

THE GOVERNMENT OF LIBERIA



THE CENTRAL AGRICULTURAL RESEARCH INSTITUTE STRATEGIC PLAN (2023-2030)

JUNE 2023

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ACKNOWLEDGEMENT

The Board Directors of the Central Agriculture Research Institute (CARI) under the chairmanship of the Honorable Minister of Agriculture (MOA) is very grateful to the CARI Strategic Plan Committee, made up of Dr. Victor H. Sumo, Director General for Central agriculture research Institute (CARI), Dr. George Tee Forpoh, Deputy Minister for the Department of Regional development for Research and Extension of the Ministry of Agriculture (MOA), Dr. Moses M. Zinnah, Vice President for Academic Affairs, University of Liberia (UL), Dr. Sam Duo, Vice President for Academic Affairs, Nimba County University (NCU), Dr. James S. Dolo senior research Officer Central agriculture research Institute (CARI), Mr. Thomas Gbokie Special Advisor to the Minister of Agriculture (MOA), Mr. Edward Perry Director for Extension, Ministry of Agriculture (MOA), with technical backstopping by FAO project team including; Alexandrova Nevena (agricultural extension officer, HQ), Mroczek, Zofia Krystyna (Agricultural extension and advisory services specialist, HQ), Mr. Hassen Ali Abegaz (International Project Coordinator), Dr. Kwame Agbenyega Amezah (International Agriculture Research and Extension Expert), Mr. Oliver Musa Lavelah (National Agriculture Research Consultant) for preparing the CARI Strategic Plan (2023-2030). The Government of Liberia is very grateful to the European Union (EU) for funding Extension Research to Farmers for Sustainable Agriculture Food Security and Nutrition” Project, under which this Strategic Plan was produced. Compliments also go to FAO for providing the technical support for the preparation of this Strategic Plan.

FOREWORD

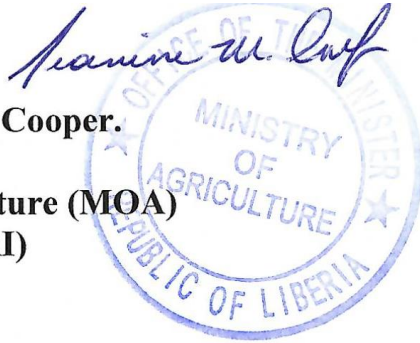
Agriculture is the biggest sector of our economy and provides main component of livelihood for the majority of people. Improvement in this sector is very important for the development of the whole country. The government of Liberia is however committed to the rebuilding of this vital sector. This is reflected in the Rising Vision 2030 and the Pro-Poor Agenda for Prosperity and Development (PAPD). These policies recognize the need to transform small holder subsistence agriculture into a more sustainable, modern and to a market oriented one.

CARI prepared a Strategic Plan in 2015 with the objective of using agricultural research for development (AR4D) to develop and deliver demand driven technologies to support the activities along the various agriculture value chains in Liberia. However, following its implementation, various challenges were identified including weak governance system, poor infrastructure, inadequate human resources and inadequate budgetary allotment. This Strategic Plan was therefore prepared to provide the strategic direction for CARI to deal with the identified challenges.

The Government of Liberia, through the Ministry of Agriculture, with support from FAO and the EU therefore assisted CARI to review the previous Strategic Plan and to elaborate a new one to deal with that CARI required to address. The Strategic Plan outlines the three specific objectives that need to be achieved by CARI including (a) development of institutional and managerial capacity for R&D and (b) generation of contextually relevant technologies and innovations and (c) communication and dissemination demand driven research results to value chain actors. The strategy plan also identified the establishment of good governance, adequate provision of resources (human capital, physical, and financial) as well as the establishment and strengthening of relationship with other research organizations, agriculture stakeholders and the use of participatory methods in the research process as vital for the success of CARI mission.

The implementation of the Strategic Plan will lead to the availability and adoption of contextually relevant technologies and innovations required to increase agricultural productivity and profitability. We thank the CARI Strategic Plan Committee for taking time off their busy schedules to prepare this document. The Board of Directors of CARI also

commends the European Union and FAO for collaborating to provide the financial resources and the technical expertise, respectively, to facilitate the preparation of the CARI Strategic Plan (2023-2030).



Hon. Jeanine Milly Cooper.

**Minister of Agriculture (MOA)
(Board Chair, CARI)**

EXECUTIVE SUMMARY

The Government of Liberia is implementing a market-led agricultural development strategy, the success of which, among other things, depends on the ability of research and extension systems to deliver on their mandates of galvanizing stakeholders to use best practices in their operations along the various agricultural value chains. FAO, with financial support from the EU, is therefore implementing the "Linking Extension Research to Farmers for Sustainable Agriculture Food Security and Nutrition" Project, in collaboration with MOA and the Central Agriculture Research Institute (CARI) to improve the capacity of the research and the Extension services. The objective of the project is to strengthen Liberia's agriculture Research and Extension Linkages and Systems to support government's agricultural development goals.

CARI is faced with various problems including, lack of research infrastructure, inadequate staff capacity and weak research extension linkages. FAO, through the EU supported Project, has therefore provided technical support to CARI to develop this Strategic Plan (2023-2030) to deal with these challenges and to provide strategic direction for the research efforts of CARI. It is the expectation of the Board that, the implementation of this strategic plan will lead to the availability, accessibility, and adoption of good agricultural practices by the agriculture value chain actors to enable the government achieve the objectives of its market-led agriculture development policy.

The Strategic Plan is based on the Vision that CARI will become a Centre of Excellence for Agricultural Research, Innovation and Capacity Building for Development with a Mission to contribute to increased productivity, commercialization and competitiveness of the agricultural sector through the development, promotion and dissemination of demand-driven knowledge, information, technologies and innovations and build capacity for sustainable food and agro-industrial commodities productivity and profitability to enhance livelihoods.

The overarching Strategic Objective of CARI under this Strategic Plan is to develop and disseminate market-oriented information, technologies and innovations required by value chain operators to produce process and market agriculture products to enable the country achieve its goal of food and nutrition security, employment creation, income generation and poverty reduction by

(a) strengthening the institutional and managerial capacity of CARI for effective R&D, (b)

generating contextually relevant technologies and innovations and (c) effectively disseminating agriculture and natural resources management technologies and innovations to value chain actors.

ACRONYMS

ACC	Agricultural Coordinating Committee
AEAS	Agricultural Extension and Advisory Services
AfDB	African Development Bank
AIS	Agricultural Innovation System
CAADP	Comprehensive Africa Agriculture Development Program
CARI	Central Agriculture Research Institute
DRDRE	Department of Regional Development, Research and Extension
DTS	Department of Technical Services
ECOWAP	ECOWAS Agricultural Policy
ECOWAS	Economic Community of West African States
EU	European Union
FAO	Food and Agriculture Organization
FBO	Farmer-based Organization
GDP	Gross Domestic Product
GoL	Government of Liberia
ICT	Information Communication Technology
IFAD	International Fund for Agricultural Development
LAfT	Liberian Agenda for Transformation
LATA	Liberia Agricultural Transformation Agenda.
LASIP	Liberia Agriculture Sector Investment Plan
LIFAAS	Liberia Forum for Agricultural Advisory Services
M&E	Monitoring and Evaluation
MIA	Ministry of Internal Affairs
MOA	Ministry of Agriculture
NCEAS	National Coordinating Committee on Agricultural Extension and Advisory Services
NGOs	Non-Governmental Organizations
PAPD	Pro-Poor Agenda for Prosperity and Development
PMU	Project Management Unit
PPPs	Public-Private Partnerships
RELCS	Research-Extension-Farmer-Liaison Committees
TOT	Training of Trainers
USAID	The United States Agency for International Development

1.0 INTRODUCTION

1.1 Background

This document is a result of efforts by the Government of Liberia through the Ministry of Agriculture (MOA), European Union (EU) and the Food and Agriculture Organization (FAO) to develop a seven (7) year strategic plan (2023-2030) for Liberia's Central Agricultural Research Institute (CARI). CARI is an Autonomous Apex Public Agricultural Research Institute, the main institution for agricultural research in Liberia, evolved from the Central Agricultural Experimental Station (CAES) in the 1980s into a reputable center of excellence in applied and adaptive research in West Africa prior to Liberia's civil crisis which devastated it. CARI is currently faced with various problems including lack of human resources and financial resource to implement its research programs.

The agriculture research strategic plan is meant to provide a framework for CARI which clearly sets the direction, new organization structure, research priorities and time frame for research, capacity development and related activities; all which are consistent with Liberian government policies and programs including the National Food Security and Nutrition Strategy (FSNS) (2008), The Pro-poor Agenda for prosperity and development (PADP) (2018), and the Liberia Agriculture Sector Investment Program (LASIP II) (2018-2021).

In conformity with the key government policies, the Central Agriculture Research Institute's (CARI) research strategy covers seven thematic research programs:

1. Crops Program, Crops Program
2. Livestock and fisheries Program
3. Natural Resource Management
4. Agricultural Biotechnology and laboratory Services Program
5. Mechanization and irrigation
6. Socio-economics and Applied statistics
7. Post-harvest and food processing.

The overall objective of the Agricultural Research Strategy for CARI is to contribute to meeting the food needs of the population, ensuring economic and social development and the eradication of poverty in Liberia through the development and dissemination of demand driven agriculture technologies and innovations.

1.2 Agriculture in the Context of National Development

According to Country Commercial Guide of the Department –USA (2022), Agriculture, including forestry, is the primary livelihood for 70 percent of Liberia’s population and accounted for 31 percent of Liberia’s 2021 real gross domestic product (GDP). It provides income for many households engaging in food and cash crops production. Cassava and rice are the primary staple food crops. More households engaged in cassava production than any other food crop. However, most agriculture are small scale, and overall agricultural productivity is low (due in large part to low-technology practices and a lack of quality agricultural inputs). As a result, Liberia imports more than 80 percent of its staple food, rice, making the country vulnerable to global food price volatility. Poorly integrated, the agricultural sector lacks basic infrastructure such as machines, farming equipment and tools, farm-to-market roads, fertilizers and pesticides, and food storage capacity. The main cash crops and foreign exchange earners are rubber, oil palm, cocoa, and timber. The key long-standing challenge of the smallholder farmers is low productivity stemming from the lack of access to markets, credit, and technology.

The Poverty Reduction Strategy (PRS) defines Liberia’s overall national development goals which comprise “shared, inclusive, and sustainable economic growth and development; food and nutrition security; increased employment and income; and measurable poverty reduction (Government of Liberia, 2006). The Liberia Agriculture Sector Investment Program (LASIP) (2009) identifies priority areas from which investment projects are aligned to the broad objectives of the agriculture sector in Liberia which are namely (i) attainment and maintenance of domestic supply of the 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. LASIP seeks to transform Liberian agriculture and in so doing maximize the

sector's contributions to economic growth, employment and income generation, food and nutrition security, and poverty reduction.

To top it up, in 2009, Liberia signed a Compact under the Comprehensive African Agricultural Development Program (CAADP), an agriculture-led economic growth initiative of the African Union/New Partnership for African Development (AU/NEPAD) which emphasizes increasing food supply and reducing hunger.

Under its CAADP Compact, the Government of Liberia tasked itself to work towards an annual growth rate of 26% in the agricultural sector and allocate at least 35% of the national budget towards agriculture. However, there are challenges facing the agriculture sector in Liberia which if not tackled could impede the implementation of the above initiatives. They include weak infrastructure, lack of inputs including credit, lack of markets, and improper management of the agriculture value chain and low adoption of best practice by value chain actors. One of the key solutions to the above challenges lies in deliberate action by the Government to invest in the modernization of agriculture at the small holder farm level and the creation of an investment environment conducive for the private sector investment in commercial and agribusiness. This government must also invest in the strengthening of agricultural research and technology dissemination process to ensure that value chain actor adopt best practices that will enable them to increase their productivity and profitability.

1.3 Agriculture Research in Liberia

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 Government of the United States of America (USAID, 1990). The early focus of the station was to conduct adaptive studies on field crops, rubber, and livestock. The station was reorganized into a semi-autonomous institute of the agricultural research apparatus of the country, thereby leading to the transformation of the CAES to the Central Agricultural Research Institute (CARI) by an August declaration in 1980, as a semi-autonomous research institute under the Ministry of Agriculture. 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, namely, 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.

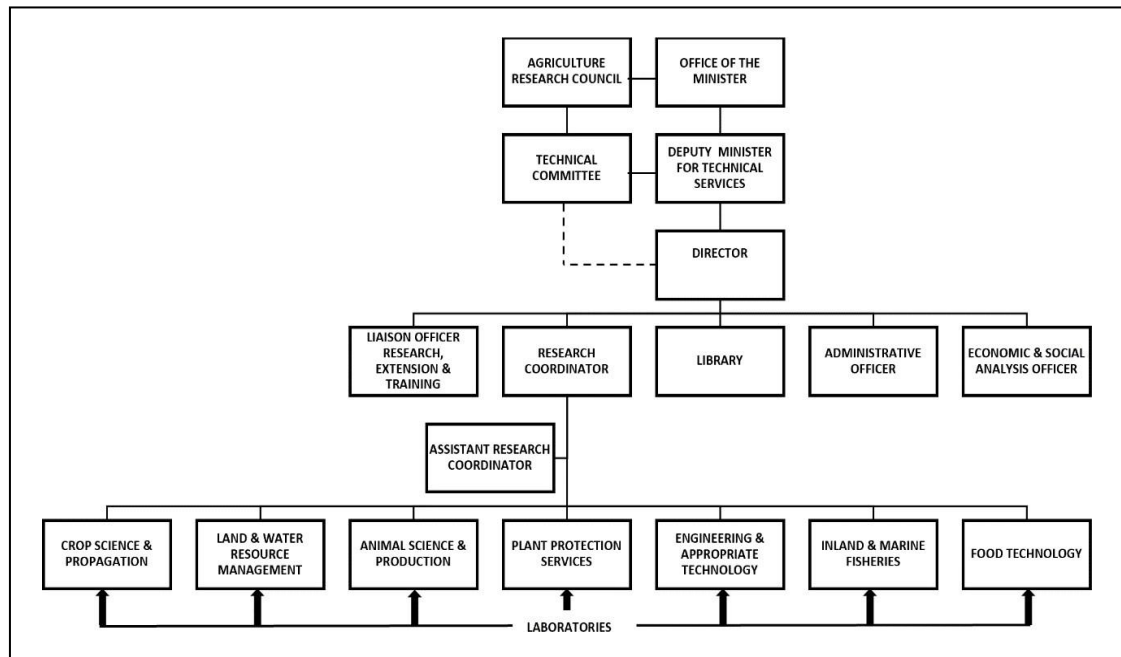


Figure 2.1: Organizational chart (1980 -1990) of the Central Agricultural Research Institute (CARI). **Source:** Adapted from Richards et.al (1983).

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 advise 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.

The institute was, however, ravished by the devastating civil war, which began in December 1989, thus leading 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).

1.4 The Policy Environment

1.4.1 The International Policy Context

Liberian agricultural development policies are aligned with the socio-economic development frameworks of the United Nations 2030 Agenda, Africa Union's CAADP Strategy and ECOWAS agricultural development as stated below. These international strategic directions are consistent with the policies and strategies being adopted by Liberia to achieve food and nutrition security, increase employment and household incomes through improved agriculture production.

a. The UN 2030 Agenda for Sustainable Development Goals (SDGs)

Goal 2 of the UN 2030 SDGs Agenda includes a target on ending all forms of hunger and malnutrition. It envision ensuring access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round. The goal projects the doubling of agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment. Research is therefore needed to support agriculture value chain actors to implement resilient agricultural practices that will (a) increase productivity and production, (b) help maintain and conserve Eco-systems and support ecosystems providers, and (c) strengthen capacity for adaptation to climate change while maintaining the genetic diversity of plants and animals of agricultural importance.

b. The AU NEPAD/CAADP Results Framework (2015-2025)

The agricultural development Policy of Liberia is also aligned to the African Union's CAADP Strategy and Road-map to accelerate Africa's Agricultural growth and transformation. The Comprehensive Africa Agriculture Development Programme (CAADP) is a good example of a framework that has inspired and energized African agricultural research institutions, farmers' associations, African governments and the private sector who believe that agriculture has a pivotal role in development. CAADP is boosting investment to stimulate growth in the agricultural sector. One of the key actions to be taken under CAADP's Strategy for increased Agriculture Production and Productivity under its 2015-2025 Results Framework is the need to support agricultural research and development (R&D) and advisory services for the development, dissemination and adoption of technologies and innovations.

c. The ECOWAS Regional Agricultural Policy (ECOWAP 2016-2025).

In 2002, ECOWAS embarked on the development of the ECOWAS regional agricultural policy (ECOWAP) through a consultative process with the 15 Member States and stakeholder groups. The Regional Agricultural Investment Program (RAIP) developed based on the ECOWAP include strategies for (i) strengthening support services to producers and the dissemination/use of improved technologies; and (ii) development of agricultural value chains as its focus.

1.2.2 National Policies and Strategies

The CARI Strategic Plan is aligned to various Liberia national policies and strategies on agriculture development as follows;

A. National Food Security and Nutrition Strategy (MOA, 2008)

This is a policy strategy aimed at ensuring food and nutrition security in the country. The strategy recognizes the need to strengthen research and extension systems to enhance their capacities to enable them to provide the needed services for the development of the agriculture sector.

B. National Gender Policy (Ministry of Gender & Development, 2009).

The aim of this policy is to mainstream gender in national development agenda. This policy is linked to agriculture development with its focus on improving women and vulnerable groups access to extension, training, and other agriculture production inputs.

C. Liberia Rising Vision 2030 (Government of Liberia, 2012)

The National Vision is to achieve middle-income country status by the year 2030. It recognizes increase agriculture productivity and incomes as critical to the achievement of this goal. The first phase of this agenda was to be achieved through Liberia's Agenda for Transformation (2012-2017) which recognizes the critical role of research and extension in the transformation process.

D. Liberia's Agenda for Transformation (AfT) (2012 -2017)-Steps Towards Liberia Rising 2030.

LAFAT is committed to working towards moving Liberia into a middle-income country by 2030 with its focus on inclusive wealth creation. It emphasizes small-holder productivity increases through the provision of effective research and extension services.

The focus of LATA is on the value chains for agricultural goods, from production to processing and manufacturing, by promoting market systems and adopting industrialization policy?

E. Liberian Agriculture Sector Investment Plan (LASIP I MOA, 2008)

LASIP I was prepared in partial fulfillment of the requirements of CAADP compact and targets achieving food security and nutrition by improving the small-holder farmers (especially the women) timely access and adoption of relevant technologies and innovations by value chain actors in the country. Its implementation has been incorporated into LASIP II.

F. Pro Poor Agenda for Prosperity and Development (2018 to 2023 PADP).

The Pro-Poor Agenda for Prosperity and Development (PADP) is the second in the series of 5-year National Development Plans (NDP) anticipated under the Liberia Vision 2030

framework. It follows the Liberia's Agenda for Transformation 2012-2017 (AfT). ***Pillar two (2) of the Pro-Poor Agenda for Prosperity and Development (PAPD)***, 2018-2023, the government of Liberia (GoL) will increase competitiveness in Agriculture and Forestry Sector with the outcome of increased agricultural production and productivity and improved forest utilization through competitive value chains and market linkages. Further, Pillar 4 of PAPD on "the Economy and Jobs", identifies the agriculture sector as the driving force for the socio-economic transformation agenda which are to be implemented using provisions in LASIP II. The strengthening of research and extension for effective extension and advisory services delivery to farmers and value chain actors is enshrined in the PADP.

G. LASIP II (MOA, 2018-2022)

The GoL, being guided by CAADP commitments, the SDGs, and ECOWAP vision for its agricultural sector, has commitments to achieve an aggressive agricultural transformation agenda by implementing LASIP II. LASIP II aims at promoting an inclusive and sustainable agricultural transformation through catalytic investment in agriculture value chains and industrialization to ensure food and nutrition security, environmental health, jobs, wealth creation and inclusive growth for Liberians. LASIP II also make provision for the strengthening of agricultural research and extension as well as the development of agricultural value chains and markets as critical to the achievement of governments agriculture development agenda.

2.0 CENTRAL AGRICULTURE RESEARCH INSTITUTE (CARI)

2.1 Current Status

Central Agricultural Research Institute evolved from the Central Agriculture Experiment Station (CAES) which started in 1952. The Central Agricultural Research Institute became a semi-autonomous research agency of the Ministry of Agriculture in 1980. As a semi-autonomous institution, its management enjoy relative latitude of flexibility to operate independently, outside the Ministry's administration. However, the Ministry established the Agricultural Research Committee as a policy making body to decide and approve policies for applied, adaptive research in agriculture in the country at the National level. The Committee decides on priorities, taking into

consideration the importance, urgency and availability of resources. It allocated and approved funds for research proposals as submitted by the Technical Committee. The Research Committee solicited, approved and received funds from Government and all other possible sources for agricultural research. It was incumbent on the Committee to lay down procedures for release of funds and for proper accounting and auditing.

The Committee met twice a year to consider matters relating to agricultural research. The composition of the Committee included the following: The Minister of Agriculture - Chairperson; Principal Deputy Minister of Agriculture - Vice chairperson; Deputy Minister of Agriculture for Technical Affairs - secretary; Deputy Minister of Agriculture for Planning and Development - Member; President of the University of Liberia - Member; President of Cuttington University - Member; Director of Rural Development Institute - Member; Director, Liberia Institute for Biomedical Research - Member; one private Farmer nominated by the Minister of Agriculture - Member. Now CARI has become an autonomous body and the role of this committee has been taken over by the CARI Board.

2.2 The Structure and Management of CARI

Figure 2.1 shows the structure when CARI became autonomous per CARI Act 2016. In this new structure CARI will have a nine-member governing Board of Directors drawn from 9 institutions as shown in Appendix 1.0. The Board should be expanded to include representatives from the Ministry of Finance and the Ministry of Commerce to give impetus to the market-oriented market envisioned.

A highly qualified and experienced Director General with a background in Agricultural Sciences/Management with over fifteen years of experience should be competitively selected and recommended by the board for appointment. The Director General will be answerable to the Board of Directors. Also, the Deputy Director General who will be responsible for all research programmes, should have a Ph.D. degree in agricultural sciences/Management with a fifteen-year of research experience and distinguished research career accompanied by quality and peer

reviewed publications in recognized international journals. He/she should have a proven record of research funds mobilization and research project writing skills; and answerable to the DG.

Heads of programmes will be headed by individuals with a minimum qualification at a Ph.D. level in one of the thematic research areas and a proved research and publication resumes. There shall be three Directors (Director of Finance and Administration, Director of Planning and Director of Project Implementation) all answerable to the Director General.

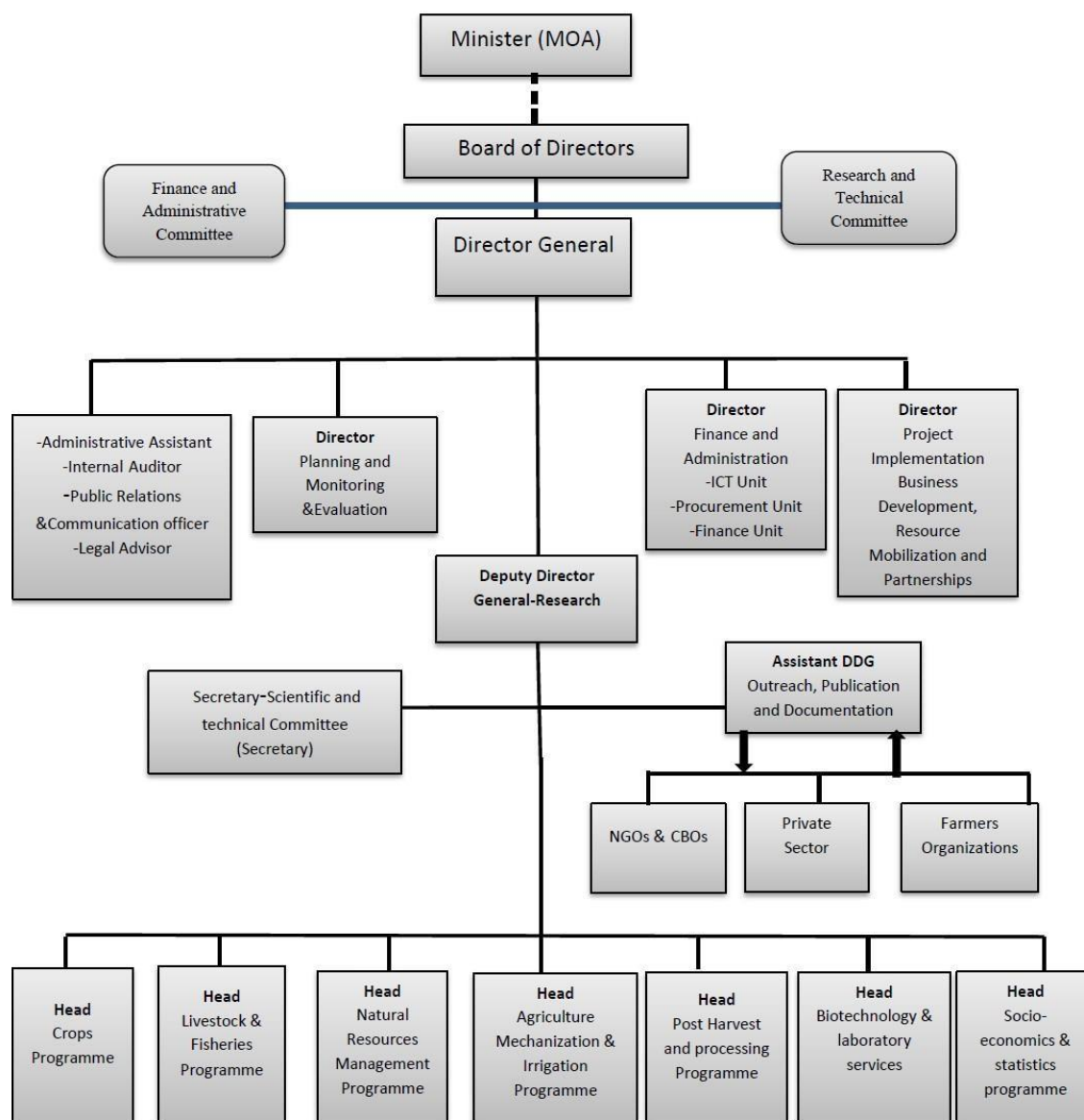


Figure 2.2. shows the new structure for the autonomous CARI Act 2016.

2. 3. Human Resources Capacity

Human resource is the most vital technical resource in any organization. With the right quantity and quality of manpower, complemented with other required resources, the optimum performance of the system can be guaranteed. 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 capacity of the sector through the facilitation and provision of scholarship opportunities for its citizens to study in various agriculture and related disciplines abroad. As a result, the national number of full-time equivalent (FTE) agricultural researchers has significantly increased over the last 10 years, in 2020, At least one-half of all FTE researchers had a minimum MSc. qualification in 2020, compared to less than 36% in 2011, indicating the relative success of the human resource capacity building programs that were funded by the government and its development partners over the period under reference (Stads and Beintema, 2017). The number of female researchers at the national agricultural research institute also increased steadily, by around 16 percentage points, between 2011 and 2020.

Currently CARI is headed by a Director General who is directly answerable to the board of directors. With a complement of about 77 professional staff with only 3 Ph.D., 32 MSc, 36 BSc, 3 BAs, and 3 MBAs. The rest of the staff are low level field workers and security staff (180). CARI is organized in seven thematic programs with all reporting directly to the Deputy Director for Research and Programs (DDG-R). Many other national agricultural research institutes in Africa and elsewhere in the world, CARI also has a Board of Directors even though it is yet to be effective board. In the new structure a fully autonomous CARI with a Board of Directors composed of representatives of all key stakeholders in the agriculture sector is now fully in place.

2.4 Strategic Analysis

The CARI Strategic Plan 2023-2030 will be built on past achievements and lessons learnt during the implementation of the Strategic Plan 2015 - 2025. The SWOT and analyses were made for CARI to inform the preparation of this strategic Plan.

2.4.1 SWOT Analysis

Achievement of a Strategic Plan 2023-2030 objectives largely depends on how CARI enhances its internal strengths, exploits existing opportunities, and manages weaknesses in its operations while

controlling factors that cause threats to its planned programs and activities. An analysis of the internal environment of CARI identified strengths as well as the weaknesses. The Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis also identified opportunities and threats posed by external environment. The Institute will Endeavor to minimize effect of the identified weaknesses and threats while maximizing on the strengths and exploiting the available opportunities. The strengths, weakness, opportunities and threats of CARI are shown in Table 2.1.

Table 2.1. SWOT Analysis for CARI

Strengths	Weaknesses
1. Rich natural resource base for agriculture/NRM activities; 2. CARI retains the national mandate for agricultural research. It is now an autonomous research body with independence to plan and execute its plans 3. The CAADP-Lib compact has the potential to increase funding to the agricultural sector; 4. CARI has an establish linkages with regional and sub-regional research organizations (AfricaRice, IITA, etc.) through CORAF.	1. Limited budgetary allocation by central government 2. Weak administrative processes/ skills. 3. Incomplete infrastructure and equipment to support meaningful research activities; 4. Lack of Strategic and Operational plans; 5. Lack of adequate research/professional staff 6. Gender inequality in professional staffing 7. Limited institutional coordination and collaboration between research institutions 8. Weak Agricultural Extension linkage limits potential collaboration and input to research programs. 9. Inadequate policy coordination among different sector ministries can undermine research efforts and adoption of technologies.

Opportunities	Threats
1. Political will exists for restructuring and organizational change; 2. Potential of regional initiatives to finance short, medium and long-term elements of action plans and finance some core infrastructure, equipment and capacity building; 3. Some potential to access technical expertise/ cooperation from the large export-oriented agricultural enterprises; 4. Potential to develop future linkages for joint activities with other research and educational institutions 5. The expanding domestic market for crops and livestock products with a high income elasticity of demand provides excellent opportunities for value chain operators to demand for appropriate technologies. 6. The unexploited natural resource base, abundant sources of surface and underground water and existence of several agro-ecological zones present an unlimited opportunity for expansion and diversification in crop and livestock production; 7. Crop farming and livestock keeping are a way of life amongst the majority of Liberians and is likely to get better if agriculture is made increasingly profitable; 8. The development of private agribusiness and large-scale farming enterprises is likely to create	1. Poor conditions of service, limited lack of incentive and institutional vision limit skilled staff recruitment and potential retention; 2. Uncoordinated donors' support dissipating effort and focus; 3. Absolute reliance on external funding potentially limiting long term planning and activities; 4. Future political instability; 5. The global trend of market liberalization has both positive and negative effects on the agricultural sector. 6. The negative effects include dumping of cheap crop and livestock commodities and products from other countries which could suppress local production; 7. High input prices relative to output prices could discourage the uptake of new technologies. 8. New biophysical constraints will emerge as a consequence of changes in the global climate, thus posing new challenges such as intensified droughts and floods, and new crop and livestock pests and diseases.

potential opportunities for strategic partnerships between them and the smallholder farmers; 9. Globally, there are technological advances that can be tapped and adopted to improve productivity. 10. There are also several indigenous technical knowledge (ITK) that can be modernized and packaged. The yield gaps between what are attained at research and farmer levels are opportunities for enhancing research impacts; 11. The presence of a growing number of potential partners and collaborators including other research institutes, NGOs, agro-industry and commercially-oriented farmers; 12. Environmental degradation and climate change provide the Institute with opportunities to engage in the development of appropriate mitigation measures to reverse these situations.	9. Unforeseen or Unpredictable global pandemic could negatively impact the agricultural sector's per 10. Some other institutions are able to provide better incentives which could lead to CARI scientists leaving.
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2.5. P-PESTLEG Analysis

P-PESTLEG is an analysis carried out on policy, political, economic, socio-cultural, technological, legal, environment and governance factors. A P-PESTLEG analysis done on CARI identified the following:

2.5.1. Policy framework

Policies by the Government will affect operations and programmes of CARI as the Institute must align itself to Government policy frameworks. The dynamic environment requires the Institute to align itself to the following:

- a) Implementation of the Government Pro-poor Agenda on increase production, food security, and nutrition
- b) Government policies on environment including; Constitution of 1986, and Vision 2030,
- c) Harmonization of operations with macro-level government policy on the economy,
- d) Government policy on; science, technology and innovation
- e) Government policy on ethics and anti-corruption
- f) Changes in Government financial policies by aligning internal policies and procedures to ensure compliance,
- g) Requirement on Monitoring and Evaluation (M&E) through effective performance management in line with the government policy on results-based management
- h) Government policies on human resource.

2.5.2. Political factors

The prevailing political environment will affect the implementation of the Strategic Plan as follows:

- a) Political stability will favor implementation of CARI programmes and activities
- b) Political support, goodwill, and adequate budgetary allocation by The National Treasury will enhance agricultural research
- c) Devolution of Government functions will require CARI to ensure its presence at county level with proper coordination
- d) Regional integration is likely to increase demand for CARI products and services hence increased demand for agricultural research and innovative technologies

2.5.3. Economic factors

Economic factors will affect operations of CARI as follows:

- a) Trends in economic growth and regional/global economic development will affect performance of CARI
- b) Fluctuations in foreign exchange rates are likely to affect financial resource base of the Institute
- c) Increased crop production will increase the demand for; certified and quality seeds, testing and analytical services, and uptake of technologies

d) Growth of Liberia's economy, especially in the forestry, housing, agriculture, and manufacturing and health sectors will increase demand for CARI products and services and subsequently impact positively on revenue base

2.5.4. Social factors

The following social factors are likely to affect CARI operations:

- a) Health issues including; lifestyle, diseases, health insurance, drug and substance abuse which may negatively affect staff
- b) Increased land fragmentation will lead to further reduction in land available which would require more innovation in the research method of CARI to maximize land usage to increase production and productivity on farmer's farms.
- c) Farmers continued demand for fast growing and high-yielding crop varieties and slow adoption of indigenous varieties may undermine the Institute's effort in conservation of biodiversity
- d) The cultural practices of different communities may affect demand for CARI products and services

2.5.5. Technological factors

The speed and rate of technological change is likely to affect CARI in the following ways:

- a) Purchase of modern equipment and facilities will enhance quality of agricultural research
- b) Emerging trends in the ICT will require adoption of new ICT technologies which though initially costly, will be cost effective in the long term
- b) Use of social media, mobile technology, and other ICT platforms will improve capacity of the Institute to disseminate agriculture information and technologies.

2.5.6. Environmental factors

Environmental factors that are likely to affect the Institute's operation include:

- a) Environmental degradation and disturbance will negatively affect agriculture ecosystem services offered by forests and may encourage emergence of invasive species
- b) Erratic weather patterns and climate change may lead to unexpected pest outbreaks, fire incidences and low agriculture productivity.

c) Climate change challenges may affect the CARI function and research focus to develop coping strategies and reduce the climate change impacts

2.5.7. Legal factors

The legal environment will be important in implementation of the Strategic Plan as follows:

- a) The Institute must conform to emerging laws and regulatory frameworks which may affect its research and development agenda.
- b) The Institute must align to the constitutional dispensation of devolved agriculture functions though with limited resources
- c) The Institute must align to relevant laws and rules of international organizations that it has joint research and development programs with. Conventions and treaties

2.5.8. Governance

The CARI Board of Directors will execute its mandate as guided by Code of Governance for State Corporations. Under the Strategic Plan 2023-2030, CARI aspires to develop and operate its own statute to ensure stability in the implementation of agriculture research in the country.

2.5. Risk Management

CARI has an established risk management process that will be used to identify, analyze, evaluate and treat the principal risks that are likely to be faced during the implementation of the Strategic Plan 2023-2030. Risk management is important for CARI to; reduce possibility of failure and ensure that the set objectives are accomplished; and identify possible opportunities that may add value to the implementation of the Strategic Plan 2023-2030. The Institute shall continuously identify potential risks that can have adverse impacts at varying levels and plan for mitigation strategies to manage them.

Risk management in the Institute will be undertaken guided by the PESTL analysis standards which provides guidelines for identification, assessment and mitigating risks. Possible risks that may affect the Institute during the implementation of the Strategic Plan are;

1. Strategic risks

2. Operational risks
3. Financial risks
4. Technological risks

Table 2.2. Anticipated Risks and Mitigation Strategies

Type of Risk	Anticipated Risk	Mitigation Strategies
Strategic Risks	Political interest in staff appointments the implementation of the research projects	✧ Focus on the strategic objectives of the Institute and their contribution to Vision 2030 and other national policies and initiatives ✧ Ensure the Institute is managed professionally in all departments ✧ Adherence to the Institute's and public service policies and guidelines
	Encroachment on research property and Possible loss of experimental sites	✧ Secure ownership of the Institute land ✧ Collaborate with other stakeholders for long term agreement to non-institute land to be use for trials ✧ Work with local community organizations in protection of experimental sites
	Environmental challenges such as prolonged drought, change of weather patterns	✧ Develop drought tolerant crop species ✧ Maximize on rainfall seasons to undertake planting and research ✧ Establish and work with meteorology department to guide on weather changes
	Security challenges in some regions which may affect the research activities.	✧ Collaborate with the local administration on security ✧ Collaborate with KFS and KWS in areas of their jurisdiction ✧ Sensitize staff on insecurity threats and ways to mitigate against them
	Outbreak of pests and diseases for various agricultural	✧ Create awareness among stakeholders on pest and disease outbreaks

	commodities	✧ Strengthen Eco-regions with appropriate facilities to handle emergencies ✧ Build capacity for quick response to disasters and collaborate with disaster management organizations
Operational risks	Inadequate equipment and infrastructure	✧ Prioritize procurement of key equipment ✧ Long term strategic planning in developing appropriate infrastructure in the Eco-regions ✧ Optimal use of available equipment and infrastructure ✧ Collaborate with county governments in supporting infrastructure development in respective areas
	Inadequate Staff for the various research thematic areas	✧ Optimize staff recruitment through strategic recruitment and succession plan ✧ Train existing staff on emerging areas of research
	Corruption	✧ Enforcement of the Institute's anti-corruption policies
	Disclosure of classified Information	✧ Vetting of officers dealing with classified information
	Lack of land tenure	✧ Acquire enough land with titles for experiments
	Litigation against the Institute	✧ Adhere to government regulations and engage competent lawyers to handle suits
Financial Risks	Inadequate GoL budgetary allocation and revenue collection for intended planned Activities	

	Lengthy negotiations and unpredictability of donor funds	✧ Create suitable environment for donor negotiations ✧ Build capacity of scientists to develop grant winning competitive research proposals ✧ Inform donors of the legal requirements of funding and related taxes in where applicable ✧ Initiate Public-Private Partnership for revenue generation ventures ✧ Exercise prudent financial management
Technological risks	Rapid technological changes affect reliability	✧ Enhance human resource capacity on technology ✧ Document processes for managing and controlling changes to ICT systems and data ✧ Develop ICT infrastructure in all centers
	Inadequate ICT infrastructure development	✧ Planned strategic roll-out infrastructure to all centers ✧ Establish, operationalize and maintain ICT infrastructure ✧ Develop and implement data integration and analytics tools
	Breach of ICT security System	✧ Regular review of ICT policy to reflect the contemporary ICT needs ✧ Strengthen institutional external data back-up for safe storage ✧ Procurement and maintenance of appropriate software and periodical renewal
	Inadequate use of Knowledge Management	✧ Implement Knowledge Management Policy ✧ Expand knowledge management facilities to capture all institutional knowledge ✧ Establish support for knowledge and information management and transfer

3.0 CHALLENGES FACED BY CARI

FAO, in 2021, undertook a comprehensive assessment of the research and extension systems of Liberia, as part of the implementation of the "Linking Extension Research to Farmers for Sustainable Agriculture Food Security and Nutrition" Project and in addition FAO, 2022, undertook an assessment of the agricultural research for development efforts and the institutional linkages between the national research system actors in Liberia. These assessments identified some challenges facing CARI as follows;

3.1 Corporate Governance and Management

The corporate governance and management structure of CARI is represented by its Organogram made up of the Board to which a management team led by the Director General reports to. It's the Board that gives strategic direction to CARI and has the power to control and guide the conduct of CARI's activities. The CARI Board has, however, been inactive since 2016. In addition, most of the key management positions (Deputy Director General for Research, who is in charge research programs planning and implementation, Director for Planning, Director for project implementation and Director of Finance and Administration) are also vacant. This means that all the key administrative and technical decisions are being taken by the Director General alone. Institutional and managerial arrangement administering CARI for the implementation of its mandate therefore suffers as a result. The need to activate the Board and fill the vacant management positions with competent persons can therefore not be overemphasized.

The CARI Act 2016, gives the President the power to appoint the DG and DDG of CARI base on the recommendation of the Board. In the current CARI's Act 2016, the position of the DG and DDG has no terms. They will therefore serve at the pleasure of the President. This makes their appointments and they may choose to serve their political masters instead of serving the research mandate of CARI

3.2 Limited and or Lack of Adequate Research Planning and Implementation

Research program planning and implementation is very vital for obtaining information, technologies and innovations needed by farmers and other value chain operators for informed decision making and action in their operations. There was consistent planning and implementation

of research programs when CARI participated in activities of the West Africa Agriculture Productivity Project (WAAPP 2006-2016). CARI, in the recent past, has also carried out few research activities in rice, cassava and vegetables in partnership with some development partners including Africa Rice and FAO. However, research program planning and implementation of specific set of research activities, by the various research thematic areas have not been adequately done in the past 5 years.

In 2015, CARI developed a strategic plan. However, no major research activities was planned or executed based on this strategic plan. Similarly, no monitoring, reviews, evaluation or impact study of CARI's research efforts have been done. There is also no formal established inter-departmental linkages and coordination of research activities of the various thematic areas. There is an urgent need for the seven thematic areas to start planning and implementing research activities to enable CARI to develop the information technologies and innovations that can be disseminated to its clients to support the agricultural development of the country.

3.3 Stakeholders-Participation in Research Planning and Implementation

The 2015 CARI Strategic Plan identified the need for stakeholder participation in the planning and implementation of CARI's research efforts. Consequently, the said Strategic Plan was committed the use of two related research approaches of Agriculture Innovation Systems (AIS) and Agriculture Research for Development (AR4D). Most of the staff are conversant with the conventional Farming System Research approach. There is evidence that, participatory research methods lead to effective stakeholder involvement in research activities leading to the development and use of contextually relevant technologies. There is therefore the need for CARI to develop the capacity in the knowledge and use of these participatory approaches.

3.4 Linkages with Extension, Farmers/Value Chain Operators

There are weak linkage among CARI, MOA, the private sector extension providers, farmers and other stakeholders. CARI, until the CARI Act was passed in 2016, was part of MOA. However, since CARI got its full autonomy, it is unable to forge a close working relationship with MOA together with other extension services providers and the farmers. This gap in the relationship between research, extension and farmers has the potential of negatively affecting the development

of contextually relevant technologies and adoption of best practices by farmers and value chain actors.

3.5 Adequacy of Research Infrastructure

CARI researchers do not have access to adequate infrastructure or the necessary resources and services for the research scientists to conduct and foster innovations in their various thematic areas. The existing infrastructure are either inadequate or are in various states of disrepair. CARI lacks major scientific equipment and research instruments, facilities- (electricity, library resources, Laboratory facility and well laid out plots) field machinery, buildings (animal houses, green houses, warehouses) and enabling information and communication Technology based infrastructures such as grid, computer soft wares and communications.

The lack of ICT facility affects communication among research scientists and overall coordination of research work in CARI.

3.6 Human and Financial Resources

3.6.1 Human Resources Capacity

The total staff strength of CARI stands at 248 including 81 research scientists. The distribution of research scientist by qualification and gender are shown in the table below;

Table 3.1. Current total staff strength of CARI

GENDER	PHD	MSC.	BSC	TOTAL
MALE	3	21	25	49
FEMALE	-	11	21	32
TOTAL	3	32	46	81

This means that only 35 of CARI staff have research degrees. The rest of the 46 of research scientists, who now have first degrees, need to be trained to have research degrees to enable them to be given the recognition as research officers. The 2015 CARI Strategic Plan also recommends the setting up of sub-stations in all the 15 counties of the country. There is need for additional

research scientists to undertake research at these satellite stations. Further, the managers of the various departments of CARI and their related administrative staff need to be recruited.

There has been recent agitation by CARI staff for equity in promotion and remuneration. This situation arises because CARI has no scheme of service stipulating the terms and conditions of service. There is therefore the need to take a strategic decision to develop and implement a scheme of service to guide the conditions of employment that could help motivate staff and develop them to effectively accomplish their responsibilities.

3.6.2 Financial Resources Allocation and Accountability

The Government budgetary allocation to CARI is inadequate. It is known that apart from paying salaries, CARI receives only operational funds for its research work. Research grant received by CARI from third parties to implementing research and conduct activities in partnership with other research organizations have been inadequate. The lack of funds means that CARI cannot plan and implement its research activities as envisaged.

3.7 Partnership with Other Research Institutions and Organizations

During the implementation of WAAPP, CARI was actively networking with other West African Research Institutes through CORAF. However, currently, CARI does not have any legal or formal partnership or network arrangement with any international research institute. The forging of formal partnerships with other research institution and other agricultural development organization by CARI can be rewarding. Such networks and partnerships could bring research funds and assist with capacity building of staff through training on joint research projects and mentoring scheme. Partnerships will put CARI in direct contact and communication with world recognized research institutions and become branded as a center of excellence that it espouses to become. The learning opportunities provided through such partnership will contribute to the improvement in the research capacity of CARI.

3.8 Political and Indigenes Interference

There is also the problem of endemic interference, into the administration and activities of CARI, by politicians due to the recruitment of staff of the institute based on party alignment or political interests.

4.0 CARI'S STRATEGIC AGENDA

According to the CARI Act (2016), CARI has the formal and legal responsibility to undertake research into all the areas of agriculture research and allied natural resources to support the government's market-led agricultural development policy. CARI is therefore expected to provide leadership in finding solutions to challenges facing the Agricultural industry of within the country and collaborate with other international research institutions and organization in dealing with regional challenges in the field of agriculture. In delivering this responsibility CARI's activities will be guided by its Mandate, Vision, Mission, Core Values and Strategic Framework as elaborated below.

4.1 Mandate

CARI is established and mandated by the CARI Act (2016) to undertake agricultural research in Liberia. CARI has a broad research mandate covering all food, Tree and industrial crops as well as livestock and fisheries and the agricultural environment. In delivering that mandate CARI will undertake the function in Section 4.2

4.2 Functions

- (a) Inclusively generate and adapt agricultural technologies and resource management practices appropriate to the needs, circumstances of value chain actors to;
- (b) Promote and facilitate applied and adaptive research in food crops, livestock, fisheries, and natural resource management.
- (c) Promote the use of appropriate and sustainable agricultural technologies and provide essential technical services to improve the productivity, income and nutritional status and food security of the populace.
- (d) Develop and promote ways of improving the output, quality, harvesting, post-harvesting, and handling and processing and marketing of food crops, tree crops, livestock and fisheries produce
- (e) Maintain and conserve the diversity of genetic resources for food and agriculture, act as custodian for these resources, and promote the effective utilization of these resources in the country;
- (f) Update and maintain the national inventory on soil resources;

- (g) Provide agricultural information services, advisory and outreach services to value chain actors;
- (h) Play an active role in the formulation national agricultural research policies and in the definition of sectorial research priorities;
- (i) Establish partnerships and cooperate with other research organizations and institutions of higher learning in joint research and training

4.3 Our Vision

To become a Centre of Excellence for Agricultural Research, Innovation and Capacity Building for Development to contribute to improved quality of life for the people.

4.4 Mission

To contribute to increased productivity, commercialization and competitiveness of the agricultural sector through the development, promotion and dissemination of demand-driven knowledge, information, technologies and innovations and build capacity for sustainable food and agro-industrial commodities productivity and profitability to enhance livelihoods for all.

4.5 The Strategic Objective and Result Areas

The agricultural development policy of the Government of Liberia as enshrined in Rising Vision 2030 and related policy documents, is to develop a market-oriented agricultural economy for food and nutrition security, employment generation, increased income, and poverty reduction. This requires the development of an agricultural research system with the capability of continuously providing agriculture value chain actors with contextually relevant information, technologies and innovations. The overarching Strategic Objective of CARI, therefore, is develop and disseminate market-oriented technologies and innovations that are required by value chain operators to produce and market agriculture products to enable the country achieve its Rising Vision 2030.

In order to deliver on this objective, CARI has to achieve the following strategic result areas as indicated below;

4.5.1 The Result Areas

The result areas to be achieved under the overall strategic objective include;

1. To strengthen the institutional capacity of CARI and enhance the research and development capacity for effective R&D by
 - a) adopting a new Organizational Structure

- b) improving upon its governance and management
- c) developing the requisite human resources
- d) ensuring sufficient financial resources for Research
- e) enhancing CARI's research infrastructure
- f) Establishing Evidence-Based Monitoring and Evaluation System

2. To enhance the scope of generating the quantity the quality of contextually relevant technologies and innovations generated by;

- a) developing the capacity, competence and the use participatory research approaches
- b) Establishing and strengthening partnerships with international research institutes and organizations
- c) enhancing the development of Agriculture and Natural Resources management technologies and innovations

3. To ensure effective dissemination of relevant information, technologies and innovations by;

- a) Improving CARI's corporate communication and publicity
- b) Providing advisory and outreach services
- c) Commercializing CARI's research Products and offering Consultancy Services
- d) Establishing and strengthening linkages between research, extension and value chain actors.

5.0 CARI's GUIDING CORE VALUES

The guiding core values that CARI holds and endeavor to put into practice while performing its functional obligations include the following:

5.1 Integrated and Holistic Approach

CARI recognizes that integration and team work across levels, disciplines, gender, time-frames and space, is critical in increasing productivity, commercialization and competitiveness of the agricultural sector because of the complex inter-linkages of the different components of the agricultural product value chains.

5.2 Impact, Performance and Service Orientation

CARI will remain focused on integrated research for development by ensuring that all research activities undertaken or promoted are demand-driven. CARI will achieve this through building and

maintaining a culture that is based on impact of research and other knowledge roles; performance of every part of the organization and service delivery as the key feature of the non-research part of the institution.

5.3 Contextual Relevance

CARI is committed to the development and dissemination of contextual relevant information, technologies and innovations. It is known that effective participation of the value chain actors in the research process ensures the contextual relevance of technologies and innovations developed and with it a higher adoption of best practices. CARI will therefore actively explore and use participatory approaches such as the Agriculture Innovation system (AIS) and Agriculture Research for Development (AR4D) in its research process. The use of these two interrelated approaches will enable all research engagements to be used as innovative platforms for setting the research agenda as well as for active learning by staff and research beneficiaries to co-create, innovate and share contextually relevant research results whilst bridging traditional local knowledge with modern science.

5.4 Agricultural Product Value Chain (APVC) Orientation

Market-oriented development focuses on developing the whole agricultural value chain which is basically the creation of the integrated range of goods and services (value chain) necessary for an agricultural product to move from the producer to the final consumer. CARI will adopt a value chain approach in agricultural development through the identification and addressing challenges that affects various points in the chain for commodities covered under the seven thematic areas.

5.5 Scientific Excellence, Creativity and Flexibility

CARI believes market-led agriculture requires a lot of investment the returns of which must be ensured by good decisions guided by information, technologies and innovations. For this reason, all research work and recommendations made to stakeholders will emanate from sound evidence based on rigorous scientific findings of the highest quality possible.

5.6 Inclusivity and Partnership for Collaborative Advantage and Synergies

CARI will pursue meaningful and productive partnerships, and team work so as to ensure synergies that have a direct bearing on finding innovative solutions to major agricultural sector problems. Clear roles, responsibilities, governance and supportive mechanisms will ensure application of

‘true ‘partnership norms CARI will adopt the concept of Inclusivity in its operations so that the research agenda responds not only to the market and more commercial farmers’ needs but also to the needs of the poor, women, youth and other marginalized groups.

5.7 Respect for Staff and Diverse Clients

CARI recognizes that staff and clients are critical resources in achieving its Mission and therefore respects staff and the diverse clients, emphasizes mutual respect for individuals and ensures equitable recognition of their contribution. In this regard, CARI is committed to timely and quick response to concerns of staff and clients including farmers, processors, policy makers, partners and collaborators.

5.8 Effective Knowledge and Information Management

CARI is committed to nurturing a strong culture of knowledge management in the generation, sharing, brokerage and application of agricultural knowledge within and outside the Institute

5.9 Transparency, Accountability and Cost Effectiveness

CARI is committed to effective and efficient utilization of all resources entrusted to the Institute in the most transparent, accountable and cost-effective manner.

6.0 THE STRATEGIC INTERVENTIONS

The Strategic Interventions necessary for CARI to overcome its obstacles and fulfill its broad objectives CARI's strategic goals are to create and spread market-oriented knowledge, technology, and innovations needed by value chain actors to process and market agricultural goods, including; (a) strengthening the institutional capacity of CARI, (b) increase the quality of technologies and innovations generated, and (c) disseminating contextually relevant agriculture and natural resources

6.1 Strengthening Institutional Capacity of CARI.

It is important to strengthen the institutional capacity of CARI as a means of enhancing its ability to perform its functions. To achieve this result area CARI has to (a) adopt new structure to align the organizational norms to its new strategic objective (b) improve its corporate governance and management including a concrete coordination protocol (ii) develop the required human resources (iii) ensure adequate finance (iv) enhance the research infrastructure and (v) improve the planning, monitoring and evaluation and feedback mechanisms of its R&D efforts.

6.1.1 Adopt a new Organizational Structure

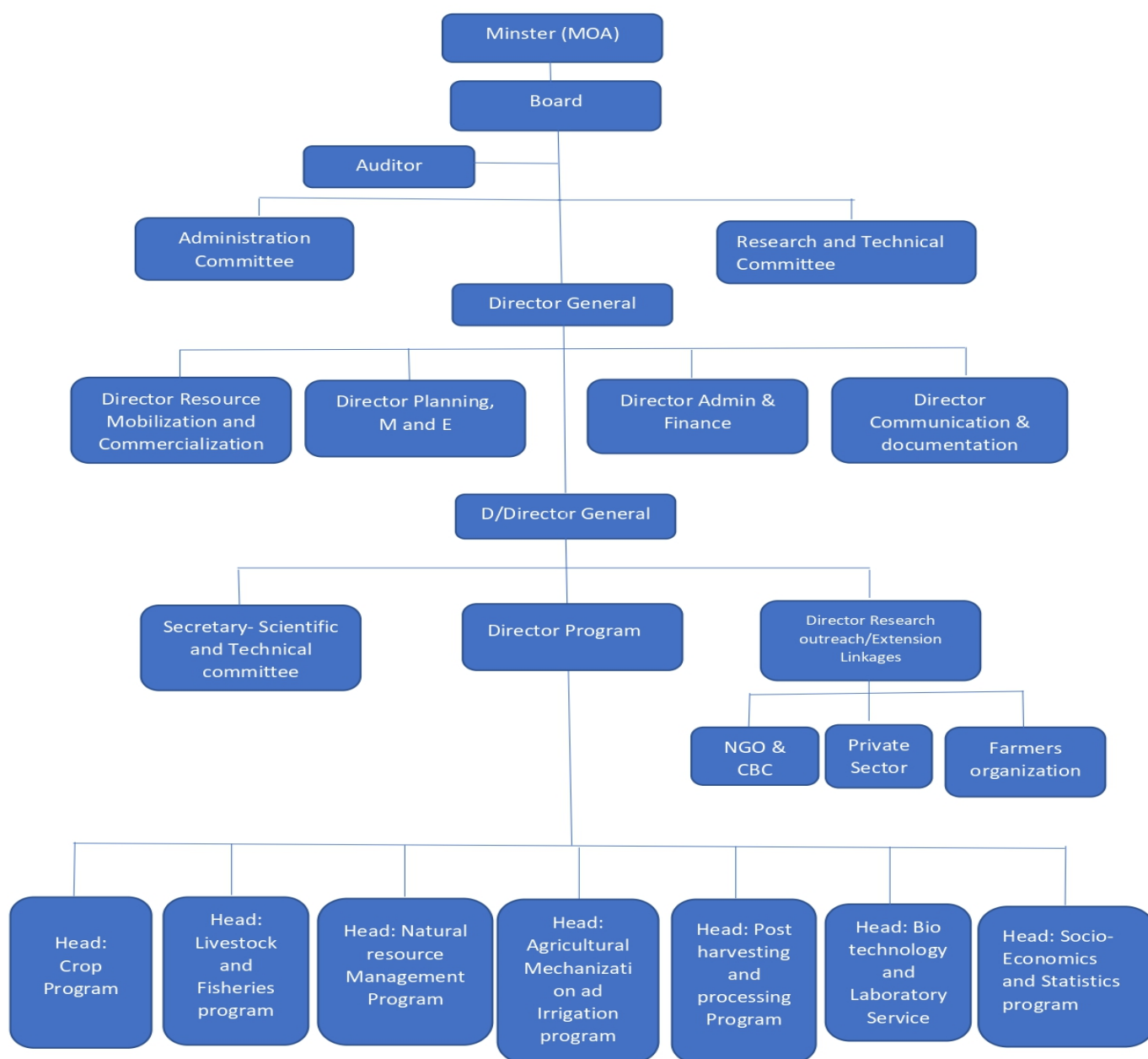
In the new structure, CARI will have a governing Board of Directors, a Director General, one Deputy Director, six Directors (as against 5 Directors in the previous structure) and seven heads of programs. The Director of programs will assist the Deputy Director General to co-ordinate all research activities of CARI. A Department of Outreach, Advisory and Consultancy Services will be established and headed by a director to ensure effective dissemination of information on CARI's activities and results as well as providing technical advice to stakeholders. This department will also be in charge of research-extension-farmer linkage activities whilst disseminating technologies and innovations in print, audio, video and electronically. The director of Resource mobilization and Commercialization will undertake commercialization of CARI's research products and co-ordinate contract research and consultancy services. The new organogram including all the offices necessary for CARI to deliver on its agenda is as shown on Figure 6.1

6.1.2 Improve the Corporate governance and Management.

- (a) Effective functioning of the Board: Being an autonomous body CARI depends on its Board for direction and administrative control and resources management. The strategy to be adopted to improve the governance of CARI is to develop the Regulation for the CARI Act (2016) to reconstitute the CARI Board with new mandate and responsibilities. The Board will technically minded to be made up mainly by persons drawn from the Universities, Ministry of Agriculture, Private Extension providers, agriculture industry and farmers. The Board membership should be increased to 11 in order to accommodate representatives from the Ministry of Commerce and the Ministry of Finance. The Board shall have a term of 5 years with members eligible to be re-nominated to serve. Being a national institution, board members must have representation from all regions of Liberia. The suggested Membership of the CARI Board is provided in Appendix 1
- (b) The Management: The CARI Act (2016) provides that, the Director-General (DG) is the Chief Executive Officer of CARI. He is both the technical and administrative head of the institute and shall manage the Institute in accordance with the policy directions of the Board and shall be subject to the directions of the Board. The Director General is assisted by the

Deputy Director General (DDG) who is in charge of the planning and implementation of CARI's research programs. There are also five other Directors who report to the DG through the office of the DDG. These vital offices will be better executed if the occupants have security of terms of office and if CARI has legally binding procedure for the appointment and termination of the office holders. The new CARI management organogram is as below

Figure 6.1 The new CARI mangement organogram



The management of CARI can be improved by developing the regulation to the CARI Act (2016) to include a legally binding procedure for,

- (i) The appointment DG and DDG in accordance with the law and ensure that the persons appointed are technically and administratively competent for the job. Adopt strict meritocratic recruitment process to prevent undue interference by politicians.

Developing and implementing a staff scheme of service that ensure the DG and DDG have a fixed term of office (e.g. maximum of two-term of 5 years) CARI should also develop and implement a succession and leadership plans to ensure that experienced and competent staff are in line to take over management positions in CARI. This will also act as motivation for professional staff to be diligent in their jobs.

6.1.3. Develop the Requisite Human Resources

The effectiveness of research work in CARI will be enhanced by building the human resources capacity of the staff through training, professional development, and adequate motivation. This will be done by;

- a. By ensuring adequate qualified staff are employed as researchers and technicians. The number of scientists needs to be increased to enable all the thematic areas and the proposed county substations to be capacitated by competent research scientists and technicians.
- b. Ensuring regular In-service training for staff in technical areas, functional skills and modern research methods. It is expected that, the 46 staff who are yet to obtain their post graduate research degrees will be provided with the opportunity to do so in order to boost the research capacity of CARI.
- c. Enhancing Career Development of staff through in-service training, upgrading of professional skills and further academic training in requisite

specialized areas to enable CARI effectively undertake research including emerging areas of agriculture and environment.

- d. Developing and operationalizing a scheme of service to detailing out qualifications and levels of experience required for entry into technician, administrative and research scientist's grades together with the methods of entry, conditions for advancement to the next grade, and remuneration attached to each grade.
- e. Developing and implementing gender-sensitive conditions of employment governed by staff regulations and rules including requirements for appointments and duration of appointment in each grade, salary attached to each grade and quantum of yearly increments, allowances (duty, dependency etc.), annual, sick and study leaves, health insurance, disciplinary process, removal, termination and terms retirement. The rules must also ensure gender equality among CARI staff and remove career obstacles for women and the physically challenged.

6.1.4 Ensure Sufficient Financial Resources for Research

Sustainable financial resources can be made available for the activities of CARI by;

- a. Ensuring that government increases its budgetary allocation for research engaging in better budgeting and encouraging the leadership of the Board to lobby government for the release of funds to CARI.
- b. Developing the capacity to develop high quality research proposal for funding from various organizations.
- c. Undertaking joint research projects with other research institutes through which financial rewards can come to CARI.
- d. Commercializing CARI's products.
- e. Encouraging government to establishing an agricultural development fund by levying all agricultural imports or mobile phone transactions to provide funds for research and extension.

6.1.5. Enhance CARI's Research Infrastructure

CARI does not have the requisite physical resources, such as adequate office spaces, laboratories, workshops, stores/warehouses, vehicles and equipment, to facilitate its research efforts. CARI will therefore have to improve upon this by;

- a) Collaborating with MOA and the Ministry of Internal Affairs to establish a total of 3 research centers and 15 sub-centers in the country.
- b) Investing in laboratories, specialized facilities and equipment in the areas of ICT, biotechnology, soil science, veterinary and animal health, animal nutrition, genetic resource conservation facilities and a unit to maintain breeders' seed and cattle, swine, poultry, small ruminants and aquaculture are envisaged.
- c) Implementing a long-term physical resources plan, taking inventory of existing facilities, new acquisitions, and maintenance, accounting, assessment and disposal procedures.
- d) Creating data base on the physical resources and implementing a physical resources management information systems.
- e) Developing and implementing machinery and equipment maintenance schedule.

6.1.6 Establish Evidence-Based Monitoring and Evaluation System

CARI will develop an effective Evidence based Monitoring and Evaluation System through (

- a) Revamping the Planning, Monitoring & Evaluation Department and the development and operationalization of a Monitoring and Evaluation Plan. Revamping the Planning Monitoring and Evaluation Department will be carried out by recruiting and training competent M&E staff. The necessary tools and equipment will also be provided. CARI will align and pursue M&E capacity development in relation to its strategic objectives.
- b) Developing and implementing an M&E Plan for CARI. An M&E plan will be developed using Result Frameworks or Log-frames approach to organize intended results. This plan will be used to systematically collect and analyze input and output data on a regular basis

to allow for real-time, evidence-based decision-making and impact evaluation. The process will also involve participatory monitoring visits to research trials and stakeholders sites as well as periodic technical reviews sessions which will provide learning opportunity for researchers and other stakeholders.

CARI's M&E system will encourage participatory learning which recognizes the importance of the involvement of a variety of different stakeholders in the definition, collection, analysis and use of data. This will help ensure that analyses and lessons learnt are directly relevant to researchers and the stakeholders by maximizing the potential for learning which will ultimately lead to the improvement in the products developed by CARI to the benefit of the agricultural value chains.

6.2 Enhancing the scope of generating quality of Contextually Relevant technologies and Innovations

CARI will enhance its scope of generating quality of contextually relevant technologies and innovations by (a) developing and strengthening the competence and use of participatory approaches (b) establishing and strengthening partnership with other research institutes, and enhancing the development of agriculture and natural resource management technologies and innovations.

6.2.1 To Develop and Strengthen Staff Capacity, Competence and the Use of Participatory Research Approaches.

Involving farmers and other stakeholders in the technology is a process of courting collective action in the research process including stakeholder needs assessment, setting priorities, and experimenting with, evaluating, and disseminating technologies. Technical recommendations that emerge from this collaborative process have the full confidence of researchers, extension, and farmers, and have a much higher probability of being adopted. CARI will therefore adopt two interrelated participatory research approaches namely Agriculture Research for Development (AR4D) and Agriculture innovation Systems (AIS) approaches to ensure that at each step in the process of developing technical recommendations, there is a close working relationship between researchers, SMSs, and farmers, until research findings are finally tested and demonstrated on

farmers' fields.

The main objective of using these participatory approaches is to empower farmers to demand and articulate their technology needs to research and encourage CARI to respond to these demands. In the process, researchers are expected to obtain feedback for use in designing appropriate research projects and effort to shift from a researcher- driven research agenda to a user demand-driven research agenda. The process will create new partnerships and strengthened existing ones as well as opportunities for feedback into the CARI research agenda, thus responding to a demand-driven and client-oriented research. This will also ensure inclusivity and gender equality in the setting of the research agenda to help address the research needs of the poor and marginalized groups, including women and youth.

6.2.2 Establish and Strengthen Partnership with other Research Institutes and Organizations

In order to successfully develop technologies and innovations in a changing world, research institutes cannot rely entirely on their own R&D efforts. This strategic result is targeted at helping CARI improve its research capability, gain research funding, valuable research findings and innovation through joint projects with other research institutes. CARI needs to work with regional and international research institutions as well as universities and other research organizations in order to gain access to different pools of knowledge, talent, research skill, capacity development opportunities and research funding. To achieve this CARI has to;

- a. Encourage staff to become members of various agriculture research and thematic organization through which CARI can gain international recognition and opportunity to partners such organizations in the future.
- b. Form long term alliances with other well established research institutes who have similar interests to CARIS' and sign formal Agreements (MOU) for joint research and development interventions. These MOUs should state roles and responsibilities, extent of involvement in each other activities, research results and resource sharing, clarifying intellectual property issues, and conditions for authorship of research publications.
- c. Invite other research organizations or their scientist to develop research projects together to be funded by donors and industry.
- d. Attach CARI scientists (short term learning spells, joint appointment of experts, visiting

research scientist schemes) to international research institutes for the purposes of capacity building.

6.2.3 Enhance the Development of Agriculture and Natural Resources management Technologies and Innovations.

CARI has a broad research mandate covering all food, tree and industrial crops. These include maize, rice, Cowpea, soybean, cassava, sweet potato, vegetables, cocoa, oil palm, coconut and rubber. CARI will enhance and improve its efforts at technology and innovations development through diligent planning and execution of its research programs and in implementing this strategic plan, CARI will adopt the thematic approach in its research activities by focusing on groups of closely related commodities or issues as the basis of technology and innovation generation as opposed to piecemeal approach. The technology and innovation development will be undertaken under five (5) research thematic areas as follows'

- a. ***Crops program to develop and promote integrated crops product value chain.*** CARI has a broad research mandate covering all food, cash crops. These include maize, cereal, leguminous, tree, vegetables, and roots & Tuber crops. CARI will use mainly adaptive research techniques to develop demand driven technologies and innovations in collaboration with value chain actors and sister research institutions and organizations to support government's market-led agriculture development efforts. CARI will endeavor to generate and promote both sustainable crop production and health technologies and innovations. The technology needs assessment of stakeholders, trials, testing and selection of technologies and their dissemination will be done in partnership and collaboration with value chain actors in a participatory manner.
- b. ***Livestock and Fisheries Research:*** Livestock and fisheries research theme will develop and promote of integrated livestock product value chains CARI's research work will develop and provide market-oriented information and knowledge that will empower livestock and fisheries producer and value chain actors to produce and sell products the meet market demands and international quality standard. The livestock and fisheries thematic areas of research will be structured into three but interrelated research sub-programs including (i) development and promotion of sustainable animal and fisheries

production, (ii) development and promotion technologies for livestock and fisheries health delivery, (iii) research into feed and forage resources.

- c. ***Natural Resource Management Thematic Area of Research:*** Natural Resource Management theme will research into sustainable and integrated natural resources management technologies and innovations and to ensure the use of the research product will lead to rational, efficient and sustainable utilization of natural resources. This will include the development of technologies for (i). Integrated natural resource management, (i) soil improvement, (iii) Water conservation, irrigation and drainage management, (iv). Climate change and adaptation, and (v) Improvement of land use planning.
- d. ***Biotechnology and Genetic Resource Management:*** Biotechnology provides modern tools for development of improved crops, foods, livestock and vaccines/drugs, increased efficiency, better returns and improved environment among others. The Biotechnology and Genetic Resource Management thematic area of research will be expected generate and promote biotechnology and genetic resource management knowledge, information and technologies that respond to clients ‘demands and opportunities. This research area will focus on (i) the development and promotion of biotechnology technologies for the improvement in the production of crops, livestock and fisheries, and (ii) conservation of genetic resources of agricultural commodities.
- e. ***Socioeconomics and Applied Statistics Research:*** The socioeconomics and applied statistics thematic area provides a platform for the interface of the users (people) of research products and technologies/information emanating from the research activities. The thematic area will therefore research towards understanding and addressing the social, cultural and economic issues that influence the development and adoption of appropriate agricultural knowledge, information and technology. The sub programs of this theme include research to (i) generation socio-economics information and knowledge to guide the technology development, dissemination and adoption processes, (ii) research into agriculture input and output markets, (iii) assessment of the usefulness of technologies developed and their adoption rates among value chain actors.

6.3 Ensure Effective Dissemination of Relevant Information, Technologies and Innovations

CARI will effectively disseminate its activities, results and achievements by improving upon its corporate communication, providing advisory and outreach services as well as establishing and strengthen its linkages with extension and the agriculture value chain actors.

6.3.1. To improve the Corporate Communication and Publicity by;

- a. Using of media (issuing press releases and feature articles) to create awareness, interest and understanding about CARI's research work.
- b. Establishing and operating a website to inform the public
- c. Organizing science fairs and open days
- d. Organizing conferences and other scientific forums to acquire and disseminate knowledge and raise awareness about CARI
- e. Encouraging research scientists to publish their research work in internationally recognized journals.

6.3.2. To provide Agricultural Advisory and Outreach Services

- a. Establish an advisory and outreach services department to provide expert advice to value chain actor and investors
- b. Establish knowledge and information management hub to provide relevant information to the agricultural industry.
- c. Produce and disseminate information on technologies and innovations in print, audio, video and digital.
- d. Organize open and field days for value chain actors in collaboration with extension services providers.

6.3.3 Commercialize CARI's Research Products and Undertake Contract Services.

The strategy is designed to enable CARI generate part of its operational funds from commercializing some of its research products as well as engaging in contract research and other services as required by the market. This will be done by;

- (a) Appointing a Director for Resources Mobilization and Commercialization who will coordinate the commercialization efforts of CARI.
- (b) Develop a strategy for private sector participation and commercialization of CARI's research products.
- (c) Identifying the products and services required by the market
- (d) Producing research products and services as and when required by the market
- (e) Undertaking Contract Research and Consultancies

6.3.4 Establish and Strengthen Linkages between Research, Extension and Value Chain Actors

The aim of the policy is to establish and strengthen institutional arrangements and mechanisms that foster coordination, collaboration, partnership and synergy between research, extension, trainers, farmers and other value chain actors by;

- (a) Developing and operationalizing mechanisms to promote sustainable linkages among research, extension, and farmer/stakeholders. This will be done by forming National, County and District Research-Extension-Farmer Liaison Committees (RELCs), signing Memorandum of Understanding between research and extension to undertake joint activities to the benefit of farmers and value-chain actors.
- (b) Empowering the Advisory and Outreach Department to designate an officer for RELC who will be responsible for planning and organizing RELC activities in collaboration with DRDRE of MOA.
- (c) Using all research interventions as innovation platforms to facilitate co-creation and co-innovation between research, extension and value chain actors.

7.0 IMPLEMENTATION ARRANGEMENTS

The implementation arrangements include taking action of the following;

1. Create awareness of Strategic Plan among policy decision makers
2. Facilitate dialogue between the Minister of Agriculture and the Senate Committee for the establishment and inauguration of the CARI Board.

3. The Minister for Agriculture and the Senate Committee on Agriculture should engage the Ministry of Finance to seek commitment for funding agriculture research and extension.
4. Form the research committee, chaired by the Deputy Director General of CARI to oversee the annual planning and budgeting, monitoring and quality assurance of CARI's research efforts.
5. To ensure effective participation of stakeholders in the research process, a research-extension-farmer/stakeholder committee should be formed and inaugurated.
6. Develop the operational plan and related M&E plan for the implementation of the strategic plan base on the Results Areas and their Indicative Actions as per Table 7.1 below;

Table 7.1: Strategic Result Areas, Indicative Activities and Cost Estimates

Result Area	Indicative Activities	Estimated Cost US\$
1.0 To strengthen the institutional capacity of CARI for effective R&D		
1.1 Improve upon and governance management	1. Reactivate the Board (Select and Appoint Board Members) 2. Inaugurate the Board 3. Organize bi-annual Board Meetings 4. Review Structure to conform to new strategic direction of CARI 5. Fill all management positions including: DDG-R Director of Planning, Director of planning, Director of Project implementation and Director of Finance and Administration	326,000.00
	6. Organize Corporate Management workshop for Board Members and CARI Management Team.	231,000.00
1.2 Develop its human resources	1. Prepare Human Resources Development Plan (base humanresources assessment and requirement)	325,000.00
	2. Recruit staff (research scientists and technicians) to man the various vacant positions	2,176,000.00

	3. Train 50% (23 out of 45 BSc) of the research scientists to at least MSc Level and 50% (15, out of 30 MSc) of the research scientists to PhD.	
	4. Train research scientists and technicians in research methods and skills 5. Develop and implement mechanisms for mentoring research scientists	579,000.00
	6. Develop for implementation a scheme of service for CARI (to ensure staff promotion better remuneration) 7. Develop and implement a sustainable staff welfare scheme (health care and staff insurance schemes) and ensure gender equality among CARI Staff	
1.3 improve upon its research infrastructure	1. Take an inventory of infrastructure to identify gaps 2. Prepare an infrastructure development plan 3. Provide adequate physical resources/Infrastructure by constructing and/or rehabilitating offices, facilities (labs, warehouses) and staff accommodation	4,500,000.00
	4. Develop and operationalize infrastructure, assert	295,000.00
	data base and tracking system	340,000.00
	5. Repair and maintain existing machinery and equipment.	
	6. Procure vehicles and equipment according to need	725,000.00
	7. Establish operationalize ICT infrastructure	265,000.00

1.4 Ensure adequate finance for CARI	1. Adopt a creative budgeting system that will enable the Board lobby for and ensure adequate GOL funding for CARI 2. Commercialize CARI's research products. 3. Create a Donor fund and grant proposal development-Office to track donor funding. 4. Train and encourage Research Scientist to write winnable proposals for research grants from donors and industry players.	250,000.00
	5. Undertake Joint research with other research institutes	3,234,000.00
1.5 improve the planning, monitoring and evaluation	1. Establish and equip the CARI M&E Office. 2. Develop and operationalize the M&E Plan 3. Organize CARI planning and Quarterly Review Sessions 4. Prepare Quarterly and Annual Reports	52,000.000
2.0 To generate contextually relevant technologies and innovations		
2.1 Develop the capacity for and use participatory research approaches	1. Develop a manual on participatory research base on AR4D and AIS approaches 2. Train research staff in participatory research approaches 3. Organize stakeholder workshops on participatory research approaches. 4. Organize participatory needs assessment, observation, and technology evaluation and selection workshops for stakeholders. 5. Establish innovative platforms, in collaboration with MOA, on all the thematic areas of research	335,000.00

2.3 Establish and strengthen partnerships with international research institutes and organizations	1. Identify relevant research institutes and organizations 2. Sign MOU and non-disclosure and confidentiality agreements 3. Prepare, execute and monitor joint projects 4. Undertake staff exchange and placement schemes	2,800,000.00
2.4 Develop contextually relevant technologies and innovations	Develop and adapt at least 3 technology and innovation for each thematic area for dissemination 1. Undertake participatory research problems identification sessions in the various thematic areas. 2. Establish participatory research trials in the 7 thematic areas (participatory data collection and analysis). 3. Develop and operationalize seed and planting material system 4. In addition to research on problems identified undertake research in the following: (a) Develop at least 3 crops/livestock/fisheries management technologies and innovations. (b) Develop/adapt at least 4 integrated pest/disease management technology tested and released for adoption. © Develop at least 3 drudgery-reduction technology prototype. (d) develop/adopt at least 3 Soil-nutrient management technologies. (e) Select at least 15 research recommendations that needs to be disseminated annually. (f) research and adapt at least 5 emerging technologies to the Liberia situation	8,500,000.00

3.0 To disseminate agriculture and Natural Resources relevant Technologies and Innovations		
3.1 Improve corporate communication and Publicity	1. Prepare a minimum of one success story feature on CARI operations every quarter for the press. 2. Undertake publicity of CARI activities through newsletter, website, mass media 3. Organize and attend conferences to bring research work to public attention and critique. 4. Host bi-annual Open day on CARI Activities 5. Advertise CARI activities in the press 6. Prepare and publish outcomes of the research work thematic areas in peer reviewed journals	500,000.00
3.2 Establish and operationalize an Outreach and Advisory Services Department	1. Establish and Equip an Outreach / liaison and advisory services committee. 2. develop an outreach and advisory services strategy 3. Establish knowledge management and information dissemination hub. 4. Organize annual seminar on improved technologies for stakeholders. 5. Prepare manual on the technologies developed by the thematic areas	254,000.00
3.3 Commercialize CARI's Research products	1. Appoint Director for Resource mobilization and commercialization 2. Develop strategy for private sector participation in research and commercialization. 3. identify the products and services to be commercialize 4. Produce and sell the selected research products and services 5. Undertake Contract Research and Consultancy services	250,000

3.4. Establish and strengthen mechanisms for research-extension-farmer/stakeholder linkages	1. Develop and operationalize mechanisms for strengthening Research-Extension-Farmer Linkages. 2. Prepare a manual for Research-Extension-Farmer Linkage Committee (RELC) at the National and Regional Levels 3. Designate an Officer/create a desk officer for RELC. 4. Organize Quarterly RELC Planning Meetings/sessions (for research/extension planning and review sessions) 5. Establish seven (7) Innovation Platforms in the various thematic areas in collaboration with MOA, NGOs, Private Extension providers, famers and value chain actors. 6. Organize seven (7) Training Workshops for RELC members. 7. prepare and sign an MOU between CARI, MOA, and Farmers Union for collaborate research and related activities	850,000
Total:		27,081,000 USD

APPENDICES

Appendix 1 Suggested Composition of the Board

- (a) The Directors of the Department of Regional development for research and extension (DRDRE) or their nominees, *ex officials*
- (b) The Director-General, and DDG *ex officials*; and
- (c) The Minister of Agriculture or her representative
- (d) The Director of Extension or his representative
- (d) One member representing the University of Liberia nominated by that University; and
- (e) One member representing the Tubman University
- (f) Two members, all of whom shall be farmers and at least one of whom shall be a woman, nominated by the Minister for Agriculture; and
- (g) One member representing NGO/Private sector in Extension; and
- (h) One member representing Agri-business sector
- (b) Board members shall hold office for a term not exceeding five years; and
- (d) Are eligible for reappointment; and
- (e) Shall be ordinarily resident in the country.

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