



FEASIBILITY STUDY FOR THE DEVELOPMENT OF PUBLIC-PRIVATE SEED DELIVERY SYSTEMS IN SIERRA LEONE



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Table of content

Introduction and Background.....	5
Agricultural production systems in Sierra Leone.....	5
Current and recent agricultural development initiatives.....	6
Scope for the development of agriculture.....	9
Crop Production Systems.....	11
Current crop production levels of major staple food crops, average crop yields, and trends, by crop.....	11
Rice production trends and yields.....	11
<i>Area under Rice cultivation</i>	11
<i>Quantity of rice Produced</i>	12
<i>Rice yields trends</i>	12.
Cassava production trends and yields.....	14
<i>Area under Cassava Production</i>	14
<i>Quantity of cassava Produced</i>	14
<i>Cassava yield trends</i>	14
Groundnut production trends and yields.....	16
<i>Area under groundnut cultivation</i>	16
<i>Quantity of groundnut produced</i>	16
Groundnut yield trends.....	16
Sweet production trends and yields.....	17
<i>Area under cultivation</i>	17
<i>Quantity of Sweet Potato produced</i>	17
<i>Sweet Potato yield Trends</i>	18
Maize production trends and yields.....	19
<i>Area under cultivation</i>	19
<i>Quantity of maize produced</i>	19
Maize yield trends.....	19
Sorghum production trends and yields.....	20
<i>Area under cultivation</i>	20.
<i>Quantity of sorghum produced</i>	20
<i>Sorghum yield Trends</i>	20
Millet production Trends.....	22
Description of the country's main agro-ecologies and their cropping systems.....	22
Current status of agricultural extension activities.....	29
Level of capacity of public extension system.....	29

Staffing, Infrastructure and facilities of the extension services.....	31
Level of activity by non-governmental and private sector entities in agricultural extension.....	34
Level of adoption of improved crop varieties, by crop.....	34
Adoption rate.....	35
Level of utilization of fertilizer and manures to increase crop yields, by crop.....	35
General description of the current system for marketing surplus production of staple crops.....	36
Trends in development of markets for staple food crops.....	37
Cassava.....	37
Maize.....	37
Sweet Potato.....	37
Cowpea.....	38
Soybean.....	38
Groundnut.....	38
Status of Seed Supply.....	39
History of Crop breeding and seed supply in the country.....	39
Recent and ongoing activities aimed at release of improved crop varieties by crop.....	47
Cassava.....	47
Sweet potato.....	47
Yam.....	47
Groundnut.....	47
Recent and ongoing activities aimed at increasing supply of improved seed.....	47
Current options to smallholder to access improved seed.....	48
Number of private seed companies operating in the country and their estimated annual supply.....	53
Other Non-Governmental and Farmer based organizations active in seed production and supply.....	53
Facilities and equipment available for seed processing and packaging in the country.....	59
Tonnage of seed certified and marketed in the past five years by crop.....	61
Number of Agro dealers currently in operation by region.....	61
Level of importation of certified seed from neighbouring countries by crop.....	63
Summary of prospects to improving seed supply.....	63
National Agricultural Research System.....	64
Description of the Institutes and Universities actively engaged in crop breeding.....	65

Nature of recent or on-going crop improvement activities by crop.....	68
Level of capacity of public crop breeding institutions.....	72
Scientific personnel.....	72
Number of Active Breeders (at Ph.D and M.Sc. levels).....	72
Infrastructure.....	73
Recent on-going collaboration with public institution farmer-based organisation and private sector in supply.....	75
Current status of crop variety licensing arrangement for production by third party entities.....	75
National seed policy framework.....	76
Documents which control the production and supply of seed.....	76
Current status of the regulatory agencies in charge of seed certification.....	77
Active personnel.....	82
Infrastructure.....	83
Current status of basic (foundation) seed supply.....	83
Availability of basic/foundation seed.....	83
Procedures for production and supply of basic (foundation) seed.....	85
Policies for supply of basic seed by private sector.....	86
Summary and Conclusions.....	87
Current status of access to improved seed among smallholder farmers.....	87
Current status of government support for improving seed systems.....	88
Trends and opportunities for seed systems improvements.....	89
Recommendations.....	90
Likely impact from the improvement of access to improved seed by smallholder farmers.....	91

List of Tables

Table 1. Trend in rice Production and Productivity, 2001-2017.....	13
Table 2 Trend in Cassava Production and Productivity, 2001-2017.....	15
Table 3 Trend in groundnut Production and Productivity, 2001-2017.....	16
Table 4 .Trend in sweet potato Production and Productivity, 2001-2017.....	18
Table 5 Trend in Maize Production and Productivity, 2001-2017.....	19
Table 6. Trend in sorghum Production and Productivity, 2001-2017.....	21
Table 7. Trend in millet Production and Productivity, 2001-2017.....	22
Table 8: Extension workers disaggregated by gender.....	32
Table 9 Level of activity of Non- governmental and private sector in agricultural extension.....	33
Table 10: Released rice varieties in Sierra Leone in 1974.....	41
Table 11: Released rice varieties in 1988.....	41
Table 12: Released rice varieties in 2014/2015.....	42
Table 13: Some Characteristics of Released cassava	

genotypes in Sierra Leone.....	44
Table 15: Some characteristics of released cowpea varieties in Sierra Leone.....	46
Table 16: Soybean Released Soybean varieties in Sierra Leone.....	46
Table 17: Yam genotypes nominated for release to the VRC.....	48
Table 18: Stakeholders and their roles in the rice seed value chain.....	49
Table 19: Market price (sales and purchase) of certified seed.....	51
Table 20: Number of private seed companies operating in Sierra Leone.....	53
Table 21. Active seed producing co-operatives, companies and individuals in Sierra Leone as at 2017.....	54
Table 22: Turnover of production over a three year period.....	56
Table 23: Quantities of rice and maize seeds supplied.....	57
Table 24: Production of Rice Seed (for 2015, 2014 and 2013), Production Station and Cultivated Area.....	61
Table 25: Officially Certified Rice Varieties in Sierra Leone.....	62
Table 26: Concentration of agro-dealer network in the country.....	63
Table 27: List of maize trials, number of entries, design, plot size, replication, spacing and area.....	70
Table 28: Number of active breeders by crop.....	73
Table 29: Prescribed seeds for release in Sierra Leone.....	78
Table 30: Seed certification scheme.....	80
Table 31: Availability of breeder/foundation (satisfaction ratings)	84
Table 32: Main source of basic seed and satisfactory ratings.....	85

List of Figures

Fig1. Map of Sierra Leone showing agroclimatic and agroecological zones.....	27
Figure 2: Organizational Structure of the Ministry of Agriculture, Forestry, and Food.....	31
Figure 3: pictures of newly installed processing and packaging equipments.....	60
Figure 4a-d.....	74
Figure 5: Sources of acquisition of cassava planting materials.....	88

Introduction and Background

Agriculture including Forestry and Fisheries contributes the largest GDP share but that share is declining reducing from 52% in 2011 to an estimated 42% in 2013. Two-thirds of the population of Sierra Leone are involved in agriculture. Sierra Leonean farmers pursue a wide range of crop and livestock enterprises that vary both across the major agro-ecological zones. Many agricultural production systems are involved in the current food security efforts initiated by the Government of Sierra Leone. This involves the cultivation of crops and the rearing of animals on the same or on different plots of land. It is important because it provides employment, it is also the basis of many manufacturing and service industries such as: food processing, agricultural equipment, agricultural inputs (seeds, fertilizers,) and a variety of services (financial, veterinary, marketing, transport). It also contributes to the *Gross National Product (GNP)* of a country.

Agricultural production systems in Sierra Leone

Sierra Leone is characterized by many agricultural systems that result from both endogenous factors (household goals, labour, technologies in use and the resource base) and exogenous factors (market development, shifts in demand, agricultural services and policies, the dissemination of new technologies and the availability of market and policy information). These systems include arable farming, pastoral farming, mixed farming, intensive farming, extensive farming, nomadic farming, sedentary farming, commercial farming and subsistence farming. The two main agricultural systems used in Sierra Leone are commercial farming and subsistence farming. Commercial Farming is usually associated with a tree crop-based system consisting of crops such as cacao, coffee, oil palm and recently cashew. This system is currently well structured in terms of production and marketing and has successfully intensified production for specialized markets. This farming system is visible in the south eastern regions of Sierra Leone from Kenema, Kailahun and Pujehun districts and recently some areas in the north regions of Kambia and Port Loko districts. The backbone of the system is the production of industrial tree crops – notably cocoa, coffee, oil palm and recently cashew. Food crops are inter-planted between tree crops and are grown mainly for subsistence.

Subsistence farming which is associated with smallholder farmers consists of the planting of various food crops and the rearing of animals as a result to be self-sufficient in food. Rice and cassava form the main crops. This farming system is characterised by low-input/low-output systems. The upland constitutes the majority of the arable land in Sierra Leone. Under this ecology intercropping and mixed cropping is common. Another major ecology is the lowland which is predominantly used for paddy rice production. This farming system is mainly in the savannah areas. Other crops such as sorghum, sweet potato yam, maize, cowpea, groundnut, are also regarded as important livelihood crops grown under this farming system mostly as intercrops as generally reflected in sub Saharan Africa.

Current and recent agricultural development initiatives

Agricultural development policies in Sierra Leone has never been deficient but have lacked coordination and continuity and have only affected a small proportion of the rural population. A number of integrated agricultural development projects, introduced in the 1970s with World Bank support, have given some direction to Sierra Leone's agricultural policy, but many farmers both within and outside designated project areas have been excluded from the new measures. Development efforts over the years includes the Swamp Rice Cultivation and Improved Variety Scheme in the 1920's, emergency of cooperative societies in the 1930's which lead to the development of the Sierra Leone producing marketing board in 1949 and positioned the country as a net exporter of rice. After independence several other agricultural development initiatives were implemented. These included a ten-Year Plan for Economic and Social Development(1962 to 1971), The National Development Plan (1974 – 1978), The Integrated Agricultural Development Projects (IADPs) late 1960s to mid-1970s, which was a failure, The Agricultural Sector Support Project (ASSP) introduced by the World Bank and other donor partners to re-structure the agriculture sector and reform policies in line with the Structural Adjustment Programme (SAP). Then came the Green Revolution and the PL 480 Agricultural Schemes followed by several interregnum as a result of the rebel war.

The Development Policies/Strategies in Post War Sierra Leone: 2001 to 2007 included The Interim Poverty Reduction Strategy Paper (IPRSP), national recovery strategy, The Vision 2025 Planning Programme, The Poverty Reduction Strategy Paper (PRSP) (2005-2007) which focuses on the promotion of food security and job creation. A range of Agricultural Sector Initiatives were aligned to the national strategy, including the Government's Food Security Strategy, and the establishment of A Right to Food Secretariat, all consistent with the UN Millennium Development Goal (MDG1) of eradicating extreme poverty and hunger. The Government stayed the course of increased policy focus on agriculture, as it entered into the second generation PRSP (2008-2012) referred to as the Agenda for Change (A4C). The renewed drive was especially driven by the formulation of a more comprehensive agriculture sector plan, the National Sustainable Agricultural Development Plan (NSADP, 2010 - 2030), consistent with Sierra Leone's participation in the CAADP. Projects emanating from these policies include the agricultural sector rehabilitation project (ASREP) and more recently the west African Agricultural productivity programme (WAAPP) a multi-year effort to transform West African agriculture by boosting productivity and sustainability, reducing hunger and improving nutrition, creating jobs and supporting collaboration across borders. Priority areas identified in Sierra Leone, supported by multi donor and Non-governmental organization focuses on Increased productivity along the food system value chain, improved livelihoods and nutrition outcomes through food and nutrition security and responsible agribusiness development. Projects under this sector includes

- I. Promoting effective engagement in agribusiness for women's cooperatives in Sierra Leone
- II. Support to Cacao Farmer Association in Peje Bonjay Chiefdom Sustainable poultry production
- III. Smallholder Commercialization Programme (SCP) which was upgraded to Smallholder Commercialisation and Agribusiness Development Project (SCADeP)

- IV. Global Agricultural Food Security Project (GAFSP) which financed commercialization of smallholder farmers through better inputs, farm management training and linking farmers to market. (<http://www.fao.org/sierra-leone/programmes-and-projects/project-list/en/>)
- V. Boosting Agriculture and Food Security (BAFS)", financed under the 11th European Development Fund. The BAFS programme aims to build-up a sustainable, diversified and commercial agricultural sector, ensuring food self-sufficiency, increasing exports and creating job opportunities for Sierra Leonean women and men. The BAFS programme is in line with the National Sustainable Agriculture Development Plan (NSADP) 2010-2030 and the Agenda for Prosperity"

Under the current dispensation, the Ministry of Agriculture and Forestry (MAF) has developed national agricultural transformation programme 2019-2023 with support from the Tony Blair foundation which focuses on five priority components and strategic interventions as follows:

- I. Towards rice self- sufficiency
- II. Livestock development
- III. Crop diversification
- IV. Sustainable forest and biodiversity
- V. Enabling environment and governance as a cross cutting issue.

Activities within this 5-year plan include but not limited to (i) policy coordination, (ii) Research inputs, (iii) Land preparation and machinery (iv) extension and training (v) processing and marketing (vi)commercial farming and out grower scheme.

Current programmes under implementation includes West African Agricultural Transformation Program (WAATPT) with the financial support of the World Bank and Technologies for African Agricultural Transformation (TAAT) to boost the transformation of Agriculture in West and Central Africa.

Scope for the development of agriculture

There is a potential for substantial agricultural sector growth in Sierra Leone, given the favourable population/land ratio, abundant and diversified resources, and present low yields for almost all the crops (hence the potential for yield increase is great). In the light of the above, GoSL's National Transformation Plan NATP 2023, sets out a framework for support to agriculture with the objectives of:

- a) Increased and diversified domestic production of food, with a view of achieving food security in the medium to long- term;
- b) Increased agricultural productivity, output, rural incomes and employment, while ensuring adequate protection of the environment
- c) Balanced regional agricultural growth and equitable distribution of income; and
- d) Maximized foreign exchange earnings from agriculture.

Since the start of the millennium, the Government has set itself the challenge of implementing poverty reduction strategy programs (PRSP) and meeting the sustainable development goals (SDGs). This has increased the need for data to understand livelihood strategies and rural incomes (levels and sources) to identify the drivers which will move households out of poverty.

Similarly, participation in the CAADP/NEPAD programme has increased both the level and the effectiveness of budget allocations to the agricultural sector with the need to evaluate the benefits and costs of different types of investments (not only direct investments in agriculture but also investments in roads, education, and health) and their impact on growth. Decentralization has also increased the demand for disaggregated agricultural statistics (i.e., those reflecting the crop and livestock production situation for Local Government) and for analytical capacity at the local council level. In line with the Comprehensive Africa Agriculture Development Programme (CAADP) of NEPAD for which the Government of Sierra Leone is a signature, the Ministry of Agriculture and Forestry had aligned its programmes to fit into the Comprehensive Africa Agriculture Development Programme (CAADP) which focus

on investment into three "pillars" that can make the earliest difference to Africa's agricultural crisis plus a fourth long-term pillar for research and technology as follows:

- Extending the area under sustainable land management and reliable water control systems.
- Improving rural infrastructure and trade-related capacities for market access.
- Increasing food supply and reducing hunger.
- Agricultural research, technology dissemination and adoption.

A national strategy for growth in Sierra Leone has been developed and in line with the International Food Policy Research Institute (IFPRI), puts agriculture as the engine for economic growth to meet the country's long-term vision of becoming a middle-income country by 2035. The country strategy paper (CSP) for Sierra Leone (2013-2017) selectively supports the country's A4P objectives. The CSP is fully aligned with the World Bank Group's Strategy (2013-2022) and the regional Integration strategy paper (RISP) for West Africa. The CSP is also underpinned by the relevant results of extensive economic and sector Work (EESW) carried out by the Government, World Bank and other development partners, while taking a participatory approach in seeking inputs from diverse stakeholders and from internally generated funds. Presently, there is a shift of focus from production-oriented research to market-oriented research for development. To this effect, the agricultural product value chain (APVC) is adopted, with the following research thematic schemes developed in response to the shift in focus:

- Seed/planting material development and multiplication;
- Natural resource management;
- Engineering, post-harvest and food technology;
- Policy, socio-economics and outreach;
- Farm management;
- Training of farmers and technical staff; and
- Fast tracking the generation and dissemination of new crop varieties.

In the light of the above, the Government of Sierra Leone's draft policy statement sets out a framework for support to agriculture with the objectives of:

- Increased and diversified domestic production of food, with a view to achieving food security in the medium to long-term;
- Increased agricultural productivity, rural incomes and employment, while ensuring adequate protection of the environment;
- Balanced regional agricultural growth and equitable distribution of income; and
- Maximized foreign exchange earnings from agriculture.

Crop Production Systems

Current crop production levels of major staple food crops, average crop yields, and trends, by crop

Sierra Leone is not self-sufficient in food. Food is one of Sierra Leone's biggest imports. In 2007 the agricultural sector grew by 14 percent, led by crops and by five percent in 2008. Agricultural exports in 2006 accounted for 4 percent of total exports. In terms of land area under food crops cultivation, of the total land area of 3,244,214 hectares (ha) under food production, just over three-quarters was used to cultivate Rice, (upland and lowland) cassava, sweet potato, groundnut, maize. The largest percentage was used for upland rice production.

Rice production trends and yields

Area under Rice cultivation

Upland rice crop: The total area of upland rice under cultivation in Sierra Leone is estimated at 1,133,925 ha. Northern region accounts for the largest cultivation of upland rice with 37.1percent of land under food crop production. This was followed by the Eastern and Southern regions of 36.1 and 25.5 percent of land under food crop cultivation respectively. In terms of district, the Kailahun and Kenema districts ranked in first and second places and recorded 4.7 per cent and 4.3 per cent of national arable land under upland rice cultivation. This was followed by Bo district in third place.

Lowland rice crop: The total area of lowland rice under cultivation in Sierra Leone is estimated 560,384 ha. In terms of district, Kambia and Port Loko district ranked first and second place with 3.3per cent and 2.4 per cent of total arable land under lowland rice cultivation. This was followed by Koinadugu, Kailahun, Kono, Bombali, Tonkolili and Kenema districts in descending order.

Quantity of rice Produced

Upland and Lowland Rice: The Northern region produced almost half (48.2 per cent) of total national food production. Nearly three-quarters of the 366,952,975 kg produced in the region came from rice crops (upland and lowland), which was 54 per cent of total rice production, 73.5per cent of regional production, and 35.5 per cent of national food production. The Southern region produced the second highest amount of food(213,784,106 kg) with 72,566,860 and 19,082,222 kg of upland and lowland rice respectively. This was 18.2 percent of total rice production, 43 per cent of the regional food production and 12.1 per cent of national food production. The Eastern region ranked third place in food crop production with 174,780,579 kg of total regional food production, which was 23 per cent of national food production Kenema district recorded 45,726,256 kg of upland rice production, equal to 14 per cent of total upland rice production and 6 per cent of total national food production. The Kenema district was closely followed by Koinadugu district with 45,339,520 kg, also 14 per cent of total upland rice production, and 6 per cent of total national food production. The Kailahun and Tonkolili districts produced 35,135,813 and 31,620,804 kg respectively. They contributed 11 per cent and 9.8 per cent respectively to total rice production; and 5 per cent and 4 per cent respectively to total national food production. Kambia and Koinadugu districts featured as the main producers of lowland rice with Kambia producing 37,062,892 kg and Koinadugu 32.024,392 kg. The Kambia and Koinadugu production figures represented 20.4 per cent and 18 per cent of total lowland rice production and 4.9 per cent and 4.2 per cent of total national food production respectively. Port Loko produced the third largest quantity of lowland rice followed by Bombali district, Tonkolili district, Kailahun district, Kenema and Kono district.

Rice yields trends

Table 1. Trend in rice Production and Productivity, 2001-2017

Year	Area (Ha)	Yield (Mt/Ha)	Production (Mt)
2001	300,000	1.0	300,000
2002	420,000	1.0	422,066
2003	440,000	1.0	445,633
2004	540,000	1.0	542,000
2005	650,000	1.1	738,000
2006	742,000	1.4	1,062,320
2007	432,356	1.4	588,004
2008	475,592	1.4	680,097
2009	499,111	1.8	888,417
2010	549,022	1.9	1,026,671
2011	603,924	1.9	1,129,338
2012	717,872	1.6	1,141,417
2013	671,422	1.9	1,255,559
2014	610,830	2.0	1,204,020
2015	433,521	2.0	871,693
2016	745,524	2.1	1,560,363
2017	647295	2.2	1,400,000

Rice production estimates from FAOSTAT data (2001 – 2017)

Cassava production trends and yields:

Area under Cassava Production:

Cassava is the second staple food crop in Sierra Leone after rice. The Southern region used the most land for cassava cultivation. This was followed by Northern region and then the Eastern region. Bonthe district had the most land used for cassava farming, followed by Port Loko, Moyamba, Pujehun and Bo. At the regional level, the Southern region produced more than half the nation's cassava crop (53 per cent), which also equated to 54 per cent of total regional food production, and 15.1 per cent of total national food production.

Quantity of cassava Produced

The Northern region was the second largest producer of cassava, which is 34 per cent of total cassava production, 20 per cent of regional food production and 9.6 per cent of total national food production. The Eastern region produced 12 per cent of total cassava production, 15.4 per cent of total regional food production and 3.5 per cent of total national food production.

The Western region recorded the lowest cassava crop in the four regions, just 1.2 per cent of total cassava production, 4.5 per cent of regional food production and 0.3 per cent of total national food production. Cassava production was highest in the Pujehun district which recorded 34,335,768kg, followed by Port Loko with 31,103,054 kg, Bonthe with 28,260,156 kg and Moyamba district with 26,443,722 kg. Pujehun the largest producer, contributed 6 per cent to total cassava production and 5 per cent to total national food production. The Kenema district production which was 10,096,844 kg represented 5 per cent of total cassava production but only 1.3 per cent of overall national food production.

Cassava yield trends

Like rice, cassava production has been increasing since the end of the conflict. Production has increased from 399,670 tons in 2001 to 4,761,385 tons in 2017. Increase in production is attributed to increase in area under cultivation..

Table 2 Trend in Cassava Production and Productivity, 2001-2017

Year	Area (Ha)	Yield (Mt/Ha)	Production (Mt)
2001	63,784	6.3	399,670
2002	77,755	6.2	479,454
2003	282,406	6.2	1,759,292
2004	288,382	6.3	1,812,071
2005	175,923	6.4	1,120,630
2006	228,700	6.4	1,456,819
2007	297,310	6.4	1,893,865
2008	321,176	6.2	1,988,561
2009	359,002	7.8	2,814,576
2010	394,902	8.2	3,250,044
2,011	420,457	8.2	3,460,357
2012	225,766	15.9	3,585,172
2013	352,816	10.8	3,810,418
2014	381,430	10.8	4,102,845
2015	399,500	11.6	4,651,707
2016	375,170	12.1	4,532,415
2017	378,375	12.6	4,761,385

FAOSTAT, 2019

Groundnut production trends and yields:

Area under groundnut cultivation: The Northern region recorded the largest amount of land devoted to groundnut cultivation followed by the Southern region and the Eastern region. A total of 299,580 ha of land was reported nationally to be under groundnut production, which is 9.2 percent of the total arable land under food crops nationwide. At the district level, Tonkolili district reported the most land area under groundnut cultivation, followed by Bombali, then Koinadugu.

Quantity of groundnut produced

The Northern region produced the largest quantity of groundnut of all four regions. The Southern region followed with just 16.5 percent of total groundnut production. The Eastern region production of groundnut was only 5 per cent of total groundnut production. The contribution by the Western region was a meagre 1 per cent of total groundnut production. Groundnut production in all districts was below 5,000 kg with the largest production from Koinadugu district.

Groundnut yield trends

Table 3 Trend in groundnut Production and Productivity, 2001-2017

Year	Area (Ha)	Yield (Mt/Ha)	Production (Mt)
2001	39,000	0.8	30,000
2002	76,000	0.8	58,400
2003	92,000	0.8	70,500
2004	120,000	0.8	91,128
2005	137,000	0.8	104,730
2006	150,000	0.8	115,200
2007		0.7	

	84,482		57,448
2008	87,017	0.7	59,720
2009	100,070	0.7	70,049
2010	110,077	0.7	81,457
2011	112,254	0.7	83,068
2012	100,890	0.8	84,748
2013	78,585	1.1	86,443
2014	75,600	1.1	86,000
2015	68,671	1.1	78,927
2016	67,002	1.0	66,083
2017		1.0	65,606

Sweet production trends and yields

Area under cultivation:

The total land under sweet potato cultivation in all four regions of the country was relatively small in line with national figures. Similarly, percentages of land under sweet potato crops cultivation at the district level were insignificant and also not very distinct among the districts.

Quantity of Sweet Potato produced:

The Northern region recorded the highest sweet potato production among the four regions and it produced more than half the entire nation's crop. The Eastern region was second largest producer with 21 per cent of total sweet potato production. The Southern region produced 20 per cent of total sweet potato production. The Western region again recorded the lowest figure in the four regions with only 1.2 per cent of total sweet potato

production. The largest production of sweet potato was recorded from Port Loko and Kambia, 3,380,272 kg and 3,049,790kg respectively.

-

Sweet Potato yield Trends

Table 4 . Trend in sweet potato Production and Productivity, 2001-2017

Year	Area (Ha)	Yield (Mt/Ha)	Production (Mt)
2001	10,000	2.5	25,450
2002	10,319	2.8	28,446
2003	48,297	3.2	153,196
2004	48,092	3.3	157,792
2005	29,652	3.4	99,927
2006	31,135	3.4	104,925
2007	32,692	3.4	110,172
2008	33,673	3.4	113,478
2009	38,724	4.6	176,969
2010	42,956	4.8	206,189
2011	41,729	5.0	210,313
2012	46,000	4.8	220,829
2013	64,354	3.5	225,246
2014	44,113	3.7	166,104
2015	48,223	4.4	212,573
2016	51,634	4.5	234,388
2017	53,783	4.6	248,247

Maize production trends and yields:

Area under cultivation:

The total land under maize cultivation in all four regions of the country was relatively small and was reflected at the district level. Area under cultivation were insignificant and also not very distinct among the districts.

Quantity of maize produced

The Northern region recorded the largest production followed by the Eastern, Southern and Western regions. The Northern production was 43 per cent of total maize production, 0.4per cent of total regional food production and 0.2 per cent of total national food production. The Eastern region represented 30 per cent of total maize production, 0.7 per cent of regional food production and 0.1 per cent of national food production. The Southern production of maize represented 24 per cent of total maize production, 0.4 per cent of total regional food production and 0.1 per cent of total national food production. Lastly, the maize production from the Western region accounted for 2.4 percent of total maize production, 1.6 per cent of total regional food production and 0.01 percent of total national food production.

Maize yield trends

Table 5 Trend in Maize Production and Productivity, 2001-2017

Year	Area (Ha)	Yield (Mt/Ha)	Production (Mt)
2001	9,700	1.0	10,000
2002	15,297	0.8	12,038
2003	16,000	1.0	16,060
2004	33,000	1.0	32,125
2005	40,000	1.0	39,051
2006	60,000	0.8	48,813

2007	27,200	0.8	22,848
2008	28,016	0.8	23,533
2009	32,218	0.9	29,641
2010	35,440	1.5	51,388
2011	34,484	1.5	52,416
2012	17,835	2.2	39,237
2013	19,059	2.1	40,022
2014	34,492	0.6	20,812
2015	36,835	0.6	22,619
2016	37,680	0.3	12,554
2017	36,000	0.5	18,000

Sorghum production trends and yields

Area under cultivation

Since 2006, sorghum production has increased enormously. Research on varieties of sorghum, trainings in best practices, access to credit and the prospect of a higher income motivated more and more farmers over the years to participate in the sorghum project.

Quantity of sorghum produced

In 2006, two participating districts produced a total of 20 metric tons (MT) of sorghum. In 2007, this amount increased to 40 MT when more farmers joined the associations in the same districts. One year later, four other districts participated in the project, which brought up a delivery of 65 MT. Almost the triple was produced in 2009 when sorghum farmers of three more districts decided to participate. The success got around, and so in

2010 a total of about 1,600 farm families, spread over 13 districts, delivered 670 MT of sorghum.

Sorghum yield Trends

Table 6. Trend in sorghum Production and Productivity, 2001-2017

Year	Area (Ha)	Yield (Mt/Ha)	Production (Mt)
2001	12,000	1.1	13,000
2002	17,298	1.1	18,546
2003	20,000	1.1	21,000
2004	21,605	1.0	21,577
2005	22,000	1.0	23,000
2006	27,000	0.7	18,000
2007	22,000	0.9	20,000
2008	22,728	1.0	21,672
2009	25,456	0.9	24,038
2010	28,070	0.9	25,644
2011	30,505	0.9	27,738
2012	33,147	0.9	30,000
2013	33,304	0.9	30,000
2014	33,462	0.9	30,000
2015	32,706	0.9	29,183
2016	31,909	0.9	28,336
2017	32,373	0.9	28,610

Millet production Trends

Table 7. Trend in millet Production and Productivity, 2001-2017

Year	Area (Ha)	Yield (Mt/Ha)	Production (Mt)
2001	9600	0.9	8500
2002	11612	0.9	10529
2003	10000	1.0	10000
2004	15000	1.0	15000
2005	20000	1.0	20000
2006	25000	1.0	25000
2007	19000	1.0	19000
2008	25000	1.0	25000
2009	27000	1.0	27000
2010	32414	1.0	32768
2011	39004	1.0	40000
2012	37890	1.0	38973
2013	37975	1.0	39351
2014	38318	1.0	40000
2015	37114	1.1	39028
2016	35839	1.1	37961
2017	35599	1.1	37979

Description of the country's main agro-ecologies and their cropping systems

Sierra Leone is located in the lowland humid tropics of West Africa with the capital Freetown on the coastal belt along the Atlantic Ocean. Administratively, the country is divided into four provinces and the western Area (Urban and Rural) and a total of 16 districts. The country has a land area of 7.3 million hectares of which 5.4 million hectares is potentially arable. The potentially cultivable lowland area comprises 630,000 ha of inland valley swamps; 120,000 ha of bolilands; 110,000 ha of riverain grasslands; and 200,000 ha of mangrove swamps. Sierra Leone has a diverse ecology, which altogether provides ideal conditions for the cultivation of a wide range of crops. The coastal plains of the Atlantic stretch approximately 200 miles; relatively flat surfaces that are frequently flooded in a range of between 5 and 25 miles off the coast; suitable for the cultivation of rice, ginger, vegetables and cassava. The interior plains comprise seasonal floodplains (or 'Bolilands'); rolling wooded areas; and a variety of savannah covered low plains and hills; suitable for the cultivation of rice, sugar, oil palm, cassava and cashew. The interior plateaus, mountains and inland valley swamps of the east are suitable for the cultivation of rice, cocoa, coffee and oil palm. The Western Area, which consist of thickly wooded mountains running parallel to the sea for about 25 miles, are suitable for mangoes, citrus fruits and livestock (Fig 1).

Over 80% of the total land area is upland and remaining 20% is in diverse lowland systems comprising

1. Inland valley Swamps
2. Mangrove Swamps
3. Bolilands
4. Riverain grasslands

Upland ecology

This is the dominant ecology constituting 64% of the total land area under rice cultivation. Crop growth on these lands depend solely on rainfall and in some cases on residual moisture. The depth of its soil varies from 3cm to 9cm and the organic matter

varies from 1% to 3% (RRS, 1987). The dominant soils are ultisols and oxisols and they are characterized by low inherent fertility, high acidity and associated Al toxicity. As a result of the heavy rainfall on these soils, there is tremendous leaching. The upland soils are slightly acidic (pH 4 – 5). The dependence of the upland on rainfall limits rice cultivation to once a year only during the rainy season and with no irrigation. Mixed cropping which is used by farmers as an insurance against crop failure, is predominant with upland and still remains the attractive ecology for rice-based crop production.

Lowland Ecology

Soils of lowland benefit to some extent from the nutrient losses of the upland areas through leaching in the movement of water downstream. Lowlands have deeper subsoil with low content of weatherable materials but with high organic matter in the top soil. There are instances where iron and Al cations are in excess leading to iron toxicity (NRSD report). Below are the commonly found lowland ecologies in Sierra Leone.

Inland Valley Swamp

The IVs occur between low lying areas often depressions and valley bottoms between adjacent valleys. They are perennial or seasonal and are found in every part of the country they are rice growing ecologies with an advantage of holding more water than the uplands and thereby produce higher rice yields grown in monocrop during the growing season and mixed cropping in the off-season

Mangrove Ecology

Mangrove swamps are low-lying areas along the coast of the Atlantic Ocean. It extends from the south and the Western Area to the Northwest region of Sierra Leone. Mangrove swamps are inundated by tidal waves twice daily. Salinity, weeds and crabs poses serious problems. Farmers plant relatively older seedlings and use more seedlings per hill, a measure to crab damage. Saline from the ocean creates a peculiar ecology through the Great and Little Scarcies rivers up to 32 miles inland. Along the Great Scarcies River rice cultivation is possible during the rainy season when most of the silt which accumulates during the dry season is washed out into the sea .It is

generally known that even though rice is cultivated in this ecology only once in the year, the mangrove ecology is the most stable rice growing ecology in Sierra Leone. The dominant grass species in the mangrove ecology, *Paspalum vaginatum* (locally called Kere Kere) has robust rhizome roots making ploughing a difficult task. It is a sole rice extensive system of production.

The two main types of mangrove ecologies include (1)Tidal mangrove swamps and (2)Associated mangrove swamps.

Tidal mangrove swamp

- Experience tidal movement of sea water twice daily.
- Based on the length of the salt free period, tidal mangroves are classified in to three categories.

Category 1:

- Mangrove that have a “salt free” period of less than four month.
- These swamps are located nearer to the sea coast. Along the Grate scarcies river this area stretches from the mouth of the ocean to the Kychom axes.
- Traditionally short duration (less than 4 months) varieties are grown in these areas to escape salinity stress.

Category 2:

Mangrove areas under tidal flow but the "salt-free" period can last longer, i.e., from four to six months. This area covers from Kassirie to Katamah. In these areas, medium duration (4 to 6 months) varieties are usually grown

Category 3:

- Areas which are subjected to tidal flow for most of the year, but with a "salt-free" period of more than 6 months.
- It occupies Mambolo through Robot section. The areas are located further away from the coast; therefore, receive larger quantity of fresh water both as direct rainfall and as river floods. Long duration varieties (more than 6 months) are grown.

Associated Mangrove Swamp

They are located between the tidal swamp and the upland

They are not subject to tidal floods but get submerged with up to 20cm depth of water received as direct rainfall, runoff and seepage from adjoining uplands.

They are characterized by excessive grass and sedge weeds with fewer broad leaved ones.

Boliland Ecology

Bolilands are vast saucer-shaped and poorly drained depressions lying between rivers.

Bolilands are generally low in cation exchange capacity and organic content and consist mainly of heavy clay or silt. Yields in this ecology are generally low – about 1 ton per ha.

Rice is cultivated in the bolilands once a year.

Riverain Ecology

The riverain grasslands are found mainly in the south of the country (around the Sewa and Wanjei rivers). These are the deep-water terrain which carries standing water from 0.5m - 3.0m during the growing season. They could be highly productive with a yield of between 2 to 3 tons per ha. However, proper agronomic management, pesticide and no fertilizer application are some of the problems.



Fig1. Map of Sierra Leone showing agroclimatic and agroecological zones

Current status of agricultural extension activities

Since becoming independent in 1961, Sierra Leone has employed a variety of extension models, and among them, the Training and Visit (T&V) approach is the most dominant model used. The nation has also implemented participatory extension models like Farmer Field Schools (FFSs), Farmer-Based Organizations (FBOs) and Agricultural Business Centres (ABCs), and Innovation Platforms. However, the agricultural capacity in terms of trained experts, such as agricultural extension staff, among others, remains very low across the country.

Over time, the Government of Sierra Leone created an agricultural extension service division within MAFFS to counter historically weak extension services. The extension division coordinates extension delivery across the whole country. Prior to the creation of

the extension division, public extension was largely disjointed in the country. Multiple divisions/departments of MAFFS ran their own extension programs in the country . In general, the extension division is responsible for the following activities: • help rehabilitate facilities for agricultural information and communication trainings; • harmonize extension services management across sectors of MAFFS and related partners in agricultural development; • initiate higher use of participatory extension models like Farmer Field Schools and innovation platforms; • strengthen the agricultural productivity capacities of rural communities through support to farmer based organizations; • address topical issues like women and youth in agriculture, farmer health concerns (i.e. HIV/AIDS), climate change and environmental degradation. -

The research and extension liaison unit link the MAFFS extension system with other agricultural departments such as Crops, Livestock, and Natural Resources. One initiative MAFFS has been involved in was the Agriculture for Development (A4D) EU-funded project, developing the cash crop industry (such as coffee, cocoa, cashew) and working with World Vision, WHH, and CRS. MAFFS staff training and development aims to create knowledge and disseminate resources throughout the extension system through links with universities and organizations including the Food and Agriculture Organization of the UN (FAO), the World Bank, and IFAD. Field-level operations, based out of MAFFS district offices, focus on coordinating the activities of farmer-based organizations and agricultural business centers, as well as working with NGO and development partners. This unit is staffed with subject matter specialists (i.e., plant doctors and soil scientists), block extension supervisors, and field-level extension workers who work directly with farmers. There remains limited use of ICTs in Sierra Leone, although extension agents do use mobile phones to communicate with other agents and farmers. Social media use has increased through the use of mobile applications like WhatsApp, and radios are used to share information at the community level. There is a Ministry of Information and Communication that works to strengthen the capacity for effective ICT use and dissemination. The use of radio programs has been a particularly common and effective means to inform farmers and extension agents. New agricultural development projects such as the SCADP are promoting enhanced ICT

systems to support extension, information accessibility for smallholder farmers, and sector coordination. As with many post-war activities in Sierra Leone, the extension system also attempts to address several cross-cutting issues, including gender and youth empowerment in a decentralized framework. Extension is generally aimed at raising awareness of and implementing strategies to adapt to and counter climate change and extreme weather variability, farmer health issues (e.g., HIV/AIDs, malaria, and typhoid, etc.), among others.

There are fifteen main extension organizations operating in Sierra Leone. Two of them are Public institutions namely; Ministry of Agriculture and Ministry of Internal Affairs, Local Government & Rural Affairs, Njala University and several non-governmental organizations including .Grassroots Gender Empowerment Movement, Destiny Agricultural Development Association, community mobilization of poverty alleviation services, Community Mobilization of poverty alleviation and Services, CREDO Community Research and Development Organization,

Level of capacity of public extension system

The extension system in Sierra Leone is largely pluralistic, pulling together resources and partners from the public, including the government and universities, as well as nongovernmental organizations, civil societies, and the private sector. MAF is the governmental unit in charge of providing public extension services to farmers. MAF is organized into seven specific divisions: Crops, Livestock, Forestry, Agric-Engineering and Services, Planning, Evaluation, Monitoring and Statistics, Agricultural Extension Services, and administration support of district MAF branches. There are 16 district offices across the country. MAF is primarily responsible for drafting agricultural development policies, advising the government on policies that concern the agricultural development of Sierra Leone, and providing extension and support for the agricultural sector. According to its website there are several development partners collaborating with MAF that help influence and fund the extension system, including the African Development Bank, Japan International Cooperation Agency (JICA), World Bank, International Fund for Agricultural Development (IFAD), World Food Program (WFP),

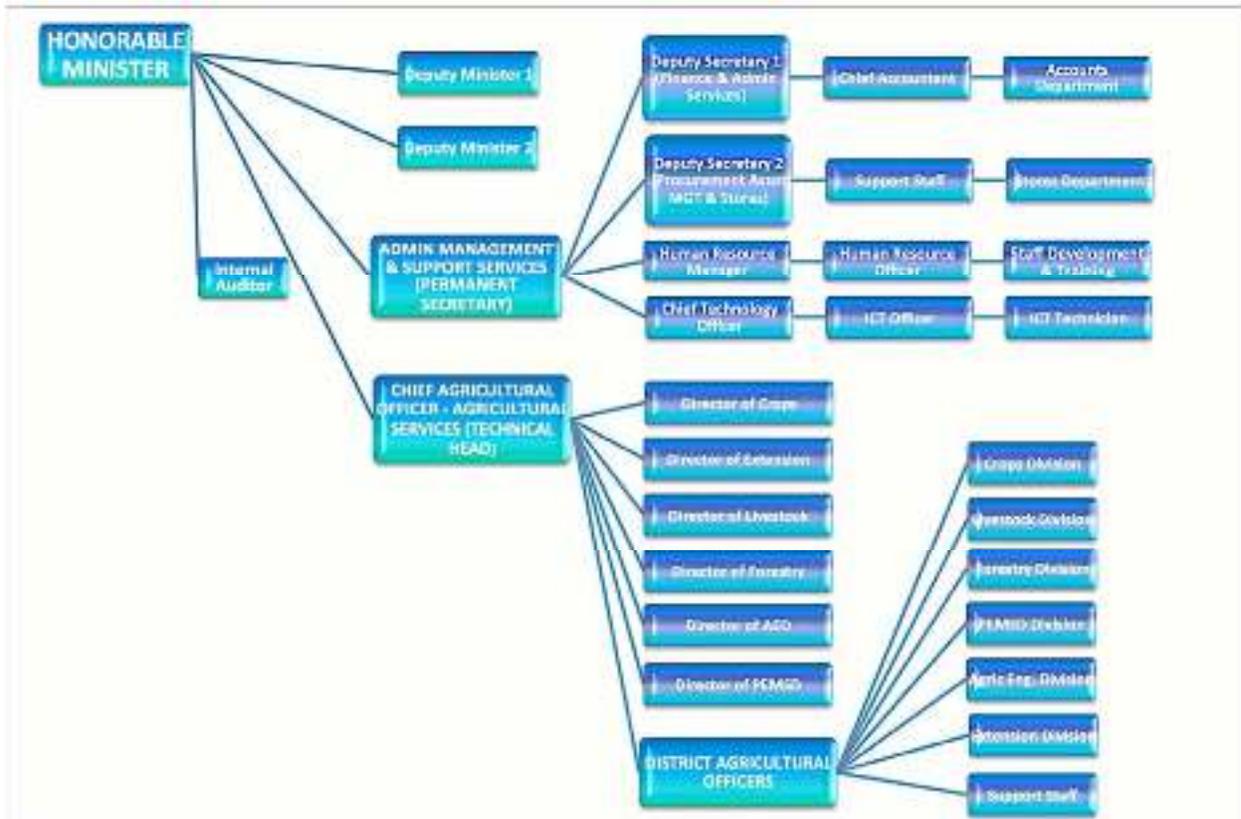
European Union, Food and Agriculture Organization of the UN (FAO), and Islamic Development Bank. Over the past ten years, MAF has implemented several major affiliate extension and advisory support (EAS) strengthening projects. Key ones include:

- Rehabilitation and Community-based Poverty Reduction Project (RCPRP) funded by the International Fund for Agricultural Development (IFAD)
- West African Agricultural Productivity Project (WAAPP)
- Diversified Food Production Project, and Linking Farmers to Market Project both funded by the Islamic Development Bank are examples of past projects.

Most of these recent projects are aligned with the Smallholder Commercialization Programme (SCP), which has been upscaled to Smallholder Commercialization and Agribusiness Development Project (SCaDEP) funded by the World Bank and DFID for a span of 6 years. Agricultural research and training institutions also support EAS in Sierra Leone, including Njala University (NU), Sierra Leone Agricultural Research Institute (SLARI), and the International Institute of Tropical Agriculture (IITA) – Sierra Leone, a CGIAR international agriculture research center with recent notable work to improve cassava genetics and production practices. Several include non-governmental organizations (NGOs) are also providers of EAS through their programming, namely World Vision, Catholic Relief Services (CRS), Plan International, Welt Hungerhilfe (WHH), Concern Worldwide, among others.

The agricultural extension sector has been rebuilding since the end of the Ebola epidemic that necessitated a rerouting of resources and funding for emergency aid relief and community resilience efforts, especially within MAFFS, SLARI, and the NGO community. Recent projects seek to strengthen the agriculture sector and increase resilience through longer-term visions and investments rather than immediate relief delivery.

Figure 2: Organizational Structure of the Ministry of Agriculture, Forestry, and Food Security



Source: <http://maffs.gov.sl/about-us/ministry-s-organoqram>

Staffing, Infrastructure and facilities of the extension services

According to the Agricultural Extension Services Division of the Ministry of Agriculture and Forestry, there is an estimated 684 agricultural extension workers in the country, 25% of are female. Most of the extension agents are employed by the Government. The estimated ratio of extension agents to farmers is 1:1,000. This is inadequate to meet the services required by farming communities. In order to promote the adoption of improved seed variety and good agricultural practices generated over the years, it is imperative for the Government to invest on the quantity and quality of the extension system in the country. Lack of logistics and funding to carry out work effectively are some of the causes of non-service delivery by extension workers in the country. According to seed cooperatives interviewed in the current TASAI study, 111 extension

workers are employed by the private sector and 18% were female. Overall, there are 795 extension workers and 24% are female (Table 8).

Table 8: Extension workers disaggregated by gender

Indicator	Male	Female	Total
Government extension workers	513	171	684
Seed companies' extension workers	91	20	111
TOTAL public and private	604	191	795

Level of activity by non-governmental and private sector entities in agricultural extension
 Agricultural extension is pluralistic in the country because of the multitude of donor projects and agendas that influence public-sector extension or implement their own extension programs. These partnerships have positively affected extension efforts in Sierra Leone. However; fragmentation of EAS programming by multi donor partners may not be sustainable, as farmers should be able to depend on reliable sources for technical support even after projects phase out. Recent shift in the extension paradigm now includes activities related value chain interventions which facilitates farmers' to access inputs, financial services and credit, and link to markets. Current projects, including the FTF SAP and EAIN projects, emphasize market-oriented value chain interventions with private sector investments. Marketing infrastructure development, such as revitalization of ABCs, is a channel to sustainably phase out project support, but continued extension services, capacity development, and linking farmers to information sharing and ICT systems are also important.

The research and extension liaison unit link the MAF extension system with other agricultural departments such as Crops, Livestock, and Natural Resources. One initiative MAF has been involved in was the Agriculture for Development (A4D) EU-funded project, developing the cash crop industry (such as coffee, cocoa, cashew) and working with World Vision, WHH, and CRS.

Food and Agriculture Organization of the UN (FAO), IFAD and the World Bank, supports MAF staff training and development in order to strengthen knowledge and dissemination activities.

Table 9 Level of activity of Non- governmental and private sector in agricultural extension

No	Non – governmental and private sector agricultural extension	Description of service provided
1	Donor Supported agricultural and rural development programmes eg IFAD, SCP	Donor initiated and supported rural development programmes which are usually well- defined vehicles of agricultural extension and other rural development information such as IFAD-SCP
2	International and Private Research centres eg FARA, AR4D	Institutions that are directly or indirectly involved in agricultural extension work usually for a wider adoption of developed technologies and transformation and evolution of research and extension approaches
3	Farmers' associations and cooperatives eg NAFFSL	Farmers' association which apart from being primary beneficiaries also participate in policy formulation through advocacy
4	NGOs and bilateral Donors eg World Vision, CRS, Action Aid ,GIZ and USAID	Both local and international NGOs represent some of the most prominent effective actors in rural development due to their being relatively better resourced for their programmes
5	Private input suppliers eg GENESIS Farm	Private input suppliers' involvement in agricultural extension is a marketing strategy to increase farmers' awareness of their products and increase their market share
6	Commodity processors, producers and exporters- WFP, P4P , ABCS	Downstream value chain actors providing information on technical production aspects to farmers producing on contract basis on their behalf

Level of adoption of improved crop varieties, by crop

The adoption of high yielding varieties of food crops have been a major challenge in Sierra Leone. However, new agricultural technologies, such as high-yielding crop varieties, offer the promise of increased productivity, but adoption of these technologies has often been slow, in sub-Saharan Africa particularly Sierra Leone Researchers are testing whether price subsidies and agricultural extension training amongst others can reduce the costs of early adoption, and whether using the improved seed varieties will ultimately benefit poor farmers. A promising solution is the dissemination and adoption of high-yielding varieties, such as rice, the main staple crop. The New Rice of Africa (NERICA) varieties, which have become known as the "miracle crop" for most rice farmers. NERICAs combine the good genetic qualities and high yields coupled with high resistance to drought and disease. Also, NERICA because of its early maturing nature and can be harvested in the hungry season is believed to have great potential in the food security drive of most households.. However, there are also concerns that NERICA requires more labour and must be dried during the rainy season, a major challenge also during the first season of its production (May to August). Current estimates suggest that only 2 percent of farmers in Sierra Leone use NERICAs. Improved varieties cost farmers 40 to 100 percent more than traditional varieties, representing a significant barrier to adoption amongst farmers. This is also the case for most cereals, grain legumes and vegetable crops. For root and tubers, a study on adoption of improved cassava in southern Sierra Leone has shown that the main source of improved varieties was from extension agents and 88.2% farmers adopted these varieties. An improved cassava variety SLICASS 4 is the most adopted cassava variety.. This may be as a result of its high dry matter content coupled with its mealiness and taste and mostly used for gari and foofoo production. The findings suggest that food quality, disease resistant, early maturing, high yielding and good market prices are reasons why farmers cultivate improved cassava. varieties. Major factors influencing adoption of improved cassava varieties include farmers contact with extension provided by MAF and NGOs and close participation in cassava related activities. The major constraints of farmer in

cassava production are non- availability of cassava cuttings when needed and inadequate access to credit facility for cassava production.

Adoption rate

The level of adoption of seeds of improved/released varieties among small scale farmers is quite low, probably as low as 5% or less because of lack of financial or purchasing power to acquire improved seeds/planting materials on their own without assistance. Also, poor extension services contribute to this phenomenon because of inadequate financial support and lack of logistics. There is need to strengthen extension service delivery to vigorously promote the use of improved seeds to farmers countrywide. The private sector also needs to be aggressive in the production and procurement of improved seed/planting material for their farming activities and marketing of their products.

Level of utilization of fertilizer and manures to increase crop yields, by crop

The levels of fertilizer used in Sierra Leone are low, about four kilograms per hectare, compared to the average levels used in sub-Saharan Africa of nine kilograms per hectare, which were themselves low compared to other regions of the world (MAF, 2009). According to the SLIHS 2003 and 2011 data, few agricultural households in Sierra Leone purchased inorganic fertilizers and even fewer purchased organic fertilizers. -

In 2003, 8.4 percent of households that owned or operated a farm purchased either inorganic fertilizers or organic fertilizers. About 7.2 percent of farm households purchased inorganic fertilizers, and just 6.2 percent of poor farm households purchased inorganic fertilizers compared to 10.0 percent of non-poor farm households. Non-poor farm households likewise spent 170 percent more on inorganic fertilizer than did poor farm households in 2003, though some care should be taken in the interpretation of these statistics. The highest incidence of farm households purchasing inorganic fertilizer was in the Western region with an estimated 71.4 percent of the limited number

of farm households. The next highest total was 11.3 percent in the Northern region, followed by 2.7 and 1.6 percent, in the Eastern and Southern regions, respectively. - In 2011, only 6.5 percent of farm households purchased inorganic or organic fertilizers, though the difference from 2003 was not statistically significant. Only 4.7 percent of farm households purchased inorganic fertilizers and 2.2 percent purchased organic fertilizers. In contrast to 2003, poor farm households spent more on inorganic fertilizer in the 12 months previous to the 2011 survey than did non-poor households, but again the difference was not significant. The incidence of inorganic fertilizer purchases was highest among farm households in the Western region and lowest among farm households in the Eastern region. In the Western region, an estimated 58 percent of farm households purchased inorganic fertilizers but, as in 2003, the small sample size of agricultural households limits the interpretation of these results. The prevalence was 5.2, 4.3, and 0.7 percent in the Northern, Southern, and Eastern region, respectively. In addition, on average 2.2 percent of farm households purchased inorganic fertilizers

[General description of the current system for marketing surplus production of staple crops](#)

Sierra Leone made substantial progress toward reducing preexisting structural deficits in staple food production following the decade-long civil war (1990-2002) that destroyed much of the existing agricultural infrastructure and supporting services and institutions. Given the relatively small size of the country, the improvement in condition of roads linking urban centers of the country has increased the circulation of goods from surplus to deficit areas of Sierra Leone and neighboring countries.

Food availability in Sierra Leone is determined by a combination of local production as well as imports from regional and international markets, although important commodity-specific and geographic differences exist.

The two main locally produced staple foods in Sierra Leone are rice and cassava. Locally produced palm oil is an important source of dietary fat and income for smallholder producers. Marine fish are the single most important source of animal

protein, followed by poultry (chicken) and ruminant meat. Although consumption of eggs and milk is increasing, especially in urban areas, contributions to aggregate protein consumption remain very low. Locally produced groundnuts, sweet potatoes, and vegetables (peppers) are also important food and incomes sources. Imports of milled rice and edible oil from international markets supplement local production of those commodities. Although Irish potatoes have made their way on to the national agricultural development agenda, the majority of production remains limited to one district (Koinadugu); neither the National Agricultural Statistics Survey nor the Sierra Leone Integrated Household Survey reported on Irish potato production, yields, or consumption patterns. Poor and very poor households throughout Sierra Leone are heavily dependent on markets to meet their staple food needs. The number of months during which households are dependent on market purchases varies by livelihood zone.

The availability of agricultural commodity storage facilities is very limited in Sierra Leone. The majority of permanent commercial and humanitarian storage facilities are located in Freetown, the country's largest commercial center and location of the main port for food imports. Shipping containers are used for commodity storage by humanitarian organizations in inland districts.

There is evidence of a strong levels of integration of markets in neighboring countries, despite the existence of different currencies (unlike much of the rest of West Africa). In this sense, food availability and access in Sierra Leone are heavily driven by marketing in the broader western marketing basin composed of Guinea, Sierra Leone, and Liberia. Market linkages between Sierra Leone and Guinea are strongest. Furthermore, there appears to be a fair amount of re-exporting of internationally imported milled rice and edible oil via Sierra Leone and into neighboring countries. Market linkages with the Sahel (northeastern Guinea, Senegal, and Mali) are strongest for cattle and small ruminants (import) and palm oil (export). The Ebola outbreak of 2014 and 2015 disrupted markets and local livelihoods, through both the loss of productive household members and restrictions on the movement of goods and people via quarantines and checkpoints within and across districts within Sierra Leone and neighboring countries. In

the same token there was increased seed import from neighboring countries for the emergency seed recovery programme of the West Africa Agricultural Productivity programme (WAAPP) funded by the world Bank.

Trends in development of markets for staple food crops

Domestic food production in Sierra Leone continues to increase and provides a major part of Sierra Leone's staples rice and cassava as well as pulses, oils, vegetables and fruits, however; the country remains in food deficit. Market assessment based on WFP report in 2013 is still reflective of the current situation. The market system is organized in three types: rural markets or collecting markets, assembly/redistribution markets, and urban consumer markets. Usually, in the permanent urban markets, there is a large amount of diversified food (imported and local food) and a large number of sellers and buyers especially during the lean season when households are mainly depending on markets for their food needs.

The local market conditions and traders' response capacity assessment revealed that households spend on average 63% of their total expenditure on food. Borrowing money to buy food is common (52%). Three quarters of the population rely on markets as their main source of food. Under such conditions, the trend of high and rising food prices poses a serious threat to food security in Sierra Leone. (CFSVA/WFP2011). Trends I market development can best be obtained in permanent urban markets which offer a large number of sellers and buyers. These markets are only partially integrated for the main commodities and are poorly organized and conduct remains unstandardized. There is a lack of information on prices series on commodities in Sierra Leone which makes market integration calculation difficult. However, using a qualitative approach and proxies such as trader restocking times and transport conditions, markets in Sierra Leone can be defined as only partially integrated for the main commodities. That is, commodities would originate from a market within the same district. Hence, markets are divided in regional networks.

Sierra Leone requires about 530,000 MT of milled rice to meet the consumption needs of the population annually. Imported rice from Thailand, Pakistan, India, etc. is the most commonly traded within the country. Cross-border flows of imported rice take place when price differentials are sufficient and also depend on the exchange with the neighboring and international countries.

The Kambia district routinely exports parboiled local rice to nearby Conakry via Bamoi Loma international market. Some 360 tons of local parboiled rice entered Guinea from Sierra Leone every month during the final quarter of 2009 (WFP, 2010). Sales of locally produced rice is generally low. Less than one per cent of agricultural households in the country are strictly speaking commercial farmers. Much of what is produced by the farmer is used to feed the family and part of the produce is reserved as seed for planting in the following cropping season. Agricultural households in the Western and Northern regions were more prone to selling rice than agricultural households in the Southern and Eastern regions. Possible explanation for this is the closeness to the Freetown market and cross border trade along the Sierra Leone-Guinea border.

Majority of the farming household consume their rice and sell their excess. The Northern and Southern regions accounted for rice trading compared to the eastern regions and the western area.

In 2017 total cassava production was estimated at 4,761,385 tons. The majority of cassava crop produced also sold either to processing centers or to the urban and rural for the boil and eat market.

The market surveys found that most of the vegetable retailers are women due to their limited financial capacity to do large business. In the surveyed markets, there is virtually no barrier to entry a market, only a permit is required to start a formal business according to interviewed traders. This is an opportunity for the new traders (especially retailers) whenever the demand increases and also a good sign for the cash and voucher interventions in these areas. When the increases in demand become incentives

to new traders to entry the markets, it may have a positive effect to drive down commodity prices or to maintain prices stable in the short run, but may have a reverse effect of pushing many traders to exit the markets in the long run, thus may drive up commodity prices (WFP, 2012).

According to interviewed traders, prices are commonly determined in the markets by either comparing to other market prices or simply by the law of supply and demand. There is no government interference in determining prices in markets; traders are then free to determine prices in these selected markets. As outlined in the Cross-border trade and food security assessment, Liberia and Sierra Leone in 2010, producers set the price of palm oil and local rice on more than half of markets while more than half of the markets, prices of imported rice market are determined by wholesalers, reflecting the concentrated nature of the imported rice business.

There is no pure monopoly in the selected markets. However, the study did not yield enough information to estimate the degree of competitiveness by commodity as the number of the interviewed traders by market is limited.

Status of Seed Supply

History of Crop breeding and seed supply in the country

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.

Rice

The development of the breeding programme in Sierra Leone started way back in the 70s at the Rice Research Station(now Rokupr Agricultural Research Centre) with breeding efforts aimed at developing varieties that drought with less shattering and resistant to major abiotic stresses resulted in the release of five ROK varieties in 1974.

In the 1980's and 1990's RRS developed another series of ROK varieties with various durations, tolerance or resistance to iron toxicity, salinity, insect pests and diseases for a large range of farming systems. Some of the best ROK varieties were selections from local land races, exploiting the potential of indigenous knowledge, using minimum levels of fertilize. Widespread use of these varieties minimizes risk of crop failures which is very important for subsistence farmers.

There was a gap in rice varietal release until 2014 when new rice varieties, tolerant to iron toxicity, salinity and resistance to important pests and diseases with yields ranging from 2-2.5mt/ha were released by the newly established Sierra Leone Seed Certification Agency. The released varieties were mostly from the ROK and NERICA rice varieties which were evaluated and found adaptable, high yielding, resistant to major pests and disease with desirable consumer characteristics. The NERICA varieties are also short duration (90-100 days) compared to 120- 150 days of typical upland varieties allowing for a second crop during the rainy season.

Rice varieties at RARC that have been developed are used extensively in other countries. Two of these are WAR 77 and ROK 5(salt tolerant) which are very popular in the sub savanna and savanna coastal countries like Senegal, Gambia, Guinea Bissau and Guinea where salinity is a major constraint in rice production. Sierra Leone in turn benefits from getting other varieties from these countries and obtaining feedback on the performance of the rice varieties.

Table 10: Released rice varieties in Sierra Leone in 1974

S N	Variety	Pedigree	Develop ing instituti on	Year of releas e	Year of registrati on	Production ecology	Days to maturity	Potenti al yield (t/ha)	Outstanding characteristics
1	ROK 3	NgiemaY akei	RARC	1974	2016	Upland and IVS	140-145	2-3	Drought tolerant

2	ROK 5		RARC	1974	2016	Upland and IVS	130-145	2.5-4.5	Salt tolerant
3	ROK 10		RARC	1974	2016	IVS and Boliland	180-190	2.0 – 3.5	MR to shattering and biotic stresses
4	ROK 14	Mange 2	RARC	1974	2016	IVS	130- 135	2.5 - 5.0	Excellent ratooning quality
5	ROK 16	Ngovie	RARC	1974	2016	Upland	120- 130	2.5 – 3.5	Little bird scaring

Table 11: Released rice varieties in 1988

S N	Variety	Pedigree	Developing institution	Year of release	Year of registration	Production ecology	Days to maturity	Potential yield (t/ha)	Outstanding characteristics
6	ROK 21	ROHYB 6-WAR-6-2-B-2	RARC	1988	2016	Mangrove	160-170	3.8	Moderately tolerant to salinity
7	ROK 22	ROHYB 15-WAR-3-3-B-2	RARC	1988	2016	Mangrove	160-165	3.9	Moderately tolerant to salinity
8	ROK23	ADNY 301	RARC	1988	2016	Mangrove and IVS	185-190	3.3- 4.0	Lodging resistant
9	ROK24	Suakoko 8	RARC	1988	2016	IVS	160-165	2.0- 2.5	Lodging resistant
10	ROK25	Mahsuri	RARC	1988	2016	IVS	150-160	2.5-3.5	Lodging resistant
11	ROK 28	BG 90-2	RARC	1988	2016	IVS	135-140	2.0- 2.5	Lodging resistant
12	ROK 29	ROHYB 1-1	RARC	1988	2016	Boli	140- 145	2.5-4.5	Lodging resistant
13	ROK 30	SL 22-617	RARC	1988	2016	Boli	170-180	2-4.0	Lodging resistant
14	ROK31	BG-400-1	RARC	1988	2016	Boli	130-140	3.0-3.5	Lodging resistant

15	ROK 32	ITA 235	RARC	1988	2016	Boli	120-125	3.2-3.6	Lodging resistant
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Table 12: Released rice varieties in 2014/2015

	Variety	Pedigree	Developing institution	Year of release	Year of registration	Production ecology	Days to maturity	Potential yield (t/ha)	Outstanding characteristics
16	ROK 34	Pa Kiamp	RARC	2014	2016	Upland	135-140	2.4	Resistant to biotic stresses
17	ROK35	GIBOB	RARC	2015	2016	IVS	140-150	2.3	Resistant to biotic stresses
18	ROK36	No. 1 B.P (148)	RARC	2015	2016	Mangrove	125-135	2.3	Moderately resistant to neck, leaf blast,RYMV and leaf scald
19	ROK37	WAR 77-3-2-2	RARC	2015	2016	Mangrove	135-145	3.0-4.0	Aroma: highly scented, MR to brown spot, neck and leaf blast, RYMV and leaf scald 20
20	NERICA 3	WAB 450-I-B-P-28-HB	RARC	2014	2016	Upland	100	2-4	Resistant to leaf & panicle blast, brown spot, leaf scald, stem borer, rice bug and grain discoloration
21	NERICA 4	WAB 450-I-B-P-91-HB	RARC	2014	2016	Upland	100-105	2-4	panicle blast, brown spot, leaf scald, stem borer, rice bug and grain discoloration
22	NERICA 15	WAB 881-10-37-18-3-P3-HB	RARC	2014	2016	Upland	100	2-4	Resistant to leaf & panicle blast, brown spot, leaf scald, stem borer, rice

									bug and grain discoloration
23	NERICA 16	WAB 881-10-37-18-9-P1-HB	RARC	2014	2016	Upland	105	2-4	Resistant to leaf & panicle blast, brown spot, leaf scald, stem borer, rice bug and grain discoloration
24	NERICA 18	WAB 881-10-37-18-12-P3-HB	RARC	2014	2016	IVS	105	2-3	Resistant to leaf & panicle blast, brown spot, leaf scald, stem borer, rice bug and grain discoloration
25	NERICA 19		RARC	2015	2016	IVS	95-100	2-4	MR to brown spot, leaf scald, dead heart, white head and case worm
	NERICA 20		RARC	2015	2016	IVS	95-100	2-3.5	MR to brown spot, leaf scald, dead heart, white head and case worm

Cassava

In Sierra Leone, organized cassava improvement work started in earnest in the mid-seventies. The first improved varieties were officially released in 1978 when the Rice Research Station at Rokupr (now Rokupr Agricultural Research Centre) released three varieties namely Rocass 1, Rocass 2 and Rocass 3 while Njala University College (now Njala university) later released three varieties viz NuCASS1, 1,2 and 3. Most of these earlier selections were not widely accepted though high yielding because they do not cook or become soft on boiling. Since these varieties were not widely accepted mainly because of undesirable consumer characteristics, due recognition was later given to consumer acceptability in addition to high tuberous root yield in the cassava improvement programme. These shift in research focus towards consumer preferences particularly cooking quality in the selection of cassava clones led to the development of cassava varieties- Slicass1, 2, 3, 4 and 5 in 2002. Slicass 6 was later developed and

released in 2006. Since then no release of cassava varieties due to poor funding of breeding programme and dismantling of the national Seed Board due to the 11year Rebel war. Effective breeding work on rice was revived when in 2011 Alliance for Green Revolution in Africa (AGRA) funded cassava, maize and rice breeding programmes at Njala Agricultural Research Centre (NARC) and Rokupr Agricultural Research Centre (RARC). NARC has recently released 8 high yielding, disease - resistant varieties with preferred end users traits recently in December 2014 and whilst RARC also released 6 rice varieties through support of AGRA to the Breeding Project of NARC and RARC backstopped by WAAPP.

Table 13: Some Characteristics of Released cassava genotypes in Sierra Leone

-	TME 419 (Slicass 7)	TME 7 (Slicass 8)	TME 7 (2) (Slicass 9)	TME 7 (4) (Slicass 10)	06/1635 (Slicass 11)	Slicass 1-05 (14) (Slicass 12)	97 4407 (6) (Slicass 13)	TME 1 (Slicass 14)
Storage roots								
Skin colour	Cream	Pink	Pink	Brown	Cream	Cream	Cream	Cream
Flesh colour	White	White	White	Orange	Yellow	White	White	White
Storage root dry matter content (%)	30 - 33.8	35.7	34.2	25 - 35	25 - 35	25 - 35	25 - 35	30-35
Taste of boiled roots	Sweet	Sweet	Sweet	Slighter Bitter	Sweet	Sweet	Sweet	Sweet
Storage root yield (t/ha)	33.4	35- 40	38	35 -40	35 - 40	30 - 35	30 - 35	30 - 40
Resistance to diseases and pests								
ACMD	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant
CBB	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant
CGM	Fairly tolerant	Fairly tolerant	Fairly tolerant	Fairly tolerant	Fairly tolerant	Fairly tolerant	Fairly tolerant	Fairly tolerant
CM	Fairly	Fairly	Fairly	Fairly	Fairly	Fairly	Fairly	Fairly

	tolerant							
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Maize

There is no release maize variety in Sierra Leone. Western Yellow and DMR are the main varieties grown in Sierra Leone. Western Yellow was introduced in the 1970s by the Sierra Leone Produce Marketing Board. DMR is relatively new and was introduced by Institute of Agricultural Research, now Njala Agricultural Research Centre in the early 1980s. Western yellow is still predominant and is cultivated by about 97% of farmers.

Sweet Potato

Four improved sweet potato varieties (SLIPOT 1-4) with fresh root yield 10mt/ha have been released by IAR (now NARC) in 2004 and adopted by farmers. Sweet potato released in Sierra Leone and their characteristics are summarized in Table 5 below

Table 14: Some Characteristics of Released Sweet Potato genotypes in Sierra Leone

Characteristics		Varieties			
		SLIPOT 1 Clone82/123R	SLIPOT 2 Clone82/123W	SLIPOT 3 Clone 82/144	SLIPOT4 Clone84/16
Leaf	Leaf outline	Triangular	Triangular	Triangular	Lobed
Vine	Pigmentation	Green	Green	Mostly purple	Green
Storage root	Shape	Round elliptic	Round elliptic	Round elliptic	Round
	Skin colour	Purple red	white	Purple red	Off-white
	Flesh colour	White	White	Dark cream	White
	Dry matter %	High(28)	High (28)	High(29)	High (29)
	Texture of boiled root	Soft & Creamy	Soft & Creamy	Soft & Creamy	Soft & Creamy
	Taste boiled root	Sweet	Sweet	Very sweet	Sweet
Resistance to diseases	Scab	Resistant	Resistant	Resistant	Resistant
	Virus complex	Resistant	Resistant	Moderately susceptible	Resistant
Resistance to pests	Weevil	Susceptible	Susceptible	Escape	Susceptible
Maturity (months)		3.5-4	3.5	4	3.5
Potential tuber		12	15	10	10

yield (mt/ha)					
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Cowpea

Research in cowpea breeding dates back to 80s with introductions from IITA. The first official release of 3 cowpea varieties was in 2004 through breeding efforts of the breeding team. There was no release until 2014 another 2 high yielding and disease resistant varieties Slipea 4 and 5 were released through support from CORAF cowpea project and N2 Africa . No official release of soybean varieties until 2014 when four varieties were released all of which are introductions from IITA.

Table 15: Some characteristics of released cowpea varieties in Sierra Leone

Characteristic	Slipea 1	Slipea 2	Slipea 3	Slipea 4	Slipea 5
Days to 50% flowering	31 -42	41- 44	40-45	48	48
Days to maturity	65 -75	70 – 80	60 – 70	70- 75	70-75
Seed colour	Dark purple	White	White	white	White
Seed Shape	Kidney	Kidney	Kidney	kidney	Kidney
Grain yield (t/ha)	1-1.5	1-1.5	1-1.5	1.1 – 2.0	1.1 – 1.8

Soybean

Table 16: Soybean Released Soybean varieties in Sierra Leone

Variety	Preliminary name	Year or release	Days to maturity	Yield (mt/ha)
SLIBEAN 1	TGx 1448-2E	2014	109	2.65
SLIBEAN 2	TGx 1951- 4F	2014	104	2.27
SLIBEAN 3	TGx 1955-4F	2014	111	2.21
SLIBEAN 4	TGx1904-6	2014	108	3.02

Groundnut

There is only one groundnut variety (SLINUT 1) developed from JL24 that has been officially released and catalogued in Sierra Leone. This was released in 2002 and has a potential yield of 2.5 MT/ha. It is early maturing, moderately resistant to early and late spots and can be grown on upland and lowland ecologies.

Recent and ongoing activities aimed at release of improved crop varieties by crop Cassava

Germplasm collection and characterization of lost cassava accession. Current breeding efforts in cassava are aimed at developing high yielding and adapted varieties for food, feed and industrial uses. Efforts are currently made to develop orange – fleshed cassava varieties rich in provitamin A (Carotene) and other micro-nutrients (Iron and Zinc) for bio - fortification. Trials are ongoing at advanced stages on the development of cassava genotypes for high starch and dry matter.

Sweet potato

For sweet potato, Helen Keller International (HKI), working in collaboration with NARC/SLARI, embarked on a project aimed at promoting OFSP to combat Vitamin A deficiency as a food-based approach. OFSP varieties were introduced and evaluated at the NARC Research site in 2014/15 and 6 elite varieties were identified for further testing in multi-locations in 2016. Three varieties (Mathuthu, Kaphulira and Chipka) have been identified and are now being multiplied and promoted one sweet potato. The three varieties have been submitted to the VRC and one variety Mathuthu has been accepted by National Seed Board approval. The other two are still being evaluated with Neem treatment for their susceptibility to stem rot. They are presently being tested at Njala and Newton which are hot spots of the disease.

Yam

Five improved yam genotypes with high yields and disease and pest resistance have been nominated by the Yam breeder to the VRC for release. Breeder was asked to produce additional information on DUS and VCU. Breeder seed multiplication ongoing. -

Table 17: Yam genotypes nominated for release to the VRC

Botanical name	Common name	Preliminary	Proposed variety
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		name/code name	name
<i>Dioscorea alata</i>	Yam	TDa 98/00174	SLIYAM 1
<i>Dioscorea alata</i>	Yam	TDa 98/00194	SLIYAM 2
<i>Dioscorea alata</i>	Yam	TDa 98/01176	SLIYAM 3
<i>Dioscorea alata</i>	Yam	TDa 98/01168	SLIYAM 4
<i>Dioscorea alata</i>	Yam	TDa 02/00012	SLIYAM 5

Groundnut

Breeder seed multiplication of 3 promising groundnut genotypes was done in the IVS at Bye- Largo, Moyamba District in 2019 during the off season. Breeder seed increase (multiplication) of these three improved groundnut genotypes with high yielding, disease and pest tolerant and consumer acceptability selected by farmers in two locations on the upland (Makeni and Njala) established in May/June this year. These genotypes are in the pipeline for release by the Njala Agricultural Research centre and includes ICGV-IS-09992, ICGV-IS-09802 and ICGV-IS-09801.

Recent and ongoing activities aimed at increasing supply of improved seed

Generally, the absence of seed companies and trained seed dealers, seed supply chain is not well developed especially in the area of certified seed. The supply of foundation seed is well defined in theory but not practically. Research institutes supplies both breeder and foundation seeds. The breeder seeds produced at research center are passed on to the farm management unit for foundation seed production. Some quantity of breeder seed is also purchased by SMP for foundation seed production. Seed entities and farmer producer groups' access foundation seed from research institutes and SMP for certified seed production. The foundation seed in some instances is procured by NGOs or agricultural projects for distribution to farmers for certified seed production.

Certified seed supply is also done by out growers' schemes under the auspices of SMP, RARC and some seed entities. They provide seed and other production inputs such as fertilizer on loan to contract seed growers. At harvest, the inputs providers recover seed based on the terms of the contract and buy any excess seed from the producers. The

Ministry of Agriculture also provides seeds and other inputs to farmers nationwide for production of certified seed. At the end of the season, seed rice is recovered for onward distribution to other farmers. Certified seed producers also sell seed in their communities at farmer to farmer level.

Marketing and sales of certified seeds are done through agro-dealer network systems in rice growing areas. The network of outlets usually comprises unregistered agents, sub-agents and stockists. Seeds supplied in response to emergencies (e.g. Ebola or flood) are through registered projects of Governmental and Non-governmental Organizations. Table shows the various stakeholders and their roles along the rice seed value chain.

Table 18: Stakeholders and their roles in the rice seed value chain

Activity	Stakeholders			
	Market varieties	Roles played	Subsistence varieties	Roles played
Breeder seed development/ Production/supply	RARC	Development and Production	RARC	Development and Production
Foundation seed production/ Supply	RARC /SMP	Production and maintenance of seed. Supply to foundation - seed producers	RARC /SMP	Production and maintenance of seed. Supply to foundation - seed producers
Certified R1 Seed production/ Supply	SMP Seed Entities such as BRAC, YEAVA etc.	Production and maintenance of seed Production and maintenance of seed	SMP Seed Entities such as BRAC, YEAVA etc.	Production and maintenance of seed Production and multiplication of seed
Certified seed R2 production/ Supply	Seed Entities Agricultural Cooperatives	Production and multiplication of seed Multiplication of seed and recovery by MAFFS	Seed Entities Agricultural Cooperatives	Production and multiplication of seed Multiplication of seed and share/sell among producers/community

Distribution of seeds	MAFFS → Agricultural Business Centres (ABCs) → FBOs → Farmers → Projects → FBOs → Farmers NGO → FBOs → Farmers Development Partners → their projects → FBOs → Farmers	Sales to cooperative members Procurement, sales of certified seeds	MAFFS → Agricultural Business Centres (ABCs) → FBOs → Farmers → Projects → FBOs → Farmers NGO → FBOs → Farmers Development Partners → their projects → FBOs → Farmers	Share/sell among producers

Seed prices are determined by the market forces and are based on the costs incurred in production, processing, storage, transportation and profit margins of the seed merchants. The current prices of certified seeds for the ROK and NERICA varieties are shown in Table 16.

Table 19: Market price (sales and purchase) of certified seed

Currency: Le (approximate exchange rate: Le = USD)			
	Name of Varieties	Sales Price (Le Million/mt)	Purchase Price (Le Million/mt)
Rain-fed Lowland and Rain-fed Upland	ROK series	2011 – 2.8	2011 – 2.0
		2012 – 3.2	2012 – 2.4
		2013 – 3.6	2013 – 2.8
		2014 – 3.6	2014 – 2.8
		2015 – 4.8	2015 – 3.2
	Nerica series	2011 – 4.4	2011 – 3.2
		2012 – 4.4	2012 – 2.4

		2013 – 5.2	2013 – 2.8
		2014 – 6.6	2014 – 4.4
		2015 – 6.6	2015 – 4.4

In Sierra Leone, RARC, NARC and SMP are the main growers of breeder and foundation seeds. However, there are seed producing entities/companies such as SEED TECH, GENESIS Farm, BRAC ,ABHAJAR etc. Government through MAFS supply inputs (improved seeds and fertilizers) to Farmer based organizations through their Agricultural Business Centres on loan recovery model. SMP also supply seed to farmers/ farmer groups on loan. Late supply of inputs by suppliers is a major challenge.-

Agro- dealership pilot project was implemented by MAFFs in 2010 with technical assistance from CNFA to develop a commercial rural private network of agro dealers to supply farmers with inputs, services and in collaboration with the MAFFS/SCP, best – bet agricultural practices and advice.-

In 2012, Concern Worldwide an NGO in Sierra Leone purchased and distributed a total of 125 MT of Improved rice Varieties (ROK 5,10, Nerica and Pa Kiamp), 2,000 bundles of cassava cuttings and potato vines and vegetable seeds and distribute to (at least 50% female) beneficiaries using local supplies, personnel (MAF extension workers), transport, and training (Farmer Field School). MAF sponsored by WAAPP also did some seed importation after the ebola crisis. A total of 1,200m/t of Nerica rice seeds and 40 m/t of maize seeds were distributed to farmers nationwide.

Also, through Japanese Bilateral Project (JBP) farmers received improved seeds of rice, tools and technical support for better irrigation so that they can rehabilitate 100ha of swampland. Since 2014 the rice fields of farmers participating in the project increased from 1mt to 3mt/ha.

Three Orange Flesh genotypes (Mathuthu, Chipka and Kaphulira) are currently been promoted by SLARI in collaboration with Hellen Keller International in 7 districts, 9 groups per district in 2018 and additional 6 districts in 2019.

Current options to smallholder to access improved seed

In Sierra Leone the informal seed system is the most predominant. Most farmers access seeds and varieties through informal network based on exchange of seeds, gifts from relative friends and neighbour or through bartering with others, farm own saved or purchasing from the local market. Private enterprises account for more than half of the certified seed produced in the country. The formal sector focuses mainly on seed rice because more improve varieties are available than any other crop and also the country's staple food. Access to production of foundation seed rice varieties/planting materials is through the research centres and Seed Multiplication programme of MAF and other accredited out growers under the supervision. The private sector normally multiply certified seed for use by the farming population and others. 90% of the 'seed requirements of stallholder farmers is met with seed from other farmers or use of own seed.

Number of private seed companies operating in the country and their estimated annual supply

Table 20: Number of private seed companies operating in Sierra Leone

	Name of seed company/entity	Crops	Estimated annual supply
	Seed Multiplication Programme (SMP)	Rice and Maize	80.000 bushels or 2.000 Mt
	Seed Tech International	Rice, Maize, Sorghum, Groundnut, Sweet potato and Vegetable	1.000 to 2.000 Mt
	Debar Group	Field crops, vegetables , local crops	500 Mt

	Farming First Sierra Leone	Rice, sorghm, field crops, vegetables , local crops	1,000 Mt
	Genesis Farm	Field crops	Over 3.000 Mt
	Mountain Lion		2,000 Mt
	Best Salone seeds	Rice , Maize and Sweet potato	300 Mt
	Equipping Ministries International Agric. Development Project	Rice , Sorghum, Groundnut	500Mt
	Yeava	Rice, Maize	300-500 Mt
	Abhajar Rice Development Company	Rice, Maize	Data not available
	BRAC	Rice and maize	Data not available
	Sakata seed and input company	Vegetables (Cabbage, pepper, tomato, okra, onion, carrot, watermelon, spinach)	500 Mt

Other Non-Governmental and Farmer based organizations active in seed production and supply

Seed production in Sierra Leone is dominated by seed co-operatives or seed producers in farmers' associations while in other African counties, especially in East and Southern Africa, seed production is done mainly by seed companies. Seed production is difficult to regulate in Sierra Leone because most seed associations and individual seed producers, are not legal entities, as they are not registered by the Government seed regulator (SLeSCA). Below is a list of some of the seed cooperatives /producers.

Table 21. Active seed producing co-operatives, companies and individuals in Sierra Leone as at 2017

	Name of seed entity	Category		Crop
		Cooperative	Individual	
	Tawopeneh Farmers Association	x		Rice, Sorghum, Cassava, Groundnut, Sweet potato
	Rofeika Womens' Farmers Association	x		Rice, Sorghum,

				Groundnut cassava
	Takilanneh Women's Farmers Association	x		Rice, Maize, Sorghum, Groundnut
	Family Poultry and Allied Agro-Enterprise	x		Maize
	Magbema Womens' Cooperative	x		Rice, maize, Sorghum , groundnut, Cassava, Sweet potato
	Muamea Farmers Association	x		
	Mutornga Agric Business Center	x		Groundnut
	Sabu Sunkunia Farmers Association	x		Rice, groundnut, sorghum
	Kusalaku Womens' Farmers' Cooperative	x		Orange Flesh sweet potato (OFSP)
	Mongo Farmers Association	x		Rice, maize, sorghum
	PC Desmond Mahayei Kargobai		x	Rice
	Munafa Womens' Cooperative	x		Rice, maize, groundnut, sorghum, OFSP
	Nyalimah Agric. Business Centre	x		Rice, maize, groundnut, OFSP
	Mamunta Development Farmers' Association	x		Rice
	Foniko Agribusiness Development	x		Rice, maize
	Nongowah Agribusiness Centre	x		Rice
	Sorghum Farmers Association	x		Sorghum
	Agriculture, Development Processing Cooperative	x		Rice, Sorghum
	Balandugu Farmers' Association	x		Rice, maize, sorghum
	Fiama Agribusiness Centre	x		Rice, maize, sorghum, groundnut, cassava, OFSP
	Marank Youth Farmers Development Association	x		Rice, maize, groundnut, cassava, Sweet potato
	Gbaneh Agribusiness Centre	x		Rice, maize, sorghum, groundnut, cassava
	Famato Farmers' Association	x		Rice, groundnut
	Shine Sierra Leone Farmers' Association	x		Rice, groundnut
	Togbanie Togbaisia Farmers' Association	x		Rice, groundnut, cassava
	Sierra Leone Sorghum Farmers and	x		Rice, maize, sorghum,

	Marketers Association			groundnut, cassava
	Kalamera Womens' Farmers' Association	x		Rice, sorghum, groundnut, cassava
	Nasurulai Farmers Association	x		Rice, maize, sorghum, groundnut, cassava
	Sakomnor Farmers Association	x		Rice, sorghum, groundnut, cassava
	Comprehensive Women Organization	x		Rice, maize
	Bo Sorghum Farmers Association	x		Sorghum
	Casti Agribusiness	x		Rice, sorghum
	Farmers United to Mitigate Hunger Gap	x		Rice, maize, sorghum, groundnut, cassava
	Groupe Alawalle	x		Rice, maize
	Kenema Sorghum Farmers Association	x		Sorghum
	Armed Forces Agricultural Unit	x		Rice, maize
	Women at Work Farmers' Association	x		Rice, cassava, OFSP
	Millegloma Agribusiness Centre	x		Rice, maize, groundnut, cassava, OFSP
	Teko Farmers Association	x		Rice, cassava, Sweet potato, OFSP
	Munafa Farmer-based Association	x		Rice, groundnut
	Crop Production and Processing Association	x		Rice, cassava, sweet potato

i. Maize Milling Company (MMC) is registered in Sierra Leone in 2010 as an agricultural company and has been in operation for ten years. Recently, a new company Best Salone Seeds Ltd has been registered and dedicated solely to seed production and marketing. It is coming along with vast experience staff that has previously managed a 1000 out-grower farmers scheme in Bonthe, Bo and Moyamba. Its MD/CEO with Masters level qualification in Agricultural Economics has over 25 years' experience in the Agriculture industry, having previously worked for seven years at a senior position with the United Nations World Food Programme. MMC has collaborative linkages with Alliance for a Green Revolution in Africa (AGRA) and other relevant relationships to make the project a success.

We produce maize and rice seeds as well as grain through out-growers and on own farms in both Torma Bum in Bonthe district and Senehun and other villages in Moyamba district. In Torma Bum , 1000acres of land is leased for 5years since 2013, and both the out-growers and company farm on this piece of land. The company provides farmer training, extension , seeds, fertilizer and tractor service for land preparation and planting to out-growers. The farmer pays back in seeds/grain after harvest and company buys the surplus from the farmer. In Senehun and surrounding villages seeds, extension services and fertilizer are provided to farmers to farm on their own plots and pay back to company in kind after harvest.

Table 22: Turnover of production over a three year period

Financial year	FY2016	FY2015	FY2014
Turnover	523,004,025	168,114,000	210,281,475

The early years as shown above were very challenging due to the ebola outbreak. In 2014 especially, the company already spent heavily on land preparation, importation of input materials (seeds and agro-chemicals) and planting, only for the scourge to break out and put a stop to farm activities, thus destroying these materials and the crops which were left unattended. The impact continued into the following year as the economy contracted resulting in most of the company's customers (poultry farms) shutting down or scaled down activities considerably. Things started returning to normality around late 2015, which was the real foundation for the performance in 2016.

Why Best Salon Seeds? In 2009, we won a national business plan competition organized by the Government in collaboration with AFFORD, DFID and SOROS Development Fund. The winning prize was used to (i) purchase maize seeds and fertilizers, (ii) train 50 farmers and (iii) set them up in maize production in the Pujehun district. The locally purchased seeds that were used for the scheme were low yielding and responded poorly to the fertilizers. In 2012, MMC went into partnership with the West Africa Venture Fund (WAVF) which wanted MMC to produce maize grains for its poultry projects in Sierra Leone. Towards this end certified maize seeds were purchased from Ghana for production of maize grains on a commercial scale.

Unfortunately, it was realized later that the seeds were of poor quality. Thus, our focus on the need to produce high quality seeds and make them available to especially smallholder farmers in Sierra Leone, was based on our own disappointing experiences with seeds of poor quality. After these experiences, in 2013/2014 MMC imported some quantity of maize foundation seeds from the International Institute of Agriculture (IITA) in Nigeria, partly for commercial grain production for the poultry industry and for seed multiplication to supply to farmers for planting, and partly from the company's farms and partly through out-growers in Tormabum and Senehun. The results were good, but the story was cut short in 2014/2015 by the Ebola Epidemic. In 2014, we started a collaboration with AGRA towards eventually setting up a seed business, but this was also disrupted by the Ebola scourge. We however still retain all relevant relationship with AGRA. We were able to supply seeds of rice, and maize since 2014 as described in table below:-

Table 23: Quantities of rice and maize seeds supplied

Seed type	Year 2013/2014	2015/2016
Rice (NL19)	15 tons	10 tons
Rice (NL34)	22 tons	10 tons
Maize(Obatampa)	15 tons	15 tons

Our mission is to explore innovative and environmentally friendly ways of making high quality seeds/planting materials available on sustainable basis to especially resource poor farmers in Sierra Leone, with the aim of improving farm outputs and incomes through collaboration with local and international actors with similar objectives.

Best Salon Seeds has the initial primary purpose of providing truly high quality seeds of rice, maize and soybeans to farmers in Sierra Leone. High quality seeds of these crops are strategically targeted, because of their positions in the rice and poultry value chains, which are strategic value chains to SLADF and the country. The project owing to its collaboration with key national and international experts will quickly gain a good standing for high quality offering of seeds of great value to farmers and strategic value chains. The unmet demand in the country for high quality planting materials will be met

by the project, and at affordable prices to the farmers with profitable outcome for the business, making it a very sustainable enterprise.

The project will be implemented in three districts (Bonthe , Bo and Moyamba). The key operational areas will be Tormabum , Bo, Tikonko and Senehun communities respectively. These are some of the rice, maize and legume belts in the country. Training of farmers, production and multiplication of seeds will take place both in out-grower farms and the company's farmlands in these areas.

Some objectives

- i. To engage outgrowers in contract farming, providing them with guaranteed markets in a buyback programme, and providing the needed processing and marketing activities
- ii. To use the company's vast leasehold lands (over 1,000 hectares) as high yielding seeds demonstration farms for training farmers, University students as well as providing commercial production output for the company.

Some expected outcomes/success indicators

Increased productivity of rice, maize and soybean to at least 4.5MT/ha, 3.5MT/ha and 2.5MT/ha respectively

In year 1, mobilized and trained a minimum of 3,000 out-growers, made up of 50 % female farmers and 33% youth

In year 1, over 30,000 MT of rice, maize and soybeans produced for over SLL90,000,000, with each participating farmer earning an average revenue of SLL 30,000,000.

A growing seed sector with over 30,000 MT of high quality certified seeds multiplied and distributed for planting, positively impacting a number of key value chains

Facilities and equipment available for seed processing and packaging in the country

The SMP has 2 major processing machines in Makeni and Kobia and a Warehouse of about 2,000MT. The SEED TECH also has a Modern Processing plant in Makeni and a Warehouse of similar tonnage.

Below are some pictures of newly installed processing and packaging equipments and machines by SEEDTECH in Makeni, Bombali District, Northern Province, Sierra Leone



Figure 3a: pictures of newly installed processing and packaging equipments



Figure 3b



Figure 3c



Figure 3d



Figure 3e

Tonnage of seed certified and marketed in the past five years by crop

Below is a table showing rice seed certified and marketed for a couple of years 2013 - 2015.

Table 24: Production of Rice Seed (for 2015, 2014 and 2013), Production Station and Cultivated Area

Year 2015	Total production/ procurement amount	Name of production station	Production amount per station	Cultivated area per station (ha)
Breeder seed	14.492kg	RARC	14.492kg	0.02
Foundation seed	-	RARC	-	-
		SMP	-	-
Certified seed (R1 & R2)	127.91 mt	SMP Makeni	65.08mt	1,041.2
		SMP Kobia	62.83mt	1,005.2
Year 2014				
Breeder seed	286kg	RARC	286 Kg	0.38
Foundation seed	123.55 mt	RARC	23.55 mt	376.8
		SMP	100.0 mt	1,600
Certified seed (R1 & R2)	100.0 mt	SMP Makeni	45.0 mt	720
		SMP Kobia	55.0 mt	880
Year 2013				
Breeder seed	54.7 kg	RARC	54.7 kg	0.09
Foundation seed	22.44 mt	RARC	22.44mt	359.04
Certified seed (R1&R2)	52.5 mt	RARC	52.5 mt	840.0

For root and tuber crops and vegetables, no reliable figures for seeds and planting materials certified and marketed are available. However, the varieties officially inspected and certified by SLeSCA are shown below. Majority of these varieties are used for commercialization as well as consumption by farm families (subsistence). Farmers keep aside a portion of their production as seed for the following year although a substantial amount of the grains produced are sold in the markets.-

Table 25: Officially Certified Rice Varieties in Sierra Leone

Agro-Ecological Zones	Name of Varieties
Rain-fed Lowland	ROK 5, ROK 10, ROK 14, ROK 25, ROK 34 NERICA- L-19 and NERICA- L-20,
Rain-fed Upland	ROK 3, ROK 34 NERICA 3, NERICA 4, NERICA 6, NERICA 15, NERICA 16 and NERICA 18

Number of Agro dealers currently in operation by region

There is no recent census of agro-dealers in Sierra Leone. However, those interviewed stock seed and other agricultural inputs like chemicals and fertilizer. They are less visible in extremely remote areas. Majority of them are not trained dealers to address the issue of fake seeds. There are 43 agro-dealers documented servicing 732,461 households (PEMS-D/MAF, 2017). The ratio of agro-dealer to agricultural households is 1: 17,033. This is clearly inadequate and leads to a situation where most farmers have very limited or no access to agro-dealers. Most of them are male and seed producers complained that they are not serviced by these agro-dealers, who do not have sufficient business or marketing knowledge. Respondents interviewed state that majority of the agro-dealers were small rural agro-dealers and it is difficult to find hub agro-dealers (wholesalers supplying small agro-dealers).

-

Table 26: Concentration of agro-dealer network in the country

Indicator	Result
Number of agro-dealers in the country	43
Number of agriculture households	732,461
Ratio of agro-dealers to agriculture households	1:17,033

Level of importation of certified seed from neighbouring countries by crop

A total of 1,200 tons of seed of improved rice varieties and 40 tons of maize seed to farmers under the rapid Ebola seed distribution. Data for other food crops and vegetables is not currently available.

Summary of prospects to improving seed supply

The government of Sierra Leone has restructured its seed industry to pave the way for the establishment of Public / Private Partnership seed enterprise, with the view to making quality seed available to farmers on a sustainable basis. The public private partnership - PPP seed enterprise option was to improve upon the performance of the national seed industry which in the past did not adequately meet the expectations of the agricultural sector in seed needs of farmers who are mostly subsistent in nature. It has also taken cognizance of the synergistic synergistic effect and complementary partnership of the private and public sectors will exhibit in creating a viable and sustainable seed industry.

Public Private Partnership, PPP market liberalization policy will favour Private sector involvement in Seed business. Through planning and promoting private sector interventions in the sector with active government support. Private sector-led, government-enabled seed industry- Speed up or expedite privatization of SMP/ the private sector gradually emerge from the activities of the SMP and FBOs/ABCs responsible for contracting and registering growers with SLeSCA

Government is opening space for competitiveness in research breeding. Private seed Company like GENESIS now in sorghum breeding and nominated and submitted one variety to VRC for release.-

Rate at which Breeders release varieties. New varieties of crops developed. Problem with multiplication and dissemination. Old varieties being recycle year in year out are now replaced with new improved varieties with better yields

National Agricultural Research System

Sierra Leone has had a long history of agricultural research spanning almost 100 years. The West Africa Institute for Oil palm Research (WAIFOR) at Njala, the Bambawo Forestry Research Station near Kenema and the Rice Research Station at Rokupr were pioneer research centres in West Africa during the colonial era. In the mid eighties, the National Agricultural Research Coordinating Council (NARCC) was established by the government of Sierra Leone to coordinate research and harmonize activities of the two existing research institutions (Rice Research Institute and the Institute of Agricultural Research).

Agricultural research systems in Sierra Leone has made significant contributions towards improving productivity in the past through the development of improved crop varieties particularly rice, cassava, sweet potato, grain legumes and vegetables 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.-

Description of the Institutes and Universities actively engaged in crop breeding

i) Sierra Leone Agricultural Research Institute (SLARI)

The Sierra Leone Agricultural Research Institute (SLARI) was established by an Act of parliament in 2007 as a semi-autonomous government agency, with the responsibility of enhancing sustainable productivity, commercialization and competitiveness of the agricultural sector through generation and promotion of innovative agricultural technologies and empowerment of stakeholders”.

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”.

SLARI is currently 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.

ii. Njala University

Njala University is the Agricultural University of Sierra Leone and therefore the School of Agriculture is the main entity of the University that has the capacity to carry out agricultural Research in Sierra Leone. Agriculture is the mainstay of the Sierra Leone economy, contributing over 36% to the GDP and employing over 70% of the rural population. Therefore, the role of the School of Agriculture in national development cannot be overemphasized. The School is made up of seven Departments/Institutes which includes the following: Animal Science, Crop Science, Agronomy, Soil Science, Crop Protection, Agricultural Extension and Rural Sociology and Nutrition and Dietetics.

The School sees itself as a facilitating agent in the areas of agricultural and national development and seeks to contribute positively to these areas. Considering the level of underdevelopment in the country particularly in the agricultural sector, the areas of concern in which the School is of service seem inexhaustible. Thus the School addresses itself to issues on teaching, agricultural research and technology development and transfer to farmers and other relevant bodies.

The purpose of the School based on its mission is, therefore, to provide higher education in agriculture through flexible admission policies to allow men and women equal opportunity regardless of tribe, belief and origin to higher education in agriculture for the agricultural sector and national development.

The general objectives of the School is to provide instruction in all branches of agriculture and make provision for research and the advancement and dissemination of knowledge in agriculture, provide services in the area of agriculture for persons who are not regularly enrolled in the University and teach courses leading to the award of degrees, diplomas and certificates in all branches of agriculture.

To achieve the above objectives the School relentlessly works towards:

1. the attainment of the highest academic standard competitive with regional and international agricultural institutions of higher learning
2. the provision of regular supplies of highly educated agriculturalists, nutritionists, food technologists and community development experts capable of effectively and efficiently managing the affairs of state and the community they serve
3. the contribution to agricultural and nutritional policies and decision making within the framework of national development
4. the building of teaching and research capacity of academic staff to enhance their own as well as students intellectual horizon and promoting outreach goals through appropriate extension strategies

To strengthen academic and/ or research capacity and to foster international educational cooperation, various link arrangements exist between the School and

institutions in and out of Sierra Leone. The School has links with the Sierra Leone Agricultural Research Institute (SLARI) and some of its staff members are Principal Research Fellows, Senior Research Fellows or Research Fellows involved in both on-farm and on-station research to improve farmers' productivity of rice, maize, cassava, sweet potato, yam, groundnut, soybean and cowpea. The School also collaborates with international research institutions such as International Institute of Tropical Agriculture (IITA), International Centre for Research in Semi-Arid Tropics (ICRISAT), International Centre for Tropical Agriculture (CIAT) and International Potato Centre (CIP) in the development of high yielding crop varieties, tolerant/resistant to major pests and diseases. The School has strong linkage with the International Atomic Energy Agency (IAEA) at Vienna, Austria, University of Ibadan (UI) and University of Agriculture, Abeokuta in Nigeria, Illinois University, Iowa State University and Oklahoma State University in the USA.-

Nature of recent or on-going crop improvement activities by crop

The main objective in the crop improvement programme is to generate improved and adapted populations with desired characteristics for different agro-ecologies targeting different end uses (food, feed and industry) and markets using the value chain approach.

Rice

The rice breeding activities at Rokupr Agricultural Research Centre since 2013 included the following:

1. Germplasm characterization of lowland rice varieties in 2010 and from the characterization, twelve (12) lowland and upland rice varieties were released in 2014 and 2015.
2. Developed crosses in 2010 are now at participatory varietal selection (PVS) and those developed in 2014 are now at F₆₋₇ stages.
3. Due to lack of proper cold room facility, we have embarked on genetic stock maintenance since 2014 to date.
4. Since 2013, we have been conducting MET, PET and PAT trials for Africa Rice to date from which varieties are going to be released soon.
5. Hundred (100) breeding lines were received from IRRI in 2017, characterized for yield and adaptation.

6. Also in 2017, we characterized fourth five (45) mangrove breeding lines for multiple stress tolerance received from IRRI.

Cassava

1. Cassava germplasm collection and genetic gain trial establishment
2. Genetic gain trial monitoring and evaluation-
3. Training population for cassava breeding trial re- establishment at lower nursery, njala campus, njala - (february—2019)
4. Scientific visit at Cornell university, Ithaca, New York, USA:plant& animal genome conference xxvii, town &country hotel, San Diego, Carlifonia, USA- (January, 2019)
5. Next-gen cassava project annual work planning week, Speke Resort, Munyonyo Kampala, Uganda (February-2019)
6. Next-gen cassavabase training at NARC, Njala Campus,Njala (March 2019)
7. Establishment of seedling nursery (SN) at Njala, 2019

Sweep potato

Three Orange Flesh genotypes (Mathuthu, Chipka and Kaphulira) are currently been promoted by SLARI in collaboration with Hellen Keller International in 7 districts, 9 groups per district in 2018 and additional 6 districts in 2019.

Cowpea

Since the release of the Slibean series effort has been focused on the introduction of new genotypes and the multiplication of certified seed to meet the demand of farmers.

Soybean

Scientist from the Njala Agricultural Research Center (NARC) are currently involved in participatory varietal evaluation trials with Genesis Farm on the release of a new variety Rokel 1. Other effort by SLARI /NARC are focused on the introduction of new genotypes and the multiplication of certified seed to meet the demand of farmers

Groundnut

Evaluation of advanced groundnut segregating lines (F3, F4 and parents) using Pedigree method is ongoing at NARC/SLARI.

Maize

The maize unit of the Crop Improvement Programme (CIP) of the Rokupr Agricultural Research Centre (RARC) continues to conduct maize trials of several different maize hybrids and open-pollinated varieties.

Trials consist of one (1) set of inbred lines, two (2) different sets of hybrids and three (3) different sets of open-pollinated varieties. Each of these trials was evaluated during the 2016/2017 and 2017/2018 cropping seasons in two (2) different locations, namely; Rokupr and Newton. The names of the trials, their entry numbers, designs used, number of rows per plot and replications are listed in Table 1. Planting materials were sourced from IITA, Ibadan, Nigeria.

We also do yearly seed maintenance of selected PVA SYN 18 and DMR-ESR-Yellow open-pollinated varieties. DMR-ESR-Yellow is an old variety in the agricultural systems of Sierra Leone.

However, we have requested for maize inbred lines at CIMMYT for 2019/2020 cropping season for evaluation and hybrid maize development. The consignment is yet to arrive. Attention has recently been focused on fall army (FAW) worm resistance.

Table 27: List of maize trials, number of entries, design, plot size, replication, spacing and area

	Trial name	Number of entry	Design	Plot size	Replication	Spacing	Area (ha)
1.	M16-02 (EVT-LSR-Y) : OPVs	20	5 x 4 lattice	2 rows/plot	3	75cm x 50cm	0.09
2.	M16-06 (Yellow maize	30	5 x 6	1 row/plot	3	75cm x	0.08

	hybrid)		lattice			50cm	
3.	M16-08 (Mid-Altitude inbred lines)	36	6 x 6 lattice	1 row/plot	2	75cm x 50cm	0.08
4.	M16-14 (Early Multiple Stress Tolerant PVA hybrids)	11	RCBD	2 rows/plot	3	75cm x 50cm	0.04
5.	M16-17 (Late/intermediate stem borer resistant/tolerant) : OPVs	14	RCBD	2 rows/plot	4	75cm x 50cm	0.08
6.	M16-18 (Late/intermediate low soil nitrogen tolerant) : OPVs	12	RCBD	2 rows/plot	4	75cm x 50cm	0.06

Sorghum

Sorghum current status at RARC are as follows:

i) Maintenance of sorghum varieties/lines and hybridization has been one of the major events being carried out in the sorghum improvement programme over the years. Promising genotypes from the breeding program are yet to be recommended for release by the seed certification agency. However in collaboration with the Sierra Leone brewery limited company, the highly promoted local landrace Katic has gain approval from the varietal release committee and the National seed board for the first release of sorghum in Sierra Leone. Other major research carried out is geared towards release of varieties for farmers use in Sierra Leone. Below is a project title held held in 2016-

ii) Participatory evaluation of selected sorghum genotypes across three provinces in Sierra Leone for distinctiveness, uniformity, stability and value for cultivation and use characterization and suitability for beverage production. Objectives were

- To identify varieties with wide adaptability and location specific types
- To obtain DUS and VCU information of promising genotypes for nomination and release into national crop variety catalogue
- To obtain information on farmers perception/opinion on the different genotype
- To determine the brewing potential on the different varieties

iii) Evaluation continued in 2017/18 planting season for obtaining additional DUS and VCU information so that data are presented to SLeSCA for verification

From this project, one variety (ROSORG-1) has been accepted by the Sierra Leone Seed Certification Agency (SLeSCA) for release and use by farmers. Sample of ROSORG-1 will be presented to the RARC Farm manager for multiplication.

Also, in 2016, upon series of field evaluation between some exotic and local varieties in the sorghum improvement programme, one exotic (IS23767) and Local variety (Medium White) was crossed using fertile by fertile techniques. Maintenance of the lines had continued and is now at the F4 stage.

Vegetables

Activity 1: Characterization and selection of best suitable varieties of vegetable crops. The main objectives are as follows:

- ❖ To identify seeds and propagating materials of high yielding potential of selected vegetables
- ❖ To compare growth and yield parameters of F1 hybrid seeds and Farmers seed
- ❖ To determine and compare marginal returns of F1 seeds and Farmers seeds
- ❖ To develop pure breeding lines of selected vegetable crops
- ❖ To acquire manual pollination, grafting and budding skills for vegetable enhancement
- ❖ To develop new varieties of tomato, pepper
- ❖ To capacitate farmers in seed enhancement techniques

Activity 2: Introduction of Pepper and Tomato Accessions for Breeding, Varietal Advancement, Development and Release in Sierra Leone -

The following specific objectives are:

1. Determine genetic Variation among pepper genotypes using phenotypic characters
2. Detect differences between pepper genotypes based on simple sequence repeat (SSR) markers
3. Classify the genotypes based on their phenotypic and molecular attributes.

Activity 3: Nation-wide germplasm collection and conservation of underutilized and neglected vegetable crops.

The aim of this work is to provide and conserve germplasm pools of vegetable crops from which new superior lines can be extracted for use in breeding programmes.

This could be useful for the following reasons:

- i. Management and utilization of crop germplasm for development of core set,
- ii. Evaluation of crop germplasm for value addition,
- iii. Evaluation of crop germplasm against biotic/abiotic stresses,
- iv. Evaluation of germplasm for quality traits,
- v. Biochemical/molecular characterization of germplasm, and
- vi. Experiments on wide hybridization.

Level of capacity of public crop breeding institutions

Scientific personnel

Number of Active Breeders (at PhD and MSc levels)

Table 28: Number of active breeders by crop

	2017			Satisfaction ratings
	Public	Private	Total	
Rice	10		10	Fair (44.3%)
Maize	1		1	Extremely poor (15.7%)
Sorghum	1	1	2	Poor (22.9%)
Groundnut	2		2	Extremely poor (18.3%)
Cassava	3		3	Poor (23.9%)
Sweet potato	2		2	Poor (27.8%)
Total	19	1	20	

At technical level, there are insufficient trained technical field and laboratory staff engaged in crop breeding activities.

Infrastructure

Severally laboratories are available at the various research centres of SLARI. Majority of them are fully equipped whilst others are under equipped. Some of these laboratories include the following:-

- i) Molecular biology laboratory-
- ii) Plant Tissue culture-

iii) Plant and soils analytic laboratory-

iv) Plant Pathology laboratory-

v) Seeds laboratory-

vi) Food and nutrition laboratory-

vii) Engineering laboratory-

However, these laboratories lack adequate electricity and good water supply.--

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Below are some pictures of laboratory facilities at the research institutions.-



Figure 4a



Figure 4b



Figure 4c

Recent on-going collaboration with public institution farmer-based organisation and private sector in supply

The seed multiplication unit (SMP) of the Ministry of Agriculture and Forestry and Food Security (MAF) was responsible to evaluate and inspect seeds to ensure acceptable seed quality. Agricultural research institutions had and still has the mandate of conducting research in crop breeding and development. Research, seed multiplication and marketing is required to maintain a continuing flow of improved seeds of high yielding varieties. Government has therefore made every effort to ensure that all current public sector seed infrastructural components are established and operated in the manner most beneficial to national agricultural and economic development.. Foundation and certified seeds are obtained from the research institutes. Certified seed production mainly produced by cooperatives, contract farmers, farmer associations and non governmental organizations (NGO's) like World Vision, CARE, Africare etc. This collaboration had existed over the years but faced major challenges. Some of the challenges included the use of impure and adulterated seeds and poor agro dealer networks and lack of reliable market and market prices, among others. This has been the case until very recently when the Government of Sierra Leone decided to established a body known as the Sierra Leone Seed Certification Agency (SLeSCA) with the responsibility of controlling and regulating standards of seeds in the country. Cooperative and supportive participation of both Government and the private sector are required to ensure efficient use of funds and other national resources, while providing

the most effective service to agriculture hence improving production and productivity of food crops..

Current status of crop variety licensing arrangement for production by third party entities

Any person who wishes to import, export, grow or process seeds in commercial quantities or distribute or sell any certified seed shall apply to the Agency for a licence for that purpose. An application for a licence is expected to submit to the Director of SLeSCA in the prescribed form and accompanied by the prescribed licence fee. SLeSCA may, after receiving an application grant a licence if it is satisfied that the applicant has complied with the requirements for the licence; or refuse the application if it is satisfied that the applicant has not complied with the requirements for the licence. SLeSCA will acknowledge receipt of the application and inform the applicant in writing of its decision within a period of not more than 14 days. The Minister of Agriculture and Food Security will prescribe the plant varieties and standards of the seeds for importation, exportation, production, processing, sale or distribution. No licence will be issued except a sample of the seed tested at a seed testing station reaches the prescribed standards in respect of purity and germination; the seeds are from a crop which has reached the prescribed standards in respect of trueness to variety and free from disease; the seed farm meets the required standards

in respect of -

- (i) physical purity;
- (ii) health status; and
- (iii) variety purity.

A seed dealer's licence shall expressly state whether it is -

- (a) a general licence which entitles the seed dealer to operate throughout Sierra Leone;
- (b) a limited licence which entitles the seed dealer to operate in a specified place in Serra Leone;
- (c) a restricted licence which entitles the seed dealer to operate either by wholesale or retail and shall specify the prescribed seed to be sold; or
- (d) an unrestricted licence which entitles the seed dealer to operate wholesale and retail and all types of prescribed seeds.

National seed policy framework

Under the authority of the Minister of Agriculture, Forestry and Food Security, a National Seed Board (NSB), was established and charged with the overall responsibility for advising the Government on all matters relating to the Seed Policy and all ensuing legislations and protocols as well as seed industry planning and implementation.

The NSB is composed of representatives from all relevant stakeholders. The terms of reference of the NSB reflects its crucial role of serving as guide, counsel, arbiter and lobbyist on behalf of the seed industry. The NSB meets periodically and organize meetings to review progress of the national seed programme. Initially, Stakeholder represented on the NSB as follows:

- MAF (1 representative)
- SLARI (1 representative)
- The Seed Sector (2 representatives)
- Farmers' Associations (NAFFSL) (1 representative)
- Njala University (1 representative)
- Ministry of Development and Economic Planning (1 representative)
- Ministry of Trade and Industry(1 representative)
- Agro-industry (1 representative)
- National Bureau of Standards (1 representative)
- Sierra Leone Centre for Agribusiness Development (1 representative)

Documents which control the production and supply of seed

The following documents control the production and supply of seeds in Sierra Leone:

- a. National Seed policy 2009
- b. Sierra Leone Seed certification act 2017
- c. Seed Regulations 2018
- d. National catalogue of plant species and varieties released and registered in Sierra Leone 2015-
- e. ECOWAS regulations on seeds and planting materials

Process for the official release of improved crop varieties

In Sierra Leone, variety release is the mandate of the Variety Release and Registration Committee – VRC (SLeSCA Act, 2017). The stipulated time for release is 24 months with regards to the focus crops. In the first year, the applicant applies to the VRC to have a new variety officially tested by depositing a reference seed sample to the Sierra Leone Seed Certification Agency (SLeSCA). In the second year, the applicant applies for the full release of the new variety after official independent testing by SLeSCA. The applicant will then submit his/her breeding information. The variety is considered so released as a result of the variety appearing in the National Catalogue of Plant Species and Varieties (SLeSCA Regulations, 2018).

The release process includes the following steps:

1. Breeders submit an initial application to the Secretary of the VRC, who is also the Director of SLeSCA. The secretary reviews the applications and asks for additional information (if any gaps in the application).
2. SLeSCA conducts trials for Distinctness, Uniformity and Stability (DUS) and Value for Cultivation and Use (VCU).
3. SLeSCA prepares and distributes the result of the report to the VRC members for evaluation.
4. Then the applicant (breeder) is invited to present his data to the VRC which will be compared with the independent findings of SLeSCA.
5. If the VRC members agreed, the crop varieties are recommended for approval for release to the National Seed Board (NSB). Otherwise, the crop variety is rejected and will not be released. However, the breeder has the liberty to appeal for re-evaluation by the committee.
6. Finally, the crop varieties released are registered in the National Catalogue of Plant Species and Varieties. -

The seed certification authority is the Sierra Leone Seed Certification Agency established through an Act of Parliament in 2017. This is an agency under the Ministry of Agriculture that is responsible for seed quality control. It conducts

inspections of seed fields and seed trade, sampling, testing and certification of seed lots and facilitation of seed imports and export.-

The production and certification of seeds in Sierra Leone follow standards set out by the Organization of Economic Cooperation and Development (OECD). The multiplication of a seed crop variety released in Sierra Leone is registered with SLeSCA at a fee for the following classes – Prebasic seed, basic seed, certified seed, quality declared seed (QDS) and Emergency seed. Seed crops are inspected during production and are subjected to minimum field standards for each class. A seed crop that fails to meet the standards is rejected from the seed certification scheme.

Table 29: Prescribed seeds for release in Sierra Leone

Crop	Botanical crop
CEREALS	
Rice	<i>Oryza sativa</i> L
Maize	<i>Zea Mays</i> L
sorghum	<i>Sorghum bicolor</i> (L) Moench
OIL CROPS	
Groundnut	<i>Arachis hypogaea</i> L.
Sesame (benni)	<i>Sesamum indicum</i>
PULSES	
Cowpea	<i>Vigna unguiculata</i> (L.) Walp
Soyabean	<i>Glycine max</i> (L.) Merr
Pigeon pea	<i>Cajanus cajan</i>
ROOT CROPS	
Cassava	<i>Manihot esculantum</i>
Sweet potato	<i>Ipomea batata</i>
Irish potato	<i>Solanum tuberosum</i>
Yam	<i>Dioscorea</i> spp
ROOT CROPS:	
Coffee	<i>Coffea</i> spp.
Cacao	<i>Theobroma cacao</i>

Oil Palm	<i>Elaeis guineensis</i>
Cashew	<i>Anacardium occidentale</i> L
VEGETABLES	
Cabbage	<i>Brassica oleracea</i> L.
Carrot	<i>Daucus carota</i> L.
Cauliflower	<i>Brassica oleracea</i> lonvar. botrytis (L.) Alef. var.botrytis L..
Cucumber (including gherkins)	<i>Cucumis sativus</i> L
Eggplant	<i>Solanum melongena</i> L
Kale	<i>Brassica oleracea</i> covar. acephala (DC.) Alef. var. medullosa Thell + var. viridis L
Leek	<i>Allium porrum</i> L.
Lettuce	<i>Lactuca sativa</i> L.Hibiscus esculentus L
Okra	<i>Abelmoschus esculentus</i>
Onion	<i>Allium cepa</i> L
Pepper	<i>Capsicum annuum</i> L.
Pumpkin	<i>Cucurbita pepo</i> L.
Raddish	<i>Raphanus sativus</i> L
Rape	<i>Brassica napus</i> L.
Tomato	<i>Lycopersicon lycopersicum</i> (L.) Karst. Ex Farw.
Watermelon	<i>Citrullus lanatus</i> (Thunb) Matsum et Nakai

Table 30: Seed certification scheme

Code	Class	Parent seed	Colour of label
A	Prebasic (breeder seed)	Produced from breeders' parent material under the control of breeder and supervision of SLeSCA. More than one generation may be permitted by the controller of seed	Violet stripe on white
B	Basic or Foundation seed	Produced from basic seed and officially inspected. Only one generation permitted	White
C1	Certified 1 st generation	Produced from basic seed officially inspected	Blue stripe on white
C2	Certified 2 nd generation	Produced from certified 1 st generation or higher class and officially inspected	Red stripe on white
C3	Certified 3 rd generation	Produced from certified 2 nd generation or higher class and officially inspected	Red stripe on white

D	Commercial seed (certified 4 th generation)	Produced from certified 3 rd generation or higher class and officially inspected	Green stripe on white
QDS	Quality Declared Seed	Produced from commercial seed class or higher generation	Green
E	Emergency class	Non-certified seed used in the case of acute seed shortage following a state declaration of national disaster. Standards are set by the controller of seeds	Red

Current status of the regulatory agencies in charge of seed certification

The Sierra Leone Seed Certification Agency Act, 2017 provides for the establishment of the Sierra Leone Seed Certification Agency responsible for the control and regulation of agricultural seeds and for other related matters. The act was enacted by the President and Members of Parliament in this present Parliament assembled. The governing body of the Agency comprised of a Board which consists of a Chairman who is a person with proven knowledge and experience in the seed sector, appointed by the President on the recommendation of the Minister, approved by Parliament and the following other members-

- (a) the Chief Agricultural Officer, Ministry of Agriculture, Forestry and food security
- (b) the Director of Crops, Ministry of Agriculture, Forestry and Food Security;
- (c) the Director, Domestic Commerce and Industry, Ministry responsible for trade;
- (d) the Director of Budget, Ministry responsible for finance ;
- (e) the Director-General, Sierra Leone Agricultural Research Institute;
- (f) a representative of exporters and importers of agricultural inputs appointed by the Sierra Leone Chamber of Commerce, Industry and Agriculture:
- (g) the Dean, School of Agriculture, Njala University;

(h) the Director, Sierra Leone Standards Bureau;

(i) a representative each, from the National Federation of Farmers in the Northern Province, Northern Western Province, Eastern Province Southern Province and Western Area.

(j) the Executive-Director.

The Agency was established to control and regulate the standards of seeds without prejudice.

the Agency is responsible to -

(a) register and cancel the registration of seed operators;

(b) conduct independent performance trials of Candidate varieties for the purpose of release by the Variety Release and Registration Committee;

(c) register and cancel the registration of released varieties on the instruction of the Variety Release and Registration Committee;

(d) maintain a catalogue of crop varieties throughout Sierra Leone;

(e) recommend to the Minister, fees for the certification and testing of seeds;

(f) inspect seed fields, seed processing factories, seed warehouses and seed selling outlets in order to ensure compliance with the Act;

(g) licence seed processing factories, seed importers and seed operators in accordance with the Act;

(h) conduct laboratory tests for purity, germination and moisture content of seeds in order to determine quality and authorise or refuse its sale and distribution to farmers;

(i) certify seeds and prescribe standards and procedures for certification of seeds;

(j) licence and accredit private laboratories and officers to execute the duties of the Agency;

(k) publish annually a list of varieties of crops for which seed marketing is permitted;

(l) monitor seed supply seeds.

(m) undertake or cause to undertake, periodic studies of relevant issues relating to the seed

industry with the aim of obtaining necessary information to guide the Board;

(n) conduct training of seed dealers in the seed industry;

(o) determine the class of non-certified seeds which may be used in times of crisis; and

(p) carry out such other functions and programmes as may be necessary.

The Agency is not engaged in the business of growing, importing, exporting or selling of seeds.

Active personnel

SLeSCA has a Director, appointed by the President, from among persons with proven knowledge and experience in the seed sector, after consultations with the Minister subject to the approval of Parliament, and who is responsible to provide overall leadership in the conduct and management of the day-to-day business or activities of the Agency. Director is responsible to-

(a) initiate and maintain high-level contact with interested parties, both local and international, in relevant areas of the operations of the agency;

(b) monitor and supervise the preparation of the annual budget and reports of the Agency for the review and approval of the Board;

(c) oversee the work and discipline of the other staff of the Agency;

(d) perform the function of controller of seeds; and

(e) carry out such other functions as may be assigned by the Board or necessary for the purposes of the Agency.

In addition SLeSCA has limited trained and qualified technical staff.

Infrastructure

SLeSCA is hosted at the headquarters of the Sierra Leone Agricultural Research Institute at Tower Hill, Freetown with a partially equipped laboratory where testing of seeds are carried out. regional laboratories are yet to be set up.-

Current status of basic (foundation) seed supply

Estimated annual seed supply is 80,000 bushels or 2,000 metric tons. Current level of certified seed importation is 700 metric tons. one hundred foundation seeds and six hundred certified seeds.

Availability of basic/foundation seed

The main sources of foundation (basic) seed for the six crops were the government Institutions of the Seed Multiplication Programme (SMP), and the Sierra Leone Agricultural Research Institute (SLARI). The Rokupr Agricultural Research Centre of the SLARI provides foundation seed for rice, sorghum and groundnut. The Institute however, was not the provider of foundation seed of maize. There is significant shortage of foundation seed supply in Sierra Leone as a result of the inadequate funds allocation to both SLARI and SMP, and absence of the private sector breeding programs. Seed producers rated their satisfaction with the availability of foundation seed as fair (41.5%) on the average. The highest satisfaction was for rice (43.7%), while the lowest was for groundnut (39.2%) (Table 31). These relatively low ratings were because seed producers do not have easy access to foundation seed from SLARI and SMP. In an advanced seed sector, most seed producers produce/maintain their own foundation seed, especially those with plant breeder/s in their employ.

Table 31: Availability of breeder/foundation (satisfaction ratings)

Crop	2017
	Average of responses for Sierra Leonean-owned seed producers
Rice	43.7
Maize	41.8
Sorghum	41.3
Groundnut	39.2
Cassava	43.7
Sweet Potatoes	39.5
Average for all crops	41.5

Rice is considered as both food and political crop in Sierra Leone. Food in the sense that irrespective of what any Sierra Leone ate other than rice, he/she would claim that he/she has not eaten if asked. Political crop in the sense that it is staple food for majority hence its scarcity may result in unpredictable public reactions. From the study rice seed alone was sourced from 4 countries, more than any of the other focus crops irrespective of quality in order to ensure that there is food on the tables of people- which is indicative of the producers' overall poor rating (31.4%) of rice seed sources (Table 12): Sierra Leone (SLARI), Senegal and Nigeria (Africa Rice) and the Philippines (IRRI), the latter however, was given a fair rating (40%) by breeders. Nigeria Africa Rice is hosted by IITA, in Ibadan, Oyo State. Maize seed coming from Nigeria (IITA), the only source, was rated as extremely poor (20%), whilst the sources of sorghum seed- SLARI and Mali (ICRISAT) were rated fair (40%). Groundnut seed like maize seed was obtained from only one source- Sierra Leone (SLARI), which was rated as either being poor (30%) or extremely poor (20%). The two sources of cassava planting materials were Sierra Leone Sierra Leone (SLARI) and Nigeria (IITA), and both were rated as being poor (30%). Similarly, sweet potato planting materials were sourced from two countries- Ghana (CIP/SLARI) and Kenya (CIP) and were rated as being fair (40%) or poor respectively.

Table 32: Main source of basic seed and satisfactory ratings

Source		Rice		Maize		Sorghum		Groundnut		Cassava		Sweet potato	
Country	Organization	%	Rating	%	Rating	%	Rating	%	Rating	%	Rating	%	Rating
Sierra Leone/ Senegal	SLARI/ARC	20	Extremely poor										
Sierra Leone/ Senegal	SLARI/ARC	30	Poor										
Sierra Leone/ Senegal	SLARI/ARC	30	Poor										
Philippines	IRRI	40	Fair										
Sierra Leone/ Senegal	SLARI/ARC	40	Fair										

Senegal													
Sierra Leone/NG/Senegal	SLARI/IITA / ARC	30	Poor										
SLARI	SLARI	30	Poor										
Nigeria (NG)	IITA			20	Extremely poor								
Sierra Leone/Mali	SLARI/ICRI SAT					40	Fair						
Ghana/Kenya	SLARI/CIP											40	Fair
Ghana/Kenya	CIP											30	Poor
Sierra Leone/NG	SLARI/IITA									30	Poor		
Sierra Leone	SLARI							30	Poor				
Sierra Leone	SLARI							20	Extremely poor				
Sierra Leone/NG	SLARI/IITA									30	Poor		
Average rating (%)		31.4											

Procedures for production and supply of basic (foundation) seed

Seed production in Sierra Leone is dominated by seed co-operatives (44) or seed producers in farmers' associations while in other African counties, especially in East and Southern Africa, seed production is done mainly by seed companies. Generally, breeders seeds are obtained from SLARI by the seed Multiplication Programme and are multiplied to generate foundation seeds in large quantities. This is done in collaboration with the seed breeders to the National research systems. These seeds are later given to contract farmers who in turn multiply them to generate certified seeds. This is subsequently given or sold to farmers through NGOs and front extension staff of the Ministry of Agriculture and Food Security. All processes are jointly monitored the extension staff of MAF, NGOs and seed breeders to avoid contamination and maintain purity of seeds.

Access by private seed companies to basic seed

Access by private seed companies , seed growers and seed cooperatives is mainly through NGOs and the front extension workers of MAF. However, seeds can be directly obtained from SMP as well as SLARI.

Policies for supply of basic seed by private sector

SLARI has the mandate of conducting research activities and release of improved varieties of rice, maize, sorghum, cassava, groundnut, cowpea. It is the responsibility of SLARI to ensure that there are constant releases of varieties, varietal maintenance and improvement of existing varieties (breeder and foundation seed production before the next stage of multiplication into certified seed by private sector. However, a private seed Company are currently developing a new improved sorghum which has been submitted to the VRC for release. The national policies made provisions for active participation of the private sector in production and supply of certified seeds. Currently, certified seed rice is produce by public institutions (such as RARC, SMP) and few private seed entities and seed producers' groups.Private seed companies acquire their foundation or basic seeds from SMP or SLARI for certified seed production in the country-

Government will encourage and support the private sector to produce, to the maximum extent possible, the seeds that are required for farmers' use. The public sector shall withdraw from the commercial production of seeds as the private sector develops the capability to produce and supply such seeds. As the private sector progresses in its supply of seeds, Government agencies shall gradually reduce their supply of such seed kinds, in order to prevent Government-subsidized competition stifling the private sector initiatives and to conserve Government funds.

The overall strategy should lead to a situation where, in general, activities/components of a public-service nature which normally require some form of subsidization shall be conducted by Government and its subsidiary organizations. All activities/components of a commercial, market-responsive nature, and in which the private sector is willing to invest in such a

manner as to efficiently serve all or part of the national needs, shall be the responsibility of the private sector, as appropriate.

Government recognizes the important role the private sector can play in certain aspects of seed production and supply, and in providing required seed at minimum Government expense and minimum cost to farmers. Government therefore expects the private sector to play a major role in seed supply, and shall provide all possible support, as specified in this policy or established in ensuing supportive protocols, upon the advice of the National Seed Board.

Summary and Conclusions

Current status of access to improved seed among smallholder farmers

Farmers normally access seed from very different seed channels both informal and formal. Systems. For example, in the case of cassava, report from cassava value chain study (2013) revealed that farmers acquire 88% of cassava planting materials from their own stock from previous harvest, 7% from local cutting producers, 2% from 2 5 from cutting dealers, 2% from Research and extension and 1% from gifts(Fig),. This is mainly because cassava can remain in the ground and does not require special management practices. Similarly The formal rice seed sector supply about 8% of rice seeds used in the country whilst the informal sector accounts for the remaining 92%.Farmers get their seed from own saved seeds, various social networks (friends, relatives and neighbours), burrowing, exchange labour for seed, exchange other crops for seed rice and aid from government. Farmers also sometimes procure seeds from the local markets from nearby villages.

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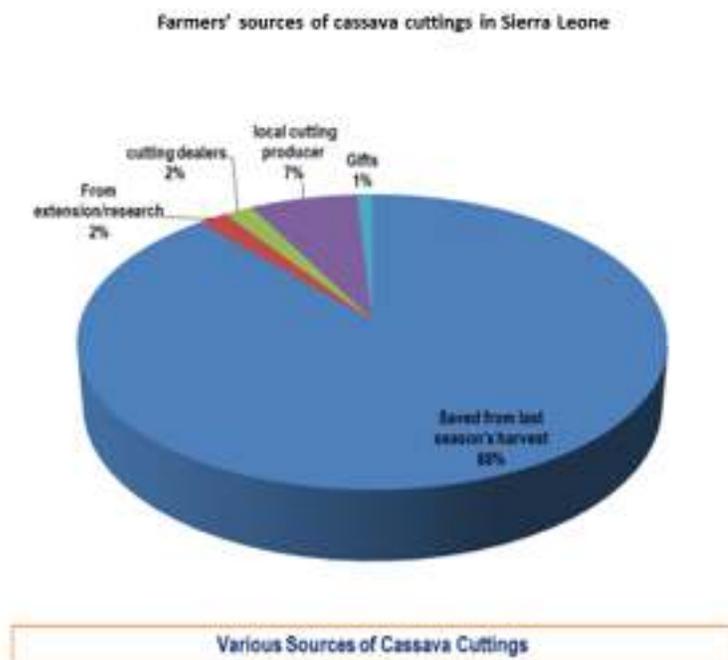


Figure 5: Sources of acquisition of cassava planting materials-

Current status of government support for improving seed systems

Sierra Leone government recognizes the importance of quality seeds by finalizing the Sierra Leone Seed Certification Agency Act 2017. The Act has been gazetted and will be enacted by Parliament by the first quarter of 2017. It aimed to regulate transactions in seeds by including institutional frameworks for the testing and certification of seeds. It also provided guidelines for the introduction of new varieties as well as importation and exportation of seeds. Strengthening the capacity of breeders through training (WAAPP) and SLeSCA – VRC to facilitate release of varieties. Importation of foundation seeds of preferred rice seed varieties for multiplication Government supply of seeds to FBOs and farmers through SMP Linking informal with formal sectors via demonstrations of new varieties or injecting small packets of improved seed into local markets Providing loans to FBOs involved in seed production through community banks and micro-credits. The government is investing heavily in the agricultural sector by improving transport infrastructure to ease the movement of goods, encouraging and supporting private sector investment, as well as lending support to farmers.

Trends and opportunities for seed systems improvements

Sierra Leone's economy is strongly reliant on the agricultural sector as it contributes 47.9% to GDP in 2014,. It is also one of the largest sources of job creation .The country has abundant natural resources, good rainfall and vast areas of land suitable for a variety of agricultural production.

Although the agricultural sector is dominated by small holder farmers in subsistence farming using traditional methods and limited use of farming inputs, there is growing interest in commercialization with fairly large estates both owned by the government and private.

Under WAATP, the project will strengthen RARC/NARC's capacities to produce appropriate quantities of foundation seed (G3) to feed the annual needs of the seed systems, mainly to produce certified (R1) seeds

WAATP will also provide finance to build on the gains made in the seed sector under the first phase. To this end support will include: (i) the operational cost of SLeSCA (Vehicle, bikes, etc.), the Seed Board and Seed Varietal committee; (ii) the establishment of electronic seed platform and linking it with the West African Regional Seed Platform to strengthening seed information flow (supply, demand, suppliers, supply source, price, quantity and quality, etc.); (iii) support to the seed certification and quality assurance processes – laboratory rehabilitation, equipment and reagent provision; and (iv) Support to the seed certification and quality assurance processes – laboratory rehabilitation, equipment and reagent provision; (v) Training of Laboratory Technicians – SLeSCA Seed Quality Testing (Moisture Content, Purity Analysis, Germination & Seed Health Testing) (5), Field Technicians: Seed field Inspections (16), Variety Testing (11); (vi) Establish a workable seed system , including: Support experience exchanges with other seed companies in the region; (vii) Provide specialized technical/extension and marketing services to seed producers (viii) Identify and train FBOs as specialized seed farmer associations purposely for certified seed

multiplication in the country - priority shall be given to women and youths FBOs; (ix) Establish a network of commodity based agro-dealers across the country.

Recommendations

In Sierra Leone seed system is still dominated by local or farmer seed system (80-90%). Therefore linking formal and farmers' seed systems and improving the latter may in many cases be a more effective strategy to improve national and local seed supply than aiming only at improving the infrastructure and investment climate for the formal (private and public) seed sector. In fact, analysis of strengths and weaknesses of both the farmer and formal seed system shows important complementarity in strength and weaknesses between the two systems, which offers multiple opportunities for improving the effectiveness of both.

There is growing dearth of breeder and foundation seed supply from Research, SMP and Universities. Little or no breeding is taking place at the Universities. The Research and Seed Multiplication programme of MAF should be funded adequately and supported to produce breeder and foundation seeds. Universities like Njala University should also be capacitated to conduct crop improvement or breeding activities and seed multiplication.

Government is striving to liberalize seed trade. It is therefore expedient to fast track its transformation of SMP to a private to create even plane field for competition with other private seed companies. Private Seed Companies should be supported with loans from commercial banks and other institution with lower interest rates. These enterprises have the potential to become more important in the future, due of their proximity to farmers and ability to meet location-specific needs, especially in terms of adapted varieties and reduced transportation costs for seeds. There are massive potentials in the country to be tapped both in the informal and formal sectors if their capacities are strengthened. Nevertheless, the establishment of SLeSCA for quality assurances has gone long way in sanitizing the entire seed sector in the country.

There is now seed policy, Law and regulations in the country but these regulations need to be enforced by SLeSCA by the relevant authorities in order to sanitize the seed system. Training and awareness creation on the need for seed certification and quality control. Should be done.

Inefficient seed production, distribution and quality assurance systems as well as bottle necks caused by lack of good seed policy on key issues such as access to credit for inputs are major factors that need to be tackled if farmers are to benefit from quality improved crop varieties produced in the country.

There is need for the development of a sustainable seed system will ensure that high quality seeds of wide range of varieties and crops are produced and fully available in time and affordable to farmers and other stakeholders.

PPP seed delivery system is a priority area that is consistent with the development objectives of Government of Sierra Leone to substantially increase food production and farmers income which in the long run would contribute to poverty reduction and enhanced food security.

[Likely impact from the improvement of access to improved seed by smallholder farmers](#)
Access to improved quality seed is important towards providing stability in food security in the country to accelerate socio- economic development and political stability. It plays a dominant role and has an invaluable contribution as an agro-input in increasing crop yields, productivity and profitability of small holder farmers.
