

THE REPUBLIC OF SIERRA LEONE

SIERRA LEONE AGRICULTURAL RESEARCH INSTITUTE



OPERATIONAL PLAN
2012-2016

NOVEMBER, 2011

© 2011: Sierra Leone Agricultural Research Institute, SLARI.

Citation: SLARI, 2011. Sierra Leone Agricultural Research Institute, Operational Plan, 2012-2016.

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TABLE OF CONTENT

Abbreviations and Acronyms.....	ix
Foreword.....	x
Preface.....	xii
Acknowledgement.....	xiv
Executive Summary.....	xvi
1.0 Background.....	1
1.1 Introduction.....	1
1.1.1 Mandate and Core Functions of SLARI.....	1
1.1.2 SLARI Strategic Plan.....	2
1.2 Critical Strategic Issues.....	3
1.2.1 Research Guiding Principles for Sustainable Growth in the Agricultural Sector.....	4
1.3 Strategy for Responding to the Agricultural Sector Development Challenges.....	5
1.4 Institutional Vision, Mission and Guiding Core Values.....	5
1.5 Objective Statements.....	6
1.6 Institutional Level Results.....	7
1.7 Strategic Research Areas of Focus.....	12
1.8 Research Support Functions.....	12
2.0 Preparation of SLARI Operational Plan.....	15
2.1 The Need for Operational Plan.....	15
2.1.1 Framework for Operationalizing the Strategic Plan.....	15
2.2 Selection and Prioritization of Agricultural Product Value Chains.....	15
2.2.1 Criteria for Prioritizing APVCs and Ranking of Chain Segments and Constraints.....	16
2.2.2 Criteria for Ranking Product Value Chain Segments and Constraints.....	18
2.3 Identification of Product Value Chain Priority Areas of Intervention.....	19
2.4 Implementation Frameworks and Plans.....	19
2.4.1 Result Frameworks.....	20
2.4.2 Programme Implementation Plans.....	20
2.4.3 Human Resource Requirements.....	20
2.4.4 Programme Financing Requirements.....	20
2.4.5 Framework for Operationalizing the Operational Plan.....	23
2.5 Monitoring and Evaluation.....	23
3.0 Root, Tuber and Grain Legume Crops Programme.....	24
3.1 Strategic Focus.....	24
3.2 Development and Promotion of Cassava Product Value Chain.....	24
3.2.1 Rationale and Justification.....	24
3.2.2 Challenges and Strategic Focus.....	25
3.3 Development and Promotion of Yam Product Value Chain.....	25
3.3.1 Rationale and Justification.....	25
3.3.2 Challenges and Strategic Focus.....	25
3.4 Development and Promotion of Sweet Potato Product Value Chain.....	26
3.4.1 Rationale and Justification.....	26
3.4.2 Challenges and Strategic Focus.....	26
3.5 Development and Promotion of Potato Product Value Chain.....	26
3.5.1 Rationale and Justification.....	26
3.5.2 Challenges and Strategic Focus.....	26
3.6 Development and Promotion of Cocoyam Product Value Chain.....	26
3.6.1 Rationale and Justification.....	27
3.6.2 Challenges and Strategic Focus.....	27

3.7	Development and Promotion of Cowpea Product Value Chain.....	27
3.7.1	Rationale and Justification.....	27
3.7.2	Challenges and Strategic Focus.....	27
3.8	Development and Promotion of Soybean Product Value Chain.....	28
3.8.1	Rationale and Justification.....	28
3.8.2	Challenges and Strategic Focus.....	28
3.9	Development and Promotion of Pigeon Pea Product Value Chain.....	28
3.9.1	Rationale and Justification.....	29
3.9.2	Challenges and Strategic Focus.....	29
3.10	Development and Promotion of Groundnut Product Value Chain.....	29
3.10.1	Rationale and Justification.....	29
3.10.2	Challenges and Strategic Focus.....	29
4.0	Cereal Crops Programme.....	29
4.1	Strategic Focus.....	31
4.2	Development and Promotion of Upland Rice Product Value Chain.....	31
4.2.1	Rationale and Justification.....	31
4.2.2	Challenges and Strategic Focus.....	31
4.3	Development and Promotion of Lowland Rice Product Value Chain.....	32
4.3.1	Rationale and Justification.....	32
4.3.2	Challenges and Strategic Focus.....	32
4.4	Development and Promotion of Maize Product Value Chain.....	33
4.4.1	Rationale and Justification.....	33
4.4.2	Challenges and Strategic Focus.....	33
4.5	Development and Promotion of Sorghum Product Value Chain.....	33
4.5.1	Rationale and Justification.....	34
4.5.2	Challenges and Strategic Focus.....	34
4.6	Development and Promotion of Pearl millet Product Value Chain.....	34
4.6.1	Rationale and Justification.....	34
4.6.2	Challenges and Strategic Focus.....	34
4.7	Development and Promotion of Digitaria Product Value Chain.....	35
4.7.1	Rationale and Justification.....	35
4.7.2	Challenges and Strategic Focus.....	35
5.0	Horticultural Crops Programme.....	35
5.1	Strategic Focus.....	36
5.2	Development and Promotion of Indigenous Vegetables Product Value Chains.....	36
5.2.1	Rationale and Justification.....	36
5.2.2	Challenges and Strategic Focus.....	36
5.3	Development and Promotion of Exotic Vegetables Product Value Chains.....	37
5.3.1	Rationale and Justification.....	37
5.3.2	Challenges and Strategic Focus.....	37
5.4	Development and Promotion of Herbs and Spices Product Value Chains.....	37
5.4.1	Rationale and Justification.....	38
5.4.2	Challenges and Strategic Focus.....	38
5.5	Development and Promotion of Tropical Fruits Product Value Chains.....	38
5.5.1	Rationale and Justification.....	38
5.5.2	Challenges and Strategic Focus.....	38
5.6	Development and Promotion of Temperate Fruits Product Value Chains.....	38
5.6.1	Rationale and Justification.....	39
5.6.2	Challenges and Strategic Focus.....	39
5.7	Development and Promotion of Indigenous Fruits Product Value Chains.....	39
5.7.1	Rationale and Justification.....	39
5.7.2	Challenges and Strategic Focus.....	39

5.8	Development and Promotion of Ornamental and Medicinal Plants Product Value Chains.....	39
5.8.1	Rationale and Justification.....	40
5.8.2	Challenges and Strategic Focus.....	40
6.0	Livestock Programme.....	42
6.1	Strategic Focus.....	42
6.2	Development and Promotion of Dairy Product Value Chain.....	42
6.2.1	Rationale and Justification.....	42
6.2.2	Challenges and Strategic Focus.....	43
6.3	Development and Promotion of Beef Product Value Chain.....	43
6.3.1	Rationale and Justification.....	43
6.3.2	Challenges and Strategic Focus.....	43
6.4	Development and Promotion of Goat Product Value Chain.....	44
6.4.1	Rationale and Justification.....	44
6.4.2	Challenges and Strategic Focus.....	44
6.5	Development and Promotion of Sheep Product Value Chain.....	44
6.5.1	Rationale and Justification.....	44
6.5.2	Challenges and Strategic Focus.....	44
6.6	Development and Promotion of Poultry Product Value Chains.....	45
6.6.1	Rationale and Justification.....	45
6.6.2	Challenges and Strategic Focus.....	45
6.7	Development and Promotion of Pig Product Value Chain.....	46
6.7.1	Rationale and Justification.....	46
6.7.2	Challenges and Strategic Focus.....	46
6.8	Development and Promotion of Non-conventional Small Stock product value chains.....	46
6.8.1	Rationale and Justification.....	46
6.8.2	Challenges and Strategic Focus.....	46
7.0	Fisheries Programme.....	48
7.1	Strategic Focus.....	48
7.2	Development and Promotion of the Demersal Product Value Chain.....	48
7.2.1	Rationale and Justification.....	48
7.2.2	Challenges and Strategic Focus.....	49
7.3	Development and Promotion of the Pelagic Product Value Chain.....	49
7.3.1	Rationale and Justification.....	49
7.3.2	Challenges and Strategic Focus.....	49
7.4	Development and Promotion of the Shrimp Product Value Chain.....	50
7.4.1	Rationale and Justification.....	50
7.4.2	Challenges and Strategic Focus.....	50
7.5	Development and Promotion of the Crabs and Lobsters Product Value Chains.....	50
7.5.1	Rationale and Justification.....	50
7.5.2	Challenges and Strategic Focus.....	50
7.6	Development and Promotion of the Cephalopodae Product Value Chain.....	51
7.6.1	Rationale and Justification.....	51
7.6.2	Challenges and Strategic Focus.....	51
7.7	Development and Promotion of the Tilapia Product Value Chain.....	51
7.7.1	Rationale and Justification.....	51
7.7.2	Challenges and Strategic Focus.....	51
7.8	Development and Promotion of the Shrimp Culture Product Value Chain.....	52
7.8.1	Rationale and Justification.....	52
7.8.2	Challenges and Strategic Focus.....	52
7.9	Development and Promotion of the Catfish Product Value Chain.....	52
7.9.1	Rationale and Justification.....	52
7.9.2	Challenges and Strategic Focus.....	52

8.0	Forestry and Tree Crops Programme.....	53
8.1	Strategic Focus.....	53
8.2	Development and Promotion of Forestry Product Value Chains.....	53
	8.2.1 Rationale and Justification.....	53
	8.2.2 Challenges and Strategic Focus.....	54
8.3	Development and Promotion of Cocoa Product Value Chain.....	54
	8.3.1 Rationale and Justification.....	54
	8.3.2 Challenges and Strategic Focus.....	55
8.4	Development and Promotion of Coffee Product Value Chain.....	55
	8.4.1 Rationale and Justification.....	55
	8.4.2 Challenges and Strategic Focus.....	55
8.5	Development and Promotion of Cashew Product Value Chain.....	56
	8.5.1 Rationale and Justification.....	56
	8.5.2 Challenges and Strategic Focus.....	56
8.6	Development and Promotion of Oil palm Product Value Chain.....	56
	8.6.1 Rationale and Justification.....	56
	8.6.2 Challenges and Strategic Focus.....	57
9.0	Land, Water and Environment Programme.....	58
9.1	Strategic Focus.....	58
9.2	Improvement on the Contribution of Integrated Soil Fertility Management on Agricultural Product Value Chains.....	58
	9.2.1 Rationale and Justification.....	58
	9.2.2 Challenges and Strategic Focus.....	59
9.3	Improvement on the Contribution of Soil and Water Management on Agricultural Product Value Chains.....	59
	9.3.1 Rationale and Justification.....	59
	9.3.2 Challenges and Strategic Focus.....	60
9.4	Improvement on the Contribution of Irrigation and Drainage on Agricultural Product Value Chains.....	60
	9.4.1 Rationale and Justification.....	60
	9.4.2 Challenges and Strategic Focus.....	61
9.5	Improvement on the Contribution of Soil Survey, Land Evaluation and Land Use Planning on Agricultural Product Value Chains.....	61
	9.5.1 Rationale and Justification.....	61
	9.5.2 Challenges and Strategic Focus.....	61
9.6	Improvement on the Contribution of Sustainable Environment Management and Climate Change Adaptation and Mitigation.....	62
	9.6.1 Rationale and Justification.....	62
	9.6.2 Challenges and Strategic Focus.....	63
10.0	Research Support Functions.....	64
10.1	Strategic Focus.....	64
10.2	Strengthening Human Resource Development and Management.....	64
10.3	Strengthening Financial Resource Acquisition and Management.....	65
10.4	Strengthening Institutional Administration and Physical Resource Development and Management.....	65
10.5	Improvement of Institutional Procurement and Supplies Services.....	65
10.6	Improvement of Institutional Information Communication and Documentation.....	66
10.7	Strengthening SLARI Directorate and Council Corporate Governance.....	66
References.....		67

Annexes.....	68
Root, Tuber and Grain Legume Crops Programme Annexes 3.1, 3.2 and 3.3.....	68
Cereal Crops Programme Annexes 4.1, 4.2 and 4.3.....	77
Horticultural Crops Programme Annexes 5.1, 5.2 and 5.3.....	83
Livestock Programme Annexes 6.1, 6.2 and 6.3.....	90
Fisheries Programme Annexes 7.1, 7.2 and 7.3.....	97
Forestry and Tree Crops Programme Annexes 8.1, 8.2 and 8.3.....	106
Land, Water and Environment Programme Annexes 9.1, 9.2 and 9.3.....	112
Research Support Functions Annexes 10.1, 10.2 and 10.3.....	118

ABBREVIATIONS AND ACRONYMS

AIS	Agricultural Innovation Systems.
APVC	Agricultural Product Value Chain.
AU	African Union.
CAADP	Comprehensive African Agricultural Development Programme.
CORAF	West and Central Africa Council for Agriculture Research and Development.
ECOWAP	ECOWAS Common Agricultural Policy.
ECOWAS	Economic Community of West African States.
FAAP	Framework for African Agricultural Productivity.
FARA	Forum for Agricultural Research in Africa.
FFRC	Freetown Fisheries Research Centre.
GDP	Gross Domestic Product.
GoSL	Government of Sierra Leone.
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune-deficiency Syndrome.
IAR4D	Integrated Agricultural Research for Development.
ICT	Information Communication Technology.
IP	Innovation Platform.
KFTCRC	Kenema Forestry and Tree Crops Research Centre.
KHCRC	Kabala Horticultural Crops Research Centre.
MAFFS	Ministry of Agriculture, Forestry and Food Security.
MDGs	Millennium Development Goals.
MLWRC	Magbosi Land and Water Research Centre.
NACU	National Agricultural Coordination Committee.
NARC	Njala Agricultural Research Centre.
NARCC	National Agricultural Research Coordinating Council.
NEPAD	New Partnership for Africa's Development.
NGO	Non Governmental Organization.
NSADP	National Sustainable Agriculture Development Programme.
PRSP	Poverty Reduction Strategy Paper.
PVC	Product Value Chain.
RARC	Rokupr Agricultural Research Centre.
SLARI	Sierra Leone Agricultural Research Institute.
TLRC	Teko Livestock Research Centre.
WECARD	West and Central African Council for Agricultural Research and Development.

FOREWORD

The performance of agriculture impacts heavily on nearly all other sectors of development and is, therefore, the mainstay of the national economy by providing the basis for the development of the other sectors. By contributing raw materials to the manufacturing/ industrial sector, the agricultural sector has a definite role in Sierra Leone's progress towards becoming a food secure and newly industrialized country. For the agricultural sector to improve on its contribution to the overall goal of national economic growth, wealth creation, food security and poverty alleviation, the sector must be transformed from subsistence to a commercial and profitable business enterprise.

The country's Second Poverty Reduction Strategy Paper: "The Agenda for Change" that was developed to deliver the economic growth envisioned in the Vision 2025 presents a comprehensive medium-term development strategy that focuses on four strategic priorities that include (i) enhancing the national power supply; (ii) increasing agricultural productivity and competitiveness; (iii) significantly improving the national transportation network; and (iv) promoting sustainable human development through decentralized service delivery. These priorities are underpinned by good governance, macroeconomic stability, private sector development, financial sector reform and natural resource management. The agenda refers to agriculture as the engine for economic growth with a focus on the agricultural value chains of input supply, production, value addition/agro-processing and marketing. The agenda recognises that from a pro-poor perspective, raising the quality and value-added productivity in agriculture in general is critical to poverty reduction as majority of the population are engaged in agriculture.

In this regard, the objectives set out by the agricultural sector to achieve the Vision of the agenda for change as spelled out in the National Sustainable Agriculture Development Plan (NSADP) include (i) increasing agricultural productivity through a variety of support measures along the entire agricultural value chain; (ii) promoting commercial agriculture through private sector participation; (iii) improving agricultural research and extension delivery systems; (iv) promoting efficient and effective sector resource management systems; (v) managing and exploiting country's fishery and marine resources and accessing local and international markets; (vi) managing and exploiting country's forestry resources to mitigate against climate change; and (vii) mainstream cross-cutting issues in agriculture. Out of this Plan, the government flagship program, Smallholder Commercialization Program (SCP), was drawn for the medium term.

The vision for the NSADP and SCP of commercializing agriculture, especially through linking of farmers to markets, emphasizes the critical role agricultural research and extension is expected to play in the development of the agricultural sector. In this regard the, Sierra Leone Agricultural Research Institute (SLARI) is expected to play a major role in addressing the many challenges facing the agriculture, fishery and forestry sub sectors. As the national agricultural research institution, SLARI is expected to conduct research to generate and disseminate knowledge, information and technologies needed for sustainable development of the country's agricultural sector.

Taking cognizance of the developments taking place at the national, regional and international levels, SLARI has developed a new Strategic Plan for the period 2012-2021. The Strategic Plan is tailored to strategically position SLARI to contribute significantly to the development of the agricultural sector. From the regional and global perspective, the Strategic Plan is in line with the Comprehensive African Agricultural Development Programme (CAADP); West and Central African Council for Agricultural Research and Development (WECARD); and the Millennium Development Goals (MDGs).

In order to position itself strategically as a key driver in the transformation of the agricultural sector from subsistence to a commercial and profitable business enterprise, SLARI has adopted the Agricultural Product Value Chain (APVC) approach to research for development within the framework of Integrated Agricultural Research for Development (IAR4D). The adoption of this approach to research requires SLARI to shift focus from production of commodities to differentiated agricultural products including increased value-addition to commodities within the rural areas and development and promotion of new products that fit the demands of the target market.

The adoption of the APVC approach to research for development has been necessitated by the renewed focus on agriculture and agribusiness as priority sectors for spurring economic growth in Africa with calls for development of APVCs that integrate producers and markets to make the agricultural sector more responsive to consumer demands. An important feature of the APVC approach is that it permits analysis of the whole product system leading to the identification and prioritization of opportunities and problems throughout the system which facilitates the development of more realistic and focussed research and development intervention projects.

The new Strategic Plan was developed within the context of the on-going national institutional and policy reforms, taking into consideration the country's new political system and structure of government as well as the available and emerging opportunities. The Strategic Plan has also taken into account the achievements and lessons learnt during the implementation of the previous guiding policies and plans of the government. In aligning itself to the guiding policies and plans at the national, regional and global levels, SLARI has formulated an inspiring Vision to see "Improved and sustainable broad-based agricultural growth". The Mission statement that expresses the fundamental purpose and business of SLARI is "To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector through generation and promotion of innovative agricultural technologies and empowerment of stakeholders".

The new SLARI Strategic Plan shall be operationalized through two Operational Plans, each covering a period of five years. Following this new development, therefore, SLARI has developed this first Operational Plan covering the period 2012-2016. The top priority for this first Operational Plan shall be on reconstruction to resurrect SLARI by putting in place the human resources, infrastructure and equipment and related facilities required for the conduct of research. The development of this Operational Plan has been a consultative process involving key stakeholders within and outside SLARI. This was done so as to ensure that it incorporates all constructive views and suggestions from all key stakeholders; builds on the current SLARI achievements and strengths and contributes significantly to the development of the agricultural sector and the country while ensuring proper alignment at the national and regional levels.

In this regards, I would like to thank most sincerely the Executive Director of Forum for Agricultural Research in Africa, Prof. Monty P. Jones; the Director of Kenya Agricultural Research Institute, Dr. E.A. Mukisira; and the Director General of AfricaRice Centre, Dr. Papa Abdoulaye Seck for facilitating the formation and support of the team of experts that spearheaded the preparation of this Operational Plan. I, in particular, wish to thank Dr. Antony M. Kilewe for providing excellent leadership to the team of experts as well as providing technical guidance to the SLARI management and for putting together the final Operational plan.

Lastly but not least, I wish to thank the SLARI Director General, Dr A. Dixon; former Chairman of SLARI Council, Dr. D.S.C. Spencer and current Chairman of SLARI Council, Prof. Edward R. Rhodes; and Dr. Adewale Adekunle of FARA for providing overall guidance and coordination of the planning process. The contribution of all other individuals or groups that assisted in one way or another towards the development of this Operational Plan is greatly acknowledged.

***Joseph Sam Sesay, PhD. Development Economics & Doctorate in Public Administration,
Minister of Agriculture, Forestry and Food Security***

PREFACE

Agricultural research in Sierra Leone has made significant contributions towards improving productivity in the past through the development of improved crop varieties particularly rice, cassava and sweet potato coupled with key management practices. Agricultural research has played a major role in the development of these technologies and has made significant contributions to rural development in the past. The impact indicators of the long-term investments in agricultural research may be grouped into three categories that include (i) the productivity impact that focuses on the efficient use of resources; (ii) the livelihood impact which determines whether gains of increased productivity benefit the mass of society; and (iii) the environmental impact which determines whether the gains achieved by the first two impact indicators can be sustained.

The Sierra Leone Agricultural Research Institute (SLARI) was established by an Act of parliament in 2007 as a semi autonomous government agency, as part of the continuing efforts to revive agricultural research. In order to align its activities to the government focus on food security, poverty reduction, employment creation and commercialization of the agricultural sector, SLARI has developed a new Strategic Plan covering the period 2012-2021. The Strategic Plan explores a new paradigm of agriculture as a commercial business where farmers will move from subsistence to earning a decent livelihood from their farming enterprises.

Given the institutional strategic direction, SLARI has identified five result areas that are necessary and sufficient to deliver on the institute's specific objective of generating and promoting innovative agricultural technologies and empowerment stakeholders. Attainment of this specific objective will contribute significantly to the realization of the overall Institute's general objective of enhancing sustainable productivity, commercialization and competitiveness of the agricultural sector.

The five results that are designed to position SLARI strategically as the key driver for enhancing productivity, commercialization and competitiveness of the agricultural sector include (i) Appropriate agricultural product value chains technologies and innovations generated and promoted; (ii) Appropriate markets and marketing strategies for enhancing agricultural product value chains developed and promoted; (iii) Appropriate policy options for enhancing agricultural product value chains facilitated and advocated; (iv) Capacity for implementing agricultural product value chains research strengthened; and (v) Appropriate mechanisms for managing, sharing and up scaling agricultural knowledge, information and technologies established and operationalized.

The new strategic Plan emphasises the need for SLARI, as a national research organization, to work with partners, collaborators, the farming community and other players along the various agricultural product value chains so as to have a vibrant commercially-oriented and competitive agricultural sector. To be responsive to client demands, and eventually deliver development objectives, there is greater need of true partnerships among key stakeholders within the agricultural sector. This Strategic Plan, therefore, provides a framework and a roadmap for SLARI's research programmes for the next ten years.

The new SLARI Strategic Plan shall be operationalized through two Operational Plans, each covering a period of five years. Following this new development, therefore, SLARI has developed this first Operational Plan covering the period 2012-2016. In order to ensure proper alignment and harmonization with the new Strategic Plan, the Operational Plan has been developed using a nesting approach that links the strategic results from the Institute level through the research programme areas of focus as well as research support functions for better outcome mapping and impact orientation. In this nesting approach, therefore, the preparation of the Operational Plan for operationalizing the Strategic Plan has taken over the planning process from the Product Value Chains level under each research programme area of focus.

The Operational Plan is the outcome of several months of continuous learning, communication and negotiation by the Institute and stakeholders, with the primary objective of building consensus around the Institute's strategic areas. In this regard, I wish to thank the Honourable Minister of Agriculture, Forestry and Food Security through whose initiative and effort a collaborative partnership with Kenya Agricultural Research Institute, Africa Rice Centre and Forum for Agricultural Research in Africa was established to assist SLARI in the development of this first Operational Plan. In view of this, I would like to thank most sincerely the team of experts from the

KARI, Africa Rice Centre and FARA under the leadership of Dr. Antony M. Kilewe who spearheaded the preparation of this Operational Plan. I appreciate the efforts and hard work of the SLARI Director General, Dr A. Dixon and all the SLARI staff and stakeholders who were involved in one way or another in the preparation of this document. It is my hope that all our stakeholders will find the document pragmatic and adequately reflective of their needs from the point of view of agricultural research for development.

Prof. Edward R. Rhodes,
Chairman, SLARI Council

ACKNOWLEDGEMENT

Agricultural research in Sierra Leone has made significant contributions towards improvement of the agricultural production and rural development in the past. In order to strengthen the role of agricultural research, the Government established the Sierra Leone Agricultural Research Institute (SLARI) through an Act of Parliament as the country's agricultural research and agricultural technology generating body for the benefit of the farming, fishing and forestry sectors. The SLARI Act embodies government's recognition of the potential role of agricultural research in contributing towards national food security, poverty alleviation and the need for providing the necessary framework that will provide the enabling environment for agricultural research to contribute towards making agriculture the engine for national economic growth. When fully operational, SLARI shall be composed of seven research centres spread throughout the country. The Centres include (i) Njala Agricultural Research Centre; (ii) Rokupr Agricultural Research Centre; (iii) Kabala Horticultural Crops Research Centre; (iv) Teko Livestock Research Centre; (v) Freetown Fisheries Research Centre; (vi) Kenema Forestry and Tree Crops Research Centre; and (vii) Magbosi Land and Water Research Centre.

SLARI is mandated to implement the agricultural policies and strategies of the Government of Sierra Leone (GoSL). In addition to being one of the few national research programmes in Africa with a comprehensive Strategic Plan, a unique feature of the SLARI Strategic Plan is its alignment with those of the regional and continental agricultural research coordinating bodies, namely, the West and Central African Council for Agricultural Research and Development (CORAF/WECARD) and Forum for Agricultural Research in Africa (FARA), respectively; as well as the Comprehensive African Agricultural Development Plan (CAADP) of the African Union's (AU) New Partnership for Africa's Development (NEPAD). In view of this, the SLARI Vision and Mission statements confirm the Institute's commitment to the national, regional and global policies and priorities aimed at creating economic development through agriculture and meeting the Millennium Development Goals of reducing poverty and eradicating hunger. Despite being a young organization in its formative stage, SLARI has kept pace with the increasing demands and has been instrumental and proactive in providing scientific solutions for agricultural development. However, more than ever before, the institute is now required to go beyond research and become a vehicle for development. It is, therefore, imperative that SLARI plans diligently and carefully so that its programmes and activities respond to real, current and future needs of the government and more particularly, the farming community and other stakeholders in the agricultural sector.

In order to deliver on the five institutional level results outlined in the new Strategic Plan, SLARI has adopted a programme approach to its research planning and management. In view of this and considering the need to ensure effective delivery of the five institutional level results, research operations in SLARI have been rationalized into seven long-term strategic research programme areas of focus. The research programme areas of focus express a stronger organizational commitment to impact on the strategic orientation and positioning of SLARI as a leader in the generation and promotion of innovative agricultural technologies and stakeholders empowerment aimed at increasing productivity, commercialization and competitiveness of the agricultural sector. The necessary and sufficient research programme areas of focus include Root, Tuber and Grain Legume Crops Programme; Cereal Crops Programme; Horticultural Crops Programme; Livestock Programme; Fisheries Programme, Forestry and Tree Crops Programme; and Land, Water and Environment Programme.

The new SLARI Strategic Plan shall be operationalized through two Operational Plans, each covering a period of five years. Following this new development, therefore, SLARI has developed this first Operational Plan covering the period 2012-2016. During this first Operational Plan period, product value chain analysis, prioritization and development of appropriate upgrading and promotion strategies shall be undertaken leading to the development, promotion and up scaling of agricultural product value chain upgrading technologies and innovations. In this first Operational Plan, each product value chain has then been discussed in terms of its rationale and justification, and challenges and strategic focus. Each challenge and strategic focus section has concluded with the identification of the necessary and sufficient broad intervention strategies required to address the identified challenges. This information has been summarized in appropriate frameworks for each of the research programme area of focus.

The preparation of this first Operational Plan has been a highly participatory process involving many internal and external stakeholders with the primary objective of building consensus around the research programme areas of focus. This document would not have been a reality without the active participation and commitment of many institutions and individuals. In this regard, I wish to express our sincere appreciation and gratitude to:

- The Honourable Minister of Agriculture, Forestry and Food Security, Dr. Joseph Sam Sesay for his continuous engagement, guidance, advice and encouragement that contributed enormously to the overall success of this SLARI planning process.
- The Executive Director of Forum for Agricultural Research in Africa, Prof. Monty Jones; the Director of Kenya Agricultural Research Institute, Dr. E.A. Mukisira; and the Director General of Africa Rice Centre, Dr Papa Abdoulaye Seck for facilitating the formation and support of the team of experts that spearheaded the preparation of this Operational Plan.
- The former Chairman, Dr. D.S.C. Spencer, and the current Chairman of SLARI Council, Prof. Edward R. Rhodes and other council members for their continuous engagement and keen interest in the SLARI planning process.
- Dr. Antony M. Kilewe for providing excellent leadership to the team of experts as well as providing technical guidance to the SLARI management and for putting together the final Operational Plan.
- The members of the team of experts that spearheaded the preparation of this Operational Plan that included Dr. Joseph G. Mureithi, Dr. Foustin P. Wandera, Dr. Lusike Wasilwa, Dr. Anthony O. Esilaba, and Ms. Violet O. Kirigua from Kenya Agricultural Research Institute; Prof. Adewale Adekunle, Dr. Solomon Bangali and Dr. Nelson Ojijo from Forum for Agricultural Research in Africa; and Dr. Moussa Sie from Africa Rice Centre.
- The SLARI senior managers, centre directors, research scientists and other key stakeholders for their dedication and commitment throughout the planning process and for making excellent arrangements and logistical support.
- All other individuals or groups that assisted in one way or another towards the success of the planning process.

Dr Alfred G.O. Dixon,
SLARI Director General

EXECUTIVE SUMMARY

1.0 Introduction

1.1 Agriculture is the engine of the Sierra Leone's economy and its performance impacts heavily on nearly all other sectors. It is the mainstay of the national economy and provides the basis for the development of the other sectors. By contributing raw materials to the manufacturing/industrial sector, the agricultural sector has a definite role in Sierra Leone's progress towards becoming a food secure and newly industrialized country. For the agricultural sector to improve on its contribution to the overall goal of national economic growth, wealth creation, food security and poverty alleviation, the agricultural sector must be transformed from subsistence to a commercial and profitable business enterprise.

1.2 Agricultural research in Sierra Leone has made significant contributions towards improvement of the agricultural production and rural development in the past. In order to strengthen the role of agricultural research, the Government established the Sierra Leone Agricultural Research Institute (SLARI) through an Act of Parliament as the country's agricultural research and agricultural technology generating body for the benefit of the farming, fishing and forestry sectors. When fully operational, SLARI shall be composed of seven research centres spread throughout the country. The Centres include (i) Njala Agricultural Research Centre; (ii) Rokupr Agricultural Research Centre; (iii) Kabala Horticultural Crops Research Centre; (iv) Teko Livestock Research Centre; (v) Freetown Fisheries Research Centre; (vi) Kenema Forestry and Tree Crops Research Centre; and (vii) Magbosi Land and Water Research Centre.

1.3 Taking cognizance of the developments taking place at the national, regional and international levels, SLARI has developed a new Strategic Plan for the period 2012-2021. The Strategic Plan is tailored to strategically position SLARI to contribute significantly to the development of the agricultural sector. From the regional and global perspective, the Strategic Plan is in line with the Comprehensive African Agricultural Development Programme (CAADP); West and Central African Council for Agricultural Research and Development (CORAF/WECARD); and the Millennium Development Goals (MDGs).

2.0 Strategy for Responding to the Agricultural Sector Development Challenges

2.1 In order to position itself strategically as a key driver in the transformation of the agricultural sector from subsistence to a commercial and profitable business enterprise, SLARI has adopted the Agricultural Product Value Chain (APVC) approach to research for development within the framework of Integrated Agricultural Research for Development (IAR4D). The adoption of this approach to research requires SLARI to shift focus from production of commodities to differentiated agricultural products including increased value-addition to commodities within the rural areas and development and promotion of new products that fit the demands of the target market.

2.2 The adoption of the APVC approach to research for development has been necessitated by the renewed focus on agriculture and agribusiness as priority sectors for spurring economic growth in Africa with calls for development of APVCs that integrate producers and markets to make the agricultural sector more responsive to consumer demands. An important feature of the APVC approach is that it permits analysis of the whole product system leading to the identification and prioritization of opportunities and problems throughout the system which facilitates the development of more realistic research and development intervention projects.

2.3 In addition to this, the APVC approach to research for development implies expansion of the research portfolio to components such as post-harvest processing, marketing and internalization of consumer needs. The approach involves working with all players along the different APVCs from resources, production, processing, marketing to consumption. The APVC approach is characterized by increased vertical coordination of many actors and would be expected to demand for more integration and coordination of all different service providers around priority APVCs.

3.0 Institutional Strategic Direction and Results Areas

3.1 SLARI is mandated to implement the agricultural policies and strategies of the Government of Sierra Leone (GoSL). It is also supposed to spearhead the implementation of CAADP Pillar IV in Sierra Leone. In view of this, the SLARI Vision and Mission statements confirm the Institute's commitment to the national, sub regional and regional policy and priorities aimed at creating economic development through agriculture and meet the Millennium Development Goals of reducing poverty and eradicating hunger.

3.2 The SLARI guiding Vision that requires the Institute and its stakeholders and partners to stretch their future expectations, aspirations and performance is to see “**Improved and sustainable broad-based agricultural growth**”. The Mission statement that expresses the fundamental purpose and business of SLARI is “**To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector through generation and promotion of innovative agricultural technologies and empowerment of stakeholders**”.

3.3 Given the institutional strategic direction, SLARI has identified five result areas that are necessary and sufficient to deliver on the institutional specific objective of **generating and promoting innovative agricultural technologies and empowerment stakeholders**. Attainment of this Specific Objective will contribute significantly to the realization of the overall Institute's General Objective of **enhancing sustainable productivity, commercialization and competitiveness of the agricultural sector**.

3.4 The five results that are designed to position SLARI strategically as the key driver for enhancing productivity, commercialization and competitiveness of the agricultural sector include (i) Appropriate agricultural product value chains technologies and innovations **generated and promoted**; (ii) Appropriate markets and marketing strategies for enhancing agricultural product value chains **developed and promoted**; (iii) Appropriate policy options for enhancing agricultural product value chains **facilitated and advocated**; (iv) Capacity for implementing agricultural product value chains research **strengthened**; and (v) Appropriate mechanisms for managing, sharing and up scaling agricultural knowledge, information and technologies **established and operationalized**.

4.0 Strategic Research Areas of Focus

4.1 In order to deliver on the five institutional level results, SLARI has adopted a programme approach to its research planning and management. In view of this and considering the need to ensure effective delivery of the five institutional level results, research operations in SLARI have been rationalized into seven long-term strategic research programme areas of focus. The research programme areas of focus express a stronger organizational commitment to impact as the strategic orientation and positioning of SLARI as a leader in the generation and promotion of innovative agricultural technologies and stakeholders empowerment aimed at increasing productivity, commercialization and competitiveness of the agricultural sector. The necessary and sufficient research programme areas of focus include Root, Tuber and Grain Legume Crops Programme; Cereal Crops Programme; Horticultural Crops Programme; Livestock Programme; Fisheries Programme, Forestry and Tree Crops Programme; Land, Water and Environment Programme.

4.2 Each of the research programme areas of focus shall be expected to contribute to the attainment of the five institutional level results. To do this in the most effective and efficient manner, each of the research programme areas of focus shall be expected to deliver on five results similar to those at the institutional level but reduced in scale and scope to the specific research programme area of interest for better outcome mapping and impact orientation.

5.0 Research Support Functions

5.1 Successful implementation of the seven strategic research programme areas of focus will depend largely on the availability, effectiveness and efficiency of the institutional research support functions. In order to ensure effective upgrading and promotion of priority Agricultural Product Value Chains under each of the research programme, SLARI will need to strengthen its institutional capacities and competences. The required

capacities and competences will emanate from within SLARI and her collaborating partners and shall focus on the human, financial and physical resources and the institutional arrangements that will be required to adequately address the issues highlighted under the strategic research programme areas of focus.

5.2 In order to contribute significantly to the attainment of the overall institutional purpose, the research support functions in SLARI shall be structured into six key functions. Like the research programme areas of focus, the research support functions shall be expected to contribute to the attainment of the overall institutional purpose. To do this in the most effective and efficient manner, the research support functions areas of intervention shall be expected to deliver on five results similar to those at the institutional level but reduced in scale and scope for better outcome mapping and impact orientation. The key research support functions include (i) Human Resource Development and Management; (ii) Financial Resource Acquisition and Management; (iii) Physical Resource Development and Management; (iv) Procurement and Supplies Services; (v) Information Communication and Documentation; and (vi) Institutional Corporate Governance.

6.0 Framework for Operationalizing the Strategic Plan

6.1 The new SLARI Strategic Plan has outlined clear strategic results and research programme areas of focus as well as research support functions. The new Strategic Plan shall be operationalized through two Operational Plans, each covering a period of five years. Following this new development, therefore, SLARI has developed this first Operational Plan covering the period 2012-2016. The development of the new Operational Plan was done through extensive consultative process involving key stakeholders within and outside SLARI. This was done so as to ensure that the Operational Plan incorporated all constructive views and suggestions from all key stakeholders; builds on the current SLARI achievements and strengths and contributes significantly to the smooth implementation of the new Strategic Plan.

6.2 In order to ensure proper alignment and harmonization with the new Strategic Plan, the Operational Plan has been developed using a nesting approach that links the strategic results from the Institute level through the research programme areas of focus as well as research support functions for better outcome mapping and impact orientation. In this nesting approach, therefore, the preparation of the Operational Plan for operationalizing the Strategic Plan has taken over the planning process from the Product Value Chains level under each research programme area of focus. Each Product Value Chain has then been discussed in terms of its rationale and justification, and challenges and strategic focus. Each challenge and strategic focus section has concluded with the identification of the necessary and sufficient broad intervention strategies required to address the identified challenges. This information has been summarized in appropriate frameworks for each of the research programme area of focus.

6.3 The top priority for this first Operational Plan shall be on reconstruction to resurrect SLARI by putting in place the human resources, infrastructure and equipment and related facilities required for the conduct of research. During this first Operational Plan period, product value chain analysis, prioritization and development of appropriate upgrading and promotion strategies shall also be undertaken leading to the development, promotion and up scaling of agricultural product value chain upgrading technologies and innovations.

6.4 Currently, SLARI has very limited human, financial and physical resources and, therefore, only few product value chains under each research programme area of focus can be developed and promoted. In view of this, SLARI research managers together with the relevant agricultural sector stakeholders will have to make a choice on those product value chains that have the greatest potential contribution to the national economic growth and agricultural sector development. To do this, SLARI will adopt the scoring method to identify and select the most important product value chains for development and promotion under each research programme area of focus. The result of this priority setting process will then form the basis for allocation of resources for research.

7.0 Identification of Product Value Chain Priority Areas of Intervention

7.1 In order to ensure improved productivity, commercialization and competitiveness, all the priority agricultural product value chains shall be expected to follow the same defined process of identifying and

implementing priority areas of intervention. The process shall require all the agricultural product value chain to carry out similar and sequential broad intervention strategies. This approach is expected to ensure that the selected areas of intervention have been identified through a participatory and consultative process involving all key stakeholders/actors who have interest in the implementation and outcome of each agricultural product value chain. The participation of all stakeholders/actors is expected to ensure comprehensive and unbiased analysis of the challenges facing each agricultural product value chain; building of consensus on the areas of intervention that are required to address the identified constraints and their order of priorities; fostering of support and commitment necessary for implementation of the priority areas of intervention; enhancement of the relevance of the expected outputs; and increasing chances of adoption and scaling up of the research results.

7.2 The sequential broad intervention strategies to be implemented by all priority agricultural product value chain shall include the following:

- (i) *Agricultural product value chain analysis, mapping and identification of constraints and opportunities:*** This broad intervention strategy shall involve carrying out detailed analysis and mapping of each product value chain and their respective segments/levels; analysis and ranking of the constraints experienced at each of the segments/levels of the product value chain as well as the available and emerging opportunities.
- (ii) *Development of agricultural product value chain upgrading technologies and innovations:*** Given the identified constraints experienced at each segment/level of each product value chain, this broad intervention strategy shall involve the development of technologies and innovations required to upgrade and promote each agricultural product value chain. This shall involve the identification of the necessary and sufficient areas of intervention that are required to address the identified constraints at each segments/levels of each product value chain and their order of priorities; development and approval of appropriate product value chain upgrading projects/action plans designed to address and overcome the identified constraints and take advantage of the available and emerging opportunities; commitment of resources and implementation of the upgrading projects/action plans; and establishment and operationalization of continuous project monitoring and evaluation system capable of tracking the implementation of the projects/action plans.
- (iii) *Promotion and up scaling of the agricultural product value chain upgrading technologies and innovations:*** Given the agricultural product value chain upgrading and promotion technologies and innovations developed in the broad intervention strategy outlined above, this broad intervention strategy shall deal with the development and implementation of appropriate mechanisms for promoting uptake, utilization and up scaling of the developed product value chain upgrading and promotion technologies and innovations as well as effective management of knowledge and information.

8.0 Framework for Operationalizing the Operational Plan

8.1 The Operational Plan shall, in turn, be operationalized and financed through Rolling Annual Work Plans in which the necessary and sufficient activities and their respective milestones required to deliver each yearly target shall be specified. The rolling annual work plans will be linked to the annual Performance Contract (PC) targets. The adoption of the rolling annual work plans shall be expected to facilitate the review of the research agenda in close consultation with the relevant key stakeholders and their adjustment in the context of emerging priorities and funding opportunities.

8.2 Monitoring and evaluation (M&E) is an integral part of performance management. The purpose of M&E is to evaluate the progress of planned activities with a view to ensuring that their implementation is proceeding according to plan and the set targets are being met. In order to institutionalize the monitoring and evaluation process, SLARI shall develop and operationalize a suitable monitoring and evaluation system/mechanisms capable of tracking the implementation of the approved Product Value Chain based projects and activities. The monitoring and evaluation system shall include the use of result frameworks, work plans, field visits, quarterly and annual reports, mid-term internal evaluation, biannual conferences and end of term external evaluation.

1.0 BACKGROUND

1.1 Introduction

Agriculture is the mainstay of Sierra Leone's economy, contributing about 46% of the Gross Domestic Product (GDP) and providing employment to about 75% of the population with women as the predominant labour force. The sector sustains about two-thirds of the population who are mainly subsistence farmers. Crop production the main sub-sector, contributes about three-quarters of agricultural value added products, with rice holding the dominant position. Agriculture also accounts for over 90% of the domestic energy for heating and cooking through the supply of fuel wood.

Sierra Leone has had a long history of agricultural research, spanning almost 100 years. Agronomic research was done at the Njala Experiment Station, Southern Province, which was opened in 1910. The Rice Research Station which was established at Rokupr, Northern Province in 1934 was devoted to research on mangrove and swamp rice and in 1953 was transformed into the West African Rice Research Institute. A veterinary station was set up at Teko, Makeni in 1942, and a livestock station at Musaia, Kabala in 1943, both in Northern Province. In 1953, the oil palm research programme at Njala became the West African Institute for Oil Palm Research. From 1953, forestry research was carried out at the Forestry Research Station at Bambawo in Eastern Province, and high yielding Amazonian cocoa planting materials were propagated and distributed from Kpuwabu. From 1953, fisheries research was conducted at the West African Fisheries Research Institute at Kissy near Freetown.

In 1985, the National Agricultural Research Coordinating Council (NARCC) was established to coordinate research and harmonize research activities. The Mission of NARCC was to support the promotion of pro-poor sustainable growth for food security and job creation as part of Sierra Leone's Poverty Reduction Strategy Paper. Its mandate was confined to annual crops. The two constituent institutes of NARCC were the Rice Research Institute dealing with rice, millet, sorghum, banana, plantain and vegetables, and the Institute of Agricultural Research dealing with cassava, sweet potato, yam, maize, cowpea, groundnut, soybean and sesame. The earlier research institutes became defunct. In addition to the research institutes, Njala University and the University of Sierra Leone also carry out agricultural research. The devastation of research infrastructure during the civil war and the departure of well-trained scientists during this period brought agricultural research to a halt. Since 2001, many of the scientists have returned and there is goodwill from the Government and partners to resuscitate the research establishment.

After a period of coordination of agricultural research under NARCC, the Government of Sierra Leone (GoSL) established the Sierra Leone Agricultural Research Institute (SLARI) through the SLARI Act of Parliament of 2007. SLARI is now the agricultural research and agricultural technology generating body for the benefit of the farming, fishing and forestry sectors and to provide for other related matters. When fully operational, SLARI will be expected to have the following seven research centres (i) Njala Agricultural Research Centre (NARC); (ii) Rokupr Agricultural Research Centre (RARC); (iii) Kabala Horticultural Crops Research Centre (KHCR); (iv) Teko Livestock Research Centre (TLRC); (v) Freetown Fisheries Research Centre (FFRC); (vi) Kenema Forestry and Tree Crops Research Centre (KFTCRC); and (vii) Magbosi Land and Water Research Centre (MLWRC).

1.1.1 Mandate and Core Functions of SLARI

SLARI has a major role to play in addressing the many challenges facing the agriculture, fishery and forestry sub sectors in Sierra Leone. As the national agricultural research institution, it is expected to conduct research to obtain knowledge, information and technologies needed for sustainable development of the country's agricultural sector. The core functions of SLARI are defined in the SLARI Act of 2007. These provide SLARI and its research Centres with a clear framework for delivering on its mandate. The core functions include:

- (a) Provide information that will assist the Government and other stakeholders in the development of agricultural policies for poverty alleviation, food security and improved livelihoods of the citizens of Sierra Leone.

- (b) Formulate agricultural research policies and programmes taking into account the Vision, Mission, Goals and objectives of the agricultural sector, in line with Government policy, and views of stakeholders, especially those which relate to sustainable food security, and conservation of renewable resources of Sierra Leone.
- (c) Conduct food and cash crops production, livestock production and health, fish production, land and water management, forestry production and conservation, food and nutrition, technology and socio-economics of post-harvest activities, emerging technologies in agricultural science biosafety and environmental conservation.
- (d) Establishment of a strong working relationship with extension agents in the public and the private sector in the transfer of technology.
- (e) Maintain a register of research scientists, research projects and research results.
- (f) Facilitate and provide the relevant training and manpower development to serve the agricultural needs of the country.
- (g) Produce annual reports highlighting management, scientific training and financial aspects of the Institute.
- (h) Establish strong links with national, regional and international agricultural research institutions or agencies involved in science and technology development and transfer.
- (i) Representing the country in regional and international fora.
- (j) Enhance public awareness on importance of scientific research to agricultural and economic development.
- (k) Disseminate knowledge on improved technologies to stakeholders.
- (l) Monitor and evaluate adoption and impact of agricultural research on agricultural productivity.
- (m) Process and forward to the Government annual estimates for funding.
- (n) Mobilize human, financial and capital resources from donors, the private sector and from within the Institute for the benefit of SLARI.

1.1.2 SLARI Strategic Plan

SLARI formulated its first Strategic Plan covering the period 2008-2017 in 2008. Although the period for this Strategic Plan is not yet over, major changes have occurred in the operating and policy environments nationally, regionally and globally as well as advances in science and technology that have necessitated the revision of the first Strategic Plan so as to ensure proper alignment. One of the key changes is the development and launch of the National Sustainable Agriculture Development Plan/Comprehensive Africa Agriculture Development Programme (NSADP/CAADP) which provides the broad framework for putting the objectives of the Government's Agenda for Change outlined in the Second Poverty Reduction Strategy Paper (PRSP-II) into action. The Vision for NSADP/CAADP is to commercialize agriculture, especially through linking of farmers to markets besides emphasizing the critical role agricultural research and extension plays in the development of the agricultural sector.

Taking cognizance of the developments taking place at the national, regional and international levels, SLARI has, therefore, developed a new Strategic Plan covering the period 2012-2021. The new Strategic Plan was developed within the context of the on-going national institutional and policy reforms, taking into consideration the country's new political system and structure of Government as well as the available and emerging opportunities. The Strategic Plan is tailored to strategically position SLARI to contribute significantly to the development of the agricultural sector. The Strategic Plan has also taken into account the achievements and lessons learnt during the last few years of the previous Strategic Plan as well as the challenges and constraints experienced during implementation of the other national and sector guiding policies and plans of the Government.

The development of the new Strategic Plan was done through extensive consultative process involving key stakeholders within and outside SLARI. This was done so as to ensure that the Strategic Plan incorporates all constructive views and suggestions from all key stakeholders; builds on the current SLARI achievements and strengths and contributes significantly to the development of the agricultural sector and the country while ensuring proper alignment at the national and regional levels for better outcome mapping and impact orientation.

1.2 Critical Strategic Issues

Following critical analysis of the SLARI operating environment during the formulation of the new SLARI Strategic Plan, broad Critical Strategic Issues that need to be addressed in order to solve the major challenges facing the Institute's mandate area and take advantage of the available and emerging opportunities and prospects were identified. Addressing these broad Critical Strategic Issues is also expected to enable the Institute to improve its efficiency and effectiveness in the generation and promotion of innovative agricultural technologies and empowerment of stakeholders. This shall, in turn, enable the Institute to position itself strategically to contribute significantly to the development of the agricultural sector and the overall national economic growth leading to the improvement of livelihoods, income generation and food security. The identified broad Critical Strategic Issues include the following:

- (i) **Strengthening of research planning, implementation and management:** Development and operationalization of appropriate mechanisms for streamlining research planning, implementation and management for better outcome mapping and impact orientation.
- (ii) **Improvement of access and utilization of modern technologies:** Development of appropriate mechanisms for catalyzing the access and utilization of modern technologies such as tissue-culture, biotechnology, participatory plant breeding and modern communication and information technologies.
- (iii) **Development of institutional Intellectual Property Rights policy:** Development and operationalization of appropriate institutional Intellectual Property Right policy.
- (iv) **Improvement of national research coordination:** Development and operationalization of appropriate mechanisms for effective and efficient national research coordination.
- (v) **Supporting formulation of policy framework for modernization and commercialisation:** Continuous lobbying and advocacy for formulation of appropriate policy frameworks supporting increased investment in agricultural modernization offers opportunity for investment in research.
- (vi) **Development of strategic links with development partners:** Development and operationalization of effective and efficient strategic links with development partners for assistance in funding research programmes and development of infrastructure and research facilities.
- (vii) **Establishment of partnerships and collaboration:** Establishment and operationalization of effective and beneficial partnerships and collaboration with other relevant research institutes and organizations
- (viii) **Improvement of the institutional financial sustainability:** Increasing the sources of sustainable funding and finance mechanisms coupled with an efficient management of funds within the framework of Agricultural Product Value Chain in SLARI and the wider National Agricultural Research System (NARS).
- (ix) **Establishment of effective National Agricultural Research System:** Spearheading the process of identifying suitable framework and arrangements that will facilitate the establishment and functioning of effective National Agricultural Research System.
- (x) **Planning, development and management of human resources:** Establishment and operationalization of appropriate institutional arrangement and mechanisms for effective and efficient planning, staffing, development and management of human resources so as to attract and retain qualified staff.
- (xi) **Development and management of physical resources:** Establishment and operationalization of appropriate institutional arrangement and mechanisms for effective and efficient development and management of physical resources and research facilities.
- (xii) **Performance orientation:** Development and operationalization of appropriate mechanisms for transforming the culture and attitude within SLARI to be more performance oriented.
- (xiii) **Conservation and sustainable use of biodiversity:** Creation of public awareness and positive attitude on the need to conserve and sustainable use of biodiversity.
- (xiv) **Market-responsive and client-orientation:** Development and implementation of market-responsive and client-oriented agricultural research programmes and projects that generate and disseminate demand-driven, problem-solving, profitable and environmentally sound technologies and innovations on a sustainable basis.
- (xv) **Improvement of the linkage between stakeholders:** Improvement of the linkage between research, extension, farmers/stakeholders in the identification of challenges and constraints facing the agricultural sector/agricultural product value chains, finding the resources to generate appropriate technical solutions and making stakeholders aware of the solutions.

- (xvi) ***Establishment of beneficial linkages, partnerships and collaboration:*** Promotion of linkages, partnerships and collaboration among various categories of service providers in the conduct and financing of agricultural research.
- (xvii) ***Strengthening organizational marketing:*** Development and operationalization of aggressive institutional marketing strategies to advocate for SLARI's role and contribution to the current and future development of the agricultural sector and national economic growth.
- (xviii) ***Realignment of the SLARI mandate and core functions:*** Review and realignment of the SLARI mandate, core functions, structure, staff competence and culture aimed at improving institutional effectiveness and efficiency so as to play a key role in agricultural research nationally, regionally and globally.
- (xix) ***Formulation of enabling policies and legal frameworks:*** Continuous lobbying and advocacy for formulation and implementation of appropriate policies and legal frameworks to create an enabling environment aimed at improving the conduct and financing of agricultural research.
- (xx) ***Promotion of uptake and utilization of research outputs:*** Development of appropriate mechanisms for catalyzing uptake and utilization of knowledge, information and innovations.
- (xxi) ***Improvement on the use of information and communication technology:*** Development and operationalization of appropriate strategies to promote the use of information and communication technology.
- (xxii) ***Mainstreaming of cross-cutting issues:*** Development of strategies to respond to different challenges brought about by cross-cutting issues such as ICT, HIV/AIDS, gender and drug and substance abuse in all SLARI programmes and projects.

1.2.1 Research Guiding Principles for Sustainable Growth in the Agricultural Sector

Being the sole Government agricultural research and agricultural technology generating body for the benefits of the farming, fishing and forestry sectors, SLARI is implementing the Government agricultural policies and supporting the implementation of CAADP Pillar IV. The Institute expects to carry out this mandate through research programme areas of focus to be coordinated and implemented by its research Centres spread throughout the country. The Institute expects to do this in accordance with the following Framework for Africa's Agricultural Productivity (FAAP) guiding principles for growth in agricultural production:

- Empowerment of end-users to ensure their meaningful participation in setting priorities and work programmes for research, extension and training to ensure their relevance.
- Planned subsidiarity to give responsibility and control over resources for agricultural research, extension and training activities at the lowest appropriate level of aggregation (local, national and regional).
- Pluralism in the delivery of agricultural research, extension and training services so that the diverse skills and strengths of a broad range of service providers such as universities, non-governmental organizations (NGOs), public and the private sector can contribute to publicly supported agricultural productivity operations.
- Evidence-based approaches with emphasis on data analysis, including economic factors and market orientation in policy development, priority setting and strategic planning for agricultural research, extension and training.
- Integration of agricultural research with extension services, the private sector, training, capacity building, and education programmes to respond in a holistic manner to the needs and opportunities for innovation in the sector.
- Explicit incorporation of sustainability criteria in evaluation of public investments in agricultural productivity and innovation programmes (fiscal, economic, social and environmental).
- Systematic utilization of improved management information systems, in particular for planning, financial management, reporting, and monitoring and evaluation.
- Introduction of cost-sharing with end-users, according to their capacity to pay, to increase their stake in the efficiency of service provision and to improve financial sustainability.
- Integration of gender considerations at all levels, including farmers and farmers' organizations, the private sector, public institutions, researchers and extension staff.

1.3 Strategy for Responding to the Agricultural Sector Development Challenges

Agriculture has remained as the engine of the national economy whose performance impacts heavily on nearly all other sectors. It is the mainstay of the national economy and provides the basis for the development of the other sectors. By contributing raw materials to the manufacturing/industrial sector, the agricultural sector has a definite role in Sierra Leone's progress towards becoming a food secure and newly industrialized country. For the agricultural sector to improve on its contribution to the overall goal of national economic growth, wealth creation, food security and poverty alleviation, the agricultural sector must be transformed from subsistence to a commercial and profitable business enterprise.

In order to position itself strategically as a key driver in the transformation of the agricultural sector from subsistence to a commercial and profitable business enterprise, SLARI has adopted the Agricultural Product Value Chain (APVC) approach to research for development within the framework of Integrated Agricultural Research for Development (IAR4D) and the Agricultural Innovation Systems (AIS) approaches. The adoption of these approaches to research requires SLARI to shift focus from commodities to differentiated agricultural products including increased value-addition to commodities within the rural areas and development and promotion of new products that fit the demands of the target market.

The adoption of the APVC approach to research for development has been necessitated by the renewed focus on agriculture and agribusiness as priority sectors for spurring economic growth in Africa with calls for development of APVCs that integrate producers and markets to make the agricultural sector more responsive to consumer demands. An important feature of the APVC approach is that it permits analysis of the whole product system leading to the identification and prioritization of opportunities and problems throughout the system which facilitates the development of more realistic research and development intervention projects. The APVC approach achieves this by bringing many concepts, instruments and techniques together in one process and presenting them as an integrated whole.

In addition to this, the APVC approach to research for development implies expansion of the research portfolio to components such as post-harvest processing, marketing and internalization of consumer needs. The approach involves working with all players along the different APVCs from resources, production, processing, marketing to consumption. The APVC approach is characterized by increased vertical coordination of many actors and would be expected to demand for more integration and coordination of all different service providers around priority APVCs. The APVC approach gives new insights into globalization and has implications on improved agricultural productivity and poverty reduction. Building on market opportunities, the approach targets the growth potential directly and provides a framework for analyzing institutional, technical and social constraints with a view to deriving strategies for commercialization and to foster pro-poor growth.

In an agricultural value chain, agricultural research and development institutions contribute to knowledge, technologies, practices and services required along the value chain to produce and deliver a product or service. Community associations, clients' organizations and trade associations have a role in improving coordination among actors in a value chain and in communicating the needs of the industry to Government. The associations and organizations can help organize production, negotiate contracts, improve market information systems, promote products, coordinate research and enforce quality standards and pool risks. A major opportunity is that the poor can participate in these arrangements and capture the benefits from new markets.

1.4 Institutional Vision, Mission and Guiding Core Values

SLARI is mandated to implement the agricultural research policies and strategies of the Government of Sierra Leone (GoSL). It is also supposed to spearhead the implementation of CAADP Pillar IV in Sierra Leone. In view of this, the SLARI Vision and Mission statements confirms the Institute's commitment to the national, sub regional and regional policy and priorities aimed at creating economic development through agriculture so as to meet the Millennium Development Goals (MDGs) of reducing poverty and eradicating hunger.

(a) The SLARI Guiding Vision

The SLARI guiding Vision that requires the Institute and its stakeholders and partners to stretch their future expectations, aspirations and performance is to see “**Improved and sustainable broad-based agricultural growth**”.

(b) The SLARI Mission Statement

The SLARI Mission statement that expresses the fundamental purpose and business of SLARI is “**To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector through generation and promotion of innovative agricultural technologies and empowerment of stakeholders.**”

(c) Guiding Core Values

Decisions and actions in SLARI are consistently based on a set of clear principles outlined here as the Institutional Guiding Core Values. The Institutional Core Values guide actions at all levels when choices are not clear or when there is a gap between intention and reality. The institutional Guiding Core Values that SLARI and its stakeholders and partners hold in common and endeavour to put into practice while performing their functional obligations include the following:

- (i) **Scientific excellence, innovativeness and ethics:** SLARI believes that the stakes in Agricultural Product Value Chain approach to research are extremely high in terms of the investments that are necessary for meaningful outcomes and is, therefore, committed to scientific excellence, innovativeness and adherent to ethics and standards so as to ensure that all research work and recommendations made to stakeholders emanate from sound evidence based on rigorous scientific findings of the highest quality possible.
- (ii) **Impact, performance and service orientation:** SLARI will remain focused on integrated agricultural research for development by ensuring that all research activities undertaken or promoted are demand-driven. SLARI will achieve this through building and maintaining a culture that is based on outcome mapping of research for better impact orientation and effective knowledge and information management as well as quality service delivery as the hallmark of the non-research part of the institution so as to meet and exceed clients’ expectation.
- (iii) **Partnerships for collaborative advantage and synergies:** SLARI will pursue productive and beneficial partnerships and strategic alliances with clearly defined roles, responsibilities, governance and supportive mechanisms so as to ensure effective collaboration and synergies that have a direct bearing on finding innovative solutions to major agricultural sector problems. In this regard, SLARI is committed to working with broad stakeholder categories and partners.
- (iv) **Respect for staff, clients, stakeholders and partners diversity:** SLARI recognizes that staff and stakeholders are critical resource in achieving its Mission and is, therefore, committed to respecting staff and stakeholder diversity with emphasis on mutual respect for individuals and assurance on equitable recognition of their contribution. In this regard, SLARI is committed to ensuring effective integration and teamwork across levels, disciplines, gender, timeframes and space as well as timely and quick response to all staff and stakeholders’ concerns.
- (v) **Integrity, transparency and accountability and cost-effectiveness:** SLARI is committed to upholding virtues of integrity through honesty, fairness and professionalism in all its operations while remaining committed to effective and efficient utilization of all resources entrusted to the Institute in the most transparent, accountable and cost-effective manner.

1.5 Objective Statements

(a) General Objective

The SLARI General Objective is “**To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector**”. This General Objective indicates that SLARI is committed to making significant contribution to the CAADP goal of agricultural growth. The General Objective is also coherent with sub regional and regional strategies and is broad-based to ensure that all priority areas are included and that no potential stakeholder groups shall be excluded.

(b) Specific Objective

The Specific Objective which SLARI is expected to achieve is “**Generation and promotion of innovative agricultural technologies and empowerment of stakeholders**” This Specific Objective is derived from the business part of its Mission statement and is coherent with the CAADP and the Strategic Plans/directions of Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles/West and Central African Council for Agricultural Research and Development (CORAF/WECARD) and the Forum for Agricultural Research in Africa (FARA). The Specific Objective has been developed in a manner that facilitates cascading to the lower levels but reduced in scale and scope at each level so as to ensure better outcome mapping and impact orientation as shown in Figure 1.1.

1.6 Institutional Level Results

Given the institutional strategic focus, SLARI has identified five result areas that are necessary and sufficient to deliver on the institutional Specific Objective. Attainment of this Specific Objective will contribute significantly to the realization of the overall Institute’s General Objective. The results are designed to position SLARI strategically as the key driver for enhancing productivity, commercialization and competitiveness of the agricultural sector. The five necessary and sufficient results are as shown in Table 1.1. Table 1.2 shows the SLARI Institutional level result framework.

Table 1.1: SLARI institutional level results

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

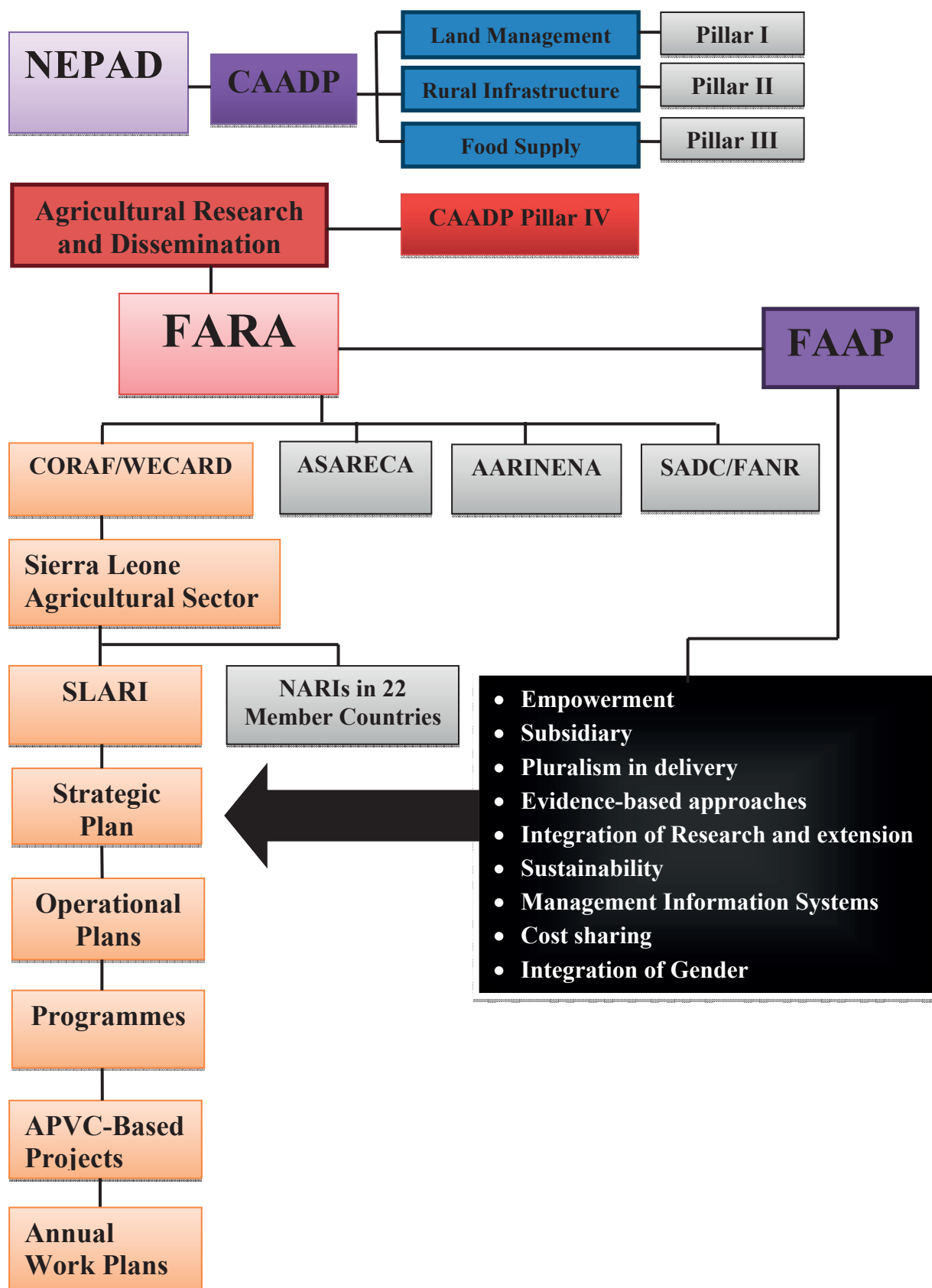


Figure 1.1: Relationship between CAADP, FARA, FAAP, CORAF/WECARD and SLARI planning process and plans

Table 1.2: SLARI institutional level result framework

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
General Objective To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector	1.1 Percentage research contribution to the sustainable broad based growth in the agricultural sector.	1.1 National impact assessment reports. 1.2 Economic survey reports.	1.1 Government policies will continue to be favourable to the development of the agricultural sector
Specific Objective Generation and promotion of innovative agricultural technologies and empowerment stakeholders	1.1 Percentage increase in agricultural productivity attributed to adoption of research knowledge, information and technologies. 1.2 Percentage increase in agricultural commercialization attributed to adoption of research knowledge, information and technologies. 1.3 Percentage increase in agricultural competitiveness attributed to adoption of research knowledge, information and technologies	1.1 Government reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports..	1.1 Enabling policy environment for increasing agricultural productivity, commercialization and competitiveness will prevail. 1.2 Political stability will continue to prevail in the country
Institutional Level Results			
1.0 Appropriate agricultural product value chains technologies and innovations generated and promoted.	1.1 Number of technologies and innovations developed and promoted along different product value chains. 1.2 Number of the developed and promoted technologies and innovations adopted by clients along different product value chains.	1.1 Government and sector reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports	1.1 Agricultural sector will continue to be a major driver of the national economy 1.2 The Government will continue to support agricultural research 1.3 Favourable weather conditions will prevail

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
2.0 Appropriate markets and marketing strategies for enhancing agricultural product value chains developed and promoted.	<p>2.1 Number of marketing strategies identified and utilized for different product value chains.</p> <p>2.2 Number of markets identified and utilized for different product value chains.</p>	- Do -	- Do -
3.0 Appropriate policy options for enhancing agricultural product value chains facilitated and advocated.	<p>3.1 Number of policies and policy issues identified and advocated</p> <p>3.2 Number of researchable policy issues addressed</p> <p>3.3 Percentage increase in the information gathered for facilitating policy change</p>	- Do -	- Do -
4.0 Capacity for implementing agricultural product value chains research strengthened.	<p>4.1 Percentage increase in human resource with the right mix, skills, attitude and knowledge.</p> <p>4.2 Percentage increase in financial sustainability and health.</p> <p>4.3 Percentage increase in required infrastructure and facilities</p>	- Do -	- Do -
5.0 Appropriate mechanisms for managing, sharing and up scaling agricultural knowledge, information and technologies established and operationalized.	<p>5.1 Number of stakeholders and their communication needs identified</p> <p>5.2 Number of communication products developed and produced.</p> <p>5.3 Number of communication channels developed and utilized</p> <p>5.4 Percentage increase in the demand for the programme information, products and services</p>	- Do -	- Do -

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
Research Programme Area of Focus			
1.0	Root, Tuber and Grain Legume crops Programme		
2.0	Cereal Crops Programme.		
3.0	Horticultural Crops Programme.		
4.0	Livestock Programme.		
5.0	Fisheries Programme.		
6.0	Forestry and Tree Crops Programme.		
7.0	Land, Water and Environment Programme.		
Each of the programme area of focus shall be expected to contribute to the attainment of the five Institutional level results			
Research Support Functions			
1.0	Human Resource Development and Management.		
2.0	Financial Resource Acquisition and Management.		
3.0	Physical Resource Development and Management.		
4.0	Procurement and Supplies Services.		
5.0	Information Communication and Documentation.		
6.0	Institutional Corporate Governance.		
Each of the research support function shall be expected to contribute to the attainment of the five Institutional level results			

1.7 Strategic Research Areas of Focus

SLARI has recognized the limitations of organizing research according to disciplines that tend to result into programmes that are too academic. Following this realization, SLARI has adopted a programme approach to its research planning and management. In view of this and considering the need to ensure effective delivery of the five institutional level results, research operations in SLARI have been rationalized into seven long-term strategic research programme areas of focus. Administratively, the research programme areas of focus corresponds to the seven research Centres that constitute SLARI. The research programme areas of focus express a stronger organizational commitment to impact as the strategic orientation and positioning of SLARI as a leader in the generation and promotion of innovative agricultural technologies and stakeholders empowerment aimed at increasing productivity, commercialization and competitiveness of the agricultural sector.

Although the research programme areas of focus shall be carried out at different research Centres, they are considered as integrally linked rather than as isolated areas of research. In operational terms, there will be overlaps and this is desired since Integrated Agricultural Research for Development seeks to deal with issues in a holistic manner. In other words, product value chains in crops and livestock will not be tackled without also considering the institutional and natural resource management aspects and their interactions. There is, therefore, no order of priority in the research programme areas of focus.

Each of the research programme areas of focus shall be expected to contribute to the attainment of the five institutional level results. To do this in the most effective and efficient manner, each of the research programme areas of focus shall be expected to deliver on five results similar to those at the institutional level but reduced in scale and scope to the specific research programme area of interest for better outcome mapping and impact orientation. The necessary and sufficient research programme areas of focus required to deliver the institutional level results leading to increasing productivity, commercialization and competitiveness of the agricultural sector and their respective coordinating and implementing research Centres are as shown in Table 1.3.

Table 1.3: SLARI research programme areas of focus and their respective coordinating and implementing research centres

Research Programme Area of Focus	Coordinating and Implementing Research Centre
1.0 Root, Tuber and Grain Legume Crops Programme	Njala Agricultural Research Centre (NARC)
2.0 Cereal Crops Programme	Rokupr Agricultural Research Centre (RARC)
3.0 Horticultural Crops Programme	Kabala Horticultural Crops Research Centre (KHCRC)
4.0 Livestock Programme	Teko Livestock Research Centre (TLRC)
5.0 Fisheries Programme	Freetown Fisheries Research Centre (FFRC)
6.0 Forestry and Tree Crops Programme	Kenema Forestry and Tree Crops Research Centre (KFTCRC)
7.0 Land, Water and Environment Programme	Magbosi Land and Water Research Centre (MLWRC)

1.8 Research Support Functions

The successful implementation of the seven programme areas of research will depend largely on the establishment and operationalization of effective and efficient research support functions. In view of this and considering the need to ensure effective delivery of the five institutional level results, the research support functions at the SLARI Headquarters shall be structured into six key functions referred to as management Divisions/Sections/Units as shown in Figure 1.2. The administrative/management Divisions/Sections/Units shall be replicated at the Centre level guided by each centre's stage of development, the size of the Centre, availability of resources and identified Centre needs. Each of the intervention strategies to be carried out under each management Divisions/Sections/Units shall be expected to contribute to the attainment of the five research support functions

strategic results. The six management Divisions/Sections/Units include the following:

- (i) Human Resource Development and Management.
- (ii) Financial Resource Acquisition and Management.
- (iii) Administration and Physical Resource Development and Management.
- (iv) Procurement and Supplies Services.
- (v) Information Communication and Documentation.
- (vi) Institutional Corporate Governance.

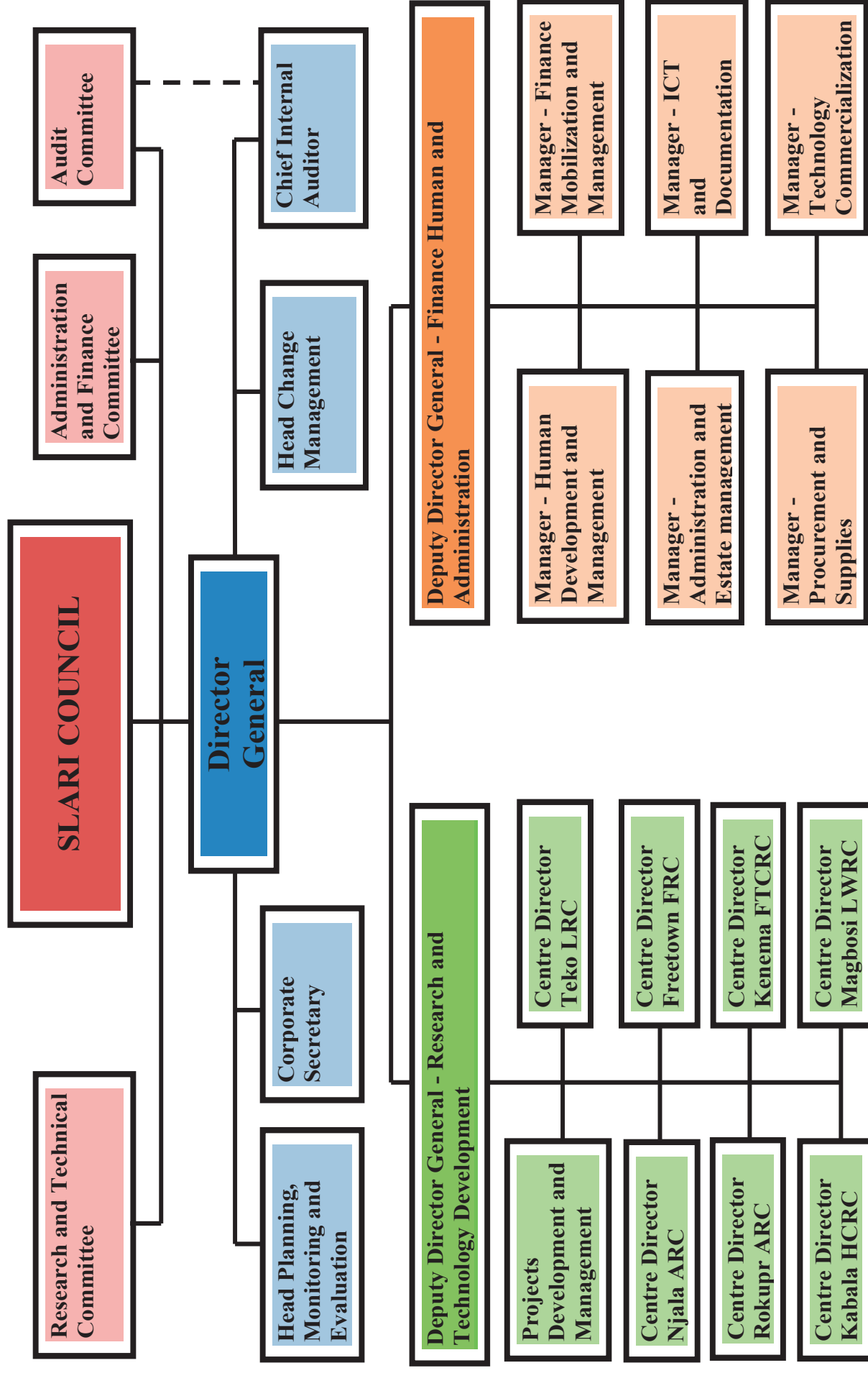


Figure 1.2: SLARI organizational governance and management structure

2.0 PREPARATION OF SLARI OPERATIONAL PLAN

2.1 The Need for Operational Plan

SLARI formulated its first Strategic Plan covering the period 2008-2017 in 2008. The Strategic Plan was to be operationalized through two Operational plans. The first Operational Plan covering the period 2008-2012 was developed in 2008. Although the period for the first Strategic Plan is not yet over, major changes have occurred in the operating and policy environments nationally, regionally and globally as well as advances in science and technology that have necessitated the revision of the first Strategic Plan so as to ensure proper alignment. Taking cognizance of these developments taking place at the national, regional and international levels, SLARI has developed a new Strategic Plan for the period 2012-2021.

2.1.1 Framework for Operationalizing the Strategic Plan

The new SLARI Strategic Plan has outlined clear strategic results and research programme areas of focus as well as research support functions. Like the first Strategic Plan, the new Strategic Plan shall also be operationalized through two Operational Plans, each covering a period of five years. Following this new development, therefore, SLARI has developed this first Operational Plan covering the period 2012-2016. The development of the new Operational Plan was done through extensive consultative process involving key stakeholders within and outside SLARI. This was done so as to ensure that the Operational Plan incorporated all constructive views and suggestions from all key stakeholders; builds on the current SLARI achievements and strengths and contributes significantly to the smooth implementation of the new Strategic Plan.

In order to ensure proper alignment and harmonization with the new Strategic Plan, the Operational Plan has been developed using a nesting approach that links the strategic results from the Institute level through the research programme areas of focus as well as research support functions for better outcome mapping and impact orientation. In this nesting approach, therefore, the preparation of the Operational Plan for operationalizing the Strategic Plan has taken over the planning process from the Product Value Chains level under each research programme area of focus. Each Product Value Chain has then been discussed in terms of its rationale and justification, and challenges and strategic focus. Each challenge and strategic focus section has concluded with the identification of the necessary and sufficient broad intervention strategies required to address the identified challenges. This information has been summarized in appropriate frameworks for each of the research programme area of focus.

The top priority for this first Operational Plan shall be on reconstruction to resurrect SLARI by putting in place the human resources, infrastructure and equipment and related facilities required for the conduct of research. During this first Operational Plan period, product value chain analysis, prioritization and development of appropriate upgrading and promotion strategies shall also be undertaken leading to the development, promotion and up scaling of agricultural product value chain upgrading technologies and innovations.

2.2 Selection and Prioritization of Agricultural Product Value Chains

In any research organization, priority setting is a pre-requisite to the formulation of sound proposals. The setting of the research priorities is guided by the national development goals, the Institute's strategy and the resources available to undertake activities within a specified timeframe. The priority setting in agricultural research is, therefore, the process of choosing the best options among a set of potential research alternatives. It aims at selecting the best portfolio of research activities for a given research system, institution or programme. The primary objective of priority setting is to make the most effective use of the resources available for research. The rigorous priority setting increases the credibility of the final outcome to stakeholders and to the outside world. This, in turn, improves the position of the institution in negotiations with the treasury, development partners and research partners.

Many methodologies have been developed and applied in priority setting with varying degrees of success. However, no priority setting method can pretend to be a substitute for experience and knowledge of researchers and other stakeholders. This notwithstanding, the use of structured method is indispensable in the systematic use of the knowledge and experience.

The Scoring method has been adopted by many research organizations in setting research priorities because it incorporates multiple criteria; is simple and easy to use; encourages participation from a wide range of stakeholders; can be implemented in a short time; does not require large amounts of background data; can use both qualitative and quantitative data; accommodates multiple goals and objectives and; allows adjustments as the environment changes.

Currently, SLARI has very limited human, financial and physical resources and, therefore, only few product value chains under each research programme area of focus can be developed and promoted. In view of this, SLARI research managers together with the relevant agricultural sector stakeholders will have to make a choice on those product value chains that have the greatest potential contribution to the national economic growth and agricultural sector development. To do this, SLARI will adopt the Scoring method to identify and select the most important product value chains for development and promotion under each research programme area of focus. The result of this priority setting process will then form the basis for allocation of resources for research. The use of this formal priority setting process in the selection of product value chains for development and promotion shall be expected to:

- Bring the key actors that have a stake in the decision together, thereby reducing the chance of personal bias.
- Build decisions on actual evidence rather than on subjective assumptions.
- Ensure clear and concrete thinking on what really matters.
- Build consensus on objectives as differences of opinions are clarified.
- Provide clarity and transparency to planners and other stakeholders.
- Improve the quality of thinking and of the decisions made.

2.2.1 Criteria for Prioritizing APVCs and Ranking of Chain Segments and Constraints

The use of the Scoring method to prioritize agricultural product value chains for development and promotion requires the development of suitable criteria, sub criteria and their respective weights. After extensive stakeholder consultations, the criteria, sub criteria and their respective weights shown in Table 2.1 have been agreed upon and used by many research organizations in prioritizing potential agricultural product value chains. These criteria and sub criteria have been reviewed and analyzed and found to contain all the national economic growth and the agricultural sector development requirements contained in the Government's guiding policies and plans/strategies. In view of this and considering the limited capacity within the Institute, SLARI will adopt these criteria and sub criteria for use in setting priorities of the agricultural product value chains for development and promotion under each research programme area of focus. However, further review, discussion and agreement on the criteria and sub criteria weighting may need to be undertaken by the stakeholders and adjusted where necessary before using them for scoring the agricultural product value chains.

Table 2.1: Criteria for prioritizing programme agricultural product value chains

Criteria	Weighting	Sub criteria	Weighting
1.0 Competitiveness potential	25	1.1 Availability of high market demand, opportunities for growth and existence of industry leadership	10
2.0 Impact potential	20	1.2 Potential for increased commercialization, value addition and product diversification	8
		1.3 Potential for competitive advantage in domestic, regional and global markets	7
		2.1 Increased employment creation and income generation	9
		2.2 Potential for effective and sustainable stakeholder and medium to small enterprises participation and growth	7
3.0 Contribution to agricultural GDP	15	2.3 Potential for effective and sustainable public-private sectors participation and partnership	4
		3.1 Potential for increased production and productivity	6
		3.2 Potential for increasing availability and access to quality and affordable food	5
		3.3 Potential for enhancing livelihoods and pro-poor economic growth	4
4.0 Opportunities for intervention	15	4.1 Expressed stakeholders' demand and their commitment and willingness to collaborate	7
		4.2 Existence of challenges and availability of capacity to address them	4
		4.3 Relevance and contribution to national and regional development objectives	4
5.0 Contribution to quality of environment	15	5.1 Potential for enhancing sustainable utilization of natural resources	6
		5.2 Potential for improving conservation and maintenance of biodiversity	5
		5.3 Promoting cleaner production and mitigation of climate change and variability	4
6.0 Social welfare	10	6.1 Potential for improving nutrition and health particularly among the poor and marginalized	4
		6.2 Potential for encouraging gender equity and equitable distribution of benefits	3
		6.3 Capacity to mainstream major cross-cutting issues	3
Total	100		100

2.2.2 Criteria for Ranking Product Value Chain Segments and Constraints

The selected priority agricultural product value chains shall be analyzed and mapped into their respective segments/levels. The constraints experienced under each segment/level of the priority APVC shall then be analyzed and ranked by the key stakeholders using the ranking criteria and sub criteria shown in Table 2.2. The ranking criteria and sub criteria have been developed based on the criteria and sub criteria used to prioritize the APVCs so as to ensure continuity of the selection and decision making process. Different segments/levels and constraints of each product value chain shall be expected to contribute differently to each of the main criteria. This shall be reflected by the total score of the sub criteria under each main criteria.

Table 2.2: Criteria for ranking agricultural product value chain segments/levels and constraints

Ranking Criteria and Sub Criteria		*Rating
1.0 Competitiveness potential		
1.1	Contribution to availability of high market demand, opportunities for growth and existence of industry leadership	
1.2	Contribution to increased commercialization, value addition and product diversification	
1.3	Contribution to competitive advantage in domestic, regional and global markets	
2.0 Impact potential		
2.1	Contribution to increased employment creation and income generation	
2.2	Contribution to effective and sustainable stakeholder and Small and Medium Enterprises participation and growth	
2.3	Contribution to effective and sustainable public-private sectors participation and partnership	
3.0 Contribution to Agricultural Gross Domestic Product		
3.1	Contribution to increased production and productivity	
3.2	Contribution to increased availability and access to quality and affordable food	
3.3	Contribution to enhanced livelihoods and pro-poor economic growth	
4.0 Opportunities for intervention		
4.1	Contribution to improved commitment and willingness to collaborate in addressing expressed stakeholders' demands	
4.2	Contribution to the availability of capacity to address existing challenges	
4.3	Contribution to national and regional development objectives	
5.0 Contribution to quality of environment		
5.1	Contribution to enhanced sustainable utilization of natural resources	
5.2	Contribution to improved conservation and maintenance of biodiversity	
5.3	Contribution to cleaner production and mitigation of climate change and variability	
6.0 Social Welfare		
6.1	Contribution to improved nutrition and health particularly among the poor and marginalized	
6.2	Contribution to improved gender equity and equitable distribution of benefits	
6.3	Contribution to improved capacity to mainstream major crosscutting issues	
Total Score		

**Rating: 6-5 High, 4-3 Medium and 2-1 Low*

2.3 Identification of Product Value Chain Priority Areas of Intervention

In order to ensure improved productivity, commercialization and competitiveness, all the priority agricultural product value chains shall be expected to follow the same defined process of identifying and implementing priority areas of intervention. The process shall require all the agricultural product value chain to carry out similar and sequential broad intervention strategies.

This approach is expected to ensure that the selected areas of intervention have been identified through a participatory and consultative process involving all key stakeholders/actors who have interest in the implementation and outcome of each agricultural product value chain. The participation of all stakeholders/actors is expected to ensure comprehensive and unbiased analysis of the challenges facing each agricultural product value chain; building of consensus on the areas of intervention that are required to address the identified constraints and their order of priorities; fostering of support and commitment necessary for implementation of the priority areas of intervention; enhancement of the relevance of the expected outputs; and increasing chances of adoption and scaling up of the research results.

The sequential broad intervention strategies to be implemented by all priority agricultural product value chain shall include the following:

- (i) ***Agricultural product value chain analysis, mapping and identification of constraints and opportunities:*** This broad intervention strategy shall involve carrying out detailed analysis and mapping of each product value chain and their respective segments/levels; analysis and ranking of the constraints experienced at each of the segments/levels of the product value chain as well as the available and emerging opportunities.
- (ii) ***Development of agricultural product value chain upgrading technologies and innovations:*** Given the identified constraints experienced at each segment/level of each product value chain, this broad intervention strategy shall involve the development of technologies and innovations required to upgrade and promote each agricultural product value chain. This shall involve the identification of the necessary and sufficient areas of intervention that are required to address the identified constraints at each segments/levels of each product value chain and their order of priorities; development and approval of appropriate product value chain upgrading projects/action plans designed to address and overcome the identified constraints and take advantage of the available and emerging opportunities; commitment of resources and implementation of the upgrading projects/action plans; and establishment and operationalization of continuous project monitoring and evaluation system capable of tracking the implementation of the projects/action plans.
- (iii) ***Promotion and up scaling of the agricultural product value chain upgrading technologies and innovations:*** Given the agricultural product value chain upgrading and promotion technologies and innovations developed in the broad intervention strategy outlined above, this broad intervention strategy shall deal with the development and implementation of appropriate mechanisms for promoting uptake, utilization and up scaling of the developed product value chain upgrading and promotion technologies and innovations as well as effective management of knowledge and information.

2.4 Implementation Frameworks and Plans

The research operations in SLARI have been rationalized into seven long-term strategic research programme areas of focus. The research programmes express a stronger organizational commitment to impact as the strategic orientation and positioning of SLARI as a leader in the generation and promotion of innovative agricultural technologies and stakeholders empowerment aimed at increasing productivity, commercialization and competitiveness of the agricultural sector. Each of the research programme areas of focus shall focus on several priority agricultural product value chains which shall be expected to contribute to the attainment of the programme specific objective. In order to ensure effective implementation, each research programme area of focus has prepared its Result Framework and research Programme Implementation Plan as well as Programme Financing/Investment Plan; Human Resource Requirement; Physical Resources Requirement; and Equipment and Related Facilities Requirement. In determining the availability of the required resources, the programmes/centres factored in the APVC approach that requires the establishment and operationalization of collaborations and partnerships between the programme and other organizations including the private sector

as one of the strategy for ensuring availability of additional resources for carrying out joint research activities. The implementation frameworks have been prepared using the plug in approach so as to ensure individual attention to the needs of each research programme/centre.

2.4.1 Result Frameworks

The implementation of the intervention strategies under each research programme area of focus shall be guided by result frameworks shown in Annexes 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, 9.1 and 10.1. The result frameworks for each research programme area of focus were completed by developing their respective overall objective, specific objective and five results cascaded down from those at the institutional level but reduced in scale and scope to the specific research programme area of focus for better outcome mapping and impact orientation. This was followed by identification of the Objectively Verifiable Indicators, Means of Verification and Assumptions that must hold true for the research programme area of focus to deliver on its targets. Finally, the result frameworks were completed by indicating the necessary and sufficient intervention strategies required to contribute to the attainment of the five research programme area of focus results.

2.4.2 Programme Implementation Plans

The product value chains under each research programme area of focus shall focus on the implementation of several intervention strategies so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the programme specific objective. In order to ensure effective implementation of the activities to be carried out under each intervention strategy, detailed research Implementation Plans for each programme have been prepared as shown in Annexes 3.2, 4.2, 5.2, 6.2, 7.2, 8.2, 9.2 and 10.2. The research Implementation Plans outline the agricultural product value chains under each research programme area of focus and their respective necessary and sufficient intervention strategies; the timeframe required to deliver each intervention strategy and who shall be responsible; the key performance indicators for each intervention strategy; and the intermediate outcome defined in terms of what will be achieved by the delivery of all the intervention strategies.

2.4.3 Human Resource Requirements

Manpower is the heart of any research system and, therefore, each research programme area of focus has carried out human resources gap analysis to determine the current and projected optimal numbers of research scientists, technical support staff and administrative staff in each of the programme coordinating and implementing centre using the ration of six support staff to every one research scientist as shown in Table 2.3. The difference between the current and projected optimal human resources requirement provided an indication of the human resource gap that need to be urgently filled with the critical mass of scientists with the right disciplinary mix to provide multidisciplinary solutions to priority programme product value chains problems so as to enable each programme/centre fulfil its mandate.

2.4.4 Programme Financing Requirements

Effective implementation of the programme/centre plans requires the availability of financial resources. In view of this, each research programme area of focus has prepared financing requirements for the period 2012-2016 based on a projected assessment of its financial resources required to deliver on its mandate. Table 2.4 summarizes the financing requirements for research activities, human resource, physical resources, equipment and related facilities for each of the programme coordinating and implementing centre. Detailed research programme financing requirement for each programme for the period 2012-2016 have been prepared as shown in Annexes 3.3, 4.3, 5.3, 6.3, 7.3, 8.3, 9.3 and 10.3.

Table 2.3: Summary of SLARI institutional current and optimal human resource requirements

SLARI research centres and headquarters		Total SLARI and centre staff requirement by cadres				Total by centre
		Current number of scientists	Optimal number of scientists	Technical support staff	Administrative support staff	
1.0	Njala Agricultural Research Centre	22	54	108	216	400
2.0	Rokupr Agricultural Research Centre	19	49	98	196	362
3.0	Kabala Horticultural Crops Research Centre	1	32	64	128	225
4.0	Teko Livestock Research Centre	4	8	16	32	60
5.0	Freetown Fisheries Research Centre	2	17	34	68	121
6.0	Kenema Forestry and Tree Crops Research Centre	6	42	84	168	300
7.0	Magbosi Land and Water Research Centre	5	19	38	76	138
8.0	SLARI Headquarters	4	10	25	15	54
Total SLARI staff requirement		63	231	467	899	1,660

Table 2.4: Summary of SLARI institutional financing requirements for the first operational plan period 2012-2016

SLARI research centres and headquarters		Estimated financial resources requirements, USD ‘000’					Total by Centre
		Research pro-grammes	Human resource	Physical infra-structure	Equipment and related facilities	Research support functions	
1.0	Njala Agricultural Research Centre	24,113.8	16,862.9	3,030.5	8,652.6	526.6	53,186.4
2.0	Rokupr Agricultural Research Centre	20,430.1	13,107.0	4,140.0	4,609.0	422.9	4,2709.0
3.0	Kabala Horticultural Crops Research Centre	9,865.3	16,529.1	3,750.0	6,141.5	362.9	36,648.8
4.0	Teko Livestock Research Centre	2,805.7	7,184.5	2,535.0	12,954.0	254.8	25,734.0
5.0	Freetown Fisheries Research Centre	18,459.7	8,106.5	3,005.0	5,180.0	347.5	35,098.7
6.0	Kenema Forestry and Tree Crops Research Centre	5,495.0	7,751.9	21,760.0	7,763.3	427.7	43,197.9
7.0	Magbosi Land and Water Research Centre	5,798.5	8,397.0	2,252.0	1,243.9	177.0	17,868.4
8.0	SLARI Headquarters	0	3,758.6	14,600.0	993.6	286.6	19,638.8
Total by category		86,968.1	81,697.5	55,072.5	47,537.9	2,806.0	274,082.0

2.4.5 Framework for Operationalizing the Operational Plan

The Operational Plan shall be operationalized through Rolling Annual Work Plans in which the necessary and sufficient activities and their respective milestones required to deliver each intervention strategy shall be specified. The rolling annual work plans will be linked to the annual Performance Contract (PC) targets. The adoption of the rolling annual work plans shall be expected to facilitate the review of the research and institutional capacity building agenda in close consultation with the relevant key stakeholders and their adjustment in the context of emerging priorities and funding opportunities. The annual work plans shall be expected to provide full details on the intervention strategies and their respective activities, milestones and operational and development budgets.

2.5 Monitoring and Evaluation

Monitoring and evaluation (M&E) is an integral part of performance management. The purpose of M&E is to evaluate progress of planned activities with a view to ensuring that their implementation is proceeding according to plan and the set targets are being met. During the implementation of different activities, a continuous participatory and rigorous self-monitoring and evaluation shall be encouraged. To monitor and evaluate progress during the implementation, SLARI and the collaborating institutions/organizations shall undertake internal and external programme reviews over the Strategic Plan and Operational Plan period and the results of the reviews widely circulated to the relevant agricultural sector ministries, development partners and key stakeholders.

In order to institutionalize the monitoring and evaluation process, SLARI shall develop and operationalize a suitable monitoring and evaluation system/mechanisms capable of tracking the implementation of the approved Product Value Chain based projects and activities. The monitoring and evaluation system shall include the use of logical frameworks, work plans, field visits, quarterly and annual reports, mid-term internal evaluation, biannual conferences and end of term external evaluation.

The abridged version of the quarterly reports from the research programmes and collaborating institutions will form the Product Value Chain based project's annual reports which will in turn feed into the mid-term internal evaluation. The mid-term internal evaluation results will, in turn, assist in the external evaluation whose results will form a major input in the preparation of the subsequent work plans. Outputs of all research activities undertaken will be consolidated into annual reports and shared among stakeholders within the agricultural sector. The research results obtained will also be presented in conferences, symposia and published as Journal articles for wider information and knowledge sharing.

3.0 ROOT, TUBER AND GRAIN LEGUME CROPS PROGRAMME

3.1 Strategic Focus

The rationale and justification as well as the challenges and constraints facing the Root, Tuber and Grain Legume Crops Programme that is coordinated and implemented at the Njala Agricultural Research Centre (NARC) have been well articulated in the SLARI Strategic Plan for the period 2012-2021. The Programme is expected to address these challenges and constraints so as to **enhance sustainable productivity, commercialization and competitiveness of the root, tuber and grain legume crops**. In order to do this, the Programme is expected to contribute to the delivery of the overall institutional specific objective through the attainment of its specific objective of **Generating and promoting innovative root, tuber and grain legume crops technologies and empowerment of stakeholders**. The Programme shall deliver this specific objective through the attainment of the following five results:

- (i) Appropriate root, tuber and grain legume crops product value chains technologies and innovations **generated and promoted**.
- (ii) Appropriate markets and marketing strategies for enhancing root, tuber and grain legume crops product value chains **developed and promoted**.
- (iii) Appropriate policy options for enhancing root, tuber and grain legume crops product value chains **facilitated and advocated**.
- (iv) Capacity for implementing root, tuber and grain legume crops product value chains research **strengthened**.
- (v) Appropriate mechanisms for managing, sharing and up scaling root, tuber and grain legume crops knowledge, information and technologies **established and operationalized**.

In order to contribute significantly to the attainment of the overall institutional specific objective, the Root, Tuber and Grain Legume Crops Programme shall focus on nine product value chains outlined below. The importance of each product value chain in contributing to the national economic growth and agricultural sector development as well as improvement of livelihoods, income generation and food security shall be determined through prioritization process discussed in chapter three. The allocation of resources for research shall then be based on the results of the priority setting process. Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme strategic results.

- (i) Development and promotion of Cassava product value chain.
- (ii) Development and promotion of Yam product value chain.
- (iii) Development and promotion of Sweet Potato product value chain.
- (iv) Development and promotion of Potato product value chain.
- (v) Development and promotion of Cocoyam product value chain.
- (vi) Development and promotion of Cowpea product value chain.
- (vii) Development and promotion of Soybean product value chain.
- (viii) Development and promotion of Pigeon Pea product value chain.
- (ix) Development and promotion of Groundnut product value chain.

The Root, Tuber and Grain Legume Crops Programme Result framework, Research implementation plan and financing requirement are shown in Annexes 3.1, 3.2 and 3.3 respectively. The centre current and optimal human resource requirement and summary of financing requirement are shown in Tables 2.3 and 2.4 respectively.

3.2 Development and Promotion of Cassava Product Value Chain

3.2.1 Rationale and Justification

Cassava is the second most important food crop in Sierra Leone after rice and is mainly a subsistence crop grown for food by small-scale farmers who sell the surplus. The crop is grown in the upland and inland valley swamp areas of Sierra Leone. Cassava is a drought tolerant crop, grown primarily for production of its roots, performs well in poor soils and has limited labour requirements. Cassava is rich in carbohydrates, calcium, Vitamins B and C, and essential minerals and plays an important role of providing affordable food for the

rapidly growing rural and urban populations. Cassava is intercropped with vegetables, plantation crops such as coconut, oil palm, coffee, yam, sweet potato, melon, maize, rice, groundnut or other legumes. Apart from food, the crop is a very versatile commodity with the potential for the development of diversified products.

3.2.2 Challenges and Strategic Focus

In spite of its popularity, cassava production is faced with many challenges. Pests and diseases are the major causes of decline in production. It is affected by pests such as the cassava green mite (CGM), cassava mealy bug (CMB) and the variegated grasshopper; and diseases which include the cassava mosaic disease (CMD), cassava bacterial blight, cassava anthracnose and root rot especially in the humid zones. Cassava mosaic disease alone accounts for a large percentage Sierra Leone's cassava production losses in serious outbreaks. Increased productivity in most parts of the country has been hampered by lack of adequate and consistent supplies of quality planting material. This is attributed to low multiplication rates of planting materials, and associated costs of transporting bulk cassava stem cuttings that are highly perishable, as they dry up within a few days, making their availability limited. Lack of well adapted varieties, poor cultivation practices and post-harvest handling, limited value addition and processing and high perishability of the roots further exacerbate yield losses by farmers.

In order to address the identified challenges facing the Cassava product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Cassava product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Cassava product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Cassava product value chain upgrading technologies and innovations.

3.3 Development and Promotion of Yam Product Value Chain

3.3.1 Rationale and Justification

Yam is the second most important tuber crop in Sierra Leone. It is a major source of food, income and also plays a vital role in the traditional culture. Small-scale farmers are the major producers of yam, and often intercrop it with cereals and vegetables. Yam tubers consist of about 21% dietary fibre and are rich in carbohydrates, vitamin C and essential minerals. Consumer demand for yams in Sierra Leone is high providing an opportunity for serving both rural and urban populations as a basic daily source of dietary energy. Yam is a very important food security crop due to its availability all year round and excellent storage properties. It can be stored for 4-6 months providing an important food safety net between growing seasons. Increasingly the crop is being commercialized and it has potential to become a non-traditional export crop especially in the region.

3.3.2 Challenges and Strategic Focus

Production of yams is declining in some traditional producing areas due to declining soil fertility, inadequate quality clean planting material due to the slow rate of multiplication, increasing pest pressures and the high cost of labour for mounding, staking especially in the forest zone, weeding and harvesting. Being vegetatively propagated, unavailability of clean planting materials has resulted in farmers using their own material which over time has accumulated and perpetuated pests and diseases over planting seasons. In addition, seed yams are also perishable and bulky to transport further hindering their availability. Increasing pressure from insect pests, fungal and viral diseases, as well as nematodes has contributed to yields loss and deterioration of tuber quality in storage. The major pests and diseases include insects such as leaf and tuber beetles, mealy bugs, and scales; parasitic nematodes; fungi causing anthracnose, leaf spot, leaf blight, and tuber rot; and viruses, especially the yam mosaic virus (YMV).

In order to address the identified challenges facing the Yam product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the programme purpose, the following broad intervention strategies shall be implemented:

- (i) Yam product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Yam product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Yam product value chain upgrading technologies and innovations.

3.4 Development and Promotion of Sweet Potato Product Value Chain

3.4.1 Rationale and Justification

Sweet potato is regarded as a food security crop due to its ability to grow in very marginal areas. Considered a small-scale farmers' crop, sweet potatoes grow well in many farming conditions in Sierra Leone, where it is used for human consumption, as well as livestock feed. The crop has relatively few natural enemies and, therefore, pesticides are rarely used to produce it. Sweet potato can be grown in arid conditions with poor soils of low fertility. In addition, the crop is highly tolerant to weeds, allowing farmers to devote time to other crop enterprises and, therefore, be easily integrated into other farming systems. Sweet potato, therefore, has tremendous advantage for the resource poor households whose members depend on diverse livelihood strategies and especially those affected by HIV/AIDS. The adoption of the high-yielding orange-fleshed varieties has opportunities for developing new uses for the crop and transforming it into a nutritious food with diverse uses and expandable markets.

3.4.2 Challenges and Strategic Focus

Despite the growing importance of sweet potato, production is still low and does not meet the growing demands in the country. Many farmers are still growing the land races that are low-yielding and late-maturing. There is need to develop and avail improved varieties to farmers. Availability of planting material is limited and there are few established nurseries where farmers can easily access improved genetic materials. Pests and diseases such as the sweet potato weevil and viral diseases are also major obstacles to sweet potato production. There is need to develop efficient integrated pest management options that can easily be adopted by farmers. Farmers have few alternatives for extending the shelf-life of sweet potatoes which are highly perishable and only harvest from the ground when they are needed. This predisposes them to pests and diseases attack.

In order to address the identified challenges facing the Sweet Potato product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Sweet Potato product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Sweet Potato product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Sweet Potato product value chain upgrading technologies and innovations.

3.5 Development and Promotion of Potato Product Value Chain

3.5.1 Rationale and Justification

Potato is a food crop that responds well to the cooler climatic temperature. It is increasingly gaining importance both as a staple food crop and as a source of farmer incomes in Sierra Leone. In the urban areas the demand is steadily increasing as a fresh product and in the processed forms. Production is rain fed and the crop is grown on a limited scale by the small-scale farmers, who lack the requisite knowledge, skills and inputs necessary for its production. This is far below the country's requirement and efforts need to be made to enhance its production of this crop.

3.5.2 Challenges and Strategic Focus

The main production challenges of potato include inadequate availability of clean planting material, diseases such as bacterial wilt, late blight and viruses and pests such as the potato tuber moth. Lack of suitable high yielding varieties tolerant to pests and diseases has further hampered potato production. In addition, lack

of knowledge and skill among the farmers on production practices has affected productivity. Research and development technologies for this crop has been limited due lack of capacity within the research and support institutions, and have, therefore, not contributed significantly to the development of the potato industry. Therefore, there is need to focus on developing and disseminating suitable varieties, availing clean planting materials to farmers, and developing appropriate crop and pests and disease management technologies.

In order to address the identified challenges facing the Potato product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Potato product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Potato product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Potato product value chain upgrading technologies and innovations.

3.6 Development and Promotion of Cocoyam Product Value Chain

3.6.1 Rationale and Justification

Cocoyam is grown in wetlands. Its corms, cormels, leaves, stalks and inflorescence are all utilized for human consumption. The leaves are rich in protein and vitamins while the root is rich in carbohydrates and minerals. The crop is also predominantly grown by the resource poor farmers. The crop has the potential of improving food security and income levels of farmers if it is developed and production increased. Due to health concerns, cocoyam is gaining popularity among the urban population as a food that is healthy to eat and nutritious. Therefore, its commercialization of this crop will have significant impact on the livelihoods of farmers.

3.6.2 Challenges and Strategic Focus

Cocoyam is produced by smallholders who rely on traditional labour-intensive practices that do not allow for optimal exploitation of the crops' productive potential. The challenges in production among others include lack of research leading to unavailability of improved varieties, lack of knowledge and information among farmers on production technologies, pests and diseases. Availability of planting material is limited due to slow rate of multiplication of this crop and production while postharvest practices still lack appropriate levels of technologies to reduce labour in production, processing and storage. This results in high costs of production. Production is seasonal and as result supplies are low and inconsistent. The crop has limited processed forms, poor market linkages and inconsistent supplies, affecting prices negatively.

In order to address the identified challenges facing the Cocoyam product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Cocoyam product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Cocoyam product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Cocoyam product value chain upgrading technologies and innovations.

3.7 Development and Promotion of Cowpea Product Value Chain

3.7.1 Rationale and Justification

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

3.7.2 Challenges and Strategic Focus

Very limited research and development has been undertaken on cowpea. Pests and diseases are the major constraints in production. Cowpea is susceptible to a number of pests such as aphids, flower thrips, pod borers, pod sucking bugs at podding, and weevils in storage; and susceptible to a number of fungal, bacterial and viral diseases such as *Cercospora* leaf spot, ashy stem blight, bacterial blight, blackeye cowpea mosaic potyvirus (BICMV), cowpea aphid-borne mosaic potyvirus (CABMV) and cowpea mosaic comovirus (CPMV). Cowpea is also attacked by *Striga gesnerioides* and adversely affected by irregular rainfall. In addition, farmers lack suitable varieties for the various agro-ecological zones. All of these factors contribute to the low grain yield harvests in the country.

In order to address the identified challenges facing the Cowpea product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Cowpea product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Cowpea product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Cowpea product value chain upgrading technologies and innovations.

3.8 Development and Promotion of Soybean Product Value Chain

3.8.1 Rationale and Justification

Soybean is an important source of high quality inexpensive protein and oil, comparable to meat, poultry and eggs. It has an average protein content of 40%, 30% carbohydrates, 20% oil and excellent amounts of dietary fibre, vitamins and minerals. Soybean protein, therefore, has great potential as a major source of dietary protein. As by-product from the oil production, soybean cake is used as a high-protein animal feed. Soybean also improves soil fertility by fixing nitrogen from the atmosphere, a major benefit for farming systems where soils under pressure to produce more food for increasing populations, and where access to fertilizers is limited.

3.8.2 Challenges and Strategic Focus

The average grain yield of soybean in Sierra Leone is low. Lack of varieties tolerant to mid-season moisture stress and high yielding varieties tolerant to low phosphorus are among the constraints in soybean production. Soybean diseases including rust, red leaf blotch, frog-eye leaf spot, bacterial pustule, bacterial blight and soybean mosaic virus have had negative impacts on yields. Soybean rust attacks and destroys the leaves of the plant and can cause up to 60% yield loss. It is widespread throughout many parts of the country and is considered the most destructive of soybean foliar diseases. Pests include pod (stink bugs) and foliage feeders, bean flies and nematodes. Other constraints to soybean production include pod shattering that reduces seed longevity, seed production and distribution difficulties and lodging. Dual-purpose improved varieties of soybean have not reached many growers to increase production, and the markets are limited hence there is no incentive for farmers to engage in production. Knowledge on processing and utilization is limited, inhibiting its usage both at household and industrial levels. Research on seed quality such as protein, oil, carbohydrate and anti-nutritional factors is lacking.

In order to address the identified challenges facing the Soybean product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Soybean product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Soybean product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Soybean product value chain upgrading technologies and innovations.

3.9 Development and Promotion of Pigeon Pea Product Value Chain

3.9.1 Rationale and Justification

Pigeon pea is both a food and a forage/cover crop. It is an important legume crop of rain fed agriculture in the arid and semi-arid areas of Sierra Leone. The crop is drought tolerant and can be grown in areas with less than 650 mm annual rainfall. Pigeon pea is cultivated on marginal land by resource-poor farmers either as a sole crop or intercropped with cereals or legumes. Traditionally, the use of input such as fertilizers, weeding, irrigation and pesticides is minimal; hence present yield levels are low. Pigeon pea contains high levels of protein and important amino acids, methionine, lysine and tryptophan and contributes significantly to improving food security and nutrition. It has multiple uses as grain, fuel wood, livestock feed, field boundary markings and soil fertilizer.

3.9.2 Challenges and Strategic Focus

Despite being a crop that contributes to food and nutrition security, very little attention has been given to the research and development of the pigeon pea value chain. Suitable varieties tolerant to pests and diseases have not been availed to farmers. Pests and diseases continue to affect its crop yields. Farmers lack the knowledge and skills on production practices. The absences of organized markets have acted as disincentive to farmers. Processing and value addition is limited due to unavailability of appropriate technologies and poor infrastructure. As a marginal crop very little research has been done to promote its production under various irrigation systems in the arid and semi-arid areas.

In order to address the identified challenges facing the Pigeon Pea product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Pigeon Pea product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Pigeon Pea product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Pigeon Pea product value chain upgrading technologies and innovations.

3.10 Development and Promotion of Groundnut Product Value Chain

3.10.1 Rationale and Justification

Groundnut is assuming increasing importance in the agriculture of Sierra Leone. The area under production has tremendously increased, doubling by 2001. Groundnut plays an important role as a high value buffer cash crop among small-scale farmers, meeting immediate cash needs of farmers between the planting seasons. The crop contributes to viable and sustainable cropping systems in the country, as an excellent rotation crop which can replace maize as a monoculture crop as it enriches the soil with nitrogen. Groundnut provides a vital source of cash income, and it is also a nutritious, high in protein food which could be used to prevent child malnutrition among vulnerable groups. The crop is considered a woman's crop and, therefore, has a significant role to play in addressing issues of gender equity

3.10.2 Challenges and Strategic Focus

Groundnut production in the country has been low due to a combination of unreliable rainfall, few technologies available to farmers, pests and diseases, poor seed varieties, increased cultivation on marginal lands, political instability and non-supportive small-scale farm policies. This has been exacerbated by poor post-harvest handling. Groundnut is particularly susceptible to contamination during growth and storage. Poor storage by farmers has led to aflatoxin contamination which has negatively affected trade. There is limited processing and development of diversified products to enhance market access. Research efforts will, therefore, focus on development of resistant high-yielding varieties and production, and post-harvest handling technologies to enhance productivity.

In order to address the identified challenges facing the Groundnut product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Groundnut product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Groundnut product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Groundnut product value chain upgrading technologies and innovations.

4.0 CEREAL CROPS PROGRAMME

4.1 Strategic Focus

The rationale and justification as well as the challenges and constraints facing the Cereal Crops Programme that is coordinated and implemented at the Rokupr Agricultural Research Centre (RARC) have been well articulated in the SLARI Strategic Plan for the period 2012-2021. The Programme is expected to address these challenges and constraints so as to **enhance sustainable productivity, commercialization and competitiveness of the cereal crops**. In order to do this, the Programme is expected to contribute to the delivery of the overall institutional specific objective through the attainment of its specific objective of **Generating and promoting innovative cereal crops technologies and empowerment of stakeholders**. The Programme shall deliver this specific objective through the attainment of the following five results:

- (i) Appropriate cereal crops product value chains technologies and innovations **generated and promoted**.
- (ii) Appropriate markets and marketing strategies for enhancing cereal crops product value chains **developed and promoted**.
- (iii) Appropriate policy options for enhancing cereal crops product value chains **facilitated and advocated**.
- (iv) Capacity for implementing cereal crops product value chains research **strengthened**.
- (v) Appropriate mechanisms for managing, sharing and up scaling cereal crops knowledge, information and technologies **established and operationalized**.

In order to contribute significantly to the attainment of the overall institutional specific objective, the Cereal crops Programme shall focus on six product value chains outlined below. The importance of each product value chain in contributing to the national economic growth and agricultural sector development as well as improvement of livelihoods, income generation and food security shall be determined through prioritization process discussed in chapter three. The allocation of resources for research shall then be based on the results of the priority setting process. Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme strategic results.

- (i) Development and promotion of Upland Rice product value chain.
- (ii) Development and promotion of Lowland Rice product value chain.
- (iii) Development and promotion of Maize product value chain.
- (iv) Development and promotion of Sorghum product value chain.
- (v) Development and promotion of Pearl millet product value chain.
- (vi) Development and promotion of Digitaria product value chain.

The Cereal Crops Programme Result framework, Research implementation plan and financing requirement are shown in Annexes 4.1, 4.2 and 4.3 respectively. The centre current and optimal human resource requirement and summary of financing requirement are shown in Tables 2.3 and 2.4 respectively.

4.2 Development and Promotion of Upland Rice Product Value Chain

4.2.1 Rationale and Justification

Rice is the main staple food in Sierra Leone. It is grown by almost all small-scale farmers, who produce it mainly for home consumption with little or no market focus, except in some key production zones in Kambia, Bonthe. Currently, the area under rice cultivation stands at 649,487 ha with production estimated at 637,983 t with an average yield at 0.97 t/ha. The annual per capita consumption is estimated at 104 kg per person. More than 350,000 farmers are involved in the production of rice and which 95% are small-scale farmers.

Rice is cultivated in five main ecosystems, which include uplands, inland valley swamps, bolilands, mangrove swamps and riverain flood lands, of which the uplands account for more than 50% and the inland valley swamps approximately 30%. Upland rice production accounts for 68% of the area under rice production and 64% of the total domestic paddy production, and therefore has the potential for contributing to the country's rice self-sufficiency. Most farmers prefer the upland rice and working on the uplands as there are other benefits such as intercropping which acts as an insurance cover for crop failure, and developing of swamps in the lowland as well as the financial returns obtained by selling wood. It is therefore necessary to continue investing in upland rice cultivation whilst improving on the efficiency of production.

Upland rice accounts for a total of 4, 300,000 million hectares of arable land (80%), of which areas cultivated under upland rice is 363, 894 ha (55%). This suggests that the vast majority of this land is on the upland ecology. Farmers perceive uplands as being more important than lowlands because upland cropping allow diversified crop stands, it imposes lower labour requirements and the rice produced is of relatively higher palatable quality compared to the lowlands.

4.2.2 Challenges and Strategic Focus

A major challenge to rice cultivation in the uplands is lack of a permanent system of cultivation, leading to shifting from one location to another. The growing demand for land for non agricultural use has restricted movement of farmers and also resulted in shorter fallow periods. This along with the inherently low base saturation and low nutrient status of the upland soils, coupled with the minimal use of fertilizers has led to very low average rice yields of less than one tonne per hectare. Lack of suitable high yielding varieties, inadequate production technologies for the specific farming systems, high costs and inaccessibility of inputs, poor soil fertility, high post-harvest losses and lack of organized marketing strategies have also contributed to low rice productivity. Poor infrastructure and policies have further acted as disincentives to adoption of improved technologies that can enhance production.

In order to address the identified challenges facing the Upland Rice product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Upland Rice product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Upland Rice product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Upland Rice product value chain upgrading technologies and innovations.

4.3 Development and Promotion of Lowland Rice Product Value Chain

4.3.1 Rationale and Justification

The diverse lowland systems comprises of the Inland Valley Swamps (IVS), Mangrove Swamps, Bolilands, and Riverain grasslands. This accounts for 45% and of which Inland valley Swamp rice occupies the greatest portion of lowland rice area; IVS 12%; Mangrove 4%; Riverian Grassland 2%; and Boliland 2%.

The total land of available arable lowland is approximately 1.2 million hectares or 20% of the total. Despite contributing a much smaller proportion to available land for cultivation, the potential for increased rice production are far greater in the lowlands than in the uplands. One great advantage of cultivation in the lowlands is that cropping can be permanent unlike in the uplands. The lowland ecosystem tends to have low opportunity costs because few staple food crops are able to withstand flooding conditions prevailing in this ecosystem, giving rice a clear comparative advantage in agronomic terms. Moreover, soils in lowland ecosystems are generally less fragile and floodwater conditions promote the growth of nitrogen-fixing bacteria and blue-green algae that produce enough nitrogen to sustain 3 t/ha rice every season. Rain fed lowlands have great potential to diversify rice systems, such as growing of vegetable crops after rice, or through combined rice-fish culture. Lowland rice is cultivated under the following two broad categories:

- (i) **The rain fed lowland rice:** The rain fed lowland rice is grown in the Inland Valley Swamps with approximately 700,000 ha available with 200,000 ha in use; the Tidal Mangrove and Associated Swamps with some 200,000 ha available and about 25,000 hectares under cultivation; the Bolilands of approximately 200,000 ha and about 30,000 ha being cultivated and the 110,000 ha of Deep Flooded Riverain Grasslands, with some 35,000 ha under cultivation.
- (ii) **The irrigated lowlands rice:** Irrigated lowlands rice has not caught up with rain fed rice cultivation. The abundance of rainfall and the presence of nine major river systems along with many other water bodies provide tremendous potentials for Sierra Leone to embark on profitable lowlands rice cultivation with the prospects for multiple cropping. Grain yield under the lowlands rice cultivation could be increased from 3-4 t/ha achievable from rain fed rice cultivation to two crops of 4 t/ha and 3.5 t/ha. Currently less than 5,000 ha are under irrigated cultivation but the area cropped could be increased to 100,000 ha.

4.3.2 Challenges and Strategic Focus

At present, ample water resources exist, amounting to about 160 km³ per annum; most of which is accounted for by surface water. Current utilization is less than 5 percent per annum. A priority need for the smallholders is an irrigation system for perennial Inland Valley Swamp (IVS) rehabilitation and development to manage surface water through drainage and irrigation structures. This would expand high-quality lowland for cultivation.

IVS play a major role in the restoration and increase of agricultural production through their potential for cropping intensification and diversification (rice and vegetables). In spite of the high potential for permanent cropping, crop production in the IVS is negatively affected by (i) inadequate drainage and flash flooding; (ii) irregular flooding due to lack of water management; (iii) low fertility levels and iron and aluminium toxicity; and (iv) inadequate residual moisture and water supply during the dry season. Irrigation schemes for smallholder production in IVS exist but only at minimal levels. There is high potential to maximize

The main constraints to rice production in the lowlands are water control, weed management and, to a lesser extent, soil fertility and iron toxicity. Others challenges include lack of suitable high yielding varieties, inadequate production technologies specific for lowland rice farming systems, high costs and inaccessibility of inputs, high post-harvest losses and lack product development and diversification, value addition and organized marketing strategies all of which have contributed to low rice productivity in this system. In addition, farmers lack the requisite skills and knowledge on production practices and pests and diseases are a major challenge. Poor infrastructure and policies have further acted as disincentives to adoption of improved varieties and technologies.

In order to address the identified challenges facing the Lowland Rice product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Lowland Rice product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Lowland Rice product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Lowland Rice product value chain upgrading technologies and innovations.

4.4 Development and Promotion of Maize Product Value Chain

4.4.1 Rationale and Justification

Maize is the third most important cereal in the country with approximately 17,000 ha under cultivation and is mainly grown by small-scale farmers. Majority of maize varieties cultivated are the local open pollinated varieties that are late maturing and low yielding. Maize is often grown as a pure stand after rice in the inland valley swamps. In the uplands, it is usually grown in mixed culture. Farmers hardly use fertilizers and improved seed and as a result yields are low and in most cases meet only household needs. Varietal improvement has been limited to characterization and evaluation of exotic materials, which have shown limited adaptation. Maize is usually eaten boiled, roasted, or prepared as porridge with very little left over for animal feed. Livestock production is consequently heavily dependent on imported feed.

4.4.2 Challenges and Strategic Focus

Maize production is affected by various challenges, most important being lack of suitable varieties and damage by pests and diseases. The diseases of economic importance include downy mildew, rust, leaf blight, stalk and ear rots, leaf spot, and maize streak virus. Insect pests, including stem and ear borers, armyworms, cutworms, grain moths, beetles, weevils, grain borers, rootworms and white grubs are also a great threat to the survival of maize in the country. In some areas *Striga* is a major weed and accounts for huge losses. The limited use of nitrogenous fertilizers and the declining soil fertility and periodic droughts are a challenge to improved productivity in the country. Very limited value addition is done for maize, with most of the processing done manually and therefore tedious.

In order to address the identified challenges facing the Maize product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Maize product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Maize product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Maize product value chain upgrading technologies and innovations.

4.5 Development and Promotion of Sorghum Product Value Chain

4.5.1 Rationale and Justification

Sorghum is cultivated in the uplands during wet seasons, in mixtures with rice and other crops. Local Guinea genotypes are exclusively cultivated. Plants are tall often exceeding 2 meters and with long maturation period of 5-6 months. Sorghum yields in the country are low averaging less than one tonne per hectare and are mostly used for household food security. The estimated annual production is 30,000 t and low level of production has been attributed to the absence of markets. However, market outlets are now opening up with increasing demands for the commodity. The national brewery has identified sorghum as an alternative to imported barley in its beverage production. The World Food Programme (WFP) is interested in using it in baby food and food supplement. Given the rising demand, there is a need to improve its productivity.

Sorghum displays an impressive diversity in both its qualities as a food grain and in its ecological adaptations and appearance. Although particularly adapted to drought prone areas that are too dry for maize, the diversity of the crop allows it also to be grown in temperate and high altitude conditions.

4.5.2 Challenges and Strategic Focus

Sorghum is a dry land crop that has great potential in the dry regions; however, very limited research has been undertaken for its development. Lack of development of suitable high yielding and drought tolerant varieties, poor quality and high cost of inputs, pests and diseases, inappropriate policies for investment, poor infrastructure such as roads, processing and storage facilities, and a narrow product range due to limited value addition and poor marketing strategies have affected sorghum productivity. Lack of skills and knowledge on production practices and limited access to credit has further discouraged production.

In order to address the identified challenges facing the Sorghum product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Sorghum product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Sorghum product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Sorghum product value chain upgrading technologies and innovations.

4.6 Development and Promotion of Pearl millet Product Value Chain

4.6.1 Rationale and Justification

Pearl millet is the most widely grown of the millets in Sierra Leone. Its ability to grow in dry and marginal environments makes it a crop with an important role especially in the arid and semi-arid areas of the country. The crop has historically received little attention from research and commercial breeders and has, therefore, remained underdeveloped. Production is still at subsistence level where it is intercropped with other cereals, legumes, oil crops and root and tuber crops. Pearl millet is a highly nutritious food consumed as food and processed into drink in most areas. Pearl millet is eaten in the form of breads, porridges and in boiled or steamed foods. As a result of its high protein content and competitive yields on marginal lands, the grain is gaining popularity as feed for poultry and other livestock.

4.6.2 Challenges and Strategic Focus

Despite its potential, investment in research and development of pearl millet has remained low. The current varieties grown by farmers are the local types that are low yielding and late maturing. In addition pests and diseases especially the downy mildew has adversely affected production in certain areas. Availability of seed for this crop remains a challenge and there is need to develop viable and sustainable seed systems in the country. Due to the low priority accorded to the crop, there has been limited research on its improvement, pests and diseases management, processing and value addition. Lack of markets and diversified uses has confined it to the subsistence level.

In order to address the identified challenges facing the Pearl millet product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Pearl millet product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Pearl millet product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Pearl millet product value chain upgrading technologies and innovations.

4.7 Development and Promotion of Digitaria Product Value Chain

4.7.1 Rationale and Justification

Digitaria is considered to be one of the declining crops in Africa which could be an effective weapon against hunger. The crop provides food early in the farming season when other crops are yet to mature for harvest. Grains are considered to be highly nutritious with about 7% crude protein. The grains are also reported to have high brewing and malting potentials. The crop fits into the low input farming system of resources limited farmers because of its ability to withstand drought and tolerate poor and marginal soils. It is grown in the uplands as a second year crop after rice.

4.7.2 Challenges and Strategic Focus

Digitaria is an important crop for farmers although its production is constrained by several factors including poor agronomic performance because of unimproved seeds and husbandry practices. Digitaria has small grains, yields less than 0.5 t/h and is prone to lodging and shattering. Local accessions are exclusively cultivated and no work has been done on genetic improvement. The husking process of the grain is tedious and time consuming, creating major constraints in processing and utilization. Developing improved high-yielding, non-shattering varieties with larger grain and stronger culm as well as developing improved processing facilities for the crop is essential in addressing enhanced productivity of the crop.

In order to address the identified challenges facing the Digitaria product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Digitaria product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Digitaria product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Digitaria product value chain upgrading technologies and innovations.

5.0 HORTICULTURAL CROPS PROGRAMME

5.1 Strategic Focus

The rationale and justification as well as the challenges and constraints facing the Horticultural Crops Programme that is coordinated and implemented at the Kabala Horticultural Crops Research Centre (KHCR) have been well articulated in the SLARI Strategic Plan for the period 2012-2021. The Programme is expected to address these challenges and constraints so as to **enhance sustainable productivity, commercialization and competitiveness of the Horticultural Crops**. In order to do this, the Programme is expected to contribute to the delivery of the overall institutional specific objective through the attainment of its specific objective of **Generating and promoting innovative horticultural crops technologies and empowerment of stakeholders**. The Programme shall deliver this specific objective through the attainment of the following five results:

- (i) Appropriate horticultural crops product value chains technologies and innovations **generated and promoted**.
- (ii) Appropriate markets and marketing strategies for enhancing horticultural crops product value chains **developed and promoted**.
- (iii) Appropriate policy options for enhancing horticultural crops product value chains **facilitated and advocated**.
- (iv) Capacity for implementing horticultural crops product value chains research **strengthened**.
- (v) Appropriate mechanisms for managing, sharing and up scaling horticultural crops knowledge, information and technologies **established and operationalized**.

In order to contribute significantly to the attainment of the overall institutional specific objective, the Horticultural Crops Programme shall focus on seven product value chains outlined below. The importance of each product value chain in contributing to the national economic growth and agricultural sector development as well as improvement of livelihoods, income generation and food security shall be determined through prioritization process discussed in chapter three. The allocation of resources for research shall then be based on the results of the priority setting process. Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme strategic results.

- (i) Development and promotion of Indigenous Vegetables product value chains.
- (ii) Development and promotion of Exotic Vegetables product value chains.
- (iii) Development and promotion of Herbs and Spices product value chains.
- (iv) Development and promotion of Tropical Fruits product value chains.
- (v) Development and promotion of Temperate Fruits product value chains.
- (vi) Development and promotion of Indigenous Fruits product value chains.
- (vii) Development and promotion of Ornamental and Medicinal Plants product value chains.

The Horticultural Crops Programme Result framework, Research implementation plan and financing requirement are shown in Annexes 5.1, 5.2 and 5.3 respectively. The centre current and optimal human resource requirement and summary of financing requirement are shown in Tables 2.3 and 2.4 respectively.

5.2 Development and Promotion of Indigenous Vegetables Product Value Chains

5.2.1 Rationale and Justification

Indigenous vegetables are leafy vegetables that have been part of food system in Sierra Leone. They are known for their importance in providing nutritious foods and are major ingredient in the diets of rural and urban households across the country. The vegetables play a crucial role in income generation and subsistence, and some of them have been attributed with having medicinal value properties. They are considered as traditional crops because they are indigenous in the areas of occurrence where some are planted, while others are readily available and harvested in their habitat. Indigenous vegetables have been consumed for countless generations signifying their value and importance in local cultures. These vegetables are mainly grown by women and production is concentrated in rural areas. The main vegetable types include krain krain, amaranthus, cassava and sweet potato leaves and okra among others.

5.2.2 Challenges and Strategic Focus

Despite the critical role indigenous vegetables play, farmers are faced with various challenges in the production and marketing of these vegetables. Among the challenges include lack of development of high yielding varieties with desirable market characteristics, lack of developed technologies to support production, inadequate pests and disease management strategies, and poor post-harvest handling and storage. Poor crop management practices and dependence on rainfall production disrupts supply consistency to rural and urban markets. The production is, therefore, limited to the lowlands along rivers and valley bottoms. In addition, the decreasing land sizes due to population pressure and declining soil fertility as a result inadequate soil management practices have resulted in low crop yields, hence farmers are unable to meet the demands of the target markets.

In order to address the identified challenges facing the Indigenous Vegetables product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Indigenous Vegetables product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Indigenous Vegetables product value chains upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Indigenous Vegetables product value chains upgrading technologies and innovations.

5.3 Development and Promotion of Exotic Vegetables Product Value Chains

5.3.1 Rationale and Justification

The production of exotic vegetables is increasingly becoming a livelihood strategy in Sierra Leone as the level of urban unemployment reaches 70%. These high value crops have the potential to contribute significantly to the country's economy. Production is dominated by women and is concentrated in urban and peri-urban areas. The Western Area, Lungi, Peninsula, Makeni and Kabala are the major vegetable producing regions. The main vegetables produced in these regions include tomato, eggplant, cabbage, chilli, onion and cucumber and are consumed mainly in urban and peri-urban areas. Exotic vegetables are widely consumed in the country and therefore provide a ready market for small-scale producers.

5.3.2 Challenges and Strategic Focus

The majority of exotic vegetable are produced by small-scale farmers often with poor yields, low quality produce and low returns. This low productivity is mainly attributed to the high costs of inputs, unavailability of seed and planting materials of high yielding varieties; inadequate research on crop and pest management, poor post-harvest handling and lack of appropriate marketing strategies. For most of these vegetables, quality and quantity standardization is lacking resulting in poor quality produce on the markets. Poor handling and storage has had detrimental effects on food safety and there are environmental concerns due to the high usage of pesticides. Due to lack of the necessary infrastructure to enhance production and compliance with sophisticated marketing requirements, farmers are unable to access regional and international markets. Existing processing technologies are mainly for large-scale production and have a high initial capital outlay discouraging investments by the local entrepreneurs. Research will, therefore, focus on introduction and development of superior vegetable varieties; promotion of good agricultural practices and appropriate harvesting and post-harvest handling of produce, and product utilization to enhance commercialization of exotic vegetables.

In order to address the identified challenges facing the Exotic Vegetable product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Exotic Vegetables product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Exotic Vegetables product value chains upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Exotic Vegetables product value chains upgrading technologies and innovations.

5.4 Development and Promotion of Herbs and Spices Product Value Chains

5.4.1 Rationale and Justification

Herbs and spices are recognized as high value products that can be produced relatively easily by small-scale farmers as they are not demanding in terms of technology and capital. They are used for various purposes, especially for seasoning and flavouring foods, medicine, perfumes and preservatives. Climates, especially those along the western coast of the country are particularly suitable for their production. The major herbs and spices include garlic and ginger. Currently, the country exports garlic. Within the country and internationally, the demand for herbs and spices continues to increase as a result of a growing number of sophisticated consumers, increasing health concerns, increase in processed foods in which herbs and spices are used as ingredient and rising incomes,

5.4.2 Challenges and Strategic Focus

Despite the increasing demand for herbs and spices in the local and export markets, production remains low as a result of minimal research on production and processing technologies; lack of improved germplasm; losses attributed to biotic and abiotic stresses; poor marketing infrastructure and non-existence of policies or legal frameworks to promote them. Currently, production of herbs and spices is carried out by small-scale farmers who lack skills and expertise in production of these crops. High cost of inputs and lack of policies to promote production hinders their development. In order to promote production, the emphasis for research will be on product development and dissemination of information to farmers. The Programme will aim at promoting postharvest handling and processing research, thereby increasing the capacity for value addition to expand market access. The development of favourable policies that promote commercialization and utilization of herbs and spices will be required.

In order to address the identified challenges facing the Herbs and Spices product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Herbs and Spices product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Herbs and Spices product value chains upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Herbs and Spices product value chains upgrading technologies and innovations.

5.5 Development and Promotion of Tropical Fruits Product Value Chains

5.5.1 Rationale and Justification

Tropical fruits can be produced over wide range agro-ecological zones in Sierra Leone. The area under fruits production is estimated at 100,000 ha producing 800 t valued at 800,000 million Leones. Apart from providing food, tropical fruits and fruit trees play significant role in environment conservation and in mitigation of climate change. One of the major tropical fruit crops is citrus that is grown on 51,923 ha constituting 2.7% of land under agriculture. The other tropical fruits include banana, mango and pineapple which are grown in various parts of the country. These fruits have the potential for processing into various products such as juice, jam, jelly and desiccated fruit. Currently, the country is experiencing postharvest losses estimated at over 60%. Establishment of processing and value addition facilities at community level and industrial scale will contribute to the reduction of losses and provide opportunities for employment creation and environmental conservation (carbon credits).

5.5.2 Challenges and Strategic Focus

Production of tropical fruits in Sierra Leone has remained low due to various challenges including lack of clean planting material, inadequate research on varietal development and production practices, poor pests and disease control and management, poor postharvest handling and value addition; lack of irrigation technologies, and lack of development of drought tolerant germplasm. Like the vegetable sub sector, majority of producers

of tropical fruits are smallholder farmers who have poor access to inputs, credit and markets due to lack of the necessary infrastructure and sophistication of the existing marketing channels. Currently, producers experience poor farm-gate prices which act as a disincentive to increased fruit production.

In order to address the identified challenges facing the Tropical Fruits product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Tropical Fruits product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Tropical Fruits product value chains upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Tropical Fruits product value chains upgrading technologies and innovations.

5.6 Development and Promotion of Temperate Fruits Product Value Chains

5.6.1 Rationale and Justification

(Please provide a paragraph on the importance of Temperate Fruits in terms of its contribution to the improvement of livelihoods, income generation as well as food and nutrition security)

5.6.2 Challenges and Strategic Focus

(Please provide a paragraph on the challenges facing the Temperate Fruits product value chain ending with the paragraph shown below)

In order to address the identified challenges facing the Temperate Fruits product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Temperate Fruits product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Temperate Fruits product value chains upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Temperate Fruits product value chains upgrading technologies and innovations.

5.7 Development and Promotion of Indigenous Fruits Product Value Chains

5.7.1 Rationale and Justification

Currently, there is increased interest in indigenous fruit species in Sierra Leone as commodities that can provide opportunities for livelihoods and development for domestic and export markets. All of these fruits grow naturally or are grown widely in the country, but they face extinction due to genetic erosion. Not only are the fruits important, but the leaves and other tree products are used for various purposes including food, medicines, animal fodder and raw materials for crafts. Some of these fruits have been domesticated and are used by the households often as a major important food security crop.

5.7.2 Challenges and Strategic Focus

While many of the indigenous fruits continue to be maintained through socio-cultural preferences, most of them remain inadequately characterized and neglected by research and conservationists. Most of these fruits have not been domesticated and, therefore, receive minimum agronomic attention. The few that have been commercialized are faced with various challenges including lack of improved high yielding varieties, incidences of pests and diseases, poor postharvest handling and limited value addition and processing. In addition, farmers lack the knowledge to manage these crops to enhance production. In most cases the fruits are only found in the rural markets with very small quantities available in the urban areas.

In order to address the identified challenges facing the Indigenous Fruits product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Indigenous Fruits product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Indigenous Fruits product value chains upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Indigenous Fruits product value chains upgrading technologies and innovations.

5.8 Development and Promotion of Ornamental and Medicinal Plants Product Value Chains

5.8.1 Rationale and Justification

Ornamental plants are high value plants that can be grown to generate income and for aesthetic and environmental management purposes. They are used as cut flowers and for landscaping in major cities all over the world. In Sierra Leone, the area under ornamental plants production is very small, producing about 20 t of ornamental plants valued at 40 million Leones. Among the ornamentals plants produced Sierra Leone include roses, bougainvillea, allamanda, hibiscus, croton and cordyline among others. These ornamental plants have aesthetic value and are used for interior decoration, landscaping and other industrial uses. Given the current efforts in reconstruction and rebuilding of urban centres, towns, homes, schools, hospitals and other social and recreational facilities, there is huge potential for use of ornamental plants and there is need for research to proactively engage in this industry to offer the necessary support. Establishment of ornamental plants nurseries and ornamental processing industries can also create employment opportunities especially for the youth, increase foreign exchange earnings and play a vital role in environmental and biodiversity conservation.

Medicinal plants which include trees, shrubs and herbaceous plants have long played an import role in the culture of the Sierra Leoneans. In addition to providing food, these plants are used for therapeutic purposes and in the management of various ailments and diseases both in humans and livestock. Very few of these plants have been domesticated and, therefore, most of them are found in the wild where they are harvested for human uses. Increasingly, their role in the improvement of the livelihoods has been recognized by the Government and there is need to promote their development for the benefits of the communities in various ecosystems.

5.8.2 Challenges and Strategic Focus

The main challenge faced by ornamental plants producers is unavailability of high quality planting material. This is magnified by lack of a formal seed system to enhance availability of clean seed and planting material. Very few ornamental species have been identified and domesticated and the few that have been identified are mainly produced and utilized in urban areas. Due to the fact that very limited research has been done on the development of ornamental plants, there are virtually no technologies that can be transferred to producers. Markets for these plants are limited with a very low demand. There is, therefore, a need for consumer awareness on the social, economic and environmental benefits of these plants. The need to develop an integrated approach for development of ornamental plants that takes cognizance of biodiversity conservation is of critical importance.

With regard to medicinal plants, the greatest challenge is the lack of domestication and the threats posed by indiscriminate harvesting in the wild, which if not checked would result in extinction of some of the very important species. Very limited research has been done on potential useful species to promote their exploitation and sustainable use. In addition, most of these plants are used in their crude forms. Very little research and product development has been undertaken to develop products that can be commercialized and traded. In order to enhance sustainable use, there is need to integrate these into the current farming systems. The development of favourable policies that promote commercialization and utilization of medicinal plants will be required.

In order to address the identified challenges facing the Ornamental and Medicinal Plants product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the

attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Ornamental and Medicinal Plants product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Ornamental and Medicinal Plants product value chains upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Ornamental and Medicinal Plants product value chains upgrading technologies and innovations.

6.0 LIVESTOCK PROGRAMME

6.1 Strategic Focus

The rationale and justification as well as the challenges and constraints facing the Livestock Programme that is coordinated and implemented at the Teko Livestock Research Centre (TLRC) have been well articulated in the SLARI Strategic Plan for the period 2012-2021. The Programme is expected to address these challenges and constraints so as to enhance sustainable productivity, commercialization and competitiveness of the livestock. In order to do this, the Programme is expected to contribute to the delivery of the overall institutional specific objective through the attainment of its specific objective of Generating and promoting innovative livestock technologies and empowerment of stakeholders. The Programme shall deliver this specific objective through the attainment of the following five results:

- (i) Appropriate livestock product value chains technologies and innovations **generated and promoted.**
- (ii) Appropriate markets and marketing strategies for enhancing livestock product value chains **developed and promoted.**
- (iii) Appropriate policy options for enhancing livestock product value chains **facilitated and advocated**
- (iv) Capacity for implementing livestock product value chains research **strengthened.**
- (v) Appropriate mechanisms for managing, sharing and up scaling livestock knowledge, information and technologies **established and operationalized.**

In order to contribute significantly to the attainment of the overall institutional specific objective, the Livestock Programme shall focus on seven product value chains outlined below. The importance of each product value chain in contributing to the national economic growth and agricultural sector development as well as improvement of livelihoods, income generation and food security shall be determined through prioritization process discussed in chapter three. The allocation of resources for research shall then be based on the results of the priority setting process. Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme strategic results.

- (i) Development and promotion of Dairy product value chain.
- (ii) Development and promotion of Beef product value chain.
- (iii) Development and promotion of Goat product value chain
- (iv) Development and promotion of Sheep product value chain
- (v) Development and promotion of Poultry product value chains.
- (vi) Development and promotion of Pig product value chain.
- (vii) Development and promotion of Non-conventional Small Stock product value chains.

The Livestock Programme Result framework, Research implementation plan and financing requirement are shown in Annexes 6.1, 6.2 and 6.3 respectively. The centre current and optimal human resource requirement and summary of financing requirement are shown in Tables 2.3 and 2.4 respectively.

6.2 Development and Promotion of Dairy Product Value Chain

6.2.1 Rationale and Justification

Currently, dairy production is almost non-existent in Sierra Leone and local production is derived from the local N'Dama cattle. This production cannot meet the present demand. This has led to increased nutritional diseases among vulnerable communities (children, pregnant and lactating mothers). The Department of Animal Science at Njala University is conducting a breeding programme to produce a dual-purpose (meat and milk) goat breed. This cross-breeding research aims at improving the productivity of the local goats in Sierra Leone. There is an absolute need to embark on dairy production and research. This is more so as the milk is sold to provide income that is utilized in the day to day running of family homes. Such milk is also consumed whole or its cream is extracted and processed into local ghee which is subsequently sold for income. Such income is used to buy household goods, pay school fees, medical bills among others. The skimmed milk is also processed into sour milk which is sold for income too.

The milk production and processing programme shall be mainly located at Musaia Livestock Station which has been identified as a key outreach station for the promotion of the Dairy Product Value Chain. Selection and multiplication of cross bred cattle and goats shall take place at Musaia for increased milk production so as to achieve marked increase in milk supply. Outreach Farmers shall be included in this programme.

6.2.2 Challenges and Strategic Focus

The local N'Dama cattle is used as a dual-purpose breed for both milk and meat production. The milk produced by this breed is estimated at 1.5-5 litres a day compared with improved breeds in the region that produce about 15-20 litres a day. Furthermore the local farmers are shy to embrace modern husbandry practices such as fodder conservation, construction of sleeping sheds, regular deworming and adherence to routine vaccination and other veterinary interventions. Little dairy production is currently going on in Sierra Leone thus dairy products are among the food imports the country relies on to meet the local demand. The challenge here is to put in place interventions that will tremendously increase local milk production. The little milk that is locally produced is sold unprocessed to consumers with a greater risk of acquiring diseases (zoonoses).

In order to address the identified challenges facing the Dairy product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Dairy product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Dairy product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Dairy product value chain upgrading technologies and innovations.

6.3 Development and Promotion of Beef Product Value Chain

6.3.1 Rationale and Justification

The present production level is low with a killing out percentage of 60%. The local N'Dama cattle is the predominant breed with a mature weight of 250-350 kg attained in 5-6 years. Sierra Leone is a net importer of meat and meat products. The available data indicates that meat, meat products and live animals make a significant proportion of imports. This is despite the fact that the country is endowed with a favourable climate, water and other natural resources that can sustain increased beef production. There are groups of cattle traders in the country who buy cattle from the weekly markets, transport them to different towns and cities and sell to butchers thereby incurring income. Such income is utilized to meet the needs of their families. In addition there are lots of meat sellers whose lively hood depends the industry and meat is widely consumed thus improving the nutritional status of the populace.

6.3.2 Challenges and Strategic Focus

There are no specialized beef production breeds in Sierra Leone. As indicated earlier, the N'Dama cattle is the predominant breed, which is a source of beef. This breed is characterized by low weight gain, low milk production and slow growth. However, it has the inherent trypanotolerant advantage and is well adapted to the local environment. Over 60% of the cattle population is found in the northern parts of the country, where serious overgrazing has occurred with an estimated 8,300 km² rendered bare. Due to the communal grazing and land ownership, no effort is undertaken for range and pasture management. Annual bush fires affect about 200,000 ha of grazing land. These factors lead to feed scarcity, which is exacerbated during dry seasons. Beef production is also affected by low fertility at 45%, high mortality and low off-take of 7%, occasioned by the deficient nutrition, diseases and parasites (NSADP 2009). There is also conspicuous absence of value-addition leading to poor economic returns. The country lacks proper processing facilities. Those that existed before were all destroyed during the war. Since then no serious attempts have been made by investors to revive the sector.

In order to address the identified challenges facing the Beef product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Beef product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Beef product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Beef product value chain upgrading technologies and innovations.

6.4 Development and Promotion of Goat Product Value Chain

6.4.1 Rationale and Justification

Goats have a huge market in Sierra Leone. Goat meat is a delicacy and the most favoured animal among the Mende tribe who use the animal for secret society purposes. The present population estimates for goats is 803,000. The improvement in goat production has been targeted in all districts, specifically for meat (NSADP, 2009) but could also be considered for milk, especially on small-scale farms that may not sustain dairy cows. Previously, no work had been done on goats except for occasional disease control and prevention through vaccination. Like cattle, goat meat is widely consumed and cuts across religious lines. Since they are small, they can be handled by women and children and as such do not pose the problems associated with the handling of cattle.

6.4.2 Challenges and Strategic Focus

Goats in Sierra Leone are phenotypically stunted, thrifty and slow maturing. They easily succumb to diseases particularly Peste des Petits Ruminants (PPR) and are prone to heavy worm infestation. Poor nutrition, inferior genetic material, poor production facilities and traditional management practices have not favoured goats to reach their full growth potentials and performance. Currently, a planned national vaccination campaign against PPR for small ruminants is underway. Also, the Department of Animal Science is conducting a dual purpose research to improve the meat and milk production potentials of the local goat breeds. Other challenges include inadequate veterinary services due to inaccessible roads particularly in the rainy season; failure of farmers to promptly report to animal Health Extension staff problems affecting their stocks; reluctance of farmers to adopt improved husbandry practices; and failure to take goat rearing as a business.

In order to address the identified challenges facing the Goat product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Goat product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Goat product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Goat product value chain upgrading technologies and innovations.

6.5 Development and Promotion of Sheep Product Value Chain

6.5.1 Rationale and Justification

Sierra Leone has a predominant Muslim population where sheep has gained favour for the accomplishment of many Muslim religious festivals. The present population estimates for sheep in Sierra Leone is 682,000. The improvement in sheep production has been targeted in all districts, specifically for meat (NSADP, 2009) but could also be considered for milk, especially on small-scale farms that may not sustain dairy cows. Previously, no work had been done on small ruminants except for occasional disease control and prevention through vaccination. Sheep are more expensive particularly if they have complete white fleece that are preferred for certain rituals. Farmers owning such sheep earn more money. Selection and multiplication of white fleeced sheep will be more profitable for farmers.

6.5.2 Challenges and Strategic Focus

Sheep in Sierra Leone are phenotypically stunted, thrifty and slow maturing. They easily succumb to diseases particularly PPR and are prone to heavy worm infestation. Poor nutrition, inferior genetic material, poor production facilities and traditional management practices have not favoured sheep to reach their full growth

potentials and performance. Currently, a planned national vaccination campaign against PPR for small ruminants is underway. Also, the Department of Animal Science is conducting a dual purpose research to improve the meat and milk production potentials of the local sheep breeds. The challenges are the same as indicated for goats above.

In order to address the identified challenges facing the Sheep product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Sheep product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Sheep product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Sheep product value chain upgrading technologies and innovations.

6.6 Development and Promotion of Poultry Product Value Chains

6.6.1 Rationale and Justification

Commercial poultry farming activities are much more concentrated in the urban and peri-urban areas. In the rural areas, local chicken which constitute about 90% of the poultry population are reared under free-range system. Most of the local chicken have been occasionally vaccinated against Newcastle disease (NCD). Local chickens are very much preferred by consumers because their meat is quite delicious and are organic in nature. However, they are inferior with respect to meat and egg production when compared with exotic breeds. A matured local cock may, on the average, weigh 1.5 kg in 12 months. Local chicken layers may lay an average of 60-80 eggs per year, but majority (90%) do not reach their end of lay period due to disease outbreaks or sold for cash. Mortality rates may reach 90% in rainy seasons for matured stock mainly due to NCD outbreak, and 80-90% for chicks in dry seasons. The high rate of mortality for chicks in the dry season is attributed to aerial predators and NCD. Improvement initiatives were carried out through the distribution of improved cockerels to local farmers for upgrading purposes. Other challenges include poor management (poor housing and feeding) of local chickens by rural farmers; predators pests and human thefts.

6.6.2 Challenges and Strategic Focus

In the National Sustainable Agricultural Development Plan, all districts have expressed the need for poultry development. This is because poultry is reared on virtually all farms. This is an enterprise that can contribute significantly to increased protein intake from the current 44 g. By its nature, poultry is also very suitable as an economic enterprise for marginalized groups such as women and the youth. However, poultry population of 1.5 million (NSADP, 2009) is very low compared to human population of 5.6 million. The birds kept in rural areas are mainly indigenous, reared under subsistence traditional systems, characterized by low mature weight, low weight gain, low egg production and high mortality. Presently there are no established poultry processing facilities in all the major rearing areas. The one present before the war was vandalized and the facility occupied by the Polio Victims.

Commercial poultry production is deeply rooted in the urban and peri-urban areas in the country where they have found a favourable economic niche for farmers. However, this enterprise is characterized by low inputs and correspondingly low outputs due mainly to erratic supply of poultry feeds, traditional management practices, disease outbreaks and to a larger extent, inferior genetic materials of the local birds. Furthermore, post-slaughter processing, packaging and storage are faced with erratic electricity supply and poor market outlets which many times force farmers to auction their products or give them out on credit basis.

In order to address the identified challenges facing the Poultry product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Poultry product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Poultry product value chains upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Poultry product value chains upgrading technologies and innovations.

6.7 Development and Promotion of Pig Product Value Chain

6.7.1 Rationale and Justification

Pig production in Sierra Leone is a traditional hobby undertaken by many urban dwellers. They are mostly kept as supplementary income generating activity, and diversification to risky economic business. The breeds of pigs reared are mainly diluted uncontrolled breeding breeds resulting from crosses of exotic and local breeds, and intersex mating among crosses. A mature pig may weigh about 40-60 kg in seven months, and may yield a 50% killing-out percentage. In addition, pig rearing is not widely practiced because of religious belief. Moreover, the absence of feed mills for the compounding of feed for monogastrics is a serious constraint.

6.7.2 Challenges and Strategic Focus

The pig industry in Sierra Leone faced with many challenges and constraints. Feed availability is the most significant constraint in rearing pigs coupled with traditional management practices, disease outbreaks, inferior genetic materials and lack of post-slaughter processing, packaging and storage. Like poultry, the pig processing plant located in Freetown was vandalized and has not yet been rehabilitated. Also the major outlets for pig products have closed. Because of this many pig farmers have lowered their production level.

In order to address the identified challenges facing the Pig product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Pig product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Pig product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the Pig product value chain upgrading technologies and innovations.

6.8 Development and Promotion of Non-conventional Small Stock Product Value Chains

6.8.1 Rationale and Justification

Rabbits, cane rats, snails and guinea fowls are indigenous livestock which are accepted and eaten by many tribes in Sierra Leone. Many farmers have expressed interest in rearing rabbits, cane rats and guinea fowls but lack the expert knowledge to profitably rear them. Few individuals are engaged in rearing cane rats in Sierra Leone but this venture is still rudimentary and requires extensive research and outreach support services. Very few people are engaged in the rearing of nonconventional small stocks because they lack the knowledge and skills. But these are very prolific and fast growing stocks. As a result, it has a quick turn over.

Virtually nothing had been done in this area. However, with this new dispensation to achieve food security, create employment opportunities for youths and the dire need to reduce the level of poverty, there is now an absolute need to embark on this area.

6.8.2 Challenges and Strategic Focus

The knowledge and skills related to the rearing of nonconventional small stocks and processing of their products are yet to be developed and delivered to farmers. This is more so because the Extension agents are also ill equipped to deliver to the Farmers. The Extension Agents, therefore, need to be trained so that they can deliver the appropriate technologies and innovations developed by research for the benefit of the Farmers.

In order to address the identified challenges facing the Non-conventional small stock product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the programme purpose, the following broad intervention strategies shall be implemented:

- (i) Non-conventional small stock product value chain analysis, mapping and identification of constraints and opportunities.

- (ii) Development of non-conventional small stock product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of the non-conventional small stock product value chain upgrading technologies and innovations.

7.0 FISHERIES PROGRAMME

7.1 Strategic Focus

The rationale and justification as well as the challenges and constraints facing the Fisheries Programme that is coordinated and implemented at the Freetown Fisheries Research Centre (FFRC) have been well articulated in the SLARI Strategic Plan for the period 2012-2021. The Programme is expected to address these challenges and constraints so as to enhance sustainable productivity, commercialization and competitiveness of the Fisheries. In order to do this, the Programme is expected to contribute to the delivery of the overall institutional specific objective through the attainment of its specific objective of Generating and promoting innovative Fisheries technologies and empowerment of stakeholders. The Programme shall deliver this specific objective through the attainment of the following five results:

- (i) Appropriate Fisheries product value chains technologies and innovations **generated and promoted.**
- (ii) Appropriate markets and marketing strategies for enhancing Fisheries product value chains **developed and promoted.**
- (iii) Appropriate policy options for enhancing Fisheries product value chains **facilitated and advocated.**
- (iv) Capacity for implementing Fisheries product value chains research **strengthened.**
- (v) Appropriate mechanisms for managing, sharing and up scaling Fisheries knowledge, information and technologies **established and operationalized.**

In order to contribute significantly to the attainment of the overall institutional specific objective, the Fisheries Programme shall focus on eight product value chains outlined below. The importance of each product value chain in contributing to the national economic growth and agricultural sector development as well as improvement of livelihoods, income generation and food security shall be determined through prioritization process discussed in chapter three. The allocation of resources for research shall then be based on the results of the priority setting process. Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme strategic results.

- (i) Development and promotion of Demersal product value chain.
- (ii) Development and promotion of Pelagic product value chain.
- (iii) Development and promotion of Shrimps product value chain.
- (iv) Development and promotion of Crabs and Lobsters product value chains.
- (v) Development and promotion of Cephalopodae product value chain.
- (vi) Development and promotion of Tilapia product value chain.
- (vii) Development and promotion of Shrimp Culture product value chain.
- (viii) Development and promotion of Catfish product value chain.

The Fisheries Programme Result framework, Research implementation plan and financing requirement are shown in Annexes 7.1, 7.2 and 7.3 respectively. The centre current and optimal human resource requirement and summary of financing requirement are shown in Tables 2.3 and 2.4 respectively.

7.2 Development and Promotion of Demersal Product Value Chain

7.2.1 Rationale and Justification

The demersal fisheries is the fishery that highly lucrative for the International market. It is the fish that is mostly exported regionally and internationally and contributes to the national economy in terms of Licence and Royalty fees,

The major Demersal species belong to the following families: Sea breams: (*Sparidae*), Groupers (*Serranidae*), Tongue soles (*Cynoglossidae*), Snappers: (*Lutjanidae*), Croakers (*Scianidae*) and Catfishes (*Ariidae*). These resources are targeted by both the artisanal and industrial fisheries, the latter with greater intensity. The potential yield of Demersal was estimated at 18,000-45,000 metric tonnes between 1982 and 1991 (USSR and FAO Surveys). This peaked to 55,000 metric tonnes in 2000 (IMBO, 2000) and then fell to 27,000 metric tonnes in 2002 (Fisheries Depart. 2002). The fluctuations in the yield of Demersal may point to the methods used but could also be an indication of management and environmental factors that should be investigated.

The last estimate was done 18 years ago and much could have changed by now. There is need to establish the current situation in terms of yield trends and factors influencing the trend.

7.2.2 Challenges and Strategic Focus

(Please provide a paragraph on the challenges facing the Demersal product value chain ending with the paragraph shown below)

In order to address the identified challenges facing Demersal product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Demersal product value chain analysis, prioritization and development of appropriate upgrading and promotion strategies.
- (ii) Development of Demersal product value chain upgrading and promotion technologies and innovations.
- (iii) Promotion and up scaling of Demersal product value chain upgrading and promotion technologies and innovations.

7.3 Development and Promotion of Pelagic Product Value Chain

7.3.1 Rationale and Justification

The Pelagic fish stock is further classified into true pelagics, semi-pelagics and large pelagics. The clupeids (*Ethmalosa fimbriata*, *Sardinella maderensis*, *Sardinella aurita*, *Illisha africana* and *Engraulis encrasicolus*) are the most important of the small pelagics. The round herring, *Sardinella aurita*, is a migratory species and has an offshore distribution. Significant among the true pelagics are the carangids, principally including *Choloroscombrus chrysurus*, *Decapterus rhonchos*, *D. punctatus*, *Caranx hippos* and *Trachurus trecae*. Other true pelagics include *Sphyraena guachancho* and *S. dubia*.

The Pelagic resources are believed to be more abundant than the demersal resources with an estimated potential sustainable yield in the region of 100,000 metric tonnes. The 2007 estimates indicate that 90% of 300,000 metric tonnes fish stock is composed of pelagics (National Sustainable Agricultural. Development, 2010-2030). These are made up of the large pelagics: Skipjack, yellow fin Tuna and Spanish Mackerel (*Scombridae*), Barracuda (*Sphyraenidae*) and the small pelagics: Horse mackerel, scad, Pollock (*Carangidae*), Herrings and Bonga (*Clupeidae*).

The semi-pelagics include *Brachydeuterus auritus*, *Priacanthus arenatus*, *Balistes capricus*, *Ariomma bondi* and these are associated with regions of high zooplankton productivity (Coutin, 1989). Large pelagics are associated with upwelling zones and the important ones include *Istiophorous albicans*, *Xiphias*, *Thunnus albacores*, *Katsuwonus pelamis*, *Euthynnus alleteratus* and *Auxis thazard* (Ssentongo and Ansa-Emmim, 1986)

The large pelagics are exploited by industrial fishing vessels, while the small pelagics such as Scad, Pollock and some Barracuda are caught by the artisanal fishermen. Herrings and Bonga are commonly targeted and landed by coastal artisanal fisheries. The estimated yields range from 85,000 120,000 metric tonnes (USSR and FAO Surveys 1982-1991, IMBO, 2000).

7.3.2 Challenges and Strategic Focus

(Please provide a paragraph on the challenges facing the Pelagic product value chain ending with the paragraph shown below)

In order to address the identified challenges facing the Pelagic product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Pelagic product value chain analysis, prioritization and development of appropriate upgrading and promotion strategies.

- (ii) Development of Pelagic product value chain upgrading and promotion technologies and innovations.
- (iii) Promotion and up scaling of Pelagic product value chain upgrading and promotion technologies and innovations.

7.4 Development and Promotion of Shrimp Product Value Chain

7.4.1 Rationale and Justification

The Shrimp Fishery is also an export oriented fishery. Most of the shrimp caught from the Industrial fishery is exported to the International market which is a lucrative market and contributes significantly to the foreign exchange earning and hence to the GDP. However a percentage of the shrimp catch is landed on the local market for domestic consumption. The artisanal fishery also produces some amount of Shrimp for the local market.

The estimated potential sustainable yield of the pink and tiger Shrimp (*Peneaidae*) is around 3,000 metric tonnes. Sixteen shrimp species occur in Sierra Leone waters but six are of commercial importance (Seisay and Ndomahina, 2005). The pink shrimp, *Penaeus notialis*, accounts for about 80% of the catch. The others include the tiger shrimp, *Penaeus kerathurus*, the inshore Guinea shrimp (accessible to artisanal beach seines), *Parapenaeopsis atlantica*, the deep-water rose shrimp (*Parapenaeus longirostris*), *Plesiopenaeus edwardsianus* and *Aristeus antennatus*. Average yearly catch of Shrimp from 1996-2001 was 1,800 tonnes (MFMR 2002). The estimated annual potential yield of the Shrimp is about 3,000 metric tonnes.

7.4.2 Challenges and Strategic Focus

The problem of Quality Assurance and the access to the EU market is a major challenge. This is because of the formation of the Competent Authority for Fish and Fishery products is been developed (that is the legal framework). The Industrial fleet is Foreign dominated, the banks to provide facilities to the Indigenous business men. There are challenges along the value chain for the artisanal fishery from production to marketing. Low production because of lack of inputs, lack processing facilities and poor distribution networks.

In order to address the identified challenges facing the Shrimp product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Shrimp product value chains analysis, prioritization and development of appropriate upgrading and promotion strategies.
- (ii) Development of Shrimp product value chains upgrading and promotion technologies and innovations.
- (iii) Promotion and up scaling of Shrimp product value chains upgrading and promotion technologies and innovations.

7.5 Development and Promotion of Crabs and Lobsters Product Value Chains

7.5.1 Rationale and Justification

The crab species consumed by the local population are *Scylla serrata*, *Callinectes spp*, *Sesarma angolense* and *Cardiosoma armatum* (Seisay and Ndomahina, 2005). The two most important lobster species are *Panulirus regius* and *P. argus*.

7.5.2 Challenges and Strategic Focus

(Please provide a paragraph on the challenges facing the Crabs and Lobsters product value chain ending with the paragraph shown below)

In order to address the identified challenges facing the Crabs and Lobsters product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Crabs and Lobsters product value chains analysis, prioritization and development of appropriate upgrading and promotion strategies.
- (ii) Development of Crabs and Lobsters product value chains upgrading and promotion technologies and innovations.
- (iii) Promotion and up scaling of Crabs and Lobsters product value chains upgrading and promotion technologies and innovations.

7.6 Development and Promotion of Cephalopodae Product Value Chain

7.6.1 Rationale and Justification

The Cuttlefish are the dominant cephalopod resources. The two main species of Cuttlefish are *Sepia officinalis hierredda* and *Sepia bertheloti*. The squid stocks comprise of four species, *Thysanoteuthis rhombus*, *Stenoteuthis petropus*, *Illex coindetii* and *Todaropsis eblanae*. Octopus species such as *O. Vulgaris*, have also been reported in trawl catches.

7.6.2 Challenges and Strategic Focus

(Please provide a paragraph on the challenges facing the Cephalopodae product value chain ending with the paragraph shown below)

In order to address the identified challenges facing the Cephalopodae product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Cephalopodae product value chains analysis, prioritization and development of appropriate upgrading and promotion strategies.
- (ii) Development of Cephalopodae product value chains upgrading and promotion technologies and innovations.
- (iii) Promotion and up scaling of Cephalopodae product value chains upgrading and promotion technologies and innovations.

7.7 Development and Promotion of the Tilapia Product Value Chain

7.7.1 Rationale and Justification

(Please provide a paragraph or two on the importance of Tilapia in terms of its contribution to the improvement of livelihoods, income generation as well as food and nutrition security)

7.7.2 Challenges and Strategic Focus

The lack of good quality seed resulting from poor brood stock management, lack of selective breeding programmes, etc. Low or lack of capital (for initial and additional investment, working capital). There are shortcomings regarding Human resources/Technical assistance/Training/Access to reliable information. The lack of access to specific aquaculture equipments. The lack of efficient professional organizations to act as umbrellas for all stakeholders (private, public and research sectors). There are restrictive regulations and unclear legislation regarding property rights and access to land. The poor road access to areas of high potential for aquaculture development. The European Union food safety regulations and approval procedures regarding the export of fish products to the European market. Marketing: access to the local/regional and international markets for finished products

In order to address the identified challenges facing the Tilapia product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Tilapia product value chain analysis, prioritization and development of appropriate upgrading and promotion strategies.

- (ii) Development of Tilapia product value chain upgrading and promotion technologies and innovations.
- (iii) Promotion and up scaling of the Tilapia product value chain upgrading and promotion technologies and innovations.

7.8 Development and Promotion of Shrimp Culture Product Value Chain

7.8.1 Rationale and Justification

(Please provide a paragraph or two on the importance of Shrimp Culture in terms of its contribution to the improvement of livelihoods, income generation as well as food and nutrition security)

7.8.2 Challenges and Strategic Focus

(Please provide a paragraph on the challenges and constraints facing the Shrimp Culture product value chain ending with the paragraph shown below)

In order to address the identified challenges facing the Shrimp Culture product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Shrimp Culture product value chains analysis, prioritization and development of appropriate upgrading and promotion strategies.
- (ii) Development of Shrimp Culture product value chains upgrading and promotion technologies and innovations.
- (iii) Promotion and up scaling of Shrimp Culture product value chains upgrading and promotion technologies and innovations.

7.9 Development and Promotion of the Catfish Product Value Chain

7.9.1 Rationale and Justification

(Please provide a paragraph or two on the importance of Catfish in terms of its contribution to the improvement of livelihoods, income generation as well as food and nutrition security)

7.9.2 Challenges and Strategic Focus

The lack of good quality seed resulting from poor brood stock management and lack of selective breeding programmes. Low or lack of capital for initial and additional investment, working capital. There are shortcomings regarding Human resources/Technical assistance/Training/Access to reliable information. The lack of access to specific aquaculture equipments. The lack of efficient professional organizations to act as umbrellas for all stakeholders (private, public and research sectors). There are restrictive regulations and unclear legislation regarding property rights and access to land. The poor road access to areas of high potential for aquaculture development. The European Union food safety regulations and approval procedures regarding the export of fish products to the European market

Marketing: access to the local/regional and international markets for finished products

In order to address the identified challenges facing the Catfish product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Catfish product value chain analysis, prioritization and development of appropriate upgrading and promotion strategies.
- (ii) Development of Catfish product value chain upgrading and promotion technologies and innovations.
- (iii) Promotion and up scaling of the Catfish product value chain upgrading and promotion technologies and innovations.

8.0 FORESTRY AND TREE CROPS PROGRAMME

8.1 Strategic Focus

The rationale and justification as well as the challenges and constraints facing the Forestry and Tree Crops Programme that is coordinated and implemented at the Kenema Forestry and Tree Crops Research Centre (KFTCRC) have been well articulated in the SLARI Strategic Plan for the period 2012-2021. The Programme is expected to address these challenges and constraints so as to enhance sustainable productivity, commercialization and competitiveness of the forestry and tree crops. In order to do this, the Programme is expected to contribute to the delivery of the overall institutional specific objective through the attainment of its specific objective of Generating and promoting innovative forestry and tree crops technologies and empowerment of stakeholders. The Programme shall deliver this specific objective through the attainment of the following five results:

- (i) Appropriate forestry and tree crops product value chains technologies and innovations **generated and promoted.**
- (ii) Appropriate markets and marketing strategies for enhancing forestry and tree crops product value chains **developed and promoted.**
- (iii) Appropriate policy options for enhancing forestry and tree crops product value chains **facilitated and advocated**
- (iv) Capacity for implementing forestry and tree crops product value chains research **strengthened.**
- (v) Appropriate mechanisms for managing, sharing and up scaling forestry and tree crops knowledge, information and technologies **established and operationalized.**

In order to contribute significantly to the attainment of the overall institutional specific objective, the Forestry and Tree Crops Programme shall focus on five product value chains outlined below. The importance of each product value chain in contributing to the national economic growth and agricultural sector development as well as improvement of livelihoods, income generation and food security shall be determined through prioritization process discussed in chapter three. The allocation of resources for research shall then be based on the results of the priority setting process. Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme strategic results.

- (i) Development and promotion of Forestry product value chains.
- (ii) Development and promotion of Cocoa product value chain.
- (iii) Development and promotion of Coffee product value chain.
- (iv) Development and promotion of Cashew product value chain.
- (v) Development and promotion of Oil palm crop product value chain.

The Forestry and Tree Crops Programme Result framework, Research implementation plan and financing requirement are shown in Annexes 8.1, 8.2 and 8.3 respectively. The centre current and optimal human resource requirement and summary of financing requirement are shown in Tables 2.3 and 2.4 respectively.

8.2 Development and Promotion of Forestry Product Value Chains

8.2.1 Rationale and Justification

Forests are important for economic development, environmental services, social and cultural values. They provide products such as timber, pulp and paper, poles and fuel wood both for industrial and domestic use and a wide range of non-wood forest products. Forests are important for conservation of biological diversity, watersheds, carbon sequestration and are a major habitat for wildlife.

Agroforestry is uniquely suited to address both the requirement for increased food security and biomass resources, and the need for sustainable management of agricultural landscapes. One of the ways of moving smallholders out of poverty is through increasing the productivity of agroforestry systems and enhancing the complementarities that trees provide for the productivity of crops and livestock. Forest trees can improve the life of farmers in many ways including:

- (i) Farm-grown trees are an investment, and their value increases over time. This is exemplified by the smallholder timber production systems, and tree crop systems based on cacao and coffee agroforestry.
- (ii) Tree assets often produce higher income per unit area, and are more resilient to drought. They require less labour investment, which is particularly important in labour-constrained households, often headed by women.
- (iii) Many agroforestry species have the potential to produce high-value fruits, oils, cash crops and medicinal plants. Agroforestry systems can also play an important role in areas where market development is difficult but pressure on natural ecosystems is high.

8.2.2 Challenges and Strategic Focus

The forestry sub sector in Sierra Leone faces a number of challenges which are closely linked to rapid human population growth. The limited area of forest land, estimated at approximately 4% of the total land area, is decreasing at a fast rate due to pressure from agricultural expansion and settlement. The area under industrial forest plantations is also expected to decrease. Woodlands and bush lands in the dry lands in northern Sierra Leone are also under great pressure from cattle farmers. The loss of forest cover and other types of woody vegetation will lead to increasing scarcity of a wide range of forest products, environmental degradation and loss of biodiversity.

The development of forestry plantations in the country is faced with the problems low rate of replanting in harvested areas, reliance on few exotic species which are being threatened by pests and diseases, poor agricultural management and inefficient use of wood. In addition to this, there is lack of value addition to the products to attract better prices for farmers. Limited value addition and product development hinders access to new market opportunities. Although there are policies in place their implementation remains a challenge. In addition, some policies covering the sub sector are not conducive for increased growth. The failure to formulate and implement conducive policies has led to increased encroachment of forests due to shifting cultivation, excessive logging and fuel wood harvesting, all of which are estimated to destroy 6,000 ha of forest per year.

Forestry research has been constrained by outbreak of diseases, inferior genetic potentials of plant materials, poor storage and processing facilities, inadequate access to knowledge and information technologies and extension services, weak technical manpower base, and the lack of production facilities. The challenge therefore is the provision of information and knowledge that will empower producers to be market-oriented.

In order to address the identified challenges facing the Forestry product value chains so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Forestry product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Forestry product value chains upgrading technologies and innovations.
- (iii) Promotion and up scaling of Forestry product value chains upgrading technologies and innovations.

8.3 Development and Promotion of Cocoa Product Value Chain

8.3.1 Rationale and Justification

The land available for cocoa production is estimated at 45,000 to 75,000 ha. Yields of cocoa trees were reported to average about 400 kg/ha in 1985, but these have since declined due to neglect and aging of the trees. Most cocoa planted is in the traditional West African Amelonado variety. Upper Amazonian varieties were introduced in the 1960s, but many of these are over 30 years of age. Estimates place current yields at 100-200 kg/ha, in comparison with average yields within West Africa of about 300 kg/ha, and a potential yield of 1-1.5 t/ha with the new hybrid varieties grown in Ghana and Côte d'Ivoire.

It is estimated that about 25,000 ha of cocoa need to be replanted while 17,000 ha could be rehabilitated. In addition to the age of trees, cocoa farms are subject to widespread infestation of pests and diseases, primarily the cocoa black pod (CBP), despite efforts at rehabilitation. The CBP infestation alone is estimated to reduce cocoa production by more than 60%. With global demand for cocoa in excess of 3 million tonnes per year

and underlying growth in the global market of some 2% per annum, the market needs an annual increase in output of 60,000 t and a variety of sources of supply. The prospects for expanding cocoa exports from Sierra Leone are very good. If the beans are handled correctly to avoid deterioration, there will be strong demand on the world market.

8.3.2 Challenges and Strategic Focus

The traditional smallholder tree crop systems can play an important role in improving rural livelihood, but underinvestment, combined at times with weak policy support, has meant that this potential has not been realized. Three common concerns in the cocoa sub sector include: promoting the production and marketing of quality cocoa; improving market access and income for small-scale producers; and creating systems that are environmentally friendly, socially responsible and economically sustainable. However, capacity for tree crop research and development does not exist in Sierra Leone. As a result, appropriate and improved planting materials, soil analysis, recommended fertilizers, application rates and other specific recommendations to improve tree crop productivity are non-existent.

In addition, there are no private sector input suppliers linked to research institutions and participating in extension activities for cocoa and other tree crops. Replanting of cocoa trees is inhibited by lack of availability of improved tree stock. Furthermore, farmers lack information on the appropriate fertilizers and pesticides to use, when to use them and in what amounts. Local availability of inputs is also a concern, with some farmers depending on cross-border markets for the inputs. Even if inputs were available, lack of financing is a major issue, especially because of the long gestation period involved in planting cocoa trees. Many farmers do not have assets that are acceptable as collateral to the financial sector.

In order to address the identified challenges facing the Cocoa product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Cocoa product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Cocoa product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of Cocoa product value chain upgrading technologies and innovations.

8.4 Development and Promotion of Coffee Product Value Chain

8.4.1 Rationale and Justification

Coffee used to be Sierra Leone's most important agricultural export. However, more recently farmers are much less interested in coffee to the extent that they are uprooting their coffee trees because prices are so low. There was still up to 2,000 t of production annually but exports declined to only 118 t in 2004. Current, coffee yields may be as low as 100 kg/ha. About 50% of the coffee area is planted with old unknown and low yielding varieties, whereas plantations established from 1982 onwards were planted with improved robusta clones introduced from Ivory Coast. The acreage under coffee is about 67,500 ha but only about half these merit rehabilitation. Globally, robusta coffees are in surplus and only the most efficient producers can survive. The prospects for growth are not encouraging – given the cyclical nature of the coffee market, it is likely that any improvements in returns are temporary.

8.4.2 Challenges and Strategic Focus

A number of coffee producers in other countries have addressed the difficult trading conditions by moving away from the commodity markets and seeking to differentiate their product. Several specialty types have emerged based on issues that might resonate with consumer demand such as organic, eco-friendly, fair trade, gourmet and single origin or estate. However, these niches are small and there is a risk of increasing supply diminishing the premia that they currently attract. There is also a requirement to maintain quality, consistency and reliability in trading. They are therefore better suited to the well developed coffee exporting countries. It is unlikely that in the near term Sierra Leone could become a reliable producer of these specialty types of coffee products.

In order to address the identified challenges facing the Coffee product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Coffee product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Coffee product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of Coffee product value chain upgrading technologies and innovations.

8.5 Development and Promotion of Cashew Product Value Chain

8.5.1 Rationale and Justification

Cashew cultivation in Sierra Leone was started in the late 1980s, when a 600 ha cashew plantation was established in Kambia District by the Magbema Cashew Farmers Association, with additional trees being planted by one hundred or so outgrowers. In January 2005, about 3,600 ha of cashew trees existed, mostly in the northern and western parts of the country, of which about 1,200 ha were bearing fruit. The 1,200 ha of fruit bearing cashew trees could potentially produce about 940 tonnes of raw cashew nuts though rough estimates put actual production at only about 500 t. The long-term prospects for cashew are very good. Long-term consumption trends on the world market have been high for years. Production is limited by the agronomic demands of the cashew tree, essentially requiring climatic conditions similar to those found in the western part of Sierra Leone. However, tolerance to the local conditions should be investigated: much of Sierra Leone has a high annual rainfall and cashew is usually susceptible to anthracnose and other fungal problems.

8.5.2 Challenges and Strategic Focus

The Magbema Cashew Farmers Association has obtained financing for the production and distribution of almost 300,000 cashew seedlings since 1990. Cashew is seen as a potentially attractive cash crop even in the traditional cocoa areas in eastern part of the country. Local farmers seem to be keen to start or expand cashew production, as evidenced by the sale of seedlings and by reported plantings in the MAFS's crop station at Kpuuwabu-Kenema. The older plantings of cashew can be expected to yield around 500 t of raw cashew nuts per year and a further yield of 1,000 t per year might be expected from the younger trees once they reach full bearing. This is not sufficient to support a processing industry for export of kernels internationally. However, it is sufficient to serve the local and regional demand in the medium-term while linkages with the export market for raw nuts are being developed.

Sierra Leone has a comparative advantage in the production of raw cashews for export. There may also be a potential for small-scale, largely manual processing of cashews for export, but this industry must be very competitive to survive. The more immediate challenge is how to attract international buyers of raw nuts given the low yields of the existing crop. To do this, growers should aim for large nut with good kernel yield. This may require the importation of planting materials.

In order to address the identified challenges facing the Cashew product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Cashew product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Cashew product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of Cashew product value chain upgrading technologies and innovations.

8.6 Development and Promotion of Oil palm Product Value Chain

8.6.1 Rationale and Justification

A formal industry on oil palm was developed in Sierra Leone in the 1950s through the Sierra Leone Produce Marketing Board (SLPMB) which planted 5,700 ha. A further 800 ha of private plantations were also established. Current estimates suggest that there are over 50,000 ha total in production. Very little production takes place under plantation conditions. The yield of oil palm grown in traditional upland farming systems is

only about one-half of the yields achievable in monocrop plantations. Data for 1985 on plantations reported fruit yields of 8 t/ha and oil yields of 1.5 t/ha. There are no reliable data on production, but more recent FAO estimates suggest current fruit production at around 200,000 t per year. This is consistent with a relatively low average yield of about 4 t/ha FFB, including village as well as plantation production.

Fruit bunches from oil palms have traditionally been processed at household level. This processing is tedious and time-consuming, and results in very low recovery rates of only about 10% of the FFB yield. Palm oil is widely traded throughout Sierra Leone and is exported to neighboring countries as cooking oil. The Dura oil is preferred to that from the higher yielding Tenera because of flavour and the physical properties of the oil in remaining liquid at ambient temperatures. There are good opportunities for palm oil, palm kernel oil and palm kernel cake in domestic and regional markets, where transport costs are low in comparison with those of imported oil.

8.6.2 Challenges and Strategic Focus

The major constraint to oil palm production is the poor condition of existing plantations. There is also uncertainty regarding access to land within the estates. There is a need to define the conditions under which farmers are able to rehabilitate oil palm trees on the estates and then to benefit from the fruits of their labour. New plantations of oil palm will require the desired planting material, multiplication and distribution of seedlings, and provision of technical advice regarding planting and maintenance of the trees.

In order to address the identified challenges facing the Oil palm product value chain so as to improve its productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Oil palm product value chain analysis, mapping and identification of constraints and opportunities.
- (ii) Development of Oil palm product value chain upgrading technologies and innovations.
- (iii) Promotion and up scaling of Oil palm product value chain upgrading technologies and innovations.

9.0 LAND, WATER AND ENVIRONMENT PROGRAMME

9.1 Strategic Focus

The rationale and justification as well as the challenges and constraints facing the Land, Water and Environment Programme that is coordinated and implemented at the Magbosi Land and Water Research Centre (MLWRC) have been well articulated in the SLARI Strategic Plan for the period 2012-2021. The Programme is expected to address these challenges and constraints so as to **enhance sustainable productivity, commercialization and competitiveness of the agricultural sector**. In order to do this, the Programme is expected to contribute to the delivery of the overall institutional specific objective through the attainment of its specific objective of **Generating and promoting innovative land, water and environment technologies and empowerment of stakeholders**. The Programme shall deliver this specific objective through the attainment of the following five results:

- (i) Appropriate land, water and environment technologies and innovations for enhancing agricultural product value chains **generated and promoted**.
- (ii) Appropriate land, water and environment contribution for enhancing agricultural product value chains markets and marketing strategies **developed and promoted**.
- (iii) Appropriate land, water and environment policy options for enhancing agricultural product value chains **facilitated and advocated**.
- (iv) Capacity for implementing land, water and environment research for enhancing agricultural product value chains **strengthened**.
- (v) Appropriate mechanisms for managing, sharing and up scaling land, water and environment knowledge, information and technologies **established and operationalized**.

In order to contribute significantly to the attainment of the overall institutional specific objective, the Land, Water and Environment Programme shall focus on five sub programmes outlined below. Each sub programme shall be expected to contribute significantly to the upgrading and promotion of priority agricultural product value chains selected through prioritization process discussed in chapter three. This shall, in turn, contribute to the national economic growth and agricultural sector development as well as improvement of livelihoods, income generation and food security. The allocation of resources for research in the programme area of focus shall then be based on the results of the priority setting process. Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme strategic results.

- (i) Improvement on the contribution of integrated soil fertility management on agricultural product value chains.
- (ii) Improvement on the contribution of soil and water management on agricultural product value chains.
- (iii) Improvement on the contribution of irrigation and drainage on agricultural product value chains.
- (iv) Improvement on the contribution of soil survey, land evaluation and land use planning on agricultural product value chains.
- (v) Improvement on the contribution of sustainable environment management and climate change mitigation on agricultural product value chains.

The Land, Water and Environment Programme Result framework, Research implementation plan and financing requirement are shown in Annexes 9.1, 9.2 and 9.3 respectively. The centre current and optimal human resource requirement and summary of financing requirement are shown in Tables 2.3 and 2.4 respectively.

9.2 Improvement on the Contribution of Integrated Soil Fertility Management on Agricultural Product Value Chains

9.2.1 Rationale and Justification

The soils of Sierra Leone have been described as highly infertile. The infertility is caused by the negative impacts of the environment. There has, therefore, always been a series of interventions from the Government, donor sponsored projects and university researchers to improve the quality of the soils, both on the uplands and lowlands.

The farming systems and practices such as shifting cultivation practices as well as deforestation, mining, uncontrolled grazing and uncoordinated bush fires have all contributed negatively to reduce soil fertility. This decline in fertility has led to reduction in yield of rice from 1.0-1.5 t/ha to 0.7 t/h (MAFFS, 2005). Other adverse effects have been the deterioration of the soil physical structure, increased incidence of weeds and reduction in vegetation cover and biodiversity. Therefore, research on integrated soil fertility management (ISFM) will be a major national area of focus geared towards appropriate management of soil fertility for sustainable agricultural productivity. Research into integrated soil and fertility management has become a global concern that must be undertaken in Sierra Leone for sustainable and improved agricultural productivity.

9.2.2 Challenges and Strategic Focus

There has been considerable amount of research in soil fertility management in the university and research stations in the country, but most of these have not been on integrated soil fertility management research. Furthermore, most of the research results are still lying on the shelves awaiting dissemination and adoption by farmers. Research on ISFM research and development will be a major concern for the Land and Water Management Research Programme for development of innovative technologies for improving soil fertility for increased agricultural productivity while conserving the environment.

Additionally, the peace meal approach to soil fertility improvement based on occasional use of chemical fertilizers only is hindering the possibilities of increased yields. The outcome of such approach is poor crop yields which tends to keep farmers perpetually poor at the end of every growing season. Farmers in Sierra Leone are highly knowledgeable in indigenous approaches to soil fertility improvement. Unfortunately, due to the absence of established integrated approaches to Soil Fertility improvement the knowledge of farmers is not being exploited fully.

In order to address the identified challenges limiting effective contribution of the integrated soil fertility management to agricultural product value chains so as to improve their productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Agricultural product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of integrated soil fertility management technologies and innovations for enhancing product value chain upgrading.
- (iii) Promotion and up scaling of integrated soil fertility management technologies and innovations for enhancing product value chain upgrading.

9.3 Improvement on the Contribution of Soil and Water Management on Agricultural Product Value Chains

9.3.1 Rationale and Justification

It is an accepted fact that no agriculture can be possible in the absence of soil and water resources. Thus, soil and water are the principal resources on which agriculture depends. The increasing population pressure in Sierra Leone has resulted in non-sustainable farming practices, and consequent environmental degradation, characterized by declining soil fertility, widespread land degradation, and loss of biomass and biodiversity. The negative attributes of the environmental conditions including sunshine, humidity and other conditions have been shown to have adverse effect on soil and soil moisture during growing seasons. The high temperatures and the leaching of soil by high intensity rain results in reduced fertility of the soils. The situation is aggravated by deforestation and wrong tillage practices resulting into runoff which leads to loss of valuable topsoil.

In order to address these problems mentioned above, there is need to develop appropriate soil and water management technologies that will minimize if not stop degradation of soil and the loss of soil moisture. Both physical and biological soil and water conservation measures are some of the technologies that can be used in soil and water management. The main thrust of this programme will be the development and promotion of simple, effective and sustainable land and water management technologies.

To ensure higher crop yields and production of healthy crops on a sustainable basis, availability of adequate amount of water on time and in the right location is essential and necessary. On the other hand, too much water than required in the fields could result to crop damage and reduce yields. Proper water management is the only solution to such problems. The country's abundant water resources in the form of ground water, surface water, rainfall and other forms of precipitation need to be controlled.

The development and production of food crops is dependent on the availability of the right quality and quantity of water at the right time and place to satisfy the moisture requirement of each crop. Once this is ensured, the benefits of viable product value chains, increased food production and eventually food security for the nation can be ensured.

9.3.2 Challenges and Strategic Focus

The total lack of soil and water management, that is soil and water conservation on the upland ecologies, is a serious constraint. Over the years, the uplands and the catchments surrounding the valley bottoms and other lowland areas are becoming more and more infertile as farmers continue shifting cultivation practices, deforestation for fuel wood, timber and uncontrolled grazing. If this is not stopped or minimized, the lowlands will eventually become infertile and degraded and even assume upland condition. For example, in some abandoned developed swamps, dry land conditions have been observed as evidenced by the presence of the *Mimosa pudica* plant which is normally associated with the uplands.

In order to address the identified challenges limiting effective contribution of the soil and water management to the upgrading and promotion of agricultural product value chains so as to improve their productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Agricultural product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of soil and water management technologies and innovations for enhancing product value chain upgrading.
- (iii) Promotion and up scaling of soil and water management technologies and innovations for enhancing product value chain upgrading.

9.4 Improvement on the Contribution of Irrigation and Drainage on Agricultural Product Value Chains

9.4.1 Rationale and Justification

Sierra Leone is a country that is well endowed with water resources with high rainfall of 2,000 to 4,000 mm concentrated in a seven-month wet season and abundant river flows. The rainfall varies in time and space. Because of the heavy rainfall discharges, runoff are high and range between 2 and 50% of the total annual rainfall. There are nine major river systems flowing through the country generally in the northeastern-southwest direction, all these flow throughout the dry season and overflow their banks during rain seasons. Even though the country has a high rainfall, it also has a prolonged dry season when flows in the rivers are sufficiently reduced and cease to flow. To extend the period of crop growth in dry seasons, the only measure is to undertake small- to medium-scale irrigation schemes.

Irrigation in Sierra Leone is predominantly on small-scale projects and, to a very large extent, is practiced in inland valleys and minor flood plains. Farmers have used these lands for rice and vegetation production for centuries and have developed simple but workable and effective methods for controlling the water.

Irrigation and drainage is seen in Sierra Leone as one of the major ways in which food production, food self sufficiency, and food security can eventually be achieved. Irrigation and drainage of the vast irrigable lands will enhance continuous food production thereby ensuring regular and sustainable supply of healthy and abundant crop products. This is necessary for increased income to farmers and other value chain actors, and improved health and well being of the nation.

9.4.2 Challenges and Strategic Focus

Agriculture in Sierra Leone is predominantly rain fed and the farmers are not accustomed to irrigated agriculture. The purpose of irrigation in Sierra Leone is to increase yields per unit area. However, experience over the years indicates that farmers do not respond to the idea of planting in dry seasons simply to increase photosynthetic production. But, they appreciate getting higher incomes since food supply in dry seasons is low.

The major challenge facing the country is changing the attitudes of farmers from total dependence on rain fed agriculture to all year round food production combining the benefits of the rain fed and irrigated farming systems. Also, the notion of irrigated agriculture replacing the current rainfed system of farming does not seem to go down well with the large majority of small scale farmers. They see irrigated agriculture interfering with their social setups and general way of life.

In order to address the identified challenges limiting effective contribution of the irrigation and drainage to the upgrading and promotion of agricultural product value chains so as to improve their productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Agricultural product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of irrigation and drainage technologies and innovations for enhancing product value chain upgrading.
- (iii) Promotion and up scaling of irrigation and drainage technologies and innovations for enhancing product value chain upgrading.

9.5 Improvement on the Contribution of Soil survey, Land Evaluation and Land Use Planning on Agricultural Product Value Chains

9.5.1 Rationale and Justification

The arable land area of Sierra Leone has been subdivided into five farming ecologies namely the uplands, inland valley swamps, mangrove swamps, riverain grasslands, and the boliland. The non-arable areas are occupied by hills, rocky areas, rivers and roads. With the above situations now prevailing in the country, the only means of controlling the situation is to survey the lands; both arable and non-arable, evaluate them for farming and other socio-economic activities, and do a thorough land use planning and mapping. Soil surveys, inventories and land use planning will be conducted for monitoring the fertility and suitability of arable land. This will assist in formulating well defined land use policies and practices through legislation and land use planning.

For a country to realise any achievement in its agricultural development goals and objectives, it must have adequate knowledge on the status of its soils and other biophysical elements. These must be researched, the data analysed, documented, and stored for future development purposes. The lack of such records greatly hinders crop production. A well developed soil survey and land use planning system in the country will enable policy makers and land development, and land use planners to plan and implement agricultural development programs and other land use activities. This can go a long way in minimising unsustainable uses of the land and create enabling environment that will ensure the well being of the nation. Without soil surveys and land use planning there will be no well structured national development.

9.5.2 Challenges and Strategic Focus

In 1974/1975, the FAO Land Resources Survey Project which became the Land and Water Development in 1981 conducted a reconnaissance survey of the whole country and classified it into 44 land systems. Information on these land system surveys now serve as baseline information for semi-detailed and detailed surveys for agricultural projects. This, however, falls short of properly conducted land use planning and resource inventory surveys. The urban and rural population use the arable and non-arable areas for food production and the non-arable areas for other purposes such as fishing, recreation, navigation, hunting and other activities which support their day-to-day activities.

With increasing population, there is bound to be scramble for farm lands, lands for property development, the creation of more facilities for people to earn their livelihood. Under these circumstances there has been a tendency for farm lands to get scarce and infertile due to overuse. Also areas for other activities will become scarce. Thus, there is the accompanying tendency for people to scramble for land. For example, in all the urban centres, Freetown and the provincial capitals, fertile lands are being used for property development, while others are using lands that are unsuitable and dangerous for human habitation.

The current land use planning and environmental policies in Sierra Leone have not been guided by technical information from research. There are no national land use plans to guide land use activities both in the capital city and in the provinces. As a result, the utilization of both the arable and the non-arable land is more like a “free-for-all” affair. There is no co-ordination and control. In the urban areas like Freetown, the steep hill sides are being utilized for constructing and developing houses, while buildings are also being constructed in the river belts of the creeks and streams that flow into the ocean. Backyard gardening and urban agriculture is mostly practiced on lands that are unsuitable for agriculture. With these types of inappropriate and unsustainable land use practices, there is potential for human disasters that result into loss of life. Many examples of such disasters have been recorded in Freetown and within the provinces.

In order to address the identified challenges limiting effective contribution of the soil survey, land evaluation and land use planning to the upgrading and promotion of agricultural product value chains so as to improve their productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Agricultural product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of soil survey, land evaluation and land use planning technologies and innovations for enhancing product value chain upgrading.
- (iii) Promotion and up scaling of soil survey, land evaluation and land use planning technologies and innovations for enhancing product value chain upgrading.

9.6 Improvement on the Contribution of Sustainable Environment Management and Climate Change Adaptation and Mitigation

9.6.1 Rationale and Justification

The agriculture and natural resources sector contribution to the Sierra Leone GDP has been substantial (41-58%): agriculture 64%, fishing 24%, forestry 7% and animal husbandry 5%. Various studies reviews and observations have revealed that the country is endowed with abundant natural resources in the form of fertile land, good rainfall, abundant water resources, and abundant and unique forest and wildlife resources (FAO, 2003). Unfortunately, the two areas, that include agricultural production and natural resources base, are bedevilled with serious constraints in the form of natural resources and environmental degradation. Some of the causes of this degradation have been described in detail under the Land Use research focus area above.

Studies have shown that arresting and reversing trends in natural resources and environmental degradation can be achieved by introducing efficient and effective forest and water management as well as land husbandry methods. This will be achieved through well strategized action plans. Such strategies and action plans should be based on a clear understanding of the state of the environment. This can be achieved through research in certain key areas such as resource mapping and inventory, assessment of the level of environmental degradation and evaluation of local community attitudes towards natural resource management and the environment in the context of agricultural production and food security.

Climate variability and climate change are directly linked to the environment. Accordingly, the current state of natural resource and environmental degradation is having direct effects on the climate. This is manifested in the behaviour of the climate over the last decade: The country is now experiencing abnormal patterns of rainfall and temperature such as fluctuations in the start and end of rain seasons which is affecting farming calendars and hence, crop production. There has been flooding in various parts of the country resulting in the destruction of rice farms in the lowlands. These few instances are examples of the impacts of climate variability which is becoming common.

9.6.2 Challenges and Strategic Focus

The major challenge faced by past studies is that all government institutions involved with environment and climatic change interventions such as the Land and Water Development Department (LWDD), Forestry Department (FD) and the Environment Unit (EU), is lack of up-to-date comprehensive resource data and information on the status of the environment. Furthermore, the general public including farmers and other stakeholders are yet to come to terms with the realities of climate change and climate variability and the effects of the latter on food production, food security, and the general well being of the society as a whole. This has been one of the main reasons behind the slow development of viable improved agricultural productivity.

In order to address the identified challenges limiting effective contribution of the environment management and climate change mitigation to the upgrading and promotion of agricultural product value chains so as to improve their productivity, commercialization and competitiveness and contribute significantly to the attainment of the Programme purpose, the following broad intervention strategies shall be implemented:

- (i) Agricultural product value chains analysis, mapping and identification of constraints and opportunities.
- (ii) Development of environment management and climate change mitigation technologies and innovations for enhancing product value chain upgrading.
- (iii) Promotion and up scaling of environment management and climate change mitigation technologies and innovations for enhancing product value chain upgrading and promotion.

10.0 RESEARCH SUPPORT FUNCTIONS

10.1 Strategic Focus

The successful implementation of the seven programme areas of research will depend largely on the establishment and operationalization of effective and efficient research support functions. The rationale and justification as well as the challenges and constraints facing the research support functions that are coordinated and implemented at the SLARI Headquarters and replicated at the Centre level have been well articulated in the SLARI Strategic Plan for the period 2012-2021. The research support functions are expected to address these challenges and constraints so as to **enhance sustainable productivity, commercialization and competitiveness of the research programme areas of focus**. In order to do this, the research support functions are expected to contribute to the delivery of the overall institutional specific objective through the attainment of its specific objective of **contributing to the generation and promotion of innovative agricultural technologies and empowerment of stakeholders**. The Research Support Functions shall deliver this specific objective through the attainment of the following five results:

- (i) Research support functions contribution to the **generation and promotion** of appropriate agricultural product value chains technologies and innovations **strengthened**.
- (ii) Research support functions contribution to the **development and promotion of** appropriate markets and marketing strategies for enhancing agricultural product value chains **strengthened**.
- (iii) Research support functions contribution to the **facilitation and advocacy for** appropriate policy options for enhancing agricultural product value chains **strengthened**.
- (iv) Research support functions contribution to the development of capacity for implementing agricultural product value chains research **strengthened**.
- (v) Research support functions contribution to the **establishment and operationalization of** appropriate mechanisms for managing, sharing and up scaling agricultural knowledge, information and technologies **strengthened**.

In order to contribute significantly to the attainment of the overall institutional specific objective, the research support functions at the SLARI Headquarters shall be structured into six key functions referred to as management divisions/sections/units as outlined below. The management divisions/sections/units shall be replicated at the centre level guided by each centre's stage of development, the size of the centre, availability of resources and identified centre needs. Each of the intervention strategies to be carried out under each management divisions/sections/units shall be expected to contribute to the attainment of the five research support functions strategic results.

- (i) Strengthening Human Resource Development and Management.
- (ii) Strengthening Financial Resource Acquisition and Management.
- (iii) Strengthening Institutional Administration and Physical Resource Development and Management.
- (iv) Improvement of Institutional Procurement and Supplies Services.
- (v) Improvement of Institutional Information Communication and Documentation.
- (vi) Strengthening SLARI Directorate and Council Corporate Governance.

The Research Support Functions Result framework, Research implementation plan and financing requirement are shown in Annexes 10.1, 10.2 and 10.3 respectively. The SLARI Headquarters current and optimal human resource requirement and summary of financing requirement are shown in Tables 2.3 and 2.4 respectively.

10.2 Strengthening Human Resource Development and Management

The rationale, challenges and constraints facing Human Resource Development and Management have been well articulated in the SLARI Strategic Plan for the period 2012-2021. In order to address these challenges and contribute significantly to the improvement of the overall Institute efficiency and effectiveness, the Division of Human Resource Development and Management will focus on the following intervention strategies:

- (i) Determination and documentation of institutional human resource requirements.
- (ii) Development and implementation of human resource staffing processes and procedures.
- (iii) Development and implementation of apprentice-to-professional staff development procedures.
- (iv) Development and implementation of performance based management system.

- (v) Development and implementation of staff compensation/motivation schemes, policies and procedures.
- (vi) Development, implementation and continuous updating of human resource development and management information systems.

10.3 Strengthening Financial Resource Acquisition and Management

The rationale, challenges and constraints facing Financial Resource Acquisition and Management have been well articulated in the SLARI Strategic Plan for the period 2012-2021. In order to address these challenges and contribute significantly to the improvement of the overall Institute efficiency and effectiveness, the Division of Financial Resource Acquisition and Management will focus on the following intervention strategies:

- (i) Formulation and implementation of institutional long-term financial requirement plan and effective strategies to mobilize and manage financial resources.
- (ii) Development and implementation of policies, systems and procedures for allocating financial resources to optimize their use.
- (iii) Development and implementation of policies, systems and procedure manuals for guiding the utilization of financial resources.
- (iv) Development and implementation of financial accounting systems and procedures for preparing periodical financial reports and internal and external audits.
- (v) Development, implementation and continuous updating of financial resource acquisition and management information systems.

10.4 Strengthening Institutional Administration and Physical Resource Development and Management

The rationale, challenges and constraints facing Administration and Physical Resource Development and Management have been well articulated in the SLARI Strategic Plan for the period 2012-2021. In order to address these challenges and contribute significantly to the improvement of the overall Institute efficiency and effectiveness, the Division of Administration and Physical Resource Development and Management will focus on the following intervention strategies:

- (i) Development and implementation of effective and efficient institutional administration services delivery systems and processes.
- (ii) Preparation and implementation of institutional long-term physical resources plan and management structure.
- (iii) Preparation and implementation of strategies to acquire, develop and manage institutional physical resources.
- (iv) Preparation and implementation of policies, systems and procedures for allocating, sharing and maintenance of physical resources to optimize their use.
- (v) Preparation and implementation of physical resources accounting, assessment and disposal systems and procedures.
- (vi) Development, implementation and continuous updating of administration and physical resource development and management information systems.

10.5 Improvement of Institutional Procurement and Supplies Services

The rationale, challenges and constraints facing Procurement and Supplies Services have been well articulated in the SLARI Strategic Plan for the period 2012-2021. In order to address these challenges and contribute significantly to the improvement of the overall Institute efficiency and effectiveness, the Division of Procurement and Supplies Services will focus on the following intervention strategies:

- (i) Strengthening of institutional procurement and supply of goods and services functions.
- (ii) Development and implementation of effective strategies to address institutional procurement and supply requirements.
- (iii) Development, implementation and continuous updating of institutional procurement and supply management information system.

10.6 Improvement of Institutional Information Communication and Documentation

The rationale, challenges and constraints facing Information Communication and Documentation have been well articulated in the SLARI Strategic Plan for the period 2012-2021. In order to address these challenges and contribute significantly to the improvement of the overall Institute efficiency and effectiveness, the Division of Information Communication and Documentation will focus on the following intervention strategies:

- (i) Development and implementation of institutional information technology infrastructure and information systems.
- (ii) Development and implementation of institutional publication services and products.
- (iii) Development and implementation of library products and information services.
- (iv) Development and utilization of effective corporate communication and marketing products and services.

10.7 Strengthening SLARI Directorate and Council Corporate Governance

The rationale, challenges and constraints facing SLARI Directorate and Council Corporate Governance have been well articulated in the SLARI Strategic Plan for the period 2012-2021. In order to address these challenges and contribute significantly to the improvement of the overall Institute efficiency and effectiveness, the Division of Institutional Corporate Governance will focus on the following intervention strategies:

- (i) Development and implementation of effective and efficient institutional planning and management systems.
- (ii) Development and implementation of effective and efficient institutional monitoring and evaluation systems.
- (iii) Development and implementation of effective and efficient institutional internal financial and asset audit systems.
- (iv) Development and implementation of effective and efficient corporate legal services.

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3.0 ROOT, TUBER AND GRAIN LEGUME CROPS PROGRAMME

Annex 3.1: Root, tuber and grain legume crops programme result framework

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
General Objective To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector	1.1 Percentage research contribution to the sustainable broad based growth in the agricultural sector.	1.1 National impact assessment reports. 1.2 Economic survey reports.	1.1 Government policies will continue to be favourable to the development of the agricultural sector
Specific Objective To generate and promote innovative root, tuber and grain legume crops technologies and empowerment stakeholders	1.1 Percentage increase in root, tuber and grain legume crops productivity attributed to adoption of research knowledge, information and technologies. 1.2 Percentage increase in root, tuber and grain legume crops commercialization attributed to adoption of research knowledge, information and technologies. 1.3 Percentage increase in root, tuber and grain legume crops competitiveness attributed to adoption of research knowledge, information and technologies	1.1 Government reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports.	1.1 Enabling policy environment for increasing agricultural production and commercialization and competitiveness will prevail. 1.2 Political stability will continue to prevail in the country
Programme Level Results			
1.0 Appropriate root, tuber and grain legume product value chains technologies and innovations generated and promoted.	1.1 Number of technologies and innovations developed and promoted along different product value chains. 1.2 Number of the developed and promoted technologies and innovations adopted by clients along different product value chains.	1.1 Government sector reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports	1.1 Agricultural sector will continue to be a major driver of the national economy 1.2 The Government will continue to support agricultural research 1.3 Favourable weather conditions will prevail
2.0 Appropriate markets and marketing strategies for enhancing root, tuber and grain legume product value chains developed and promoted.	2.1 Number of marketing strategies identified and utilized for different product value chains. 2.2 Number of markets identified and utilized for different product value chains.	- Do -	- Do -

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
3.0 Appropriate policy options for enhancing root, tuber and grain legume product value chains facilitated and advocated	<p>3.1 Number of policies and policy issues identified and advocated</p> <p>3.2 Number of researchable policy issues addressed</p> <p>3.3 Percentage increase in the information gathered for facilitating policy change</p>	- Do -	- Do -
4.0 Capacity for implementing root, tuber and grain legume product value chains research strengthened.	<p>4.1 Percentage increase in human resource with the right mix, skills, attitude and knowledge.</p> <p>4.2 Percentage increase in financial sustainability and health.</p> <p>4.3 Percentage increase in required infrastructure and facilities</p>	- Do -	- Do -
5.0 Appropriate root, tuber and grain legume e knowledge management and up scaling systems established and operationalized.	<p>5.1 Number of stakeholders and their communication needs identified</p> <p>5.2 Number of communication products developed and produced.</p> <p>5.3 Number of communication channels developed and utilized</p> <p>5.4 Percentage increase in the demand for the programme information, products and services</p>	- Do -	- Do -
Product Value Chain Areas of Focus			
1.0 Development and promotion of Cassava product value chain.			
2.0 Development and promotion of Yam product value chain.			
3.0 Development and promotion of Sweet Potato product value chain.			
4.0 Development and promotion of Potato product value chain.			
5.0 Development and promotion of Cocoyam product value chain.			
6.0 Development and promotion of Cowpea product value chain.			
7.0 Development and promotion of Soybean product value chain.			
8.0 Development and promotion of Pigeon Pea product value chain.			
9.0 Development and promotion of Groundnut product value chain.			
Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme level results.			
Research Support Functions			

1.0	Human resource development and management.
2.0	Financial resource acquisition and management.
3.0	Administration and physical resource development and management.
4.0	Procurement and supplies services.
5.0	Information communication and documentation.
6.0	Centre corporate governance.
Each of the centre research support function shall be expected to contribute to the attainment of the five programme level results	

Annex 3.2 Root, tuber and grain legume crops programme implementation plan for the period 2012 - 2016

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
1.0 Development and promotion of Cassava product value chain						
1.1	Cassava product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	1.1.1 Analyzed and mapped PVCs 1.1.2 Identified and ranked PVC constraints and opportunities 1.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Cassava product value chain
1.2	Development of Cassava product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.2.1 Identified priority areas of intervention to address priority constraints 1.2.2 Developed and approved projects/action plans and committed resources 1.2.3 Implemented, monitored and evaluated approved projects/action plans		
1.3	Promotion and up scaling of the Cassava product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 1.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
2.0 Development and promotion of Yam product value chain						
2.1	Yam product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	2.1.1 Analyzed and mapped PVCs 2.1.2 Identified and ranked PVC constraints and opportunities 2.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Yam product value chain
2.2	Development of Yam product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.2.1 Identified priority areas of intervention to address priority constraints 2.2.2 Developed and approved projects/action plans and committed resources 2.2.3 Implemented, monitored and evaluated approved projects/action plans		
2.3	Promotion and up scaling of the Yam product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 2.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
3.0 Development and promotion of Sweet Potato product value chain				
3.1 Sweet Potato product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	3.1.1 Analyzed and mapped PVCs 3.1.2 Identified and ranked PVC constraints and opportunities 3.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Sweet Potato product value chain
3.2 Development of Sweet Potato product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.2.1 Identified priority areas of intervention to address priority constraints 3.2.2 Developed and approved projects/action plans and committed resources 3.2.3 Implemented, monitored and evaluated approved projects/action plans	
3.3 Promotion and up scaling of the Sweet Potato product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 3.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
4.0 Development and promotion of Irish Potato product value chain				
4.1 Irish Potato product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	4.1.1 Analyzed and mapped PVCs 4.1.2 Identified and ranked PVC constraints and opportunities 4.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Irish Potato product value chain
4.2 Development of Irish Potato product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.2.1 Identified priority areas of intervention to address priority constraints 4.2.2 Developed and approved projects/action plans and committed resources 4.2.3 Implemented, monitored and evaluated approved projects/action plans	
4.3 Promotion and up scaling of the Irish Potato product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 4.3.2 Developed and implemented approaches for up scaling technological and innovative packages	

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
5.0 Development and promotion of Cocoyam product value chain				
5.1 Cocoyam product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	5.1.1 Analyzed and mapped PVCs 5.1.2 Identified and ranked PVC constraints and opportunities 5.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Cocoyam product value chain
5.2 Development of Cocoyam product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.2.1 Identified priority areas of intervention to address priority constraints 5.2.2 Developed and approved projects/action plans and committed resources 5.2.3 Implemented, monitored and evaluated approved projects/action plans	
5.3 Promotion and up scaling of the Cocoyam product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 5.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
6.0 Development and promotion of Cowpea product value chain				
6.1 Cowpea product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	6.1.1 Analyzed and mapped PVCs 6.1.2 Identified and ranked PVC constraints and opportunities 6.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Cowpea product value chain
6.2 Development of Cowpea product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.2.1 Identified priority areas of intervention to address priority constraints 6.2.2 Developed and approved projects/action plans and committed resources 6.2.3 Implemented, monitored and evaluated approved projects/action plans	
6.3 Promotion and up scaling of the Cowpea product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 6.3.2 Developed and implemented approaches for up scaling technological and innovative packages	

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
7.0 Development and promotion of Soybean product value chain				
7.1 Soybean product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	7.1.1 Analyzed and mapped PVCs 7.1.2 Identified and ranked PVC constraints and opportunities 7.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Soybean product value chain
7.2 Development of Soybean product value chain upgrading technologies and innovations.	2012-2016	- Do -	7.2.1 Identified priority areas of intervention to address priority constraints 7.2.2 Developed and approved projects/action plans and committed resources 7.2.3 Implemented, monitored and evaluated approved projects/action plans	
7.3 Promotion and up scaling of the Soybean product value chain upgrading technologies and innovations.	2012-2016	- Do -	7.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 7.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
8.0 Development and promotion of Pigeon Pea product value chain				
8.1 Pigeon Pea product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	8.1.1 Analyzed and mapped PVCs 8.1.2 Identified and ranked PVC constraints and opportunities 8.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Pigeon Pea product value chain
8.2 Development of Pigeon Pea product value chain upgrading technologies and innovations.	2012-2016	- Do -	8.2.1 Identified priority areas of intervention to address priority constraints 8.2.2 Developed and approved projects/action plans and committed resources 8.2.3 Implemented, monitored and evaluated approved projects/action plans	
8.3 Promotion and up scaling of the Pigeon Pea product value chain upgrading technologies and innovations.	2012-2016	- Do -	8.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 8.3.2 Developed and implemented approaches for up scaling technological and innovative packages	

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
9.0 Development and promotion of Groundnut product value chain						
9.1	Groundnut product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	9.1.1 Analyzed and mapped PVCs 9.1.2 Identified and ranked PVC constraints and opportunities 9.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Groundnut product value chain	
9.2	Development of Groundnut product value chain upgrading technologies and innovations.	2012-2016	- Do -	9.2.1 Identified priority areas of intervention to address priority constraints 9.2.2 Developed and approved projects/action plans and committed resources 9.2.3 Implemented, monitored and evaluated approved projects/action plans		
9.3	Promotion and up scaling of the Groundnut product value chain upgrading technologies and innovations.	2012-2016	- Do -	9.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 9.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
Linking the Operational Plan to Annual Work Planning		This is a rolling implementation plan in which broad activities under each intervention strategy and their respective budgets shall be specified in Rolling Annual Work Plans				

Annex 3.3: Summary of root, tuber and grain legume crops programme financing requirements for the period 2012-2016

Root, tuber and grain legume crops programme product value chains		Indicative product value chain annual budget (USD '000')						Total	Financing Sources
		2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017			
1.0	Development and promotion of Cassava product value chain	536.2	535.9	535.9	535.9	535.9	2,679.8	GoSL and Partners	
2.0	Development and promotion of Yam product value chain	535.8	535.9	535.9	535.9	535.9	2,679.4	- Do -	
3.0	Development and promotion of Sweet Potato product value chain	535.8	535.9	535.9	535.9	535.9	2,679.4	- Do -	
4.0	Development and promotion of Irish Potato product value chain	535.8	535.9	535.9	535.9	535.9	2,679.4	- Do -	
5.0	Development and promotion of Cocoyam product value chain	535.8	535.9	535.9	535.9	535.9	2,679.4	- Do -	
6.0	Development and promotion of Cowpea product value chain	535.8	535.9	535.9	535.9	535.9	2,679.4	- Do -	
7.0	Development and promotion of Soybean product value chain	535.8	535.9	535.9	535.9	535.9	2,679.4	- Do -	
8.0	Development and promotion of Pigeon Pea product value chain	535.8	535.9	535.9	535.9	535.9	2,679.4	- Do -	
9.0	Development and promotion of Groundnut product value chain	535.8	535.6	535.6	535.6	535.6	2,678.2	- Do -	
Total financing requirements for root, tuber and grain legume crops Programme at NARC		4,822.6	4,822.8	4,822.8	4,822.8	4,822.8	24,113.8	- Do -	

4.0 CEREAL CROPS PROGRAMME

Annex 4.1: Cereal crops programme result framework

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
General Objective To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector	1.1 Percentage research contribution to the sustainable broad based growth in the agricultural sector.	1.1 National impact assessment reports. 1.2 Economic survey reports.	1.1 Government policies will continue to be favourable to the development of the agricultural sector
Specific Objective To generate and promote innovative Cereal Crops technologies and empowerment stakeholders	1.1 Percentage increase in Cereal crops productivity attributed to adoption of research knowledge, information and technologies. 1.2 Percentage increase in Cereal crops commercialization attributed to adoption of research knowledge, information and technologies. 1.3 Percentage increase in Cereal crops competitiveness attributed to adoption of research knowledge, information and technologies	1.1 Government reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports.	1.1 Enabling policy environment for increasing agricultural productivity, commercialization and competitiveness will prevail. 1.2 Political stability will continue to prevail in the country
Programme Level Results			
1.0 Appropriate Cereal crops product value chains technologies and innovations generated and promoted.	1.1 Number of technologies and innovations developed and promoted along different product value chains. 1.2 Number of the developed and promoted technologies and innovations adopted by clients along different product value chains.	1.1 Government sector reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports	1.1 Agricultural sector will continue to be a major driver of the national economy 1.2 The Government will continue to support agricultural research 1.3 Favourable weather conditions will prevail
2.0 Appropriate markets and marketing strategies for enhancing Cereal crops product value chains developed and promoted.	2.1 Number of marketing strategies identified and utilized for different product value chains. 2.2 Number of markets identified and utilized for different product value chains.	- Do -	- Do -
3.0 Appropriate policy options for enhancing Cereal crops product value chains facilitated and advocated	3.1 Number of policies and policy issues identified and advocated 3.2 Number of researchable policy issues addressed 3.3 Percentage increase in the information gathered for facilitating policy change	- Do -	- Do -

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
4.0 Capacity for implementing Cereal crops product value chains research strengthened .	4.1 Percentage increase in human resource with the right mix, skills, attitude and knowledge. 4.2 Percentage increase in financial sustainability and health. 4.3 Percentage increase in required infrastructure and facilities	- Do -	- Do -
5.0 Appropriate Cereal crops knowledge management and up scaling systems established and operationalized .	5.1 Number of stakeholders and their communication needs identified 5.2 Number of communication products developed and produced. 5.3 Number of communication channels developed and utilized 5.4 Percentage increase in the demand for the programme information, products and services	- Do -	- Do -
Product Value Chain Areas of Focus			
1.0 Development and promotion of Upland Rice product value chain.	Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme level results.		
2.0 Development and promotion of Lowland Rice product value chain.			
3.0 Development and promotion of Maize product value chain.			
4.0 Development and promotion of Sorghum product value chain.			
5.0 Development and promotion of Pearl millet product value chain.			
6.0 Development and promotion of Digitaria product value chain.			
Research Support Functions			
1.0 Human resource development and management.	Each of the centre research support function shall be expected to contribute to the attainment of the five programme level results		
2.0 Financial resource acquisition and management.			
3.0 Administration and physical resource development and management.			
4.0 Procurement and supplies services.			
5.0 Information communication and documentation.			
6.0 Centre corporate governance.			

Annex 4.2: Cereal crops programme implementation plan for the period 2012 - 2016

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
1.0 Development and promotion of Upland Rice product value chain				
1.1 Upland Rice product value chain analysis, mapping and identification of constraints and opportunities	2012-2013	Research Scientists and other relevant product value chain actors	1.1.1 Analyzed and mapped PVCs 1.1.2 Identified and ranked PVC constraints and opportunities 1.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Upland Rice product value chain
1.2 Development of Upland Rice product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.2.1 Identified priority areas of intervention to address priority constraints 1.2.2 Developed and approved projects/action plans and committed resources 1.2.3 Implemented, monitored and evaluated approved projects/action plans	
1.3 Promotion and up scaling of the Upland Rice product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 1.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
2.0 Development and promotion of Lowland Rice product value chain				
2.1 Lowland Rice product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	2.1.1 Analyzed and mapped PVCs 2.1.2 Identified and ranked PVC constraints and opportunities 2.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Lowland Rice product value chain
2.2 Development of Lowland Rice product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.2.1 Identified priority areas of intervention to address priority constraints 2.2.2 Developed and approved projects/action plans and committed resources 2.2.3 Implemented, monitored and evaluated approved projects/action plans	
2.3 Promotion and up scaling of the Lowland Rice product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 2.3.2 Developed and implemented approaches for up scaling technological and innovative packages	

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
3.0 Development and promotion of Maize product value chain				
3.1 Maize product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	3.1.1 Analyzed and mapped PVCs 3.1.2 Identified and ranked PVC constraints and opportunities 3.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Maize product value chain
3.2 Development of Maize product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.2.1 Identified priority areas of intervention to address priority constraints 3.2.2 Developed and approved projects/action plans and committed resources 3.2.3 Implemented, monitored and evaluated approved projects/action plans	
3.3 Promotion and up scaling of the Maize product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 3.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
4.0 Development and promotion of Sorghum product value chain				
4.1 Sorghum product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	4.1.1 Analyzed and mapped PVCs 4.1.2 Identified and ranked PVC constraints and opportunities 4.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Sorghum product value chain
4.2 Development of Sorghum product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.2.1 Identified priority areas of intervention to address priority constraints 4.2.2 Developed and approved projects/action plans and committed resources 4.2.3 Implemented, monitored and evaluated approved projects/action plans	
4.3 Promotion and up scaling of the Sorghum product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 4.3.2 Developed and implemented approaches for up scaling technological and innovative packages	

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
5.0 Development and promotion of Pearl millet product value chain				
5.1 Pearl millet product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	5.1.1 Analyzed and mapped PVCs 5.1.2 Identified and ranked PVC constraints and opportunities 5.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Pearl millet product value chain
5.2 Development of Pearl millet product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.2.1 Identified priority areas of intervention to address priority constraints 5.2.2 Developed and approved projects/action plans and committed resources 5.2.3 Implemented, monitored and evaluated approved projects/action plans	
5.3 Promotion and up scaling of the Pearl millet product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 5.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
6.0 Development and promotion of Digitaria product value chain				
6.1 Digitaria product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	6.1.1 Analyzed and mapped PVCs 6.1.2 Identified and ranked PVC constraints and opportunities 6.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Digitaria product value chain
6.2 Development of Digitaria product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.2.1 Identified priority areas of intervention to address priority constraints 6.2.2 Developed and approved projects/action plans and committed resources 6.2.3 Implemented, monitored and evaluated approved projects/action plans	
6.3 Promotion and up scaling of the Digitaria product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 6.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
Linking the Operational Plan to Annual Work Planning				
This is a rolling implementation plan in which broad activities under each intervention strategy and their respective budgets shall be specified in Rolling Annual Work Plans				

Annex 4.3: Summary of cereal crops programme financing requirements for the period 2012-2016

Cereal crops programme product value chains		Indicative product value chain annual budget (USD '000')						Financing Sources
		2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	Total	
1.0	Development and promotion of Upland Rice product value chain.	881.0	881.0	881.0	881.0	881.0	4,405.0	GoSL and Partners
2.0	Development and promotion of Lowland Rice product value chain.	831.0	831.0	831.0	831.0	831.0	4,155.0	- Do -
3.0	Development and promotion of Maize product value chain.	681.0	681.1	681.0	681.0	681.0	3,405.1	- Do -
4.0	Development and promotion of Sorghum product value chain.	681.0	681.0	681.0	681.0	681.0	3,405.0	- Do -
5.0	Development and promotion of Pearl millet product value chain.	531.0	531.0	531.0	531.0	531.0	2,655.0	- Do -
6.0	Development and promotion of Digitaria product value chain.	481.0	481.0	481.0	481.0	481.0	2,405.0	- Do -
Total financing requirements for Cereal crops Programme at RARC		4,086.0	4,086.1	4,086.0	4,086.0	4,086.0	20,430.1	- Do -

5.0 HORTICULTURAL CROPS PROGRAMME

Annex 5.1: Horticultural Crops Programme Result Framework

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
General Objective To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector	1.1 Percentage research contribution to the sustainable broad based growth in the agricultural sector.	1.1 National impact assessment reports. 1.2 Economic survey reports.	1.1 Government policies will continue to be favourable to the development of the agricultural sector
Specific Objective To generate and promote innovative Horticultural Crops technologies and empowerment stakeholders	1.1 Percentage increase in Horticultural Crops productivity attributed to adoption of research knowledge, information and technologies. 1.2 Percentage increase in Horticultural Crops commercialization attributed to adoption of research knowledge, information and technologies. 1.3 Percentage increase in Horticultural Crops competitiveness attributed to adoption of research knowledge, information and technologies	1.1 Government reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports..	1.1 Enabling policy environment for increasing agricultural productivity, commercialization and competitiveness will prevail. 1.2 Political stability will continue to prevail in the country
Programme Level Results			
1.0 Appropriate Horticultural Crops product value chains technologies and innovations generated and promoted.	1.1 Number of technologies and innovations developed and promoted along different product value chains. 1.2 Number of the developed and promoted technologies and innovations adopted by clients along different product value chains.	1.1 Government sector reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports	1.1 Agricultural sector will continue to be a major driver of the national economy 1.2 The Government will continue to support agricultural research 1.3 Favourable weather conditions will prevail
2.0 Appropriate markets and marketing strategies for enhancing Horticultural Crops product value chains developed and promoted.	2.1 Number of marketing strategies identified and utilized for different product value chains. 2.2 Number of markets identified and utilized for different product value chains.	- Do -	- Do -
3.0 Appropriate policy options for enhancing Horticultural Crops product value chains facilitated and advocated	3.1 Number of policies and policy issues identified and advocated 3.2 Number of researchable policy issues addressed 3.3 Percentage increase in the information gathered for facilitating policy change	- Do -	- Do -

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
4.0 Capacity for implementing Horticultural Crops product value chains research strengthened.	4.1 Percentage increase in human resource with the right mix, skills, attitude and knowledge. 4.2 Percentage increase in financial sustainability and health. 4.3 Percentage increase in required infrastructure and facilities	- Do -	- Do -
5.0 Appropriate Horticultural Crops knowledge management and up scaling systems established and operationalized.	5.1 Number of stakeholders and their communication needs identified 5.2 Number of communication products developed and produced. 5.3 Number of communication channels developed and utilized 5.4 Percentage increase in the demand for the programme information, products and services	- Do -	- Do -
Product Value Chain Areas of Focus			
1.0 Development and promotion of Indigenous Vegetables product value chains.	Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme level results.		
2.0 Development and promotion of Exotic Vegetables product value chains.			
3.0 Development and promotion of Herbs and Spices product value chains.			
4.0 Development and promotion of Tropical Fruits product value chains.			
5.0 Development and promotion of Temperate Fruits product value chains.			
6.0 Development and promotion of Indigenous Fruits product value chains.			
7.0 Development and promotion of Ornamental and Medicinal Plants product value chains.			
Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme level results.			
Research Support Functions			
1.0 Human resource development and management.	Each of the centre research support function shall be expected to contribute to the attainment of the five programme level results		
2.0 Financial resource acquisition and management.			
3.0 Administration and physical resource development and management.			
4.0 Procurement and supplies services.			
5.0 Information communication and documentation.			
6.0 Centre corporate governance.			

Annex 5.2: Horticultural crops programme implementation plan for the period 2012 - 2016

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome	
1.0 Development and promotion of Indigenous Vegetables product value chains							
1.1	Indigenous Vegetables product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	1.1.1 Analyzed and mapped PVCs 1.1.2 Identified and ranked PVC constraints and opportunities 1.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Indigenous Vegetables product value chains		
1.2	Development of Indigenous Vegetables product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.2.1 Identified priority areas of intervention to address priority constraints 1.2.2 Developed and approved projects/action plans and committed resources 1.2.3 Implemented, monitored and evaluated approved projects/action plans			
1.3	Promotion and up scaling of the Indigenous Vegetables product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 1.3.2 Developed and implemented approaches for up scaling technological and innovative packages			
2.0 Development and promotion of Exotic Vegetables product value chains							
2.1	Exotic Vegetables product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	2.1.1 Analyzed and mapped PVCs 2.1.2 Identified and ranked PVC constraints and opportunities 2.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Exotic Vegetables product value chains		
2.2	Development of Exotic Vegetables product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.2.1 Identified priority areas of intervention to address priority constraints 2.2.2 Developed and approved projects/action plans and committed resources 2.2.3 Implemented, monitored and evaluated approved projects/action plans			
2.3	Promotion and up scaling of the Exotic Vegetables product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 2.3.2 Developed and implemented approaches for up scaling technological and innovative packages			

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
3.0 Development and promotion of Herbs and Spices product value chains						
3.1	Herbs and Spices product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	3.1.1 Analyzed and mapped PVCs 3.1.2 Identified and ranked PVC constraints and opportunities 3.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Herbs and Spices product value chains
3.2	Development of Herbs and Spices product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.2.1 Identified priority areas of intervention to address priority constraints 3.2.2 Developed and approved projects/action plans and committed resources 3.2.3 Implemented, monitored and evaluated approved projects/action plans		
3.3	Promotion and up scaling of the Herbs and Spices product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 3.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
4.0 Development and promotion of Tropical Fruits product value chains						
4.1	Tropical Fruits product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	4.1.1 Analyzed and mapped PVCs 4.1.2 Identified and ranked PVC constraints and opportunities 4.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Tropical Fruits product value chains
4.2	Development of Tropical Fruits product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.2.1 Identified priority areas of intervention to address priority constraints 4.2.2 Developed and approved projects/action plans and committed resources 4.2.3 Implemented, monitored and evaluated approved projects/action plans		
4.3	Promotion and up scaling of the Tropical Fruits product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 4.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
5.0 Development and promotion of Temperate Fruits product value chains						
5.1	Temperate Fruits product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	5.1.1 Analyzed and mapped PVCs 5.1.2 Identified and ranked PVC constraints and opportunities 5.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Temperate Fruits product value chains	
5.2	Development of Temperate Fruits product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.2.1 Identified priority areas of intervention to address priority constraints 5.2.2 Developed and approved projects/action plans and committed resources 5.2.3 Implemented, monitored and evaluated approved projects/action plans		
5.3	Promotion and up scaling of the Temperate Fruits product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 5.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
6.0 Development and promotion of Indigenous Fruits product value chains						
6.1	Indigenous Fruits product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	6.1.1 Analyzed and mapped PVCs 6.1.2 Identified and ranked PVC constraints and opportunities 6.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Indigenous Fruits product value chains	
6.2	Development of Indigenous Fruits product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.2.1 Identified priority areas of intervention to address priority constraints 6.2.2 Developed and approved projects/action plans and committed resources 6.2.3 Implemented, monitored and evaluated approved projects/action plans		
6.3	Promotion and up scaling of the Indigenous Fruits product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 6.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
7.0 Development and promotion of Ornamental and Medicinal Plants product value chain						
7.1	Ornamental and Medicinal Plants product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	7.1.1 Analyzed and mapped PVCs 7.1.2 Identified and ranked PVC constraints and opportunities 7.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Ornamental and Medicinal Plants product value chains	
7.2	Development of Ornamental and Medicinal Plants product value chain upgrading technologies and innovations.	2012-2016	- Do -	7.2.1 Identified priority areas of intervention to address priority constraints 7.2.2 Developed and approved projects/action plans and committed resources 7.2.3 Implemented, monitored and evaluated approved projects/action plans		
7.3	Promotion and up scaling of the Ornamental and Medicinal Plants product value chain upgrading technologies and innovations.	2012-2016	- Do -	7.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 7.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
Linking the Operational Plan to Annual Work Planning		This is a rolling implementation plan in which broad activities under each intervention strategy and their respective budgets shall be specified in Rolling Annual Work Plans				

Annex 5.3: Summary of horticultural crops programme financing requirements for the period 2012-2016

Horticultural crops programme product value chains		Indicative product value chain annual budget (USD '000')						Total	Financing Sources
		2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017			
1.0	Development and promotion of Indigenous Vegetables product value chains.	281.8	281.9	281.9	281.9	281.9	1,409.4	GoSL and Partners	
2.0	Development and promotion of Exotic Vegetables product value chains.	282.1	281.9	281.9	281.9	281.9	1,409.7	- Do -	
3.0	Development and promotion of Herbs and Spices product value chains.	281.8	281.9	281.9	281.9	281.9	1,409.4	- Do -	
4.0	Development and promotion of Tropical Fruits product value chains.	281.8	281.9	281.9	281.9	281.9	1,409.4	- Do -	
5.0	Development and promotion of Temperate Fruits product value chains.	281.8	281.9	281.9	281.9	281.9	1,409.4	- Do -	
6.0	Development and promotion of Indigenous Fruits product value chains.	281.8	281.9	281.9	281.9	281.9	1,409.4	- Do -	
7.0	Development and promotion of Ornamental and Medicinal Plants product value chains.	281.8	281.7	281.7	281.7	281.7	1,408.6	- Do -	
Total financing requirements for Horticultural crops Programme at KHCRC		1,972.9	1,973.1	1,973.1	1,973.1	1,973.1	9,865.3	- Do -	

6.0 LIVESTOCK PROGRAMME

Annex 6.1: Livestock Programme Result Framework

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
General Objective To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector	1.1 Percentage research contribution to the sustainable broad based growth in the agricultural sector.	1.1 National impact assessment reports. 1.2 Economic survey reports.	1.1 Government policies will continue to be favourable to the development of the agricultural sector
Specific Objective To generate and promote innovative Livestock technologies and empowerment stakeholders	1.1 Percentage increase in Livestock productivity attributed to adoption of research knowledge, information and technologies. 1.2 Percentage increase in Livestock commercialization attributed to adoption of research knowledge, information and technologies. 1.3 Percentage increase in Livestock competitiveness attributed to adoption of research knowledge, information and technologies	1.1 Government reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports..	1.1 Enabling policy environment for increasing agricultural productivity, commercialization and competitiveness will prevail. 1.2 Political stability will continue to prevail in the country
Programme Level Results			
1.0 Appropriate Livestock product value chains technologies and innovations generated and promoted.	1.1 Number of technologies and innovations developed and promoted along different product value chains. 1.2 Number of the developed and promoted technologies and innovations adopted by clients along different product value chains.	1.1 Government sector reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports	1.1 Agricultural sector will continue to be a major driver of the national economy 1.2 The Government will continue to support agricultural research 1.3 Favourable weather conditions will prevail
2.0 Appropriate markets and marketing strategies for enhancing Livestock product value chains developed and promoted.	2.1 Number of marketing strategies identified and utilized for different product value chains. 2.2 Number of markets identified and utilized for different product value chains.	- Do -	- Do -
3.0 Appropriate policy options for enhancing Livestock product value chains facilitated and advocated	3.1 Number of policies and policy issues identified and advocated 3.2 Number of researchable policy issues addressed 3.3 Percentage increase in the information gathered for facilitating policy change	- Do -	- Do -

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
4.0 Capacity for implementing Livestock product value chains research strengthened.	4.1 Percentage increase in human resource with the right mix, skills, attitude and knowledge. 4.2 Percentage increase in financial sustainability and health. 4.3 Percentage increase in required infrastructure and facilities	- Do -	- Do -
5.0 Appropriate Livestock knowledge management and up scaling systems established and operationalized.	5.1 Number of stakeholders and their communication needs identified 5.2 Number of communication products developed and produced. 5.3 Number of communication channels developed and utilized 5.4 Percentage increase in the demand for the programme information, products and services	- Do -	- Do -
Product Value Chain Areas of Focus			
1.0 Development and promotion of Dairy product value chain.	Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme level results.		
2.0 Development and promotion of Beef product value chain.			
3.0 Development and promotion of Goat product value chain			
4.0 Development and promotion of Sheep product value chain			
5.0 Development and promotion of Poultry product value chains.			
6.0 Development and promotion of Pig product value chain.			
7.0 Development and promotion of Non-conventional Small Stock product value chains.			
Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme level results.			
Research Support Functions			
1.0 Human resource development and management.	Each of the centre research support function shall be expected to contribute to the attainment of the five programme level results		
2.0 Financial resource acquisition and management.			
3.0 Administration and physical resource development and management.			
4.0 Procurement and supplies services.			
5.0 Information communication and documentation.			
6.0 Centre corporate governance.			

Annex 6.2: Livestock programme implementation plan for the period 2012 – 2016

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
1.0 Development and promotion of dairy product value chain						
1.1	Dairy product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	1.1.1 Analyzed and mapped PVCs 1.1.2 Identified and ranked PVC constraints and opportunities 1.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Dairy product value chain
1.2	Development of Dairy product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.2.1 Identified priority areas of intervention to address priority constraints 1.2.2 Developed and approved projects/action plans and committed resources 1.2.3 Implemented, monitored and evaluated approved projects/action plans		
1.3	Promotion and up scaling of the Dairy product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 1.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
2.0 Development and promotion of Beef product value chain						
2.1	Beef product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	2.1.1 Analyzed and mapped PVCs 2.1.2 Identified and ranked PVC constraints and opportunities 2.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Beef product value chain
2.2	Development of Beef product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.2.1 Identified priority areas of intervention to address priority constraints 2.2.2 Developed and approved projects/action plans and committed resources 2.2.3 Implemented, monitored and evaluated approved projects/action plans		
2.3	Promotion and up scaling of the Beef product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 2.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
3.0 Development and promotion of Goat product value chain					
3.1 Goat product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	3.1.1 Analyzed and mapped PVCs 3.1.2 Identified and ranked PVC constraints and opportunities 3.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Goat product value chain	
3.2 Development of Goat product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.2.1 Identified priority areas of intervention to address priority constraints 3.2.2 Developed and approved projects/action plans and committed resources 3.2.3 Implemented, monitored and evaluated approved projects/action plans		
3.3 Promotion and up scaling of the Goat product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 3.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
4.0 Development and promotion of Sheep product value chain					
4.1 Sheep product value chain analysis, mapping and identification of constraints and opportunities..	2012-2013	Research Scientists and other relevant product value chain actors	4.1.1 Analyzed and mapped PVCs 4.1.2 Identified and ranked PVC constraints and opportunities 4.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Sheep product value chain	
4.2 Development of Sheep product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.2.1 Identified priority areas of intervention to address priority constraints 4.2.2 Developed and approved projects/action plans and committed resources 4.2.3 Implemented, monitored and evaluated approved projects/action plans		
4.3 Promotion and up scaling of the Sheep product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 4.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
5.0 Development and promotion of Poultry product value chain				
5.1 Poultry product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	5.1.1 Analyzed and mapped PVCs 5.1.2 Identified and ranked PVC constraints and opportunities 5.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Poultry product value chain
5.2 Development of Poultry product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.2.1 Identified priority areas of intervention to address priority constraints 5.2.2 Developed and approved projects/action plans and committed resources 5.2.3 Implemented, monitored and evaluated approved projects/action plans	
5.3 Promotion and up scaling of the Poultry product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 5.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
6.0 Development and promotion of Pig product value chain				
6.1 Pig product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	6.1.1 Analyzed and mapped PVCs 6.1.2 Identified and ranked PVC constraints and opportunities 6.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Pig product value chain
6.2 Development of Pig product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.2.1 Identified priority areas of intervention to address priority constraints 6.2.2 Developed and approved projects/action plans and committed resources 6.2.3 Implemented, monitored and evaluated approved projects/action plans	
6.3 Promotion and up scaling of the Pig product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 6.3.2 Developed and implemented approaches for up scaling technological and innovative packages	

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
7.0 Development and promotion of Non-conventional Small Stock product value chains				
7.1 Non-conventional Small Stock product value chains analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	7.1.1 Analyzed and mapped PVCs 7.1.2 Identified and ranked PVC constraints and opportunities 7.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Non-conventional Small Stock product value chains
7.2 Development of Non-conventional Small Stock product value chains upgrading technologies and innovations.	2012-2016	- Do -	7.2.1 Identified priority areas of intervention to address priority constraints 7.2.2 Developed and approved projects/action plans and committed resources 7.2.3 Implemented, monitored and evaluated approved projects/action plans	
7.3 Promotion and up scaling of the Non-conventional Small Stock product value chains upgrading technologies and innovations.	2012-2016	- Do -	7.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 7.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
Linking the Operational Plan to Annual Work Planning	This is a rolling implementation plan in which broad activities under each intervention strategy and their respective budgets shall be specified in Rolling Annual Work Plans			

Annex 6.3: Summary of livestock programme financing requirements for the period 2012-2016

Livestock programme product value chains		Indicative product value chain annual budget (USD ‘000’)						
		2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	Total	Financing Sources
1.0	Development and promotion of Dairy product value chain.	120.4	120.6	120.4	120.4	120.4	602.2	GoSL and Partners
2.0	Development and promotion of Beef product value chain.	100.5	100.5	100.5	100.5	100.5	502.5	- Do -
3.0	Development and promotion of Goat product value chain	85.0	85.0	85.0	85.0	85.0	425.0	- Do -
4.0	Development and promotion of Sheep product value chain	85.0	85.0	85.0	85.0	85.0	425.0	- Do -
5.0	Development and promotion of Poultry product value chains.	90.0	90.0	90.0	90.0	90.0	450.0	- Do -
6.0	Development and promotion of Pig product value chain.	40.1	40.1	40.1	40.1	40.1	200.5	- Do -
7.0	Development and promotion of Non-conventional Small Stock prod- uct value chains.	40.1	40.1	40.1	40.1	40.1	200.5	- Do -
Total financing requirements for Livestock Programme at TLRC		561.1	561.3	561.1	561.1	561.1	2,805.7	- Do -

7.0 FISHERIES PROGRAMME

Annex 7.1: Fisheries Programme Result Framework

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
General Objective To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector	1.1 Percentage research contribution to the sustainable broad based growth in the agricultural sector.	1.1 National impact assessment reports. 1.2 Economic survey reports.	1.1 Government policies will continue to be favourable to the development of the agricultural sector
Specific Objective To generate and promote innovative Fisheries technologies and empowerment stakeholders	1.1 Percentage increase in Fisheries productivity attributed to adoption of research knowledge, information and technologies. 1.2 Percentage increase in Fisheries commercialization attributed to adoption of research knowledge, information and technologies. 1.3 Percentage increase in Fisheries competitiveness attributed to adoption of research knowledge, information and technologies	1.1 Government reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports.	1.1 Enabling policy environment for increasing agricultural productivity, commercialization and competitiveness will prevail. 1.2 Political stability will continue to prevail in the country
Programme Level Results			
1.0 Appropriate Fisheries product value chains technologies and innovations generated and promoted.	1.1 Number of technologies and innovations developed and promoted along different product value chains. 1.2 Number of the developed and promoted technologies and innovations adopted by clients along different product value chains.	1.1 Government sector reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports	1.1 Agricultural sector will continue to be a major driver of the national economy 1.2 The Government will continue to support agricultural research 1.3 Favourable weather conditions will prevail
2.0 Appropriate markets and marketing strategies for enhancing Fisheries product value chains developed and promoted.	2.1 Number of marketing strategies identified and utilized for different product value chains. 2.2 Number of markets identified and utilized for different product value chains.	- Do -	- Do -

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
3.0 Appropriate policy options for enhancing Fisheries product value chains facilitated and advocated	3.1 Number of policies and policy issues identified and advocated 3.2 Number of researchable policy issues addressed 3.3 Percentage increase in the information gathered for facilitating policy change	- Do -	- Do -
4.0 Capacity for implementing Fisheries product value chains research strengthened .	4.1 Percentage increase in human resource with the right mix, skills, attitude and knowledge. 4.2 Percentage increase in financial sustainability and health. 4.3 Percentage increase in required infrastructure and facilities	- Do -	- Do -
5.0 Appropriate Fisheries knowledge management and up scaling systems established and operationalized .	5.1 Number of stakeholders and their communication needs identified 5.2 Number of communication products developed and produced. 5.3 Number of communication channels developed and utilized 5.4 Percentage increase in the demand for the programme information, products and services	- Do -	- Do -
Product Value Chain Areas of Focus			
1.0 Development and promotion of Demersal product value chain.			
2.0 Development and promotion of Pelagic product value chain.			
3.0 Development and promotion of Shrimps product value chain.			
4.0 Development and promotion of Crabs and Lobsters product value chains.			
5.0 Development and promotion of Cephalopoda product value chains.			
6.0 Development and promotion of the Tilapia product value chain.			
7.0 Development and promotion of Shrimp Culture product value chain.			
8.0 Development and promotion of Catfish product value chain.			
Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme level results.			
Research Support Functions			

1.0	Human resource development and management.
2.0	Financial resource acquisition and management.
3.0	Administration and physical resource development and management.
4.0	Procurement and supplies services.
5.0	Information communication and documentation.
6.0	Centre corporate governance.
Each of the centre research support function shall be expected to contribute to the attainment of the five programme level results	

Annex 7.2: Fisheries programme implementation plan for the period 2012 - 2016

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
1.0 Development and promotion of Demersal product value chain						
1.1	Demersal product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	1.1.1 Analyzed and mapped PVCs 1.1.2 Identified and ranked PVC constraints and opportunities 1.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Demersal product value chain
1.2	Development of Demersal product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.2.1 Identified priority areas of intervention to address priority constraints 1.2.2 Developed and approved projects/action plans and committed resources 1.2.3 Implemented, monitored and evaluated approved projects/action plans		
1.3	Promotion and up scaling of the Demersal product value chain upgrading technologies and innovations.	2012-2016	- Do -	1.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 1.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
2.0 Development and promotion of Pelagic product value chain						
2.1	Pelagic product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	2.1.1 Analyzed and mapped PVCs 2.1.2 Identified and ranked PVC constraints and opportunities 2.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Pelagic product value chain
2.2	Development of Pelagic product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.2.1 Identified priority areas of intervention to address priority constraints 2.2.2 Developed and approved projects/action plans and committed resources 2.2.3 Implemented, monitored and evaluated approved projects/action plans		
2.3	Promotion and up scaling of the Pelagic product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 2.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
3.0 Development and promotion of Shrimps product value chains						
3.1	Shrimps product value chains analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	3.1.1 Analyzed and mapped PVCs 3.1.2 Identified and ranked PVC constraints and opportunities 3.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Shrimps product value chain
3.2	Development of Shrimps product value chains upgrading technologies and innovations.	2012-2016	- Do -	3.2.1 Identified priority areas of intervention to address priority constraints 3.2.2 Developed and approved projects/action plans and committed resources 3.2.3 Implemented, monitored and evaluated approved projects/action plans		
3.3	Promotion and up scaling of the Shrimps product value chains upgrading technologies and innovations.	2012-2016	- Do -	3.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 3.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
4.0 Development and promotion of Crabs and Lobsters product value chains						
4.1	Crabs and Lobsters product value chains analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	4.1.1 Analyzed and mapped PVCs 4.1.2 Identified and ranked PVC constraints and opportunities 4.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Crabs and Lobsters product value chains
4.2	Development of Crabs and Lobsters product value chains upgrading technologies and innovations.	2012-2016	- Do -	4.2.1 Identified priority areas of intervention to address priority constraints 4.2.2 Developed and approved projects/action plans and committed resources 4.2.3 Implemented, monitored and evaluated approved projects/action plans		
4.3	Promotion and up scaling of the Crabs and Lobsters product value chains upgrading technologies and innovations.	2012-2016	- Do -	4.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 4.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
5.0 Development and promotion of Cephalopodae product value chains						
5.1	Cephalopodae product value chains analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	5.1.1 Analyzed and mapped PVCs 5.1.2 Identified and ranked PVC constraints and opportunities 5.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Cephalopodae product value chains	
5.2	Development of Cephalopodae product value chains upgrading technologies and innovations.	2012-2016	- Do -	5.2.1 Identified priority areas of intervention to address priority constraints 5.2.2 Developed and approved projects/action plans and committed resources 5.2.3 Implemented, monitored and evaluated approved projects/action plans		
5.3	Promotion and up scaling of the Cephalopodae product value chains upgrading technologies and innovations.	2012-2016	- Do -	5.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 5.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
6.0 Development and promotion of Tilapia product value chain						
6.1	Tilapia product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	6.1.1 Analyzed and mapped PVCs 6.1.2 Identified and ranked PVC constraints and opportunities 6.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Tilapia product value chains	
6.2	Development of Tilapia product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.2.1 Identified priority areas of intervention to address priority constraints 6.2.2 Developed and approved projects/action plans and committed resources 6.2.3 Implemented, monitored and evaluated approved projects/action plans		
6.3	Promotion and up scaling of the Tilapia product value chain upgrading technologies and innovations.	2012-2016	- Do -	6.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 6.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
7.0 Development and promotion of Shrimp culture product value chain						
7.1	Shrimp culture product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	7.1.1 Analyzed and mapped PVCs 7.1.2 Identified and ranked PVC constraints and opportunities 7.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Shrimp culture product value chain
7.2	Development of Shrimp culture product value chain upgrading technologies and innovations.	2012-2016	- Do -	7.2.1 Identified priority areas of intervention to address priority constraints 7.2.2 Developed and approved projects/action plans and committed resources 7.2.3 Implemented, monitored and evaluated approved projects/action plans		
7.3	Promotion and up scaling of the Shrimp culture product value chain upgrading technologies and innovations.	2012-2016	- Do -	7.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 7.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
8.0 Development and promotion of Catfish product value chain						
8.1	Catfish product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	8.1.1 Analyzed and mapped PVCs 8.1.2 Identified and ranked PVC constraints and opportunities 8.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Catfish product value chain	
8.2	Development of Catfish product value chain upgrading technologies and innovations.	2012-2016	- Do -	8.2.1 Identified priority areas of intervention to address priority constraints 8.2.2 Developed and approved projects/action plans and committed resources 8.2.3 Implemented, monitored and evaluated approved projects/action plans		
8.3	Promotion and up scaling of the Catfish product value chain upgrading technologies and innovations.	2012-2016	- Do -	8.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 8.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
Linking the Operational Plan to Annual Work Planning		This is a rolling implementation plan in which broad activities under each intervention strategy and their respective budgets shall be specified in Rolling Annual Work Plans				

Annex 7.3: Summary of fisheries programme financing requirements for the period 2012-2016

Fisheries programme product value chains		Indicative product value chain annual budget (USD ‘000’)						
		2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	Total	Financing Sources
1.0	Development and promotion of Demersal product value chain.	461.5	461.5	461.5	461.5	461.5	2,307.5	GoSL and Partners
2.0	Development and promotion of Pelagic product value chain.	461.5	461.5	461.5	461.5	461.5	2,307.5	- Do -
3.0	Development and promotion of Shrimps product value chain.	461.5	461.5	461.5	461.5	461.5	2,307.5	- Do -
4.0	Development and promotion of Crabs and Lobsters product value chains.	461.5	461.5	461.5	461.5	461.5	2,307.5	- Do -
5.0	Development and promotion of Cephalopodae product value chains.	461.5	461.5	461.5	461.5	461.5	2,307.5	- Do -
6.0	Development and promotion of the Tilapia product value chain.	461.5	461.5	461.5	461.5	461.5	2,307.5	- Do -
7.0	Development and promotion of Shrimp Culture product value chain.	461.5	461.5	461.5	461.5	461.5	2,307.5	- Do -
8.0	Development and promotion of Catfish product value chain.	461.5	461.6	461.5	461.5	461.5	2,307.6	- Do -
Total financing requirements for Fisheries Programme at FFRC		3,691.9	3,692.1	3,691.9	3,691.9	3,691.9	18,459.7	- Do -

8.0 FORESTRY AND TREE CROPS PROGRAMME

Annex 8.1: Forestry and tree crops programme result framework

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
General Objective To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector	1.1 Percentage research contribution to the sustainable broad based growth in the agricultural sector.	1.1 National impact assessment reports. 1.2 Economic survey reports.	1.1 Government policies will continue to be favourable to the development of the agricultural sector
Specific Objective To generate and promote innovative Forestry and Tree Crops technologies and empowerment stakeholders	1.1 Percentage increase in Forestry and Tree Crops productivity attributed to adoption of research knowledge, information and technologies. 1.2 Percentage increase in Forestry and Tree Crops commercialization attributed to adoption of research knowledge, information and technologies. 1.3 Percentage increase in Forestry and Tree Crops competitiveness attributed to adoption of research knowledge, information and technologies	1.1 Government reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports.	1.1 Enabling policy environment for increasing agricultural productivity, commercialization and competitiveness will prevail. 1.2 Political stability will continue to prevail in the country
Programme Level Results			
1.0 Appropriate Forestry and Tree Crops product value chains technologies and innovations generated and promoted.	1.1 Number of technologies and innovations developed and promoted along different product value chains. 1.2 Number of the developed and promoted technologies and innovations adopted by clients along different product value chains.	1.1 Government sector reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports	1.1 Agricultural sector will continue to be a major driver of the national economy 1.2 The Government will continue to support agricultural research 1.3 Favourable weather conditions will prevail
2.0 Appropriate markets and marketing strategies for enhancing Forestry and Tree Crops product value chains developed and promoted.	2.1 Number of marketing strategies identified and utilized for different product value chains. 2.2 Number of markets identified and utilized for different product value chains.	- Do -	- Do -
3.0 Appropriate policy options for enhancing Forestry and Tree Crops product value chains facilitated and advocated	3.1 Number of policies and policy issues identified and advocated 3.2 Number of researchable policy issues addressed 3.3 Percentage increase in the information gathered for facilitating policy change	- Do -	- Do -

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
4.0 Capacity for implementing Forestry and Tree Crops product value chains research strengthened.	4.1 Percentage increase in human resource with the right mix, skills, attitude and knowledge. 4.2 Percentage increase in financial sustainability and health. 4.3 Percentage increase in required infrastructure and facilities	- Do -	- Do -
5.0 Appropriate Forestry and Tree Crops knowledge management and up scaling systems established and operationalized.	5.1 Number of stakeholders and their communication needs identified 5.2 Number of communication products developed and produced. 5.3 Number of communication channels developed and utilized 5.4 Percentage increase in the demand for the programme information, products and services	- Do -	- Do -
Product Value Chain Areas of Focus			
1.0 Development and promotion of Forestry product value chains.	Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme level results.		
2.0 Development and promotion of Cocoa product value chain.			
3.0 Development and promotion of Coffee product value chain.			
4.0 Development and promotion of Cashew product value chain.			
5.0 Development and promotion of Oil palm crop product value chain.			
Each of the intervention strategies to be carried out under each product value chain shall be expected to contribute to the attainment of the five Programme level results.			
Research Support Functions			
1.0 Human resource development and management.	Each of the centre research support function shall be expected to contribute to the attainment of the five programme level results		
2.0 Financial resource acquisition and management.			
3.0 Administration and physical resource development and management.			
4.0 Procurement and supplies services.			
5.0 Information communication and documentation.			
6.0 Centre corporate governance.			

Annex 8.2: Forestry and tree crops programme implementation plan for the period 2012 – 2016

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome	
1.0 Development and promotion of Forestry product value chains							
1.1	Forestry product value chains analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	1.1.1 Analyzed and mapped PVCs 1.1.2 Identified and ranked PVC constraints and opportunities 1.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Forestry product value chains	
1.2	Development of Forestry product value chains upgrading technologies and innovations.	2012-2016	- Do -	1.2.1 Identified priority areas of intervention to address priority constraints 1.2.2 Developed and approved projects/action plans and committed resources 1.2.3 Implemented, monitored and evaluated approved projects/action plans			
1.3	Promotion and up scaling of the Forestry product value chains upgrading technologies and innovations.	2012-2016	- Do -	1.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 1.3.2 Developed and implemented approaches for up scaling technological and innovative packages			
2.0 Development and promotion of Cocoa product value chain							
2.1	Cocoa product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	2.1.1 Analyzed and mapped PVCs 2.1.2 Identified and ranked PVC constraints and opportunities 2.1.3 Analyzed existing solutions to the identified constraints		Highly productive, commercialized and competitive Cocoa product value chain	
2.2	Development of Cocoa product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.2.1 Identified priority areas of intervention to address priority constraints 2.2.2 Developed and approved projects/action plans and committed resources 2.2.3 Implemented, monitored and evaluated approved projects/action plans			
2.3	Promotion and up scaling of the Cocoa product value chain upgrading technologies and innovations.	2012-2016	- Do -	2.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 2.3.2 Developed and implemented approaches for up scaling technological and innovative packages			

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
3.0 Development and promotion of Coffee product value chain					
3.1 Coffee product value chain analysis, mapping and identification of constraints and opportunities..	2012-2013	Research Scientists and other relevant product value chain actors	3.1.1 Analyzed and mapped PVCs 3.1.2 Identified and ranked PVC constraints and opportunities 3.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Coffee product value chain	
3.2 Development of Coffee product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.2.1 Identified priority areas of intervention to address priority constraints 3.2.2 Developed and approved projects/action plans and committed resources 3.2.3 Implemented, monitored and evaluated approved projects/action plans		
3.3 Promotion and up scaling of the Coffee product value chain upgrading technologies and innovations.	2012-2016	- Do -	3.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 3.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
4.0 Development and promotion of Cashew product value chain					
4.1 Cashew product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	4.1.1 Analyzed and mapped PVCs 4.1.2 Identified and ranked PVC constraints and opportunities 4.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Cashew product value chain	
4.2 Development of Cashew product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.2.1 Identified priority areas of intervention to address priority constraints 4.2.2 Developed and approved projects/action plans and committed resources 4.2.3 Implemented, monitored and evaluated approved projects/action plans		
4.3 Promotion and up scaling of the Cashew product value chain upgrading technologies and innovations.	2012-2016	- Do -	4.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 4.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
5.0 Development and promotion of Oil palm product value chain					
5.1	Oil palm product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	5.1.1 Analyzed and mapped PVCs 5.1.2 Identified and ranked PVC constraints and opportunities 5.1.3 Analyzed existing solutions to the identified constraints	Highly productive, commercialized and competitive Oil palm product value chain
5.2	Development of Oil palm product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.2.1 Identified priority areas of intervention to address priority constraints 5.2.2 Developed and approved projects/action plans and committed resources 5.2.3 Implemented, monitored and evaluated approved projects/action plans	
5.3	Promotion and up scaling of the Oil palm product value chain upgrading technologies and innovations.	2012-2016	- Do -	5.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 5.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
Linking the Operational Plan to Annual Work Planning		This is a rolling implementation plan in which broad activities under each intervention strategy and their respective budgets shall be specified in Rolling Annual Work Plans			

Annex 8.3: Summary of forestry and tree crops programme financing requirements for the period 2012-2016

Forestry and tree crops programme product value chains		Indicative product value chain annual budget (USD '000')						Financing Sources
		2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	Total	
1.0	Development and promotion of Forestry product value chains.	219.8	219.8	219.8	219.8	219.8	1,099.0	GoSL and Partners
2.0	Development and promotion of Cocoa product value chain.	219.8	219.8	219.8	219.8	219.8	1,099.0	- Do -
3.0	Development and promotion of Coffee product value chain.	219.8	219.8	219.8	219.8	219.8	1,099.0	- Do -
4.0	Development and promotion of Cashew product value chain.	219.8	219.8	219.8	219.8	219.8	1,099.0	- Do -
5.0	Development and promotion of Oil palm crop product value chain.	219.8	219.8	219.8	219.8	219.8	1,099.0	- Do -
Total financing requirements for Forestry and tree l crops Programme at KFTCRC		1,099.0	1,099.0	1,099.0	1,099.0	1,099.0	5,495.0	- Do -

9.0 LAND, WATER AND ENVIRONMENT PROGRAMME

Annex 9.1: Land, water and environment programme result framework

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
General Objective To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector	1.1 Percentage research contribution to the sustainable broad based growth in the agricultural sector.	1.1 National impact assessment reports. 1.2 Economic survey reports.	1.1 Government policies will continue to be favourable to the development of the agricultural sector
Specific Objective To generate and promote innovative land, water and environment technologies and empowerment stakeholders	1.1 Percentage increase in agricultural PVCs productivity attributed to adoption of land, water and environment knowledge, information and technologies. 1.2 Percentage increase in agricultural PVCs commercialization attributed to adoption of land, water and environment knowledge, information and technologies. 1.3 Percentage increase in agricultural PVCs competitiveness attributed to adoption of land, water and environment knowledge, information and technologies	1.1 Government reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports.	1.1 Enabling policy environment for increasing agricultural productivity, commercialization and competitiveness will prevail. 1.2 Political stability will continue to prevail in the country
Programme Level Results			
1.0 Appropriate land, water and environment technologies and innovations for enhancing agricultural product value chains generated and promoted.	1.1 Number of technologies and innovations developed and promoted along different product value chains. 1.2 Number of the developed and promoted technologies and innovations adopted by clients along different product value chains.	1.1 Government sector reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports	1.1 Agricultural sector will continue to be a major driver of the national economy 1.2 The Government will continue to support agricultural research 1.3 Favourable weather conditions will prevail
2.0 Appropriate land, water and environment contribution for enhancing agricultural product value chains markets and marketing strategies developed and promoted.	2.1 Number of marketing strategies identified and utilized for different product value chains. 2.2 Number of markets identified and utilized for different product value chains.	- Do -	- Do -

Intervention Logic	Basis for Objectively Verifiable Indicators by 2016	Means of Verification	Assumptions
3.0 Appropriate land, water and environment policy options for enhancing agricultural product value chains facilitated and advocated.	3.1 Number of policies and policy issues identified and advocated 3.2 Number of researchable policy issues addressed 3.3 Percentage increase in the information gathered for facilitating policy change	- Do -	- Do -
4.0 Capacity for implementing land, water and environment research for enhancing agricultural product value chains strengthened.	4.1 Percentage increase in human resource with the right mix, skills, attitude and knowledge. 4.2 Percentage increase in financial sustainability and health. 4.3 Percentage increase in required infrastructure and facilities	- Do -	- Do -
5.0 Appropriate land, water and environment knowledge management and up scaling systems established and operationalized.	5.1 Number of stakeholders and their communication needs identified 5.2 Number of communication products developed and produced. 5.3 Number of communication channels developed and utilized 5.4 Percentage increase in the demand for the programme information, products and services	- Do -	- Do -
Product Value Chain Areas of Focus			
1.0 Improvement on the contribution of integrated soil fertility management on agricultural product value chains.	Each of the land, water and environment intervention strategies to be carried out under each agricultural product value chain shall be expected to contribute to the attainment of the five Programme level results.		
2.0 Improvement on the contribution of soil and water management on agricultural product value chains.			
3.0 Improvement on the contribution of irrigation and drainage on agricultural product value chains.			
4.0 Improvement on the contribution of soil survey, land evaluation and land use planning on agricultural product value chains.			
5.0 Improvement on the contribution of sustainable environment management and climate change mitigation on agricultural product value chains.			
Each of the land, water and environment intervention strategies to be carried out under each agricultural product value chain shall be expected to contribute to the attainment of the five Programme level results.			
Research Support Functions			
1.0 Human resource development and management.	Each of the centre research support function shall be expected to contribute to the attainment of the five programme level results		
2.0 Financial resource acquisition and management.			
3.0 Administration and physical resource development and management.			
4.0 Procurement and supplies services.			
5.0 Information communication and documentation.			
6.0 Centre corporate governance.			

Annex 9.2: Land, water and environment programme implementation plan for the period 2012 - 2016

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators		Outcome
1.0 Improvement on the contribution of integrated soil fertility management on agricultural product value chains.					
1.1 Agricultural product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	1.1.1 Agricultural PVCs analyzed and mapped 1.1.2 Agricultural PVCs segment constraints and opportunities identified and prioritized 1.1.3 Existing solutions to the identified constraints analyzed	Highly productive, commercialized and competitive agricultural product value chains in a sustainably managed land, water and environment	
1.2 Development of agricultural product value chain integrated soil fertility management upgrading technologies and innovations.	2012-2016	- Do -	1.2.1 Identified priority areas of intervention to address priority constraints 1.2.2 Developed and approved projects/action plans and committed resources 1.2.3 Implemented, monitored and evaluated approved projects/action plans		
1.3 Promotion and up scaling of agricultural product value chain integrated soil fertility management upgrading technologies and innovations.	2012-2016	- Do -	1.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 1.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
2.0 Improvement on the contribution of soil and water management on agricultural product value chains.					
2.1 Agricultural product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	2.1.1 Agricultural PVCs analyzed and mapped 2.1.2 Agricultural PVCs segment constraints and opportunities identified and prioritized 2.1.3 Existing solutions to the identified constraints analyzed	Highly productive, commercialized and competitive agricultural product value chains in a sustainably managed land, water and environment	
2.2 Development of agricultural product value chain soil and water management upgrading technologies and innovations.	2012-2016	- Do -	2.2.1 Identified priority areas of intervention to address priority constraints 2.2.2 Developed and approved projects/action plans and committed resources 2.2.3 Implemented, monitored and evaluated approved projects/action plans		
2.3 Promotion and up scaling of agricultural product value chain soil and water management upgrading technologies and innovations.	2012-2016	- Do -	2.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 2.3.2 Developed and implemented approaches for up scaling technological and innovative packages		

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
3.0 Improvement on the contribution of irrigation and drainage on agricultural product value chains.				
3.1 Agricultural product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	3.1.1 Agricultural PVCs analyzed and mapped 3.1.2 Agricultural PVCs segment constraints and opportunities identified and prioritized 3.1.3 Existing solutions to the identified constraints analyzed	Highly productive, commercialized and competitive agricultural product value chains in a sustainably managed land, water and environment
3.2 Development of agricultural product value chain irrigation and drainage upgrading technologies and innovations.	2012-2016	- Do -	3.2.1 Identified priority areas of intervention to address priority constraints 3.2.2 Developed and approved projects/action plans and committed resources 3.2.3 Implemented, monitored and evaluated approved projects/action plans	
3.3 Promotion and up scaling of agricultural product value chain irrigation and drainage upgrading technologies and innovations.	2012-2016	- Do -	3.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 3.3.2 Developed and implemented approaches for up scaling technological and innovative packages	
4.0 Improvement on the contribution of soil survey, land evaluation and land use planning on agricultural product value chains.				
4.1 Agricultural product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	4.1.1 Agricultural PVCs analyzed and mapped 4.1.2 Agricultural PVCs segment constraints and opportunities identified and prioritized 4.1.3 Existing solutions to the identified constraints analyzed	Highly productive, commercialized and competitive agricultural product value chains in a sustainably managed land, water and environment
4.2 Development of agricultural product value chain soil survey, land evaluation and land use planning upgrading technologies and innovations.	2012-2016	- Do -	4.2.1 Identified priority areas of intervention to address priority constraints 4.2.2 Developed and approved projects/action plans and committed resources 4.2.3 Implemented, monitored and evaluated approved projects/action plans	
4.3 Promotion and up scaling of the agricultural product value chain soil survey, land evaluation and land use planning upgrading technologies and innovations.	2012-2016	- Do -	4.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 4.3.2 Developed and implemented approaches for up scaling technological and innovative packages	

Product Value Chains and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome	
5.0 Improvement on the contribution of sustainable environment management and climate change mitigation on agricultural product value chains.					
5.1 Agricultural product value chain analysis, mapping and identification of constraints and opportunities.	2012-2013	Research Scientists and other relevant product value chain actors	5.1.1 Agricultural PVCs analyzed and mapped 5.1.2 Agricultural PVCs segment constraints and opportunities identified and prioritized 5.1.3 Existing solutions to the identified constraints analyzed	Highly productive, commercialized and competitive agricultural product value chains in a sustainably managed land, water and environment	
5.2 Development of agricultural product value chain environment management and climate change mitigation upgrading technologies and innovations.	2012-2016	- Do -	5.2.1 Identified priority areas of intervention to address priority constraints 5.2.2 Developed and approved projects/action plans and committed resources 5.2.3 Implemented, monitored and evaluated approved projects/action plans		
5.3 Promotion and up scaling of agricultural product value chain environment management and climate change mitigation upgrading technologies and innovations.	2012-2016	- Do -	5.3.1 Developed and implemented mechanisms for promoting uptake and utilization of technologies and innovations 5.3.2 Developed and implemented approaches for up scaling technological and innovative packages		
Linking the Operational Plan to Annual Work Planning	This is a rolling implementation plan in which broad activities under each intervention strategy and their respective budgets shall be specified in Rolling Annual Work Plans				

Annex 9.3: Summary of land, water and environment programme financing requirements for the period 2012-2016

Land, water and environment crops programme product value chains		Indicative product value chain annual budget (USD '000')						Financing Sources
		2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	Total	
1.0	Improvement on the contribution of integrated soil fertility management on agricultural product value chains.	232.1	232.1	232.1	232.1	232.1	1,160.5	GoSL and Partners
2.0	Improvement on the contribution of soil and water management on agricultural product value chains.	231.9	231.9	231.9	231.9	231.9	1,159.5	- Do -
3.0	Improvement on the contribution of irrigation and drainage on agricultural product value chains.	231.9	231.9	231.9	231.9	231.9	1,159.5	- Do -
4.0	Improvement on the contribution of soil survey, land evaluation and land use planning on agricultural product value chains.	231.9	231.9	231.9	231.9	231.9	1,159.5	- Do -
5.0	Improvement on the contribution of sustainable environment management and climate change mitigation on agricultural product value chains.	231.9	231.9	231.9	231.9	231.9	1,159.5	- Do -
Total financing requirements for land, water and environment Programme at MLWRC		1,159.7	1,159.7	1,159.7	1,159.7	1,159.7	5,798.5	- Do -

10.0 SLARI DIRECTORATE/HEADQUARTERS AND COUNCIL

Annex 10.1: SLARI Directorate Result Framework

Intervention Logic	Basis for Objectively Verifiable Indicators ¹ by 2016	Means of Verification	Assumptions
General Objective To enhance sustainable productivity, commercialization and competitiveness of the agricultural sector	1.1 Percentage research contribution to the sustainable broad based growth in the agricultural sector.	1.1 National impact assessment reports. 1.2 Economic survey reports.	1.1 Government policies will continue to be favourable to the development of the agricultural sector
Specific Objective Generation and promotion of innovative agricultural technologies and empowerment stakeholders	1.1 Percentage increase in agricultural productivity attributed to adoption of research knowledge, information and technologies. 1.2 Percentage increase in agricultural commercialization attributed to adoption of research knowledge, information and technologies. 1.3 Percentage increase in agricultural competitiveness attributed to adoption of research knowledge, information and technologies	1.1 Government reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports.	1.1 Enabling policy environment for increasing agricultural productivity, commercialization and competitiveness will prevail. 1.2 Political stability will continue to prevail in the country
Institutional Level Results			
1.0 Research support functions contribution to the generation and promotion of appropriate agricultural product value chains technologies and innovations strengthened .		1.1 Government and sector reports. 1.2 Institutional reports. 1.3 External evaluation and impact assessment reports. 1.4 Programme reports	1.1 Agricultural sector will continue to be a major driver of the national economy 1.2 The Government will continue to support agricultural research 1.3 Favourable weather conditions will prevail
2.0 Research support functions contribution to the development and promotion of appropriate markets and marketing strategies for enhancing agricultural product value chains strengthened .		- Do -	- Do -

Intervention Logic	Basis for Objectively Verifiable Indicators ¹ by 2016	Means of Verification	Assumptions
3.0 Research support functions contribution to the facilitation and advocacy for appropriate policy options for enhancing agricultural product value chains strengthened .		- Do -	- Do -
4.0 Research support functions contribution to the development of capacity for implementing agricultural product value chains research strengthened .		- Do -	- Do -
5.0 Research support functions contribution to the establishment and operationalization of appropriate mechanisms for managing, sharing and up scaling agricultural knowledge, information and technologies strengthened .		- Do -	- Do -
Research Programme Area of Focus			
1.0 Root, tuber and grain legume crops programme			
2.0 Cereal crops programme			
3.0 Horticultural crops programme			
4.0 Livestock programme			
5.0 Fisheries programme			
6.0 Forestry and tree crops programme			
7.0 Land, water and environment programme			
Each of the Programme Area of Focus shall be expected to contribute to the attainment of the five Institutional Level Results			
Research Support Functions			
1.0 Human resource development and management.			
2.0 Financial resource acquisition and management.			
3.0 Physical resource development and management.			
4.0 Procurement and supplies services.			
5.0 Information communication and documentation.			
6.0 Directorate and council corporate governance.			
Each of the SLARI Headquarters research support function shall be expected to contribute to the attainment of the five Institutional level results			

Annex 10.2: SLARI Directorate research support functions implementation plan for the period 2012 - 2016

Research Support Functions and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
1.0 Strengthening human resource development and management					
1.1	Determination and documentation of institutional human resource requirements.	2012-2016	Human resource managers, Research managers and SLARI Council		Strengthened institutional human resource planning, development and management systems, processes and services.
1.2	Development and implementation of human resource staffing processes and procedures.	2012-2016	- Do -		
1.3	Development and implementation of apprentice-to-professional staff development procedures.	2012-2016	- Do -		
1.4	Development and implementation of performance based management system.	2012-2016	- Do -		
1.5	Development and implementation of staff compensation/ motivation schemes, policies and procedures.	2012-2016	- Do -		
1.6	Development, implementation and continuous updating of human resource development and management information systems.	2012-2016	- Do -		
2.0 Strengthening financial resource acquisition and management					
2.1	Formulation and implementation of institutional long-term financial requirement plan and effective strategies to mobilize and manage financial resources.	2012-2016	Finance managers, Research managers and SLARI Council		Strengthened institutional financial resource acquisition, budgeting, accounting and management systems and processes
2.2	Development and implementation of policies, systems and procedures for allocating financial resources to optimize their use.	2012-2016	- Do -		
2.3	Development and implementation of policies, systems and procedure manuals for guiding the utilization of financial resources.	2012-2016	- Do -		
2.4	Development and implementation of financial accounting systems and procedures for preparing periodical financial reports and internal and external audits.	2012-2016	- Do -		
2.5	Development, implementation and continuous updating of financial resource acquisition and management information systems.	2012-2016	- Do -		

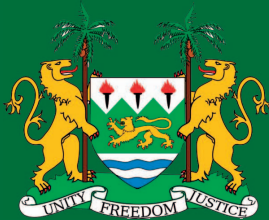
Research Support Functions and their Respective Intervention Strategies		Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
3.0 Strengthening institutional administration and physical resource development and management					
3.1	Development and implementation of effective and efficient institutional administration services delivery systems and processes.	2012-2016	Administration and physical resource managers, Research managers and SLARI Council		Strengthened institutional administration and physical resources development and management systems and processes and services.
3.2	Preparation and implementation of institutional long-term physical resources plan and management structure.	2012-2016	- Do -		
3.3	Preparation and implementation of strategies to acquire, develop and manage institutional physical resources.	2012-2016	- Do -		
3.4	Preparation and implementation of policies, systems and procedures for allocating, sharing and maintenance of physical resources to optimize their use.	2012-2016	- Do -		
3.5	Preparation and implementation of physical resources accounting, assessment and disposal systems and procedures.	2012-2016	- Do -		
3.6	Development, implementation and continuous updating of administration and physical resource development and management information systems.	2012-2016	- Do -		

Research Support Functions and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
4.0	Strengthening institutional equipment and related facilities development and management			Strengthened institutional equipment and related facilities development and management.
4.1	Development and implementation of effective and efficient institutional equipment and related facilities systems and processes.	Equipment and facilities managers, Research managers and SLARI Council		
4.2	Preparation and implementation of institutional long-term equipment and related facilities plan and management structure.	- Do -		
4.3	Preparation and implementation of strategies to acquire, develop and manage institutional equipment and related facilities.	- Do -		
4.4	Preparation and implementation of policies, systems and procedures for allocating, sharing and maintenance of equipment and related facilities to optimize their use.	- Do -		
4.5	Preparation and implementation of equipment and related facilities accounting, assessment and disposal systems and procedures.	- Do -		
4.6	Development, implementation and continuous updating of equipment and related facilities development and management information systems.	- Do -		
5.0	Improvement of institutional procurement and supplies services			Improved institutional procurement and supplies systems and processes
5.1	Strengthening of institutional procurement and supply of goods and services functions.	Procurement and supplies managers, Research managers and SLARI Council		
5.2	Development and implementation of effective strategies to address institutional procurement and supply requirements.	- Do -		
5.3	Development, implementation and continuous updating of institutional procurement and supply management information system.	- Do -		

Research Support Functions and their Respective Intervention Strategies	Time Frame	Responsible/ Collaborators	Key Performance Indicators	Outcome
6.0 Improvement of institutional information communication and documentation				
6.1 Development and implementation of institutional information technology infrastructure and information systems.	2012-2016	Information communication and documentation managers, Research managers and SLARI Council		Improved institutional information communication systems and processes
6.2 Development and implementation of institutional publication services and products.	2012-2016	- Do -		
6.3 Development and implementation of library products and information services.	2012-2016	- Do -		
6.4 Development and utilization of effective corporate communication and marketing products and services.	2012-2016	- Do -		
7.0 Strengthening Directorate and Council Corporate Governance				
7.1 Development and implementation of effective and efficient institutional planning and management systems.	2012-2016	SLARI Directorate, administration, finance, human and research managers and SLARI Council		Strengthened institutional Directorate and Council Corporate Governance systems and processes
7.2 Development and implementation of effective and efficient institutional monitoring and evaluation systems.	2012-2016	- Do -		
7.3 Development and implementation of effective and efficient institutional financial and asset audit systems.	2012-2016	- Do -		
7.4 Development and implementation of effective and efficient corporate legal services.	2012-2016	- Do -		
Linking the Operational Plan to Annual Work Planning	This is a rolling implementation plan in which broad activities under each intervention strategy and their respective budgets shall be specified in Rolling Annual Work Plans			

Annex 10.3: Summary of SLARI Directorate financing requirements for the period 2012-2016

Land, water and environment crops programme product value chains		Indicative product value chain annual budget (USD '000')						Financing Sources
		2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	Total	
1.0	Human resource development and management.	3,637.3	3,511.7	3,437.5	3,309.9	3,062.5	16,958.9	GoSL and Partners
2.0	Financial resource acquisition and management.	3,342.2	3,261.7	3,197.1	3,118.7	2,923.0	15,842.7	- Do -
3.0	Administration and physical resource development and management.	4,242.4	4,127.4	4,038.7	3,956.2	3,775.6	20,140.3	- Do -
4.0	Equipment and related facilities development and management	5,588.3	5,520.8	5,457.5	5,363.8	5,193.7	27,124.1	
5.0	Procurement and supplies services.	1,771.1	1,721.0	1,691.7	1,637.0	1,547.2	8,368.0	- Do -
6.0	Information communication and documentation.	3,610.9	3,525.8	3,494.9	3,420.8	3,237.2	17,289.6	
7.0	Directorate and council corporate governance.	3,610.9	3,525.8	3,494.9	3,420.8	3,237.2	17,289.6	- Do -
Total financing requirements for SLARI Directorate at the Headquarters		19,211.6	20,587.6	20,261.0	19,774.2	18,818.1	98,652.5	- Do -



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