Sierra Leone Country Report 2021

The African Seed Access Index

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TASAI
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CONTENTS

LIST OF ACRONYMS:

CGIAR	Consultative Group on International Agricultural Research
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
DUS	Distinctness, Uniformity, and Stability
ECOWAS	Economic Community of West African States
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IITA	International Institute of Tropical Agriculture
INSAH	Institute for Drought Control in the Sahel
IRRI	International Rice Research Institute
LSB	Local Seed Business
MAF	Ministry of Agriculture and Forestry
NARC	Njala Agricultural Research Centre
NERICA	New Rice for Africa
NGO	Non-governmental Organization
NSB	National Seed Board
OPVs	Open Pollinated Varieties
RARC	Rokupr Agricultural Research Centre
SLARI	Sierra Leone Agricultural Research Institute
SLESCA	Sierra Leone Seed Certification Agency
SMP	Seed Multiplication Programme
UEMOA	West African Economic and Monetary Union
VCU	Value for Cultivation and Use
VRRC	Variety Release and Registration Committee

INTRODUCTION

The increased use of productivity-enhancing technologies, including mechanization, irrigation, fertilizer, and high-quality seed are critical to improving food and nutritional security across Africa. For field crops, a competitive formal seed sector is key to ensuring the timely availability of high-quality seed of improved, appropriate varieties at affordable prices for smallholder farmers. High-quality seed can deliver state-of-the-art technology to farmers, offering higher yields, disease and pest resistance, climate change adaptation, reduced post-harvest losses, and improved nutrition. To facilitate delivery of these benefits to end users, The African Seed Access Index (TASAI) conducts seed industry assessments at the national level and uses the findings to encourage public policymakers and development agencies to create and maintain enabling environments that will accelerate the development of competitive formal seed systems serving smallholder farmers in Africa.

This report summarizes the key findings of the study conducted by TASAI in 2018 and updated in 2021 to appraise the structure and economic performance of Sierra Leone's formal seed sector.[1] TASAI studies focus on the four grain and legume crops important to a country's food and nutritional security (the "four focus crops"). In Sierra Leone, these crops are maize, rice, sorghum, and groundnut. The cultivation of these four crops covers 83% of the country's harvested area under cereals and pulses[2]. Rice is the most important cereal crop in Sierra Leone, accounting for over 75% of the area harvested to cereals in the country (Seed Systems Group 2020).

OVERVIEW OF SIERRA LEONE'S FORMAL SEED INDUSTRY

Like most other African countries, Sierra Leone's seed industry consists of two systems: the informal and formal sectors. This Country Report focuses almost exclusively on the formal seed sector.

The informal sector refers to a system in which seed is produced, maintained, and distributed through informal networks. These activities "tend to be decentralized and might revolve around local entrepreneurship, seed banking, community-based seed production, or seed villages" (McGuire & Sperling, 2016). In many cases, farmers keep seed from the harvest and exchange it with neighbors, relatives, and through rural markets. Seed from this system is of variable varietal purity, and physical and sanitary quality[3]. In Sierra Leone, the informal seed sector is predominant and supplies up to 92% of rice seed (Seed Systems Group, 2020).

The formal sector is a structured and regulated value chain for the production of improved seed varieties. This process involves many actors and institutions, and activities from breeding varieties to the multiplication, processing, and distribution of certified seed. The different stages of improved seed production are regulated by governments, based on approved regulations and standards. The sale of seed from this system takes place through limited distribution channels such as registered seed companies, cooperatives and individuals, and agro-dealers. This system produces seed of the highest varietal purity and physical and sanitary quality. Sierra Leone's seed policy 2009 (MAFS, 2009) set the development pace for the seed sector by encouraging the modernization and evolution of the informal seed sector to the formal sector. The structure and activities in the formal seed sector in Sierra Leone are guided by the Sierra Leone Seed Certification Agency Act, 2017 (Government Printing Department of Sierra Leone, 2018), and the Sierra Leone Seed Certification Agency Regulations 2020 (The Sierra Leone Gazette, 2020).

1 The study in 2018 was halted in 2018 due to funding delays and was restarted in 2021. Wherever possible given the limitations of time and costs, we refreshed the data to present a picture that is as up to date as possible (See Table 2 for the indicators surveyed in 2021).

2 FAOSTAT http://www.fao.org/faostat/en/#data/QC

3 See seed system definitions at https://www.agrilinks.org/post/seed-system-definitions

Table 1 lists the agencies in charge of various aspects of Sierra Leone's seed industry. The Sierra Leone Agricultural Research Institute (SLARI) is the main public research institution in charge of variety development, and works in close collaboration with the centers of the Consultative Group on International Agricultural Research (CGIAR). Prior to the formation of the Sierra Leone Seed Certification Agency (SLeSCA) in 2014, SLARI served both as the developer of plant varieties and as a seed quality control unit to ensure the quality of breeder and foundation seeds it produced. The recently formed National Seed Board (NSB) has constituted the Variety Registration and Registration Committee (VRRC) to coordinate all activities related to applications for variety evaluation and release. Seed production and marketing is mainly by seed companies, cooperatives, and individual seed producers, though NGOs and SLARI are sometimes involved. Sierra Leone does not have an umbrella body for agro-dealers or a national seed trade association.

Table 1: Role of key players in Sierra Leone's formal seed sector

ROLE	KEY PLAYERS
Research and breeding	Sierra Leone Agricultural Research Institute (SLARI), Consultative Group on International Agricultural Research (CGIAR) centers, private companies
Variety release and registration	Sierra Leone Seed Certification Agency (SLeSCA), Variety Release and Registration Committee (VRRC), National Seed Board (NSB)
Seed production and processing	Seed companies, seed cooperatives, individual producers, Seed Multiplication Programme (SMP)
Education, training, and extension	Universities, SLARI, Ministry of Agriculture and Forestry (MAF) (Extension Division), SLeSCA
Distribution and sales	SLARI, MAF, seed companies, seed cooperatives, agro-dealers, Non-Governmental Organizations (NGOs)

METHODS

TASAI studies cover 22 indicators divided into 5 categories: **Research and Development, Industry Competitiveness, Seed Policy and Regulations, Institutional Support, and Service to Smallholder Farmers**[4] (Table 2). In most TASAI studies, the bulk of the performance data reported comes from the year preceding the study ("the study year") because this is the most recent data available. Accordingly, the data reported in this Country Report pertain primarily to 2017 and 2018. However, as indicated in Table 2, additional data was collected in 2021 on select indicators.

Table 2: TASAI Indicators

		Crop-specific	Impact on seed access	Revised in 2021
A	**RESEARCH AND DEVELOPMENT**			
A1	Adequacy of active breeders	**Yes**	+	**No**
A2	Number of varieties released	**Yes**	+	**Yes**
A3	Number of varieties with 'special' features	**Yes**	+	**No**
A4	Availability of basic seed	**Yes**	+	**No**
B	**INDUSTRY COMPETITIVENESS**			
B1	Number of active seed companies/producers	**Yes**	+	**Yes**
B2	Quantity of seed produced and sold	**Yes**	+	**Yes**
B3	Number of varieties sold and dropped	**Yes**	+	**No**
B4	Average age of varieties sold	**Yes**	-	**No**
B5	Market concentration	**Yes**	-	**No**
B6	Market share of state-owned seed company	**Yes**	-	**No**
B7	Efficiency of seed import/export processes	**Yes**	+	**Yes**
C	**SEED POLICY AND REGULATIONS**			
C1	Length and cost of variety release process	**Yes**	-	**No**
C2	Status and implementation of national seed policy framework	**No**	+/-	**Yes**
C3	Harmonization with regional regulations	**No**	+	**Yes**
C4	Adequacy of efforts to eradicate counterfeit seed	**No**	+	**Yes**
C5	Use of government subsidies	**No**	+/-	**Yes**
D	**INSTITUTIONAL SUPPORT**			
D1	Performance of national seed association	**No**	+	**No**
D2	Adequacy of seed inspection services	**No**	+	**Yes**
E	**SERVICE TO SMALLHOLDER FARMERS**			
E1	Availability of agricultural extension services for smallholder farmers	**No**	+	**Yes**
E2	Concentration of agro-dealer network	**No**	+	**Yes**
E3	Availability of seed in small packages	**Yes**	+	**No**
E4	Seed-to-grain price ratio at planting time	**Yes**	-	**No**

4 The list of indicators and recent TASAI data are available at https://tasai.org/wp-content/uploads/TASAI-Appendix_CURRENT.pdf

To assess the progress of Sierra Leone's formal seed sector, the present Country Report draws comparisons between the 2017 and 2021 data, when data was available for 2021. In addition, since TASAI has conducted similar studies in 20 other African countries, this report also draws relevant cross-country comparisons.

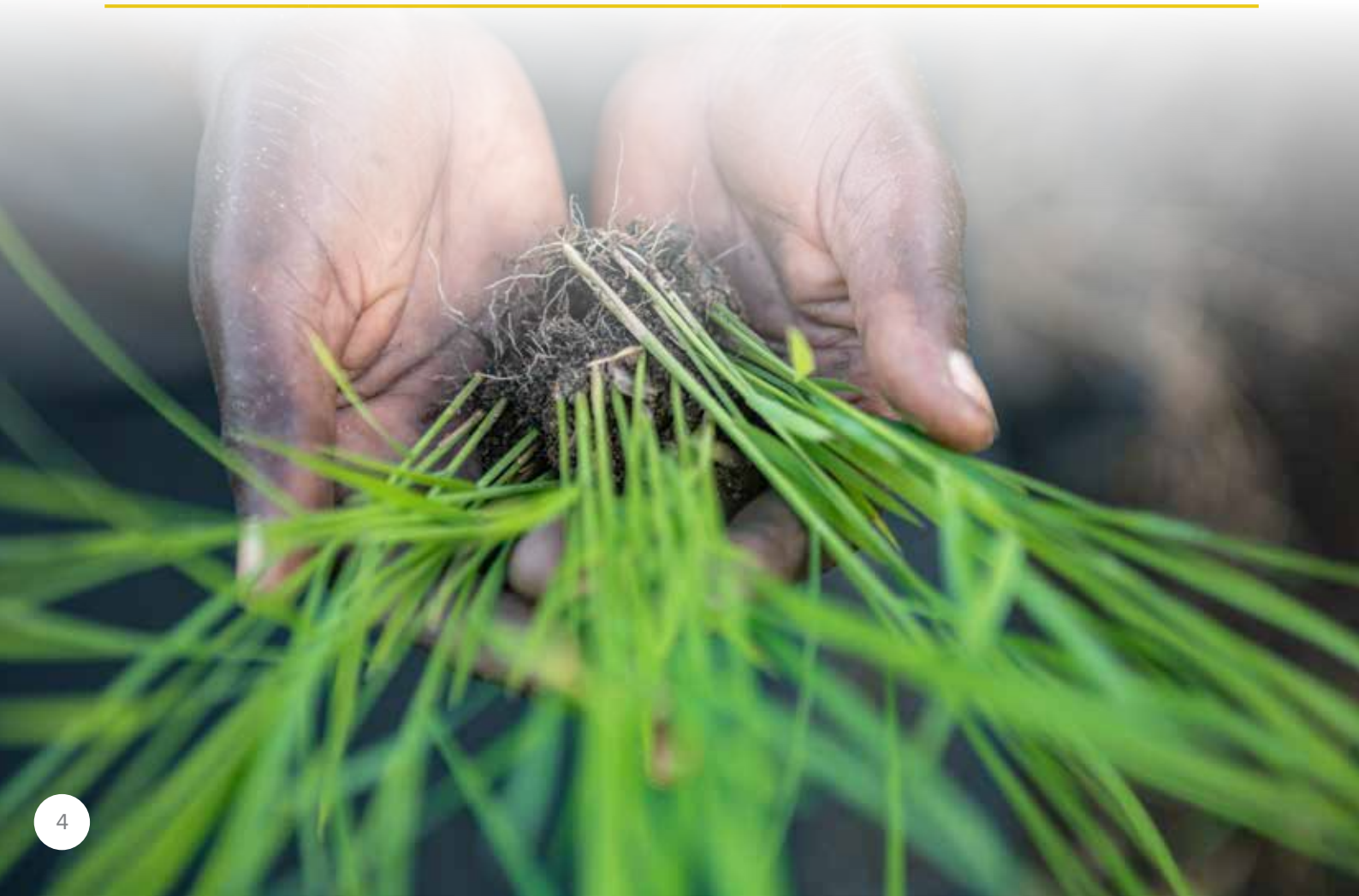
Using TASAI survey tools, data collection focused on three key seed industry players: seed producers (seed companies, seed cooperatives, and individual seed producers), plant breeders, and representatives of government entities active in the country's seed sector. Of these, seed producers were the study's primary source of information. For several indicators, TASAI supplemented quantitative data with industry opinion, in which respondents were asked to rate various aspects of the seed sector in Sierra Leone on a scale of 0-100, color-coded as follows: 0-19.99% extremely poor, 20-39.99% poor, 40-59.99% fair, 60-79.99% good, and 80-100% excellent.

Table 3 presents a breakdown of the active seed producers by crop in 2017 and 2020. The active seed producers in 2017 were all interviewed for the TASAI study. Seed producers are counted as active when they are registered by the SLeSCA[5]: in 2017, 43 seed companies, seed cooperatives, and individual seed producers. In 2020, the number of registered seed producers was 46.

5 SLeSCA have in place criteria for registering seed companies, seed cooperatives, and individual seed producers, as well as other industry actors (processors, importers/exporters).

Table 3: Active seed producers

Crop	Number of active seed companies, seed cooperatives and producers	
	2017	2020
Rice	43	46
Maize	22	21
Sorghum	24	15
Groundnut	25	28



RESEARCH AND DEVELOPMENT

NUMBER OF ACTIVE BREEDERS

A functioning seed system needs vibrant public and private breeding programs to develop improved varieties that respond to farmer and consumer needs. The number of active breeders is indicative of the level of investment in research and development[6] In addition to tracking the number of breeders working on the four focus crops, this study measures the level of satisfaction reported by seed producers with the public breeding programs The latter can offer an indication of the ability of active breeders in public institutions to produce new varieties.

Table 4 shows the number and adequacy of active breeders in Sierra Leone in 2017. There were 15 active breeders for the four focus crops – 10 for rice, two each for groundnut and sorghum, and one for maize. Nearly all of these breeders (14 out of 15) were employed in the two public research centers under the Sierra Leone Agricultural Research Institute (SLARI): the rice, maize and sorghum breeders worked at the Rokupr Agricultural Research Centre (RARC) in the northwestern region, and the groundnut breeder worked at the Njala Agricultural Research Centre (NARC) in the southern region. The private breeder worked on sorghum in the northwestern region.

The breeders at the two SLARI centers work closely with four centers of the Consultative Group on International Agricultural Development (CGIAR): AfricaRice, the International Institute of Tropical Agriculture (IITA), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and the International Rice Research Institute (IRRI)[7]. On average, seed producers were not satisfied with the number of active breeders for the four crops. The highest level of satisfaction was reported for rice at 44% (“fair”). The level of satisfaction with the number of available breeders was “poor” for sorghum (23%) and “extremely poor” for groundnut (18%) and maize (16%).

Figure 1 shows the number of rice breeders in countries studied by TASAI where rice is one of the four focus crops. Sierra Leone is second to Madagascar’s highest number of rice breeders. This indicates that Sierra Leone has one of the basic requirements for building a rice breeding program – important, since rice is the leading food crop in the country.

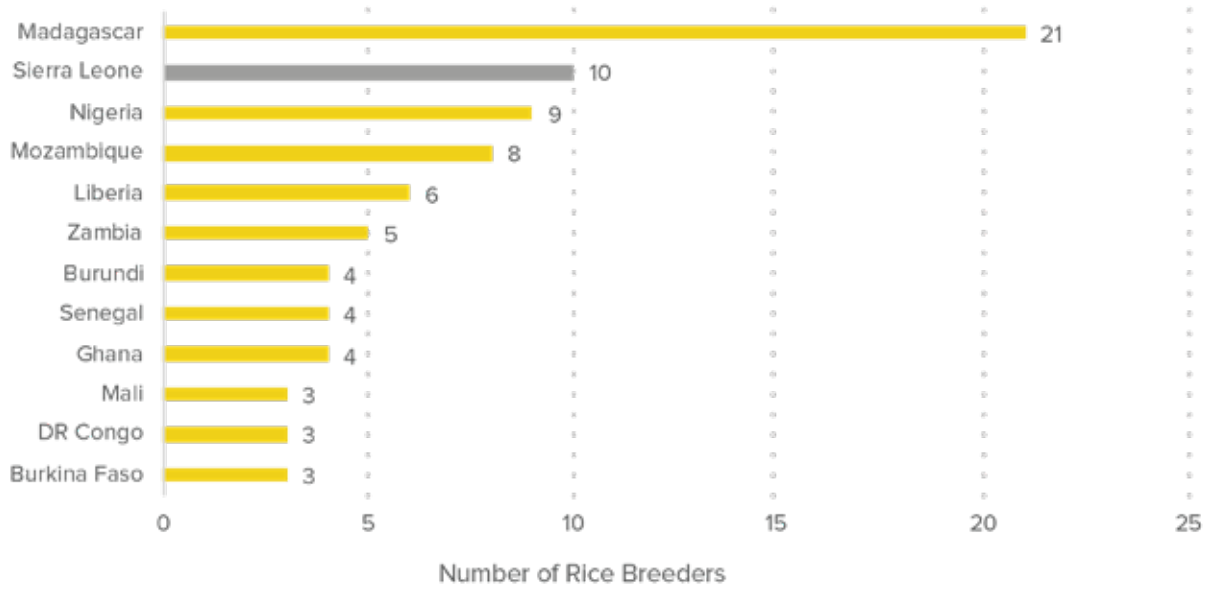
6 TASAI studies define an “active breeder” as a breeder who is currently engaged in breeding/maintaining a variety, or a breeder who had either developed and released at least one variety or was developing a variety of the crop of interest at the time of the TASAI study.

7 Note that in this indicator, TASAI only considers public breeders and not those from the international research institutes.

Table 4: Number and adequacy of active breeders in Sierra Leone

Crop	Number of active breeders in 2017			Satisfaction with breeders (out of 100%)	
	Public	Private	Total	Rating out of 100%	Interpretation
Rice	10	0	10	44%	Fair
Maize	1	0	1	16%	Extremely poor
Sorghum	1	1	2	23%	Poor
Groundnut	2	0	2	18%	Extremely poor
Total	**14**	**1**	**15**		

Figure 1: Number of rice breeders across countries studied by TASAI (2016-2021)



VARIETIES RELEASED IN THE LAST THREE YEARS

The number of varieties released in a given period is a good measure of the performance of the variety development and release system. The greater the number of varieties released in a country – counted across the prior three years - the higher the chances of enhancing smallholders' access to improved seed. In addition to higher yields, new varieties often carry desired traits such as climate smartness, disease and pest resistance, and nutrition enhancement. However, TASAI recognizes that release of varieties needs to be supported by commercialization and bulking of parental seed before the varieties become accessible to farmers.

The Sierra Leone Seed Certification Agency (SLeSCA), the government institution in charge of seed inspection and certification, also serves as the secretariat of the Variety Release and Registration Committee (VRRC). The committee is responsible for releasing varieties and registering them in the National Catalogue of Plant Species and Varieties.

Between 2000 and 2020, the VRRC released 12 rice varieties (seven of which were released in 2014, five in 2015), and 1 sorghum variety (2020). There were no releases for maize and groundnut. In 2016, all 12 varieties were added to the ECOWAS Catalogue of Plant Species and Varieties. The lack of variety releases prior to 2014 was largely due to longstanding conflicts in the country that dated back to the 1990s. The conflicts ended in 2002; plant breeding programs resumed work in 2005. Among the varieties submitted for release in October 2014, several were not released due to incompleteness or inadequacy of the information submitted by breeders (MAFFS, 2014): specifically, incomplete results from the Distinctness, Uniformity and Stability (DUS) and Value for Cultivation and Use (VCU) tests. Breeders had not met the requirement to conduct tests in multiple locations and had provided the VRRC an inadequate quantity of breeder seed.

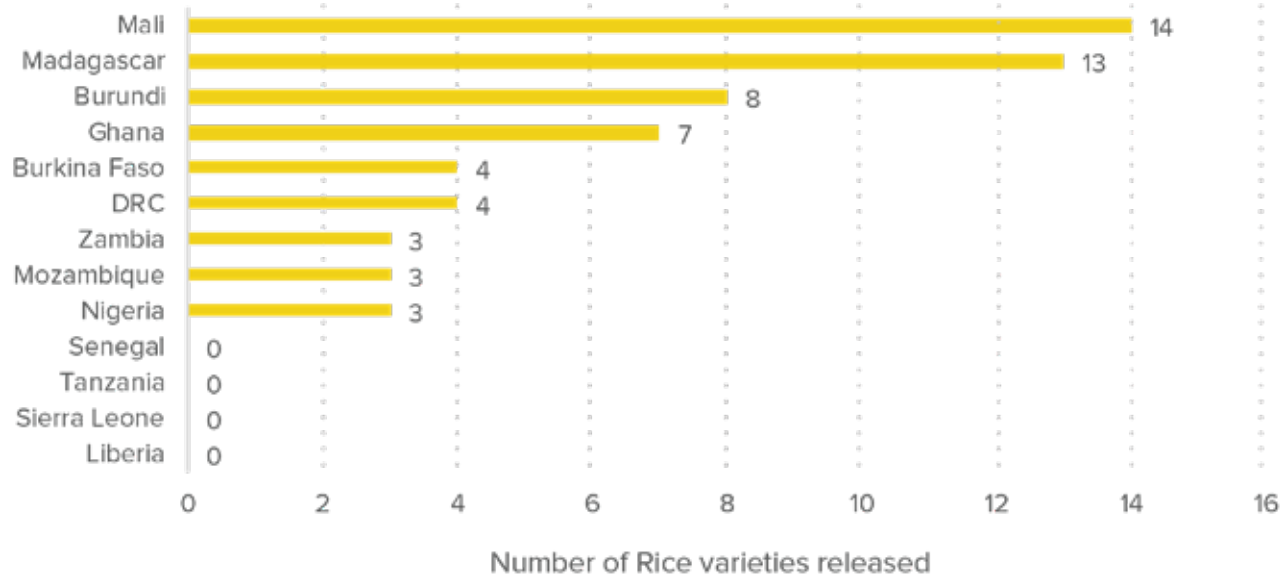
Figure 2 shows the number of rice varieties released in the last three years in twelve countries surveyed by TASAI. While the number of rice varieties released is quite low in all countries, Sierra Leone is one of four countries that did not release any variety.

Table 5: Number of varieties released and 3-year moving average between 2014 and 2020

	Rice		Maize		Sorghum		Groundnut	
Year	Annual Counts	Moving Average	Annual Counts	Moving Average	Annual Counts	Moving Average	Annual Counts	Moving Average
2000-2013	0	0	0	0	0	0	0	0
2014	7	-	0	-	0	-	0	-
2015	5	-	0	-	0	-	0	-
2016	0	4	0	0	0	0	0	0
2017	0	1.67	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0
2020	0	0	0	0	1	0.33	0	0

Source: National Catalogue of Plant Species and Varieties, 2016 (Ministry of Agriculture, Forestry and Food Security, 2016) and 2020 (reference pending)

Figure 2: Number of varieties released in the last 3 years (2016-2021)



VARIETIES WITH SPECIAL FEATURES

Varieties may have special characteristics, for instance climate-smart, fast-cooking and nutrition-enhanced, or industry-demanded features. While acknowledging the increased biotic stress (pests, weeds, and diseases) due to climate change, TASAI studies narrowly define "climate-smart features" as those that respond to extreme weather events, such as droughts, floods and frost, that affect current farming practices. Examples of climate-smart features are drought tolerance, early maturity, or extra early maturity. To be classified as climate-smart, a crop variety must meet at least one of two criteria: early maturity and/or tolerance to extreme weather conditions, such as drought, flooding, or frost. Out of the 12 rice varieties released in 2014 and 2015, five were very-early maturing, two were early-maturing and five were medium-maturing and thus met the standard for climate-smart. In addition, two of the rice varieties – ROK 36 and ROK 37 – are tolerant to flooding. All 12 rice varieties had good cooking, taste, and keeping features. None were nutritionally enhanced or had specifically industry-demanded features.

NUMBER OF VARIETIES SOLD IN 2017

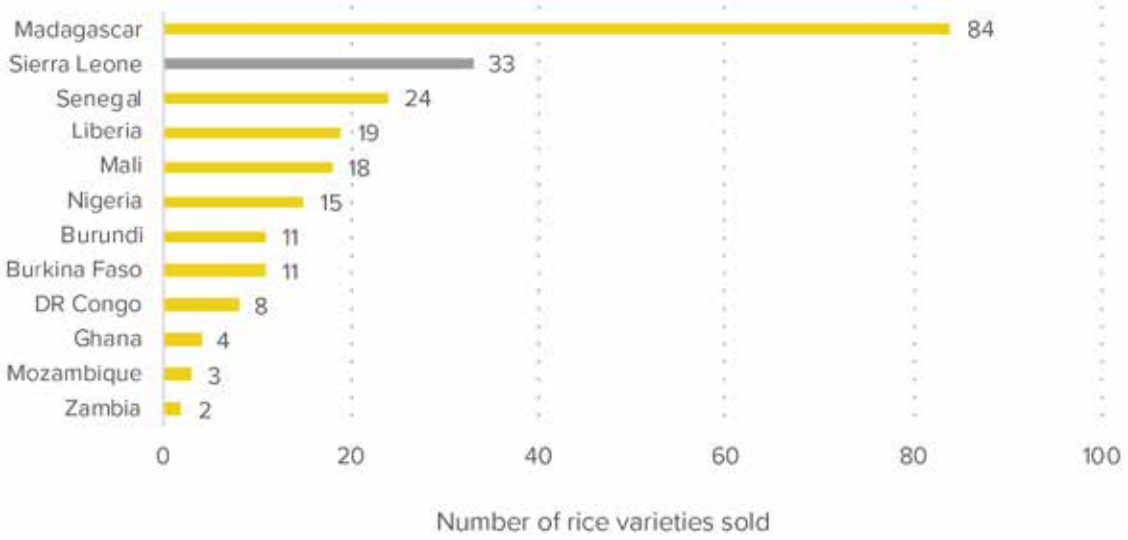
An increase in the number of varieties sold in a country often reflects an increased choice of varieties available to farmers. Table 6 shows the names of popular varieties sold in 2017 in the country. The seed producers surveyed sold a total of 63 varieties across the four crops. Of these, 33 were rice varieties, 11 were groundnut varieties, 10 were maize varieties and 9 were sorghum varieties. The calculation for popular varieties is based on the number of seed producers who sold the variety in 2017. The two popular maize and rice varieties were sold by over 70% of the seed producers.

Figure 3 shows the number of rice varieties sold in the different countries where the TASAI study has been conducted. The number of rice varieties sold in Sierra Leone in 2017 (33) is second to those sold in Madagascar (84) and is the highest in other ECOWAS countries.

Table 6: Popular varieties

Crop	Number of varieties sold in 2017	Name of popular variety sold	% of seed producers selling variety in 2017	Age of variety (years) in 2017	Average age of popular varieties
Rice (n=43)	33	Rok 34	70%	4	3.5
		Nerica L 19	70%	3	
Maize (n=22)	10	Western yellow	91%	Not released	
Sorghum (n=24)	9	Katic (white sorghum)	96%	Not released	
Groundnut (n=25)	11	Marace	64%	Not released	
		Babangiba	48%	Not released	

Figure 3: Number of rice varieties sold across countries studied by TASAI (2016-2021)



AVERAGE AGE OF VARIETIES SOLD

In vibrant seed systems, farmers regularly replace old varieties with new ones. In many African countries, old varieties persist, despite the fact that newer varieties – bred for traits that respond to demands made by farmers, consumers, and industry – often outperform the old. A lower average age of varieties signals higher rates of variety turnover. TASAI tracks the average age of varieties by crop.

The average age of popular rice varieties sold in 2017 was 3.5 years (Table 6). This is because the two most popular varieties were released in 2014 and 2015. It is worth noting that although all the popular maize, sorghum and groundnut varieties had not yet been formally released, they were being commercialized by seed producers.

SOURCES AND AVAILABILITY OF FOUNDATION (BASIC) SEED

Seed producers use basic seed to produce certified seed for sale to farmers. In many African countries, limited access to basic seed from public research institutions limits the ability of seed companies to scale up production. The general process to obtain the desired quantities of basic seed starts with the producer applying to the research institution that produces or supplies the particular basic seed, specifying the crop, variety, and quantity needed. The research institution invoices the producer for the basic seed, and upon payment, the producer receives the seed.

Table 7 shows the sources and availability of basic seed in 2017. Seed producers' main sources of basic seed are two government institutes: SLARI and the Seed Multiplication Programme (SMP). SLARI was the most important source for rice seed producers, while most maize seed producers and all the groundnut seed producers maintained their own basic seed by retaining seed from the previous season. Sorghum seed producers sourced basic seed from the Sierra Leone Brewery and the Sierra Leone Sorghum Farmers Association. However, apart from SLARI and SMP, basic seed produced by the other entities was neither inspected, nor certified as basic seed.

Availability of basic seed is a major challenge in Sierra Leone. The two government institutes (SLARI and SMP) are significantly underfunded, resulting in a shortage of basic seed for producers. Consequently, in 2017, seed producers rated the availability of foundation seed as "fair" for rice (44%), maize (42%) and sorghum (41%) and "poor" for groundnut (39%). These ratings are the lowest for the respective four focus crops across the countries studied by TASAI and signify that seed producers in Sierra Leone face serious challenges with availability of basic seed.

Table 7: Sources and availability of basic seed in 2017

Sources of basic seed	Rice (n=43)	Maize (n=14)	Sorghum (n=19)	Groundnut (n=18)
SLARI	30	3	3	0
Seed Multiplication Program	7	3	0	0
Sierra Leone Brewery	0	0	13	0
Sierra Leone Sorghum Farmers Association	0	0	5	0
Own sources	17	8	7	10
Satisfaction with availability of basic seed (out of 100%)	44%	42%	41%	39%

INDUSTRY COMPETITIVENESS

NUMBER OF ACTIVE SEED PRODUCERS

Competition breeds excellence: the presence of more active seed companies and individual producers increases competition and creates incentives for companies and individual producers to innovate and improve service delivery. A vibrant seed sector depends on a robust private sector in which seed companies invest in developing, producing, processing, and marketing improved varieties to farmers. This section tracks the number of registered seed producers that produced and marketed seed of one or more of the focus crops.

Seed producers fall into three categories: companies, cooperatives, and individual producers. Table 8 shows the number of active seed producers in Sierra Leone in 2017 and 2020. In 2020, there were 46 active seed producers for the four crops – six companies, and 40 cooperative and individual producers. Of the six companies, five were private and one was a government parastatal: the Seed Multiplication Program (SMP). The private companies are all locally owned and started operations after 2014. In 2020, there were more active seed companies and fewer active individual seed producers in 2017. In 2020, both seed companies and producers were registered by the SLeSCA. In 2017, only seed companies were registered; at the time, the SLeSCA did not have the capacity to monitor the activities of the entire sector, including cooperatives or individual seed producers, across the country.

Table 8: Breakdown of active seed producers

Crop	No. of seed producers in 2017			No. of seed producers in 2020		
	Companies	Other producers	Total	Companies	Other producers	Total
Rice	4	39	43	6	40	46
Maize	2	18	20	3	18	21
Sorghum	3	21	24	4	24	28
Groundnut	2	23	25	0	15	15
Total	**4**	**45**	**49**	**5**	**40**	**46**

PRODUCTION AND SALE OF CERTIFIED SEED

To measure the overall size of a country's seed sector, TASAI tracks the volumes of seed produced and sold for the four focus crops. The data is presented as aggregate quantities (in MT[8]) of seed sold in the data collection year, as reported by active seed producers.

Table 9 shows seed production and sales. In 2017, seed producers reported producing 3,288 MT of sorghum seed, 3,056 MT of rice seed, 902 MT of groundnut seed, and 328 MT of maize seed. In 2020, according to the SLeSCA, a total of 5,021 MT of rice seed, 3,822 MT of sorghum seed, 823 MT of groundnut seed, and 483 MT of maize seed were produced. This was an increase from the 2017 volumes of certified seed produced for rice, maize, and sorghum. For groundnut there was a decrease in volumes produced between the two years. All the seed that was produced in 2020 was certified by the SLeSCA. However, this was not the case in 2017 because, at the time, most seed producers were not registered, meaning that the seed that they produced and sold was neither inspected or certified.

8 metric ton

Table 9: Seed production and sales

Crop	Volume of seed in 2017 (in MT)		Volume of seed produced in 2020 (in MT)
	Sold	Produced	
Rice	3,065	3,056	5,021
Maize	351	328	483
Sorghum	3,260	3,288	3,822
Groundnut	858	902	823

MARKET CONCENTRATION

Competition among seed producers benefits farmers via lower prices, wider choices, increased innovation, and better customer service. TASAI uses seed sales data for each crop, as reported by seed producers, to calculate the market share of the four largest firms – also known as four-firm concentration ratio (CR4) – and the Herfindahl-Hirschman Index (HHI).[9] In 2017, the market share for the top four producers (CR4) was 95% for sorghum, 90% for groundnut, 87% for maize, and 84% for rice (Figure 4). The market share for all four crops was very high, above 80% for all crops, meaning a few seed producers dominated the seed market.

Another useful way to assess the competitiveness of a market is to look at the level of market concentration as measured by the Herfindahl-Hirschman Index (HHI). The lower the HHI scores, the more competitive the market. Sierra Leone yielded the following HHI scores in 2017: 8,476 for sorghum, 4,390 for rice, 3,781 for groundnut, and 2,775 for maize. The market shares of the top four seed producers (CR4) and the HHI results both indicate that the seed markets for all four crops were not competitive, with few players controlling large market shares.

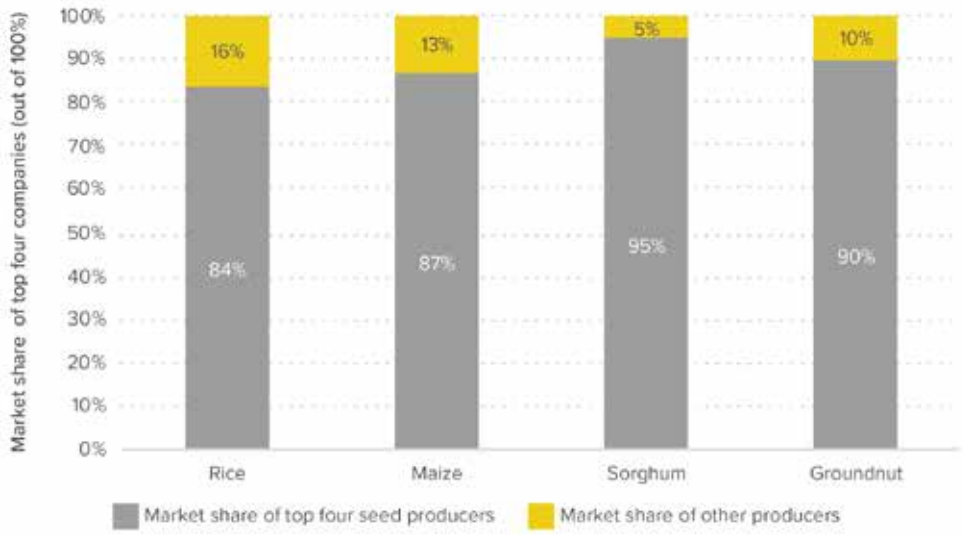
9 See below Table 10

Table 10: HHI in 2017

Crop	HHI	Interpretation of HHI
Rice	4,390	Extremely high
Maize	2,775	Moderate
Sorghum	8,476	Extremely high
Groundnut	3,781	High

The HHI is a measure of market concentration and is calculated by squaring the market share of each firm competing in a market, and then adding up the results. It ranges from close to zero for perfect competition to 10,000 for monopoly. The scale for HHI scores, ranges from extremely low to extremely high levels of market concentration: less than 1,000 is extremely low, 1,000-1,999 is low, 2,000-2,999 is moderate, 3,000-3,999 is high, and greater than 4,000 is extremely high, i.e., monopoly or near monopoly.

Figure 4: Market share of top our seed companies/producers in 2017



MARKET SHARE OF GOVERNMENT PARASTATALS

In some countries, public entities are still active players in the marketing and sale of certified seed. Public seed companies can play a critical role in supplying varieties that farmers desire, which private seed companies may consider to be less profitable. They also tend to support multiple national objectives such as university training and research, in addition to seed production. However, state-owned companies may benefit from preferential treatment, less stringent enforcement of regulations, access to competitor information, and indirect production subsidies. Collectively, these privileges can result in unfair competition against purely private seed companies. In Sierra Leone, the Seed Multiplication Programme (SMP) is the only government parastatal mandated to produce certified seed. The SMP was established in 1976 to produce basic and certified seed for all food crops. In 2017, the SMP sold 212 MT of rice seed and 26 MT of maize seed. This translates to a market share of 7% for each crop. SMP sells on the open market or through government channels (e.g., public institutions and subsidy programs), NGOs, agro-dealers, and other buyers.

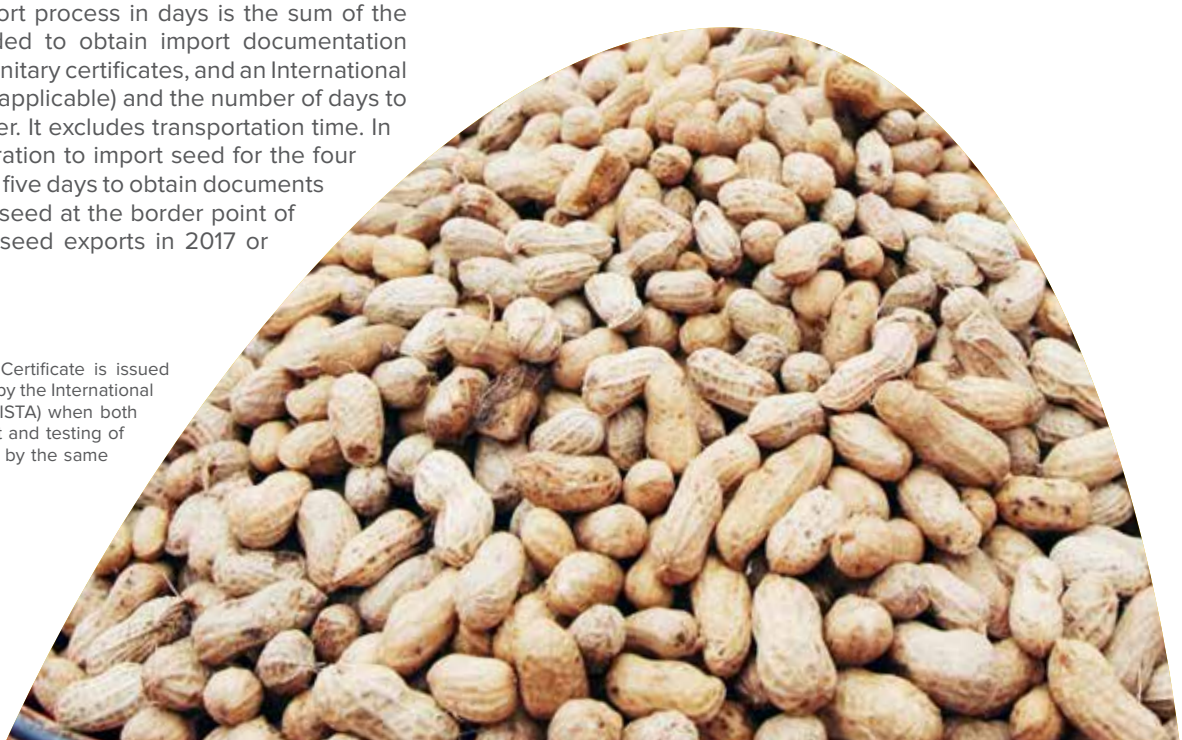
SEED IMPORT AND EXPORT PROCESSES

Efficient seed import and export processes extend the seed market beyond national borders. While seed companies benefit from an expanded market, farmers can access a wider range of varieties from across the region. Procedures for seed import and export in Sierra Leone are outlined in Part VII of the SLeSCA Act, 2017 (Government Printing Department of Sierra Leone 2018). According to the Act, seed imports/exports have the following steps: Importer/exporter declares the purpose of the transaction (personal, commercial or research purposes) with the National Revenue Authority; importer/exporter applies for import/export permit from the Sierra Leone Seed Certification Agency; importer/exporter applies for a phytosanitary certificate from the Crop Protection Unit in the Ministry of Agriculture and Forestry (MAF). In addition, in the case of imports, seed is tested by SLeSCA for germination, physical purity, varietal purity, and moisture content. There were no seed imports into Sierra Leone for the four crops in 2017. In 2020, the country imported 425 MT of rice seed, 12.8 MT of maize seed and 0.02 MT of sorghum seed. The imports were from Nigeria, Vietnam, Brazil, and Argentina (Table 11). There were no imports for groundnut seed.

Table 11: Seed imports in 2020

Crop	Source country	Aggregate volume of imports (in MT)	Number of days for import process	
			To obtain an import permit	To clear seed at the border point
Rice	Nigeria, Vietnam	425	5	3
Maize	Brazil, Argentina, Nigeria	12.8	5	3
Sorghum	Argentina	0.02	5	3

The length of the import process in days is the sum of the number of days needed to obtain import documentation (import permit, phytosanitary certificates, and an International Orange Certificate[10], if applicable) and the number of days to clear seed at the border. It excludes transportation time. In 2020, the average duration to import seed for the four crops was eight days – five days to obtain documents and three to clear the seed at the border point of entry. There were no seed exports in 2017 or 2020.



10 The International Orange Certificate is issued by a laboratory accredited by the International Seed Testing Association (ISTA) when both sampling from the seed lot and testing of the sample are carried out by the same laboratory.

SEED POLICY AND REGULATIONS

LENGTH OF VARIETY RELEASE PROCESS

Plant variety release is the process by which new varieties undergo various tests for yield, Value for Cultivation and Use (VCU), and Distinctness, Uniformity, and Stability (DUS). Varieties that perform satisfactorily in these tests are approved for release by the Variety Release and Registration Committee (VRRC). A vibrant seed sector has a functional variety release system that is well understood by the relevant actors and is followed diligently. Lengthy and/or costly variety release processes can limit the number of released varieties, which can adversely affect farmer choice. The length of the variety release process is calculated as the number of days from the date of the application to the VRRC for a variety release to the date when the variety is approved for release by the National Seed Board (NSB).

To release a crop variety in Sierra Leone, a breeder applies to SLeSCA, which acts as the Secretariat to the VRRC. The application includes a sample of the variety to be tested. SLeSCA conducts field trials for DUS and VCU and reports the results to the VRRC. Breeders are invited to the VRRC meeting to present the findings from their own field trials for comparison.

After reviewing this information, the VRRC approves or rejects the application. Approved applications are recommended to the NSB for official release and registration in the National Catalogue of Plant Species and Varieties. Breeders may appeal rejected applications.

According to Seed Regulations of 2018, the time for variety release is 24 months and all seed actors are aware of this. As shown in the section on varieties released, only rice varieties were released in 2014 and 2015. Rice breeders reported that, on average, the variety release process took 30 months. The rice breeders rated their satisfaction with the variety release process as "excellent" (81%). The total cost for variety release (including DUS and VCU trials) was US$ 206[11] per variety.

11 If a breeder appeals the decision, the application cost increases to US$ 241 per variety.

STATUS AND IMPLEMENTATION OF THE NATIONAL SEED POLICY FRAMEWORK

Well-functioning formal seed sectors have effective coordinating institutions that work well together, following rules and procedures stipulated in clearly defined and regularly updated legal instruments. Sierra Leone's seed industry is governed by the National Seed Policy (MAFS, 2009), which aims to provide the enabling regulatory and institutional infrastructure to maintain an efficient seed supply for farmers. The two policy instruments - the Sierra Leone Seed Certification Agency (SLeSCA) Act, 2017 (Government Printing Department of Sierra Leone, 2018), and the Sierra Leone Seed Certification Agency Regulations, 2020, (The Sierra Leone Gazette, 2020) are guided by the National Seed Policy.

The SLeSCA Act, 2017 establishes the SLeSCA as the government agency responsible for the control and regulation of agricultural seeds. SLeSCA's functions include the registration of all seed actors, coordinating the variety release process and maintenance of the catalogue of crop varieties. Other functions are seed inspection and certification, seed testing, and monitoring of seed supply in the country. The Act also establishes the NSB as the governing body of the SLeSCA. The SLeSCA Regulations, 2020 provide detailed operationalization mechanisms pertaining to the different mandates outlined in the SLeSCA Act. The Regulations include standards for certified seed, fees for various services, and forms to be used, for example, to apply for registration as a seed producer and to report on field inspections.

QUALITY AND ENFORCEMENT OF SEED REGULATIONS

Seed regulations give structure to the formal seed sector. The TASAI assesses the status of implementation of the seed regulations, as well as stakeholder perspectives on various aspects of seed regulations, including whether they are supportive to the growth of the seed sector, the role stakeholders play in their design and implementation, stakeholders' awareness of laws and regulations, presence of an enforcement agency, costs of regulation, and effectiveness of punitive measures.

The study assessed four key areas of implementation required under the ECOWAS regulations: i) setting up a national seed committee, ii) issuing a decree for seed import and export, iii) updating the national variety catalogue, and iv) creation of a seed support fund. Of these four, three have been instituted in the SLeSCA Act and Regulations and are being implemented, as detailed below.

The National Seed Board (NSB): Formed in 2014, the NSB serves as the national seed committee. The NSB is chaired by a seed industry expert appointed by the President on the recommendation of the Minister of Agriculture and Forestry (MAF). The NSB includes representatives from the MAF, SLARI, Ministry of Trade, Ministry of Finance, Sierra Leone Standards Bureau, Njala University, and the National Federation of Farmers in Sierra Leone. SLeSCA's Executive Director serves as secretary to the NSB, which meets annually.

Decree for seed imports and exports: The SLeSCA Act and SLeSCA Regulations provide detailed guidelines to support the import and export of seed into and from Sierra Leone. The two instruments outline the steps and the roles played by the different institutions that facilitate seed trade. These details are outlined in the section on the seed import process. The guidelines for import and export are being followed.

Updating the national variety catalogue: The National Catalogue of Plant Species and Varieties has not been updated regularly. The last update was in 2016 (MAFFS, 2016), due to lack of SLeSCA funding.

Seed Support Fund: The Seed Sector Support Fund (SSSF) has been established. The SLESCA opened an account for funds from the registration and licensing of seed industry actors, fees for seed inspection and testing, and licenses for seed processing and storage facilities are to be used for seed sector development. However, the NSB has yet to determine the specific activities to be supported by the SSSF.

EFFORTS TO ERADICATE COUNTERFEIT SEED

Counterfeit seed (also known as fake seed) threatens the seed sector in two important ways. First, it reduces farmers' confidence in certified seed when farmers unknowingly plant inferior-quality grain labeled as certified seed. Second, it threatens the success of efforts to increase the adoption of improved varieties because farmers are not sure which seed is genuine. TASAI tracks the number of cases of counterfeit seed reported by seed companies and the government in the data collection year. In addition, seed companies report their level of satisfaction with government efforts to eliminate counterfeit seed.

The SLeSCA Act outlines a list of offences commonly associated with counterfeit seed, including selling seed without a license, selling untested seed, and tampering with seed labels. Offenders are liable to a penalty of US$ 500, a term of imprisonment not exceeding 3 months, or both. SLeSCA has established a Seed Inspection Department and has been in communication with NGOs to ensure that they only procure seed from registered seed dealers. As a result of these measures, SLeSCA recorded 10 cases of counterfeit seed in 2020, less than a quarter of the 42 cases reported in 2017. According to SLeSCA, these cases were mainly driven by the COVID-19 pandemic which increased the demand for seed by farmers. This caused some seed dealers to bypass formal procedures of seed inspection and certification.

Implementation of the law through the establishment and functioning of the SLeSCA is a significant improvement in government efforts to address the problem of counterfeit seed.

USE OF GOVERNMENT SUBSIDIES

Seed subsidies are intended as a short or medium-term measure to encourage farmers to adopt improved crop varieties. The design and execution of subsidy programs, in terms of the scale, targeting, distribution arrangements, and payment systems, may contribute to the development of the seed market in positive ways, but may also be disruptive to market forces.

MAF has implemented an agricultural input subsidy program since 2002 (Ministry of Agriculture Forestry and Food Security, 2002). The program procures seed, fertilizers, and machinery to distribute to farmers. In the 2016/17 planting season, MAF procured 1,058 MT of certified rice seed from seed producers: 35% of total rice seed sales. The seed was distributed to 3,627 farmers and farmer-based organizations. While seed producers welcomed the "ready" market for the seed they produce, they expressed dissatisfaction with payment delays after delivering their seed to the government.

In 2020, MAF implemented a new subsidy program called the Seed Loan Distribution Program (Ministry of Agriculture and Forestry, 2020). The program ran from May to December 2020. The program only focused on rice seed and targeted individual farmers and farmers' associations. Under the program, participating farmers received 50 kg of rice seed. The seed was distributed by MAF after it had been verified as certified seed R112 by the SLeSCA. The farmers paid back 50 kg of rice seed (certified seed, R2) after harvest. The R2 certified seed was then distributed to other farmers.

12 R1 is the first generation of certified seed and 2 is the second generation. The two are recognized in the ECOWAS regulations.

INSTITUTIONAL SUPPORT

QUALITY OF THE NATIONAL SEED TRADE ASSOCIATION

Well-functioning national seed trade associations play a key role in representing the interests of the industry and engaging with the government. Membership of national seed associations often includes seed companies, seed cooperatives, seed associations, individual seed producers, and at times agro-dealers. Sierra Leone does not have a seed traders' association, and seed producers are not organized under any umbrella organization. In the absence of an official body representing the interest of the seed industry, there is no organized method for the industry to engage with the public sector, especially on matters of policy and regulatory reform. Of the 20 countries covered by TASAI studies, Sierra Leone and Liberia are the only two countries that do not have a national seed trade association.

ADEQUACY OF SEED INSPECTORS

Seed inspection services ensure that certified commercial seed meets regulatory quality standards. Adequate inspection services require sufficient numbers of well-resourced inspectors. TASAI tracks the number of inspectors and other information pertinent to their effectiveness, such as the availability of resources and the use of (new) digital tools.

Due to a lack of funding, the SLeSCA's Seed Inspection Department has a shortage of inspectors. In 2020, the SLeSCA added five inspectors, increasing the total to ten from the five inspectors in 2017. MAF has requested funding from the government and hired an additional 6 seed inspectors in 2021 and appointed a full-time Executive Director (previously an interim position supported by several part-time staff members seconded from SLARI and MAF). MAF has approached the West and Central African Council for Agricultural Research and Development (CORAF), the implementing institution of the West Africa Agricultural Transformation Project (WAATP), for assistance in developing a certification and accreditation system for private seed inspection services. In addition, SLeSCA has received support from the African Development Bank, under the Agribusiness and Rice Value Chain Support project. Part of this support is directed towards building capacity of seed inspectors. TASAI did not collect company satisfaction ratings in 2020; in 2017, seed producers rated their overall satisfaction with seed inspection services as "extremely poor" (19%), clearly signaling a need for improvement.

SERVICE TO SMALLHOLDER FARMERS

ADEQUACY OF EXTENSION SERVICES

Well-functioning agricultural extension services are critical to the successful adoption of improved seed by smallholder farmers. TASAI tracks the average number of agricultural households served by one extension officer. The lower this ratio, the better access farmers have to expert information and advice on how to access and use improved seed and other relevant agricultural technologies. This indicator tracks number of extension officers by sector (public and private); it is not crop-specific.

Table 12 shows the number and adequacy of agricultural extension workers in 2020. Sierra Leone had 795 agricultural extension officers. The majority (684) are employed by the Agricultural Extension Services division of MAF. The remaining 111 extension workers are employed by seed companies and seed cooperatives. MAF has not hired any new extension officers since 2017; none of the officers have left the service. Most of the seed producers who were interviewed in 2017, (33 out of 49) employed between 1 and 13 extension workers each, with an average of 3 extension workers per producer. There were about 732,000 agricultural households in Sierra Leone (Statistics Sierra Leone, 2015). Since there was no current data on the number of agricultural households in Sierra Leone in both 2017 and 2020, we estimated the number of agricultural households using the country's population, for the two years. Accordingly, Sierra Leone's population grew by 2.2% during the 2015-2017 period and 2.1% during the 2017 -2020 period (World Bank Data, 2021). Applying this growth rate, we extrapolated the number of agricultural households in 2017 to be 763,956,208 and in 2020 they were 813,271. This gave a ratio of extension officers to agricultural households of 1: 1,023 in 2020. Although this ratio is lower than in many African countries, it is higher than the 1:560 in Zambia (Mabaya et al., 2019a), 1:127 in Zimbabwe (Mabaya et al., 2019b), and 1:124 in Rwanda (Waithaka et al., 2019). Seed producers were dissatisfied with the availability of public extension workers in the country, rating it as "poor" (24%).

Table 12: Number and adequacy of agricultural extension workers

Indicator	2020
Number of agricultural extension officers	795
Ratio of extension officers to agriculture households	1:1,023
Satisfaction with extension services in 2017 (out of 100%)	24%

CONCENTRATION OF THE AGRO-DEALER NETWORK

Agro-dealers play a key role in Africa's seed distribution systems, connecting seed growers to individual farmers, especially in hard-to-reach rural areas. They are often the main point of sale for certified seed. A higher concentration of agro-dealers means that smallholder farmers have greater access to improved seed. TASAI tracks the number of agro-dealers and, where possible, disaggregates registered and non-registered agro-dealers. This indicator is not crop specific.

SLeSCA is responsible for registering and training all seed dealers (including agro-dealers) in Sierra Leone. Table 13 shows the number and adequacy of agro-dealers in 2017. In 2020, SLeSCA had registered 69 agro-dealers, an increase from the 43 agro-dealers who were registered in 2017. However, the number is still very low. Using the calculated number of households from the previous section, resulted in a ratio of one agro-dealer for every 17,766 agricultural households in 2017. The increase in agro-dealers reported in 2020 gives a ratio of one agro-dealer to 11,787 agricultural households – still very high, indicating that many farmers do not have access to agro-dealers.

Table 13: Number and adequacy of agro-dealers

Indicator	2017	2020
Number of agro-dealers	43	69
Ratio of agro-dealers to farming households	1:17,766	1:11,787
Satisfaction w/ agro-dealer network (out of 100%)	26%	

AVAILABILITY OF SEED IN SMALL PACKAGES

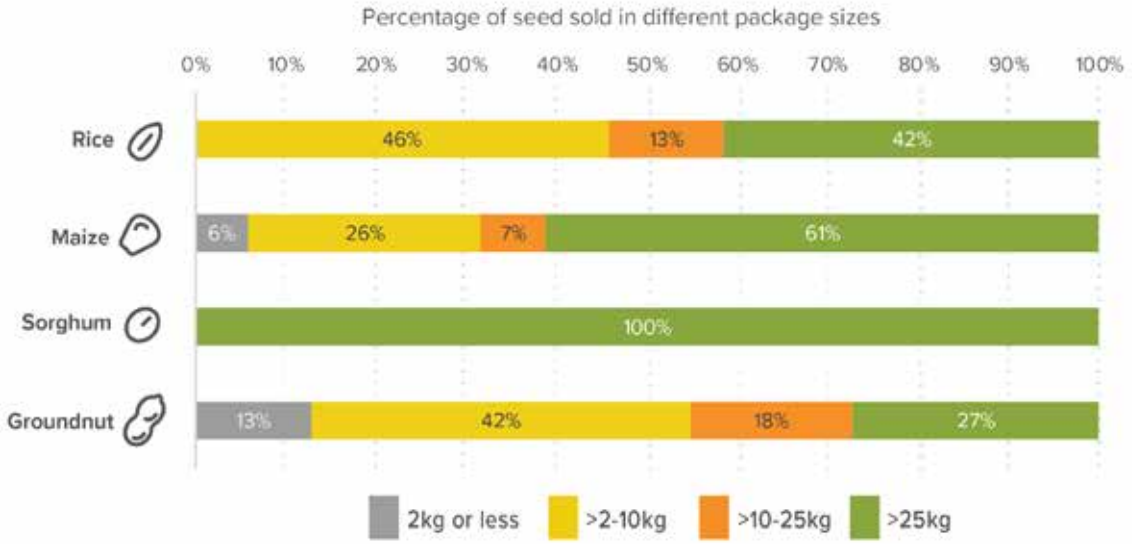
Because most farmers in Sub-Saharan Africa operate on a small scale, making seed available in small, more affordable packages is a good way to increase adoption rates of certified seed. TASAI tracks the percentage of seed sold in different package sizes, i.e., 2 kg or less, 2-10 kg, 10-25 kg, and above 25 kg. Table 14 shows the percentage of seed sold in small packages in 2017. Most seed producers (84%) packaged their seed before it was sold. However, only 13% of groundnut seed and 6% of maize seed were sold in packages of 2 kg or less and no sorghum or rice seed was sold in the smallest packages.

Figure 5 shows a breakdown of the percentage of seed sold in different package sizes for the four crops in 2017. All sorghum seed and close to 2/3 (61%) of maize seed was sold in package sizes of 25 kg or more. The reason for the large package sizes is that the seed market in Sierra Leone is not yet developed; seed companies do not sell seed in small packages due to the cost, given low demand from small farmers. Most seed is sold in large package sizes targeting large commercial farmers.

Table 14: Seed in small packages in 2017

Crop	% of seed producers who package their seed	% of seed in packages of 2kg or less
Rice (n=43)	79%	0%
Maize (n=22)	95%	6%
Sorghum (n=24)	79%	0%
Groundnut (n=25)	88%	13%

Figure 5: Percentage of seed sold in different package sizes in 2017



SEED-TO-GRAIN PRICE RATIO

The seed-to-grain price ratio at the time of planting is a good measure of the affordability of improved seed. Many smallholder farmers end up making a choice between purchasing seed from the formal sector or planting grain. The greater the price difference between the two, the less likely that resource-poor farmers will purchase certified seed. TASAI tracks the ratio of the retail price of seed (at agro-dealer level) vis-à-vis the market price of grain at the time of planting. Table 15 shows the price of seed and grain for the four crops in 2017, and the seed-to-grain price ratios. The seed-to-grain price ratios for the four crops were all below 2:1. This is expected since there were no hybrid varieties in the market. Hybrid varieties tend to be more expensive than open pollinated varieties. In addition, in 2017, the price of seed was low because not all of the seed was inspected and certified by the SLeSCA, further reducing the cost of seed sold to farmers.

Table 15: Seed-to-grain price ratios for various crops in 2017

Crop	Seed price (US$/kg)	Grain price (US$/kg)	Seed/grain price ratio
Rice	1.05	0.78	1.33:1
Maize	4.65	3.25	1.43:1
Sorghum	1.22	1.07	1.14:1
Groundnut	2.09	1.78	1.18:1

13 Exchange rate on 25th February 2021 (US $ 1 = Le 8,610)

CONCLUSION

Sierra Leone's seed sector is at the nascent growth stage (Ariga et al., 2019). The early growth stage is characterized by incomplete or emerging seed policy environments, a few seed companies and producers who produce and sell a limited range of staple crops, with governments and NGOs still playing a significant role in the sector. With the majority of farmers relying on informal seed sources for the key crops, there is significant room for growth of the formal seed sector. The Sierra Leone TASAI country report highlights several positive aspects about the country's seed industry as well as challenges constraining growth.

Under the **research and development category,** SLARI faces human resource capacity constraints and is significantly underfunded, limiting the institution's capacity to produce and maintain early generation seed for all crops. These constraints have led to the unavailability of basic seed of improved varieties, which has a ripple effect on the availability of high-quality seed to farmers. The ratings on availability of basic seed are the lowest for the four focus crops across the countries studied by TASAI and signify serious challenges with availability of basic seed in Sierra Leone.

In the **industry competitiveness** category, the low volumes of certified seed produced for maize, cowpea, and sorghum suggest ample room for growth. One improvement since 2017 is that, as of 2020 all seed producers (not just seed companies) were required to register with SLeSCA – a step toward enhancing the production and sale of quality seed in the country.

In the **seed policy** environment, the SLeSCA Act, 2017 established SLeSCA as the body that coordinates seed sector work in the country. The Seed Regulations, 2020 provide the regulatory framework under which SLeSCA operates. The Seed Regulations have been conformed to the ECOWAS Harmonized Seed Regulations, and will provide the seed industry in Sierra Leone with increased access to plant varieties already listed in the West Africa Catalogue of Plant Varieties and Species. However, to be useful to seed producers and farmers, the national variety catalogue needs to be updated more frequently.

SLeSCA has established a Seed Inspection Department and has been in communication with NGOs to ensure that they only procure seed from registered seed dealers. SLeSCA recorded 10 cases of counterfeit seed in 2020, less than a quarter of the 42 cases reported in 2017. The establishment and functioning of the SLeSCA is a significant improvement in government's efforts to address the sale of counterfeit seed.

Institutional support for Sierra Leone's seed sector is weak but there are a few improvements. SLeSCA has significantly improved over the last four years, facilitated by the hiring of a full-time Director and an additional five seed inspectors, doubling the inspection staffing reported in 2017. With this enhanced capacity, the agency has made efforts to improve seed quality assurance in the country by registering and monitoring all seed producers and enhancing the number of seed inspectors. These efforts will enhance the production and sale of quality improved seed.

There is no national seed association which would serve as a platform for private sector engagement with the government. When fully functional, a national seed association works closely with the government in the design and implementation of seed-related programs and policies. Seed sector stakeholders led by seed producers should develop plans towards the formation of a national seed trade association.

Well-planned and -implemented seed subsidy programs can catalyze seed sector development in Sierra Leone where the formal seed sector is still in the nascent growth stage and many institutions are weak or not in place.

Under **service to smallholder farmers,** agricultural extension services provided by MAF are inadequate. Most seed companies and cooperatives employ their own agricultural extension agents. The combined total agents are too few to provide the needed services to all farmers across the country.

The agro-dealer network across the country is inadequate, evidenced by the low number of agro-dealers, and low levels of satisfaction with the existing agro-dealer network. SLeSCA should design and implement strategies for the accreditation and training of agro-dealers.

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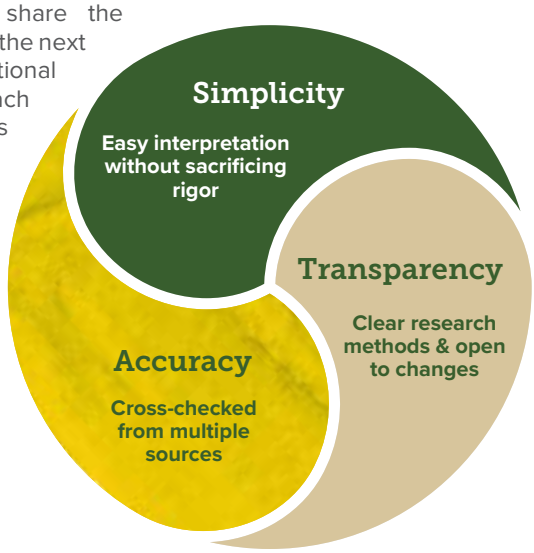
ABOUT TASAI

PILLARS OF COMPETITIVE SEED SECTORS

The African Seed Access Index (TASAI) is a seed industry research initiative that is coordinated by the nonprofit organization TASAI Inc. TASAI's goal is to encourage African governments and other seed industry players to create and maintain enabling environments that will accelerate the development of a vibrant private sector-led seed system serving smallholder farmers. It is this enabling environment that TASAI seeks to measure, track, and compare across African countries. The intended outcome of the index is improved access to locally adapted, affordable, and high-quality seed of improved varieties by smallholder farmers in Sub-Saharan Africa.

To assess the status of the seed industry value chain, TASAI tracks indicators in the following five categories: Research and Development, Industry Competitiveness, Policy and Regulations, Institutional Support and Service to Smallholder Farmers. By the end of 2021, TASAI studies will have been completed in 20 African countries: Burkina Faso, Burundi, the Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe. In each country, TASAI works closely with local seed industry actors, government and international development agencies to share the TASAI findings and to identify the next steps for creating a vibrant national seed sector. TASAI's approach is guided by the principles of Simplicity, Transparency, and Accuracy.

TASAI PRINCIPLES



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For a comparison of TASAI Indicators across different countries, please visit: http://tasai.org/wp-content/uploads/TASAI-Appendix-CURRENT.pdf

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