limited staff capacity</td>
<td>Poor financial management support</td>
<td>Limited flow of information &amp; technologies from research</td>
<td>Poor road network</td>
<td>Often skeptical</td>
</tr>
<tr>
<td>Poor communication and networking</td>
<td>Lack of funding</td>
<td>Funding delays</td>
<td>Unwillingness to adapt to new technologies</td>
<td>Weak linkage with research</td>
<td>Limited involvement in decision making</td>
</tr>
<tr>
<td></td>
<td>Lack of access to basic instruments and laboratories</td>
<td></td>
<td>High cost of input, supplies &amp; implements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.2.3 Efforts and suggestions to address challenges faced in AR4D implementation

When the researchers were asked what they have been doing to address the challenges faced by them or what can be done to address the challenges, most indicated that they have been improvising and even using proceeds from their meager salaries to finance most of their research activities. They also added that they regularly developed proposals but have not had much success in attracting any significant funding. They lamented that even the little funding for implementation of AR4D projects that have come to the institute were seldom administered properly by some leaders of the institute and cited the inadequate governance structure of the institute as one of the key challenges facing the institute.

The farmers indicated that to improve implementation of AR4D, farmers should have access to low-cost loans and other financial assistance to enable them to fully benefit from the research outputs of AR4D. In addition, AR4D projects should have wider reach to farmers by targeting more communities and farmers for their participation in projects.

Extension workers emphasized that the GOL and/or donors should ensure timely or advance availability of funding and resources intended for project start-up and develop and advance a policy to guarantee coordination between extension and AR4D partners who implement AR4D projects in the country. They further indicated that extension workers should be duly empowered to work independently with partners and that the coordination between research and extension should be revamped, as key steps towards improving the implementation of AR4D.
2.2.4 Knowledge and skill-related changes to improve staff capacity to conduct research

Questions related to several knowledge and skill-related changes were addressed to the individual researchers from CARI to explore possible areas for human capacity building. At least 36 percent of the respondents indicated that all the suggested knowledge and skill-related changes were missing (Table 7). Project proposal writing, project management, risk management and monitoring and evaluation were identified to be the knowledge and skill-related skill-sets missing among the researchers, as indicated by the majority (at least 60 percent) of the respondents. About 18-73 percent of the respondents indicated that there was a strong need for those and other knowledge and skill related changes to improve staff capacity to carry out agricultural research in the country (Table 8).

Interestingly, none of the researchers rejected the proposition that four of the relevant knowledge and skill related attributes (participatory approaches, project management, monitoring and evaluation, and scaling out approaches) were missing. These skill shortages were further accentuated by the researchers, as at least 64 percent of those interviewed agreed that those skills were strongly needed.

Gaining new knowledge and skills helps professionals to achieve their goals, boosts their confidence and increases their motivation for doing their work. Assessing the present status of the various knowledge and skill related changes among the researchers was important to identify any gap that needs to be addressed for the improvement of AR4D programs. Hence, it is highly recommended that appropriate capacity building exercises should be organized to help address all the relevant gaps indicated by the respondents in this study.

Table 8. Status and need for relevant knowledge and skill related attributes among research staff in Liberia (N = 11)

<table>
<thead>
<tr>
<th>Skill-related</th>
<th>Missing (%)</th>
<th>Needed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Project proposal writing</td>
<td>64</td>
<td>9</td>
</tr>
<tr>
<td>Project implementation planning</td>
<td>45</td>
<td>9</td>
</tr>
<tr>
<td>Participatory approaches</td>
<td>45</td>
<td>-</td>
</tr>
<tr>
<td>Project management</td>
<td>73</td>
<td>-</td>
</tr>
<tr>
<td>Communication</td>
<td>45</td>
<td>27</td>
</tr>
<tr>
<td>Risk management</td>
<td>64</td>
<td>9</td>
</tr>
<tr>
<td>Conflict management</td>
<td>36</td>
<td>27</td>
</tr>
<tr>
<td>Monitoring and evaluation</td>
<td>64</td>
<td>-</td>
</tr>
<tr>
<td>Scaling out approaches</td>
<td>55</td>
<td>-</td>
</tr>
<tr>
<td>Reporting and publishing</td>
<td>45</td>
<td>18</td>
</tr>
</tbody>
</table>
2.2.5 Contribution of farmers to AR4D implementation at the community level

The contribution of farmers to the implementation of AR4D is important not only to enhance further testing, but also to facilitate the adoption of new technologies. From the individual questionnaires, roughly 70 percent of the farmers indicated that they have contributed to AR4D programs more or less frequently at the community level (Figure 12). Among those, 45 percent indicated that they constantly contributed, and that they have contributed mainly by applying improved technologies, such as new crop varieties in small plots on their farms or through their farmer-based organizations. A considerable percentage (30 percent) of farmers never contributed to AR4D. This indicates the importance of highlighting participatory and community-based approaches in the training sessions as well as in the supportive guidelines to implement AR4D.

Figure 12. Frequency of farmers’ contribution to AR4D implementation

2.2.6 Challenges negatively influencing stakeholders’ opportunity to benefit from AR4D results

The opportunity for stakeholders to benefit from agricultural research can be influenced in various ways by key AR4D and other players. The levels of consensus among the farmers and extension workers interviewed on the various challenges limiting the benefits stakeholders were deriving from research results are presented in Table 9. At least 50 percent of those respondents agreed that the five key AR4D players (decision makers, researchers, project managers, farmers, and extension workers), including the local communities posed challenges that negatively influenced
stakeholders’ opportunity to benefit from agricultural research. Some of the extension workers (38 percent) revealed that agricultural input suppliers, including the financial market, were also limiting farmers’ opportunity to fully benefit from AR4D. The reasons provided by the respondents for characterizing how these factors served as challenges are summarized in Table 10.

Overall, farmers and extension workers observed that the researchers and decision makers did very little to ensure that the concerns of the end-users were fully considered during the design and approval stages of AR4D projects, and that most of the people who have managed AR4D projects lacked the requisite technical knowledge on the subject matter promoted by the project. In addition, they observed that the extension workers who should ideally complement AR4D efforts across the country were rarely empowered to help farmers benefit adequately from the results of the projects. These negative perceptions sometimes held by farmers and local communities towards projects were also cited by the respondents as factors that similarly limited their opportunity to benefit from AR4D results. Hence, to increase opportunities for stakeholders to benefit more from AR4D, awareness among the decision makers and researchers should be enhanced to ensure that the concerns of end-users are appropriately gathered and addressed at every stage. Farmers and local communities also need to be educated to manage their expectations of the roles and contributions of the AR4D projects as they are extended to them. The extension workers must also be trained adequately and be provided with the necessary resources to facilitate their contribution to AR4D implementation in their areas of assignment.

Table 9. View of farmers and extension workers on the challenges negatively influencing stakeholders’ opportunity to benefit from agricultural research results

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Farmers (%)</th>
<th></th>
<th></th>
<th>Extension workers (%)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Undecided</td>
<td>Yes</td>
<td>No</td>
<td>Undecided</td>
</tr>
<tr>
<td>Decision makers</td>
<td>95</td>
<td>-</td>
<td>5</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Researchers</td>
<td>95</td>
<td>-</td>
<td>5</td>
<td>75</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Project managers</td>
<td>60</td>
<td>40</td>
<td>-</td>
<td>63</td>
<td>38</td>
<td>-</td>
</tr>
<tr>
<td>Farmers</td>
<td>75</td>
<td>15</td>
<td>10</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Extension workers</td>
<td>85</td>
<td>10</td>
<td>5</td>
<td>50</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>Local communities</td>
<td>90</td>
<td>5</td>
<td>5</td>
<td>63</td>
<td>38</td>
<td>-</td>
</tr>
<tr>
<td>Others (input suppliers)</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>38</td>
<td>-</td>
<td>63</td>
</tr>
</tbody>
</table>
Table 10. Indication of the involvement of researchers, farmers, and extension workers in the implementation of AR4D in Liberia

<table>
<thead>
<tr>
<th>Factor</th>
<th>Negative influence on stakeholders’ opportunity to benefit from agricultural research results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision makers</td>
<td>Do not assure beneficiaries’ input when approving projects; condone political interference in the management and implementation of AR4D activities</td>
</tr>
<tr>
<td>Researchers</td>
<td>Do not consider beneficiaries’ input when designing projects; do not publish or provide information on research findings</td>
</tr>
<tr>
<td>Project managers</td>
<td>Often have limited technical knowledge on agricultural research subjects; are often partial, corrupt and favor cronies over existing competent staff</td>
</tr>
<tr>
<td>Farmers</td>
<td>Have cultural biases; often slow to adopt; often interested more in material benefits, like free inputs, other supplies / materials and / or cash that are often not sustainable after the project ends</td>
</tr>
<tr>
<td>Extension workers</td>
<td>Insufficiently trained; poorly empowered, with very little or no material support for their activities or work; barely serve the farmers</td>
</tr>
<tr>
<td>Local communities</td>
<td>Often skeptical / suspicious of the motives of projects; sometimes harbor negative perception about the interventions of AR4D</td>
</tr>
<tr>
<td>Others (Input suppliers)</td>
<td>Too little or no support to farmers; absence of competitive business outlets to source quality inputs</td>
</tr>
</tbody>
</table>

2.3 Implementation mechanisms of AR4D

2.3.1 Participation of farmers and extension workers in research gap identification

All the farmers interviewed indicated that they have never contributed to any decision-making regarding research topics. Among the extension workers interviewed, only 12 percent said they have participated in research gap identification, and that they participated only through direct contact with the researcher. This observation is largely correct because there is no evidence of any participatory forum held for research gap identification since 2007. Admittedly, the annual research stakeholders’ meeting initiated by CARI in 2017 (Sigman and Davis, 2017) was intended to lay the foundation for stakeholders to meet on a regular basis to discuss AR4D progress and implementation, including research gap identification and agenda setting. Unfortunately, there has been no other such meeting since then, as the agenda for revitalizing agricultural research in Liberia have stalled due to the poor governance of the system. Therefore, the AR4D framework in the country needs to be reviewed, with urgent emphasis on the governance and administration of the research system. This would provide the requisite support base for all the processes that should be followed to guarantee successful implementation of AR4D activities in Liberia.
2.3.2 Involvement of researchers, farmers, and extension workers in the implementation of AR4D

An indication of the involvement of the various respondents (researchers, farmers, and extension workers) in the implementation of AR4D over the years in Liberia is summarized Table 11. Most of the respondents (64-90 percent) responded that they have had the opportunity to be engaged in the implementation of AR4D. The farmers indicated that their involvement have mainly been to try new crop varieties in small plots on their farms as indicated by 90 percent of participants, while most of the extension workers (up to 75 percent) indicated that they have been involved as liaisons to connect farmers to the project implementation team and to help in the selection of sites for the project. Both the researchers and extension workers indicated that helping farmers by being part of efforts to solve the problems faced in food production has been the main motivation for their involvement in the implementation of AR4D.

<table>
<thead>
<tr>
<th>Category</th>
<th>Involvement in AR4D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Researchers</td>
<td>64</td>
</tr>
<tr>
<td>Farmers</td>
<td>90</td>
</tr>
<tr>
<td>Extension workers</td>
<td>75</td>
</tr>
</tbody>
</table>

2.3.3 Funding-related challenges faced by researchers in AR4D implementation

When asked about the funding-related challenges faced by researchers, the common theme echoed by the researchers interviewed was that insufficient and sustainable funding were the most pressing challenges. They explained that with the funding deficiency from the government, they have tried to depend largely on donors; unfortunately, most of the limited donor funding received by CARI were not administered properly by the management of the institute, and this has further worsened the funding challenges faced by researchers.

The difficulty of accessing funding to deliver the mandates of the research institute was similarly emphasized by the key informants asked about this issue. They described the situation as the key challenge facing CARI and other NARS institutions in the country. One of the key informants specifically observed that the annual budget allocation to the institute by the central government has been progressively reduced over the past three years and even accessing those funds was not always possible. The respondents further indicated that even funding from donors have not been forthcoming, particularly since CARI gained an autonomous status.
2.3.4 Processes applied by researchers during the planning and implementation stages of their AR4D activities

The individual researchers were asked several specific questions about how they designed and implemented their AR4D projects, including the participation of farmers in their processes. Roughly 50 percent of the researchers who have previously engaged in the implementation of AR4D indicated that the beneficiaries and farmers were able to participate in research gap identification through workshops and meeting conducted with them, while 75 percent indicated that they were able to participate in the implementation of AR4D through participatory varietal selection exercises and training on how to maintain and manage their crop varieties and livestock.

On the question on how the researchers designed their research projects, the responses were mixed: two out of the five who responded indicated that they brainstormed perceived problems faced by farmers and developed a proposal to address the problems. One of the five specifically indicated that they applied the design thinking methodology that involves “empathizing, defining, ideating, prototyping, and testing”, while the responses of the other two were not very clear. On the approach adopted by researchers to implement AR4D, 50 percent of the researchers indicated that they adopted a community-based approach, while 63 percent of them indicated that they adopted a participatory approach of stakeholders and beneficiaries.

On the question of how researchers ensured gender issues (including women and youth) in their projects from participation to delivery of outputs, only four of the respondents provided answers. Two of them indicated that women and youth were encouraged to participate by reserving spaces for them, while the other two indicated that no special preference was given to gender issues.

2.3.5 Criteria considered by researchers in AR4D implementation

It is of vital importance that the implementation of AR4D is guided by certain minimum criteria aimed at enhancing the impact of projects on the beneficiaries and the larger society. The researchers were requested to provide an indication and explanation of the criteria they considered when implementing AR4D activities. The various criteria considered by the individual researchers who have implemented AR4D activities in the past are presented in Table 12. Overall, at least 50 percent of the researchers indicated that during their planning and implementation of AR4D projects they holistically considered a combination of factors that would ensure positive impact. These factors include, but are not limited to the relevance of the intervention to the research priorities of the country and to food security and nutrition, the applicability and adoptability of the intervention, its cost effectiveness and affordability to the end-users, and its responsiveness to gender concerns and others, as well as its impact on the environment.
This suggests that the researchers certainly know how to approach their work, and as such they should be given all the necessary support and the conducive environment to help complement their efforts to ensure a more effective delivery of AR4D services in the country.

Table 2. Criteria considered by researchers when implementing AR4D in Liberia

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Percentage of researchers who considered criteria</th>
<th>Researchers’ remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance to country research priorities</td>
<td>100</td>
<td>Developing high yielding and early maturing planting materials for farmers is a key priority national priority</td>
</tr>
<tr>
<td>Relevance to food security and nutrition</td>
<td>100</td>
<td>The emphasis has mainly been on staple food and nutrition commodities</td>
</tr>
<tr>
<td>Applicability</td>
<td>63</td>
<td>Technologies considered for introduction were those that were largely compatible with the prevailing agroecological conditions in the country</td>
</tr>
<tr>
<td>Adoptability and scaling out</td>
<td>75</td>
<td>The focus has been on technologies that could be easily multiplied and readily adopted by farmers in the country</td>
</tr>
<tr>
<td>Cost-effectiveness and affordability</td>
<td>75</td>
<td>Researchers ensured that the promoted technologies were affordable to farmers and relatively cheap to apply</td>
</tr>
<tr>
<td>Gender sensitivity</td>
<td>50</td>
<td>Since most of the farming activities are undertaken by women, technologies suitable for their use were highly considered</td>
</tr>
<tr>
<td>Impact on environment and biodiversity</td>
<td>75</td>
<td>Steps have been taken to use environmentally friendly applications</td>
</tr>
<tr>
<td>Feedback mechanism</td>
<td>88</td>
<td>Regular meetings were held with beneficiaries associated with the projects mainly during the implementation stages</td>
</tr>
</tbody>
</table>

2.3.6 Resources and facilities available to NARS organizations

The resources and facilities needed to facilitate research work within NARS organizations require keen attention to help improve the workflow and output of the system. When asked whether the resources and facilities the NARS depend on in their AR4D are always updated or upgraded, the key informants closely associated with the various NARS organizations indicated that most of the institutions, including CARI have been operating without laboratories, and with dilapidated fields and field operation facilities and equipment. They added that accessing the necessary assistance has not been easy, despite writing and submitting numerous proposals and requests for assistance.

The insufficiency of funding and the difficulty of accessing funding for agricultural research activities in the country was similarly accentuated by the researchers at CARI. Indeed, such grim assessment of the resources and facilities available for agricultural research in Liberia is an indication that the ability of the system to
respond to the sustainable development needs of the agriculture sector is severely compromised. The GOL is responsible for this poor state of affairs due to the policies it has implemented to not only reduce its funding to CARI, but also to pay less attention to the governance of the institute. This has probably discouraged international partners from assisting the NARS. The basic governance structure of CARI has badly deteriorated since 2018, as the board of directors has been fragmented, and the institute has been allowed by the GOL to function with neither a proper director general nor a duly appointed technical leader for its research and other strategic programs.

Given these shortcomings, it will be impossible to enhance the impact of the NARS if the GOL does not change its negative attitude towards the system. Hence, national leaders must become more aware that it is their responsibility to ensure that every facet of the government, including the NARS, is equitably resourced and governed in accordance with relevant national statutes to enable them to function efficiently and to deliver their mandates effectively to the people of the country.

2.4 Monitoring and evaluation of AR4D

Monitoring and evaluation (M&E) is an essential activity to measure the implementation and progress of any program. Assessment of the views of key informants on the existence of an effective M&E system for AR4D projects implemented in last ten years in Liberia revealed that there has been no properly established M&E mechanism in place at the level of the MOA. Some “pockets” of data collection activities were carried out occasionally by the ministry and most activities have been project driven. The on-going Tree Crop (cocoa) Extension Project, implemented within the ministry, and another cocoa project being implemented by the NGO, Solidaridad, were two examples cited by a key informant in which these projects were not linked to a common M&E system that would collect and aggregate relevant data from both projects. The respondents generally described the present situation of the M&E system as “rudimentary” and recommended that it needs to be strengthened and better supported.

Monitoring and evaluation is very important for AR4D projects to ensure that a robust and reliable system that guarantees the proper implementation of activities outlined in projects is in place. The limitation of M&E activities in AR4D, even at CARI, could be one factor that has limited the opportunities for the growth and development of the NARS in the country. Ideally the MOA and every NARS organization should develop and sustain an efficient M&E system to ensure that their research and development programs are constantly updated and remain responsive to the dynamic needs of the country. The NARS must be assisted and supported in every way possible to establish and implement the culture of regularly monitoring and evaluating the impact of their programs and activities in the country.
2.4.1 Feedback mechanisms adopted by researchers and extension workers in their AR4D projects

When researchers were asked about the mechanisms they applied to gather feedback from farmers or stakeholders before, during and after implementation of their AR4D projects, none of the individual researchers was able to answer the question directly. Feedback from farmers or project beneficiaries have been gathered mostly through informal conversations with farmers, community members and others involved with the activities of the project. Formally, feedback can be gathered as part of project planning and implementation requirements by the donor, through special assessment exercises but this has not been the case.

Separately, extension workers indicated that they gathered and reported feedback from farmers or project beneficiaries whenever they visited fields, by informally conversing with them and asking relevant questions. All the extension worker respondents indicated that they used their monthly written reports to their supervisors to highlight any feedback received from the farmers or project beneficiaries.

About 88 percent of the extension workers interviewed reported that the feedback they received from farmers were considered, but not always addressed, when planning for new research activities. In terms of how the feedback was taken into consideration when planning the new research activities, both the researchers and extension workers indicated that whenever they had the opportunity to be involved, they proposed changes to the new projects based on the gaps identified from the implementation of previous studies, and sometimes the necessary changes were made and adopted.

Certainly, the extension field staff and individual researchers have been doing a great job liaising with the farmers as much as possible to help improve the implementation of AR4D in Liberia; however, without the support of an effective M&E mechanism within the AES and the NARS to provide feedback, these efforts are difficult to evaluate. Addressing farmers’ feedback on AR4D projects should be done on a routine basis. Every feedback provided by end-users and other stakeholders should always be evaluated properly and addressed to the fullest when planning for subsequent research activities. This will help encourage their participation in further studies and ultimately enhance the impact of the recommendations that will be taken to them by the NARS.

2.4.2 Farmers’ feedback on AR4D

About 45 percent of the farmers interviewed reported that they never had the chance to provide their feedback regarding AR4D projects in which they participated, as according to them, there was no means available to them to give their feedback. This assessment was similarly echoed by the key informants who were asked the
same questions. They indicted that farmers were not consulted during the planning of AR4D projects, and that the only time they were informed about projects was when they were told “we are bringing this project to this community and this is what you need to do to make it work”. They asserted that farmers were seldom consulted on what they really wanted or needed. As a result, to ensure involvement of farmers and others in AR4D programs, guidelines must be in place to encourage full participation of these groups.

The other 55 percent who indicated that they provided feedback explained that they gave their feedback during individual or group meetings with extension workers, project staff and other visitors who contacted them during and/or after the start of the project. Of the farmers who indicated that they had the opportunity to provide feedback, about 80 percent indicated that their concerns were addressed fully. The rest of them reported that their feedbacks were addressed either partly or never addressed at all.

2.4.3 Sustainability of AR4D deliverables after project closure

A proper sustainability plan for AR4D projects is highly important to ensure that communities continue to benefit from the services delivered by the project following its closure. When asked whether a sustainability plan was adopted following the end of AR4D projects, about 50 percent the individual researchers with experience in AR4D implementation responded positively and explained that most of the projects implemented were aimed at extending improved planting materials and crop or livestock management techniques. To ensure sustainability, according to the researchers, technologies that could be easily reproduced independently by the farmers were the types of results that should be targeted by projects. This is important because any such technology can easily be upscaled and advanced for commercialization by local entrepreneurs and small-scale businesses.

The extension workers interviewed were similarly split evenly on the issue of sustainability. The extension workers who claimed that there was sustainability in providing the same services after project closure explained that in some cases, farmers or project beneficiaries were still utilizing the knowledge and other technologies such as improved varieties introduced by the AR4D projects. Those who indicated that sustainability was an issue explained that many of the beneficiaries were often wholly dependent on material support from the project and could not continue on their own after project closure. This suggests that recommendations from some of the projects were not sustainable.

2.4.4 Accountability mechanism for deliverables

Strong accountability mechanisms for deliverables are necessary to ensure proper implementation of AR4D activities. Three of the key informants were asked specifically about the existence of any such mechanism in Liberia and who should
bear the fiduciary responsibility for financial and resource accountability. They responded that there is no strong accountability mechanism in the country. One of them further suggested that there is a need to revisit the idea of establishing a national research council. This body would serve to coordinate, monitor, and evaluate all research activities (in all research disciplines, including agriculture, health, education, policy, etc.) in the country. It was stated that such a body, when established, could more effectively facilitate collaboration between researchers and organizations involved in common areas of research and make it easier for them to source funding and enhance accountability, as researchers and NARS institutions would be required to compete for funding and provide feedback and results for the funds they would receive.

The AR4D focus group participants similarly indicated that there has been a lack of transparency and accountability of the management and use of limited funds committed to the national agricultural research institute over the past ten years. To ensure proper implementation of AR4D activities, another key informant suggested that a legal accountability framework be put in place and enforced. Admittedly, there are legal channels available in Liberia to address poor performance and misuse of public fund; unfortunately, the system has not been able to successfully control these issues due to the lack of the political will within higher levels of the GOL. Proper accountability for deliverables, resources use and fiscal responsibility in AR4D projects could be assured if the capacities of the relevant anti-graft and integrity institutions were sufficiently strengthened to support and enhance their independence from powerful officials and interests.

### 2.5 Impact of AR4D

Developmental research involves the promotion of science-based recommendations aimed at reducing poverty and improving human welfare through science and technology. This should be an overarching goal of all governments within developing countries. To attain these desired goals, it is important to ensure that AR4D projects are properly aligned with national priorities. Promoted technologies must be applicable for use by end-users, affordable and easy to adopt, responsive to gender-based issues, and limit adverse impacts on the environment. The link between the AR4D projects and the national priorities, and the relevance of the projects and their influence on policy and decision-making at the national level were assessed to estimate the impact of AR4D in the country over the past ten years.

#### 2.5.1 Evaluation of the impact of AR4D projects

Overall, at least 50 percent of the individual researchers, extension workers and farmers rated the impacted of AR4D implemented in Liberia over the past ten years as medium (Figure 13). Approximately 63 percent of the individual researchers
rated the impact of AR4D as medium, while 38 percent rated it as low. Among the extension workers interviewed, about 87 percent reported that they experienced positive feedback from AR4D programs. They have observed improvements among farmers such as higher yields, better pest and water control, and reduction in poverty. For the farmers, up to 95 percent of those interviewed rated the impact of AR4D as medium to high and 90 percent of them indicated that they have experienced improvement in their farm productivity as a result of AR4D projects they have participated in. The other 10 percent indicated that they did not obtain positive results from their participation because the projects ended prematurely.

The participants in the AR4D focus group collectively rated the impact of AR4D as medium, noting that AR4D activities implemented over the past ten years have positively affected the productivity and livelihood of many small-scale farmers in the country. They, including the key informants interviewed on the matter, recounted various positive cases such as the establishment of demonstration plots and the dissemination of improved varieties of rice and cassava. Many farmers have been able to adopt such technologies, as they are presently growing many of the newly introduced varieties, such as the NERICA-L-19 rice and yellow root cassava.

Despite the relatively positive assessment of the impact of AR4D in Liberia, one of the key informants noted that there were some gaps, as there has been very little support for research. He added that because the research findings need to be taken to farmers all over the country, the lack of funding support has made it difficult for all farmers to benefit from the impact of AR4D activities in the country. This was true for donor-funded activities as well, since the selected group of beneficiaries were often limited, with little or no sustainability mechanism or plans to continue, let alone to extend new technologies to other areas of need. Therefore, the respondent continued, the NARS have been doing their best under the circumstances to research, promote and disseminate improved technologies, but the overall performance cannot be regarded as satisfactory until the farmers in all parts of the country are well served. Other respondents also made reference to the devastating effect of the Liberian civil wars on the delivery of agricultural extension services in the country. They added that with just one extension worker for every 30 000 plus farmers and with CARI struggling to function properly, they found it difficult to say that AR4D projects implemented over the years have had a desired impact on farming communities.

Given these assessments, it is vitally important for the GOL and its development partners to ensure that the capacity of the NARS in Liberia is sufficiently strengthened to help enhance their performance. Additionally, AR4D activities should also be sufficiently resourced to ensure that the impact of such projects implemented in the country are felt by the intended end-users and beneficiaries.
2.5.2 AR4D link to national priorities

Since 2006, the key AR4D priority of the GOL has been to introduce and extend improved varieties, seeds and planting materials of priority food and cash crops to promote the adoption of best crop and animal production practices and value addition in the country. Four of the 17 key respondents were specifically asked whether the AR4D projects have been linked to research priorities of the country. Three of the respondents answered to the affirmative and the other declined to answer directly. The three explained that over the last ten years and currently most of the development projects have had research or research support components that sought to both strengthen the institutional capacity of the national agricultural research institute and at the same time test and extend new technologies (like improved seeds, new cassava and rice processing machines and technologies) to farmers through partner institutions like AfricaRice and IITA in collaboration with CARI. The WAAPP (West Africa Agricultural Productivity Project) and SAPEC (Smallholders Agricultural Productivity Enhancement and Commercialization) projects were cited as recent examples of projects that undertook such initiatives.

Specific mention was also made of the cassava processing facilities in Bomi (operated by Falama, Inc), Montserrado (Bensonville) and Bong Counties (at CARI) as examples of where new crop processing and postharvest management technologies have been introduced and are impacting the livelihood of farmers and local communities. The key message emphasized by the key informants was that many of the AR4D activities were linked to the priorities of the government, arguing that donors such as the World
Bank, USAID and the African Development Bank would not have supported projects that were not aligned to the agricultural development priorities of the country.

2.5.3 Relevance of AR4D projects

All of the key informants and AR4D focus group participants interviewed on the subject indicated that many of the AR4D projects started in the country over the last ten years were in one way or another linked to the national priorities of the country and to some extent, have had influence on policy and decision-making. Overall, the various respondents noted that although not in all cases, AR4D projects implemented in the last ten years were able to address critical issues like the applicability, adoptability, affordability, gender sensitivity and environmental impact of the strategies or technologies promoted by the AR4D.

In instances where some aspects of a newly introduced technology presented problems for their adoption, additional complementary technologies were said to be introduced later to overcome these obstacles. Two examples cited were the introduction of sickle reaping and parboiling technology to facilitate adoption of short stature improved rice varieties, such as NERICA-L-19, which becomes easier to mill when parboiled.

In spite of the assertion that the AR4D projects were linked to national priorities, the AR4D FG participants noted that some of the AR4D projects did not properly consider the beneficiaries’ ownership of the introduced solutions through participatory or community-based approaches, particularly during the planning stages. They added that in such cases, the project recommendations were abandoned shortly following the end of donor support, because most often the methods used to achieve the objectives of the project were not sustainable.

These results show that efforts to ensure the alignment of AR4D projects to national priorities have not been implemented well with those that could assure greater ownership of the introduced solutions by the beneficiaries. This disconnect is an indication for the need to always involve the targeted end-users in the design and planning arrangements for new AR4D activities going forward.

2.5.4 AR4D influence on policy and decision-making at national level

Of the key informants asked how much influence AR4D projects have had in agricultural policy and decision-making processes at national level, two explained that AR4D projects greatly shaped the policies developed for the agricultural sector of the country. Lessons learned from the implementation of past projects have been used by authorities to inform current decisions and actions. The recently completed SAPEC project was cited as an example in which several unfinished development activities like the rice mills and irrigated rice fields were not yet fully functional in the south east of the country, and indicated that those unfinished activities were
currently being considered for implementation under up-coming projects like the Smallholder Agriculture Development for Food and Nutrition Security project.

2.5.5 Consideration of other critical issues in AR4D implementation

Other issues, including the applicability, adoptability, affordability, gender sensitivity and environmental impact of recommendation and introduced technologies need to be taken into consideration in AR4D to ensure a balanced impact on the target communities and beneficiaries. Several of the key informants and the AR4D thematic focus group participants were asked if AR4D projects implemented in the last ten years have considered or addressed such critical issues.

The respondents indicated that the various AR4D projects have, but not always, considered these issues. A project aimed at introducing a new rice variety (FKR-19) to farmers in the south eastern part of the country in 2011 was cited as an example of an AR4D activity in which prior assessment to determine the applicability and adoptability of the technology in the target region was not done prior to implementation. It was further mentioned that the project implementers did not even demonstrate to the farmers how to grow and manage the new variety prior to its introduction, “they simply gave farmers seeds of the variety and some other inputs and returned later to assess the outcome”. Accordingly, the net result was that the farmers lost interest in the new variety after it performed poorly in their fields.

In other instances, the respondents indicated that to some extent, the environmental impacts had been considered because most of the AR4D projects implemented in the country had largely been funded by donors who have usually insisted that such assessments be made even before they would approve funding for the project.

2.6 Key areas of improvement in AR4D implementation

The general assessment of AR4D in the country was that the present state of the NARS was largely dysfunctional and broken and needed to be fixed. One of the key informants indicated that the decision makers must get back to the basics; that is to revert to the original intent and plan for the revitalization of the national agricultural research institute (which is CARI), as clearly envisioned from the very beginning. The informant further indicated that Liberia needs an independent agricultural research institution that has qualified men and women with the mindset of and are excited about growing professionally and advancing their research career by meaningfully investing their time and energy at the institute. Others also affirmed that the country needs a good research institute and CARI needs to be fully supported.

The need for CARI and the AR4D system in the country to collaborate with other institutions to mobilize support for the work they do was also emphasized by all the key informants interviewed on the subject. One indicated that the NARS can learn
a lot from those of several other regional countries like Cote d’Ivoire and Ghana, which have developed many useful technologies for their farmers.

Another key informant also emphasized that farmers should be registered and organized into cooperatives, as farmers working by themselves or in small groups cannot leverage the kind of support and exert their collective influence on AR4D. The need to improve governance and transparency to alleviate corruption, by putting in place proper M&E and accountability mechanisms for the administration and use of funding, was also emphasized by the key informants.

Overall, majority of the key informants strongly indicated that the situation at CARI needs to be faced squarely, and outlined the following suggestions:

1. That CARI needs a proper director general (independently and competitively recruited) that is employed based on the act of the legislature which created the institute as an autonomous agency of the government. They maintained that there is no shortage of qualified national candidates to fulfil that role; however, by simply handpicking someone, as is being done by the government, it does not serve the strategic interest of the country.

2. A competent cadre of staff with relevant qualifications should be recruited and provided the resources to do the work for which they will be recruited.

3. There should be a functional Board of Directors to guide the policies and direction of the institute. The board should not implement the work of the institute, as observed from the actions of members of one of the previous boards, it should help guide the institute. Currently, in the eyes of keen observers, the respondent maintained, CARI was operating illegally and, on such basis, it would be difficult for donors to provide funding assistance to the institute. They revealed that officials of the agriculture donors working group in the country have often expressed grave concerns about the present situation at CARI. They emphasized the importance of doing the right things to save the institute and allow the AR4D system in the country to positively impact the lives of farmers, farming communities, and agricultural activities in the country.

In summary, the various key informants interviewed on the subject added that to improve implementation of AR4D in Liberia, the following points should be implemented:

1. Policy makers need to be repeatedly reminded of their obligation to help national institutions function properly.

2. The practice of academics working in isolation should be discouraged and they should be supported to network and collaborate with others across the various spectrums of the NARS.

3. The heads of NARS institutions should make the necessary contact with local and international AR4D organizations to seek partnerships and forge collaboration.
4. Liberia should be divided into various agroecological zones, as the conditions across the different regions of the country are not the same. Research activities of the national institute should be decentralized to make it more effective and responsive to the specific needs of farmers in each of the various agroecological zones of the country.

5. Specialized centers should be created for specific crops (rice, vegetables, tree crops, etc.) and various technologies (postharvest and mechanization).

6. The research cycle approach should be adopted by the AR4D institutions, whereby activities would begin with consultation meetings between the various stakeholders (including farmers), followed by research agenda setting, proposal development, and implementation, and ending with feedback meetings with the stakeholders.

7. The NARS system must be advanced in Liberia, with CARI as the lead center and supported and aided by the collaborative efforts of the universities, regional and international AR4D institutions, civil society, NGO and private sector research organizations, with a working committee to coordinate the activities of the sector.

8. Relationship with international support and donor institutions and organizations should be forged to solicit funding, develop proposals, collaborate with external research partners, and increase advocacy for sourcing more funding from the government.

9. CARI needs to partner with national universities and develop joint proposals to solicit funding.

10. Motivate and support researchers to publish to enhance their visibility and that of the NARI.

11. Improve the training of the scientists to address specific skill-related gaps.

12. Improve the extension services and make it more competitive, effective, and efficient.

3. Link between NARS organizations

3.1 Status of linkage between NARS organizations

The consensus among the AR4D FGD participants was that there has not been much collaboration between and amongst the NARS institutions and organizations in the country. A similar assessment was shared by the participants of the FGD held on the collaboration between NARS actors. The participants referred to a past collaborative effort forged between CARI and the CU-CASD in 2011, when they signed an MoU that allowed researchers from CARI to undertake teaching responsibilities at CU-CASD, but that collaboration broke down within a year due to the lack of incentives to facilitate participation of staff from CARI.
Outside of institutional arrangements, the results of the FGDs revealed that several researchers from CARI were still collaborating with their counterparts at the various higher education institutes around the country. They were collaborating on various aspects of research, such as joint supervision of 4th year student research projects and piloting multi-locational trials for new crop varieties. Participants of both focus groups listed the lack of funding to undertake joint research activities, the lack of trust in the financial management system at CARI, the lack of policy or guidelines to guide collaboration and the lack of interest and commitment on the part of decision makers as key challenges that have limited the coordination, integration and collaboration among and between the NARS actors in the country.

3.2 Strategies to strengthen linkages and improving collaboration between NARS organizations

The FGDs on institutional collaboration revealed that the key strategy in place for the enhancement of linkage and collaboration between NARS actors had been the revitalization of CARI by positioning the organization to lead and coordinate agricultural research efforts in the country. It was noted that the entire process has been stalled by poor implementation. The respondents further stressed that what has been keeping the linkage between the universities and CARI alive is the individual efforts exerted by many of the researchers to contribute to the teaching and research portfolio of the various institutions of higher learning.

To improve the current situation, the respondents called for the entire AR4D strategy of the country to be revisited to put into perspective what went wrong and then develop concrete actions (not only proposals) to remedy the situation. Such actions are outlined here:

1. CARI should reach out to potential partners.
2. NARS actors should increase public awareness so that others can know what their counterparts are doing.
3. Individual researchers should network with colleagues at other institutions both at home and abroad.
4. Researchers and NARS institutions and organizations should frequently communicate with each other.
5. NARS institutions and organizations should provide opportunities for knowledge sharing and learning with colleagues from elsewhere.

3.3 Link between research and extension

The EAS thematic focus group agreed that the linkage between the extension services and farmers was inadequate and weak, and the main reason for this was the limited number of extension workers available to service the farmers.
It was suggested that this was a result of the lack of funding to hire, train and deploy enough extension staff. All the extension workers stressed that based on the current manpower of the EAS, each extension officer in the country has had to cover more than 30,000 farmers. Given these numbers, it would take many years before a farmer had the opportunity to meet and interact with an extension worker. They noted that they could try reaching out to as many farmers as possible using the group methods, but the major bottleneck to achieving this has been the lack of funding to arrange and implement group meetings with farmers.

3.4 Link between extension and farmers

3.4.1 Effectiveness of EAS

Both farmers and extension workers represented in the EAS focus group discussion recognized that the national extension entities are not as effective as they need to be. They highlighted that the extension system is not working for all farmers, as only a few farmers benefit from extension services, such as delivery of improved planting materials and breeds of livestock (especially chicken and pig) or training to enhance their capacity to farm profitably. They agreed that what has been lacking in terms of the linkage between research and the farmers is the information that should flow to the farmers through the extension services. It was further stated that the extension services could try and get bits and pieces of information to the farmers. Furthermore, there is a lack of any mechanism by which the extension service can relay information from farmers back into the research system.

3.4.2 Proposed strategies to improve EAS

The FGD participants on the EAS theme suggested that the only way that extension programs can be truly vibrant is for adequate funding support to the system. Funding should be used to recruit and deploy more extension officers, similar to how it was utilized prior to the civil war in 1990. Participation of NGOs and private-sector organizations and businesses (such as agro-input dealers) in EAS delivery must be fully coordinated by the MOA to avoid duplication of extension and outreach efforts.

To find the resources to deploy more extension workers, the EAS FGD participants suggested that more proposals should be developed to solicit funding. The MOA, Farmers Union Network of Liberia, Civil Society and other advocacy groups should intensify advocacy efforts to increase budgetary allocation to the sector to a minimum of 10 percent of GDP as recommended by the Malabo Declaration. They also concluded that the GOL should pay more attention to CARI to enable it to fully support the EAS.
4. Conclusion

Agricultural research in Liberia has been plagued by a series of critical challenges related to institutional organization, governance, and funding. Research programs within the NARS did not appear properly organized, even at the national agricultural research institute (CARI), despite deliberate efforts in the recent past to revitalize the system. The lack of collaboration and effective linkages among and between the various NARS organizations and the extension and advisory services was widely reported by the respondents and participants in this study as the main problem. Limited involvement of end-users and extension workers in AR4D decision making during the project planning stages was also cited as an issue. Critical facilities, including laboratories, research field facilities and equipment, and funding for research activities were acutely lacking, as reported by the researchers, key informants and focus group participants interviewed. It was also stated that the capacity of extension workers to adequately participate in AR4D was limited due to the lack of manpower.

Even though it was reported that AR4D programs in the country were linked in some ways to the national priorities of the government and that the lessons learned from projects were used to inform policy and decision making at the national level, effective accountability mechanisms must be put in place to assure proper implementation of projects with efficient financial accountability. The capacity of the research and extension staff of the country needs to be further improved to enhance their contribution to AR4D efforts. Also, deliberate actions must be taken to ensure the participation of all the stakeholders, including farmers and local communities, in AR4D planning and implementation. Additionally, enough funding for AR4D must be assured and the NARS fully revitalized with emphasis on CARI if the implementation of AR4D in Liberia is to improve for the better.

5. References


COMPREHENSIVE ASSESSMENT OF NATIONAL AGRICULTURAL RESEARCH AND EXTENSION SYSTEMS WITH A SPECIAL FOCUS ON INSTITUTIONAL LINKAGES BETWEEN VARIOUS ACTORS IN LIBERIA

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CHAPTER 5
Assessment of linkages between NARS actors

1. Introduction

Traditionally, researchers and extension workers, representing the agricultural research organizations (both public and private, and colleges of agriculture) and the agricultural extension and advisory services (AEAS) have been the key agents for AR4D and worked together to serve the needs of their farmer clients. The focus has been primarily on the supply of, and less on demand for, technologies, which were developed by the researchers and/or research organizations and disseminated by and through the extension agents or AEAS to farmers. Under this arrangement, the farmers were regarded more as recipients and less as partners in the generation and transfer of agricultural knowledge and technologies. It has been observed that this linear and supply-driven system has largely failed to respond effectively to the constraints of food and nutrition security, poverty alleviation and socio-economic development, which have persisted as major development challenges in Sub-Saharan Africa, including Liberia (Hall et al., 2000; 2006).

Today, the focus of AR4D is being directed more on people and the reduction of poverty, hunger, and malnutrition in the developing world (TAC, 2001). Organizations and professionals are increasingly expected to contribute more directly to poverty alleviation, eradicating hunger, and sustaining economic growth and development through the programs and activities they undertake and implement. This has necessitated the call for changes to alternative paradigms that encourage, facilitate, and support interdisciplinary research, multi-institutional, and multi-stakeholder approaches and collaborations that can promote efficiency in resource utilization which leads to improved outcomes (Mbabu and Ochieng, 2006; Buruchara et al., 2013). The pool of AR4D actors have expanded from the traditional groupings of researchers, extensionists and farmers to more inclusive and equitable partnerships that often include consumer groups, input dealers, produce aggregators and marketers, agro-industry businesses, financial services and banking, environmental groups, policy makers, community leaders and decision makers and relevant civil society groups (Daane and Boothe, 2004).

In Liberia, AR4D implementation has largely focused on the traditional linear approach involving the NARS, AEAS and farmers. However, in line with the revitalization program for the NARS, which is encapsulated in research strategy and autonomy legislation for CARI, the AR4D is now intended to follow the new paradigm involving interdisciplinary research involving multiple stakeholders working with the various
agricultural value chains. To improve AR4D delivery in Liberia, it will be important to ensure that the linkages among the various AR4D actors are strong enough to enhance the efficiency and effectiveness of their efforts, which should be aimed at raising the socio-economic performance and status of rural communities across the country. This study was therefore undertaken to examine the level of collaboration among the various AR4D actors and stakeholders to determine the capacity of the system to contribute effectively to the development objectives of the country. The recommendations from this report could be used to inform decisions and policy strategies with the stated goal of improving AR4D programs in Liberia.

2. Organizational set-up and linkage between the NARS organizations

The NARS consists of both public and private-sector entities that conduct research in various fields of agriculture. Presently, there are at least 19 NARS organizations in Liberia, about 80 percent of which are post-secondary and higher education institutions. These organizations function independently of each other, and the government-owned Central Agricultural Research Institute (CARI) is the only dedicated center for agricultural research in the country. The results of the discussions with various AR4D actors and experts, however, revealed that the current set-up involving various NARS institutions may not be adequate enough to enable them to fully fulfil the AR4D mission to reach every part or region of the country. As an example, there are no sub-stations for regional testing of agricultural technologies around the country. The desk review analysis revealed that the research functions of most of the NARS organizations were largely unstructured. These findings suggest that there is a need to expand the reach of the NARS by creating sub-stations in other parts of the country. The NARS must be encouraged and supported to properly structure their research programs and to develop and publish comprehensive strategies for their research activities. This will help enhance their roles and improve their contribution to the success of the AR4D system in Liberia.

As the leading body for agricultural research in Liberia, CARI was established with the objective of guiding, coordinating, and providing general oversight to all aspects of agricultural research in the country. However, it does not seem that CARI has been fulfilling these roles effectively, as most of the NARS organizations have been operating in isolation to the others with little or no coordinated approach by them to collectively address the strategic agricultural research and development needs of the country. Also, the findings of the desk review analysis suggest that there is a need to correctly identify all the organizations that conduct research in agriculture in Liberia to better understand the scope and dimension of the agricultural research services that can be provided to the country. CARI should do more to foster viable linkages with various national and international AR4D organizations in the country and could begin
by taking steps to establish and maintain a database of all entities that are conducting agricultural research in the country. The institute should organize meetings that will bring together various AR4D actors on a regular basis to share experiences and it should lead the effort to develop joint proposals, seek collective funding and aim to jointly implement research activities with other NARS and international AR4D organizations. This should help to promote synergy and enable them to achieve more R4D outcomes for the country.

The participatory discussions also revealed that there is a gap in stakeholders’ understanding of a NARS, as the acronym has been widely applied in the country to mean “National Agricultural Research Station”. It became necessary to carefully explain the term “National Agricultural Research System” at the beginning of each interview session, as it was widely accepted among the stakeholders that there was only one NARS in Liberia, and that NARS was CARI. Consequently, the weak linkage between the NARS organizations in Liberia can be partly attributed to this widely held connotation of the NARS acronym, leading to the other NARS organizations being thought of something other than an agricultural research organization. It is important to emphasize both the definition of the NARS and the significance of the collective efforts of the various NARS organizations in addressing the AR4D needs of the country. If this is done, the organizations will become more aware of their position as a counterpart with CARI and this awareness could help draw them closer to each other.

3. The extension and advisory services (EAS)

Farm enterprises and smallholder farmers require regular and sustained access to technology and knowledge to enable them to improve the production and productivity of their crops and animals. The extension and advisory services (EAS) are critical for facilitating such access by serving as the bridge that links the farmers and producer organizations to research and knowledge generation services and agribusiness.

Agriculture extension and advisory services have been delivered in Liberia by an array of public sector entities, including several ministries and agencies of the GOL, non-profit NGOs and civil society organizations, and private business, such as agro-input dealers and aggregators of various agricultural products. The results of the interviews conducted with representatives of various stakeholders, including farmers, researchers, extension workers and key experts revealed that the EAS in Liberia has not been working for all farmers and have therefore been ineffective.

Before the 1990 civil war in Liberia, government extension agents were active in every administrative district and clan (township) across the country. Presently, coverage is far less, as several districts across the country lack the presence of governmental extension staff. The main provider of extension services, the MOA, has less than 100
extension staff to serve the estimated 1.6 million farmers in the country. Even the few extension workers in the system are handicapped by poor logistics for mobility and road networks, and the shortage of critical supplies and equipment for on-farm demonstration of many promoted technologies.

National budgetary constraints were cited as the main limiting factor contributing to the low performance of the EAS in Liberia. One way to improve the performance of the national extension program would be for the GOL to mobilize and provide the necessary funding to the MOA. Additionally, such funding should be used to recruit, deploy and support the work of more extension officers. The participation of NGOs and private-sector organizations and businesses, such as input dealers and suppliers, could be leveraged through a well-coordinated approach by the MOA to reduce the risks of confusion, overlap, duplication of effort and misallocation of resources to further enhance synergy to increase the output, impact, and performance of the EAS. Furthermore, the current sectorial coordination efforts by the MOA should be expanded and focused further towards ensuring full compliance of all private and other public EAS providers with both the national AR4D priorities and the EAS policies of the GOL.

The MOA has developed a national EAS policy, which was validated by stakeholders in 2012 (Heritage, 2012; MOA, 2012a, 2012b). The policy was intended to provide guidance to all AEAS stakeholders and envisions a pluralistic, decentralized, demand-driven, and market-oriented AEAS that is flexible enough to address priority issues such as gender inequality, nutrition, climate change and natural resource management. Assuredly, when fully implemented, this noble intent and vision could yield high dividends for farmers, agribusiness, and the economy of the country.

4. Linkage between research and the EAS

As mentioned earlier, the EAS is responsible for bridging the gap between research and farmers. In order to achieve this, there must be a strong liaison between the research station and the EAS. Results from the participatory discussions indicated that researchers and experts in Liberia believed that the official linkages between the EAS and NARS organizations were weak and ineffective, as they overwhelmingly flagged the issue as one of the main challenges facing AR4D in the country. A majority of the extension workers indicated that because of the weak linkage between the EAS and the research station, farmers cannot fully benefit from AR4D efforts. To address these challenges, it will be important to mend and strengthen the linkage between research and the EAS. A Research-Extension forum could be established and supported to bring together both NARS and EAS actors on a regular basis to review AR4D progress, share experiences on emerging issues and adopt appropriate plans of action. The research system should also be supported to communicate frequently with the EAS and farming community through appropriate mass media outlets, as
this will help increase their visibility and enhance contact with the EAS, farmers and other end-users.

5. Linkage between the EAS and farmers

Like the linkage between the NARS and the EAS, the results of the participatory discussions revealed that the agriculture extension delivery system was ineffective because it was reportedly not working for all farmers as only a few farmers tended to benefit from these services. The reasons for the disparity related to not only the limitation of extension workers and logistics to service farmers in remote localities, but also to the duplication of extension service deliveries in certain localities.

As discussed earlier, increasing budgetary allocation to the national extension services by MOA and national government would be necessary to support the recruitment, deployment and functions of the additional extension workers needed to serve in every district and clan across Liberia. Also, effective coordination of the entire EAS apparatus, including both public and private sector organizations and agribusinesses will be needed to improve the utilization of the already scare EAS resources in the country.

6. References


COMPREHENSIVE ASSESSMENT OF NATIONAL AGRICULTURAL RESEARCH AND EXTENSION SYSTEMS WITH A SPECIAL FOCUS ON INSTITUTIONAL LINKAGES BETWEEN VARIOUS ACTORS IN LIBERIA

©FAO/Quaqua S. Mulbah (CARI)
1. Annex 1

Developing a guideline to support NARS’ AR4D impact and strengthen the institutional linkages between NARS actors in Liberia

Questionnaire for Individual Research Staff and focus group discussion

**Biodata**

Name of research organization: ....................................................................................................................................................

Name of interviewee: .................................................................................................................................................................

Position: ..................................................................................................................................................................................

Sex: Male ( ) Female ( )

Age: Years ( )

Educational level: BSc ( ) MSc ( ) PhD ( )

Phone number:................................. Email address:.................................................................

Research areas:
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1. **Research for development**

I) **Research arrangement and capacity to implement AR4D:**

1. Do you contribute in decisions making on research topics at your organization or national level? Always ( ) Usually ( ) Rarely ( ) Never ( )

2. How are decisions made on research for development (AR4D) at national level? Demand driven ( ) Supply driven ( )

please explain how
3. How do you see the technical, administrative and financial support of the government to your research institution?

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4. What are the main challenges facing AR4D in your organization?

Lack of financial resources (    ) High turnover of staff (    ) Low staff capacity (    )
Lack of coordination (    ) Weak linkage between research and extension (    )
Other (please specify):

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5. In your opinion, what are the main challenges that affects the performance of:

<table>
<thead>
<tr>
<th>#</th>
<th>Actors in AR4D project cycle</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Decision makers (for enabling environment)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Researchers (as project designers)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Project managers (as project implementers)</td>
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</tr>
<tr>
<td>4</td>
<td>Farmers (as service recipient)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Extension officers (the link between researchers and farmers)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Others (local communities)</td>
<td></td>
</tr>
</tbody>
</table>

6. What are the knowledge and skill related changes needed to improve your own and your staff/colleagues capacity to better conduct AR4D projects?

<table>
<thead>
<tr>
<th>#</th>
<th>Skills</th>
<th>Missing</th>
<th>Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Project proposal writing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Project implementation planning</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>Participatory approaches</td>
<td></td>
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<tr>
<td>4</td>
<td>Project management</td>
<td></td>
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<tr>
<td>5</td>
<td>Communication</td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td>Risk management</td>
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<tr>
<td>7</td>
<td>Conflict management</td>
<td></td>
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<tr>
<td>8</td>
<td>Mentoring and evaluation</td>
<td></td>
<td></td>
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<tr>
<td>9</td>
<td>Scaling out approaches</td>
<td></td>
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<tr>
<td>10</td>
<td>Reporting and publishing</td>
<td></td>
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<tr>
<td>11</td>
<td>Others (please specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
II) **Aspects on implementation mechanisms of AR4D:**

1. Have you managed or been involved in research for development projects before?
   - Yes ( )  
   - No ( )

2. What was the motivation for you to implement AR4D?

3. What are the challenges related to funding e.g. sustainability, insufficiency of funds, fluctuations, dependency on donors, etc.?
   - ........................................................................................................................................
   - ........................................................................................................................................
   - ........................................................................................................................................

4. How did you design your research projects? (Specify the steps)
   - ........................................................................................................................................
   - ........................................................................................................................................
   - ........................................................................................................................................

5. Did farmers/beneficiaries/WUAs participate in research gap identification? how?
   - ........................................................................................................................................

6. Did farmers/beneficiaries/WUAs participate in implementation of AR4D? how?
   - ........................................................................................................................................

7. What was the approach you adopted to implement AR4D?
   - community-based approach ( )  
   - Benchmarking for farm business model ( )
   - Scaling out GAPs ( )  
   - Interactive systemic innovation platforms ( )
   - Demonstration and awareness raising ( )  
   - Participatory of stakeholders and beneficiaries ( )  
   - Back-up research trials ( )  
   - Other (please specify) ( )
   - ........................................................................................................................................
   - ........................................................................................................................................
   - ........................................................................................................................................

8. How did you ensure gender issues (including women and youth) in your projects from participation and delivery of the outputs?
   - ........................................................................................................................................
   - ........................................................................................................................................
   - ........................................................................................................................................
9. Which of the followings did you considered when you implemented your AR4D projects?

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<thead>
<tr>
<th>#</th>
<th>Criteria</th>
<th>Responds</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Relevance to country research priorities</td>
<td>Yes</td>
<td></td>
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<tr>
<td></td>
<td>Relevance to food security and nutrition</td>
<td>Yes</td>
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<td></td>
<td>Applicability</td>
<td>Yes</td>
<td></td>
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<td></td>
<td>Adoptability and scaling out</td>
<td>Yes</td>
<td></td>
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<tr>
<td></td>
<td>Cost-effectiveness and affordability</td>
<td>Yes</td>
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<tr>
<td></td>
<td>Gender sensitivity</td>
<td>Yes</td>
<td></td>
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<tr>
<td></td>
<td>Impact on environment and biodiversity</td>
<td>Yes</td>
<td></td>
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<tr>
<td></td>
<td>Feedback mechanism</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others (Please specify)</td>
<td>Yes</td>
<td></td>
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</table>

III) Aspects on monitoring and evaluation of AR4D:

1. What was the feedback mechanism you used to collected from the farmers or stakeholders before, during and after implementation of your AR4D projects?

2. How is feedback taken into account when planning new research activities?

3. Do the stakeholders feel the ownership of the implemented AR4D projects?

4. How is monitoring and evaluation system for AR4D incorporated into projects?

5. Was there a sustainability plan adopted after project closure? please describe
IV) **General thoughts on AR4D**

1. How do you evaluate the impact of AR4D in your organization?
   - Low (  )
   - Medium (  )
   - High (  )

2. What were the main challenges in implementing AR4D?
   ....................................................................................................................................................
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3. What were your actions to overcome these challenges?
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   ....................................................................................................................................................
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2- **Institutional coordination between research institutions**

I) **Institutional coordination**

1. What is the institutional set-up in your organization? level of decentralization? roles at different levels?

2. In your opinion how should the organization be set-up (coordinated and governed) for its effective performance including enhancing linkage with other research institutions?
   ....................................................................................................................................................
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3. What is the modality of cooperation and integration with other similar organization at national and regional level?
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   ....................................................................................................................................................

4. What is the strategy in place to strengthen the linkages between research organizations in the country?
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   ....................................................................................................................................................
   ....................................................................................................................................................
5. Is this strategy effective/efficient?
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II) Challenges in linkages between NARs actors
1. What are the benefits and limitations of this institutional set up, as perceived by the target stakeholders and beneficiaries?
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....................................................................................................................................................

2. What are the main perceived challenges of collaboration with other research organization?
Lack of will to collaborate ( ) Lack of trust ( ) Socio-cultural norms ( )
Competition ( ) Lack of and resources ( ) Lack of knowledge about other organization ( )
Inadequate policies and regulations ( ) Other negative experiences (please specify): ...................................................................................................
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III) Link between research and extension
1. In your opinion how should the organization be set-up (coordinated and governed) for its effective performance including enhancing linkage between research and extension?
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2. What is the strategy in place to strengthen the linkages between research and extension?
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3. What is the strategy in place to strengthen the linkages between extension and farmers?
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4. Are these strategies effective/efficient?

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IV) General thoughts:

1. In your opinion, what are the key points to improve cooperation between your organization and other research organizations in the country?

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2. Do you have any other relevant information or relevant published documents that you think would be helpful for this assessment?

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2. Annex 2

Developing a guideline to support NARS’ AR4D impact and strengthen the institutional linkages between NARS actors in Liberia

Questionnaire for key-informants/Individual experts

**Biodata**

Name: ....................................................................................................................................................
Country: ..................................................................................................................................................
Organization: ...........................................................................................................................................
Position: ....................................................................................................................................................
Phone number: ........................................ Email address: .................................................................
Area of expertise:
..........................................................................................................................................................
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1. **Implementation of AR4D**

1. How and to what extent do NARS identify their research agenda and priorities?
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2. How and to what extent are AR4D's topics identified?
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3. Do you think that the AR4D projects are mostly relevant to country priorities?
4. Why?
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5. Do you think the AR4D projects in the country are mostly demand or supply driven? And how?
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6. Do you think that AR4D projects implemented in last ten years have considered/addressed (applicability, adoptability, affordability, gender sensitivity and environmental impact) of the implemented interventions/introduced technologies? How?
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....................................................................................................................................................

7. Do you think that AR4D projects implemented in last ten years have considered/addressed the beneficiaries’ ownership of the introduced solutions through participatory or community-based approaches? How?
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8. Do you think that AR4D projects implemented in last ten years had a good and reliable monitoring and evaluation system that ensured the proper implementation as planned?
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9. Do you think that AR4D projects implemented in last ten years have considered the stakeholders’ feedback mechanism? How?
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10. What accountability mechanisms for deliverables are in place (if any)? Who is held responsible for the efficiency in resource use and value for money?
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11. Have AR4D projects in last ten years had proper sustainability and exit plans?
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I) Challenges in AR4D
1. What are the challenges related to funding e.g. sustainability, insufficient funds, fluctuations, dependency on donors, etc.?
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2. Do you think the available resources and facilities that NARS depend on in their AR4D are always updated/upgraded?
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II) Impact of AR4D
1. To what extent does the AR4D programs link to research priorities of the country?
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2. Do you think that the AR4D projects implemented in last ten years have achieved the targeted impact on small-scale farmers or end users? How?
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3. How much influence do AR4D projects have in agricultural policy and decision-making processes at national level?
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III] **General thoughts in AR4D**

1. In general, what is your opinion of the NARS performance? Are you satisfied from their efforts on implementing AR4D? and why?

2. What are the key areas for improvement in implementation of AR4D?

3. Are there other recommendations that you have, or suggestions you would like to mention to improve implementation of AR4D?

2- **Institutional coordination between research intuitions**

1. What do you think about the institutional set up in the research organizations in your country? And how it should be? e.g. level of decentralization, roles at different levels etc.

2. How do you assess Intra/Inter-institutional coordination, integration and collaboration between NARS actors in the country?

3. What is the modality of collaboration and integration between research organization in the country?
4. Is there a strategy in place to strengthen the linkages between research organizations in the country?
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5. What are the main perceived challenges of collaboration between research organizations?

Lack of will to collaborate (   ) Lack of trust (   ) Socio-cultural norms (   )
Competition (   ) Lack of resources (   ) Lack of knowledge about other
organization (   ) Inadequate policies and regulations (   ) Other negative
experiences (please specify):
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6. In your opinion, what are the key-points to improve cooperation between agricultural research organizations in the country?
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7. How effective are the national extension systems in delivering advisory services? and how are they linked to research organizations at national level?
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8. How do you evaluate effectiveness and performance of current linkage between research and extension?
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9. Are there any strategies in place to strengthen the linkages between Research and extension? Please describe in details
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10. What is the strategy in place to strengthen the linkages between extension and farmers?

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11. How do you evaluate these strategies? Low ( )  Medium ( )  High ( )

Please explain below

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Do you have any other relevant information or relevant published documents that you think would be helpful for this assessment?

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3. Annex 3

Developing a guideline to support NARS’ R4D impact and strengthen the institutional linkages between NARS actors in Liberia

Questionnaire for extension agents

Biodata

Name of interviewee: ..............................................................................................................................

Sex: Male ( ) Female ( )

Age: Years ( )

Educational level:

Specialization: Agricultural Extension ( ) Water Extension ( )

Years of Experience: ( )

Phone number: .................................................................

3- Agricultural research for development

V) Research arrangement and capacity to implement AR4D:

7. Do you contribute to decisions making on research topics in your organization?
   Always ( ) Usually ( ) Rarely ( ) Never ( )

8. In your opinion, what are the challenges negatively influencing stakeholders’ benefiting from the results of agricultural research? In case you answer is yes, please mention the reasons:

   • Decision makers: Yes ( ) No ( ) Reason: .................................................................
   • Researchers: Yes ( ) No ( ) Reason: .................................................................
   • Project managers: Yes ( ) No ( ) Reason: .................................................................
   • Farmers: Yes ( ) No ( ) Reason: .................................................................
   • Extension Agents: Yes ( ) No ( ) Reason: .................................................................
   • Local communities: Yes ( ) No ( ) Reason: .................................................................
   • Others, please mention: ( ) Reason: .................................................................
VI) **Aspects on implementation mechanisms of AR4D:**

10. Did you participate in research gap identification?

   Yes ( )  
   No ( )

   If yes, how?
   - Direct contact with the researcher
   - Through the organization I work for
   - Through Agricultural Cooperatives
   - Through Water Users Associations
   - Through NGOs
   - Other, please specify: .................................................................

11. Have you been involved in agricultural research for development activities/projects before?

   Yes ( )  
   No ( )

   If yes, how?
   - Explaining those problems facing farmers that need to be studied and tackled through research
   - Selecting and supervising the establishment of a pilot plot at a targeted site
   - Transferring knowledge to farmer and his neighbours on how to apply new production methods of technology packages
   - Developing traditional irrigation methods
   - Implementing modern irrigation methods
   - Other, please mention: .................................

12. What was the motivation for your participation in AR4D projects?

   Yes ( )  
   No ( )

   If yes, how?
   - Solving problems farmers face in plant, animal and fish production
   - Reducing losses in agricultural production
   - Solving problems farmers face in irrigation
- Receiving financial benefits
- Other, please mention: ...........................................

• If your answer is No, please mention the motivation for your participation in AR4D projects:

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VII) **Aspects on monitoring and evaluation of AR4D:**

6. What was the feedback mechanism you used to report problems stakeholders face during and after the implementation of AR4D project?

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7. Was feedback taken into account when planning for new research activities?
If Yes ( ); how?

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If No ( ); why?

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8. Did you record positive impacts from implementing the AR4D project?
If Yes ( ); how?

- Learning new/modern methods that lead to:
  - Solving soil-related problems
  - Improve in plant, animal and fish productivities
  - Solving irrigation problems
  - Other, please mention: ..........................................................

If No ( ), Why?

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9. Was there sustainability strategy for providing the same services after project closure?
If Yes ( ); Please describe how:

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If No ( ); Why?

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4. Institutional coordination between research and extension institutions

V) Link between research and extension

5. In your opinion how should the organization be set-up (coordinated and governed) for its effective performance including enhancing linkage between research and extension?

6. What is the strategy in place to strengthen the linkages between research and extension?

7. What is the strategy in place to strengthen the linkages between extension and farmers?

8. Are these strategies effective/efficient?
If Yes; How?
If No; Why?

VIII) General thoughts on farmers’ opinions regarding AR4D

4. How do you evaluate the impact of AR4D?
Low ( )  Medium ( )  High ( )

5. In your opinion, what are the main challenges in implementing AR4D?

6. In your opinion, what are the actions that could help overcome these challenges?

VI) General thoughts:

3. In your opinion, what are the key points to improve cooperation between your organization and other research organizations in the country?
4. Do you have any other relevant information or relevant published documents that you think would be helpful for this assessment?

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Developing a guideline to support NARS' AR4D impact and strengthen the institutional linkages between NARS actors in Liberia

Questionnaire for farmers

**Biodata**
Name of interviewee: ............................................................................................................................
Sex: Male ( ) Female ( )
Age: Years ( )
Educational level:
Illiterate ( )
Read & Write ( )
Phone number: .................................................................

5- **Research for development**

IX) **Research arrangement and capacity to implement AR4D:**

9. Do you contribute to decision making regarding research topics?

Always ( ) Usually ( ) Rarely ( ) Never ( )

If yes, how?

• Through Unions of Producers ( )
• Through Agricultural Cooperatives ( )
• Through Water Users Associations ( )
• Other, Please Mention: .................................................................
10. Do you contribute implementing research activities at the community level?
Always ( ) Usually ( ) Rarely ( ) Never ( )
If yes, how?
• Through Unions of Producers ( )
• Through Agricultural Cooperatives ( )
• Through Water Users Associations ( )
• Other, Please Mention: .................................................................

11. In your opinion, which of the following represents a challenge obstructing your opportunity to benefit from the results of agricultural researches? In case your answer is yes, please mention the reasons:
• Decision makers: Yes ( ) No ( ) Reason: ....................................................
• Researchers: Yes ( ) No ( ) Reason: ....................................................
• Project managers: Yes ( ) No ( ) Reason: ....................................................
• Farmers: Yes ( ) No ( ) Reason: ....................................................
• Extension Agents: Yes ( ) No ( ) Reason: ....................................................
• Local communities: Yes ( ) No ( ) Reason: ....................................................
• Others, please mention: (.................................) Reason: ........................................

X) Aspects on implementation mechanisms of AR4D:
13. Did you participate in research gap identification?
Yes ( ) No ( )
If yes, how?
• Direct contact with the researcher
• Through Extension Agents
• Through Agricultural Cooperatives
• Through Water Users Associations
• Through NGOs
• Other, please specify: ...........................................................................................................
14. Have you been involved in agricultural research for development projects before?
Yes (  )  No (  )
If yes, how?
• Agreed to establish a pilot plot on your farm?
• Agreed to apply new technologies packages?
• Agreed to adopt modern irrigation methods?
• Other (please mention): .........................

15. What was the motivation for your participation in AR4D projects?
• Solving problems on your land
• Solving problems in plant production
• Solving problems in animal production
• Solving problems in fish production
• Solving problems in irrigation
• Learning new farming methods/practices that boosts production
• Increasing farm income and profitability
• Receiving financial benefits
• Other, please specify: ..............................................................................................................

XI) Aspects on monitoring and evaluation of AR4D:

10. Did you have the chance to give your feedback regarding those AR4D projects in which you participated?
If Yes ( ); What was the feedback mechanism you used during and after implementation of project?
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If No (  ); why?
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11. How is feedback taken into account when planning new research activities?
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12. Did you obtain positive impacts from participating in the AR4D project?
If Yes ( ); how?
  • Learning farming or irrigation methods that lead to:
    - Solving soil-related problems
    - Improvement in productivity
    - Solving irrigation problems
    - Other, please mention

If No ( ), Why?

13. Did you receive the same services after project closure?
If Yes ( ); Please describe

If No ( ); Why?

XII) General thoughts on farmers’ opinions regarding AR4D

7. How do you evaluate the impact of AR4D?
Low ( )  Medium ( )  High ( )

8. In your opinion, what are the main challenges in implementing AR4D?

9. In your opinion, what are the actions that could help overcome these challenges?