

South Sudan Country Report 2022

The African Seed Access Index

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TASAI
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July 2023

The findings in this report were presented to seed sector stakeholders in a TASAI dissemination meeting held in Juba, South Sudan on April 27, 2023. The published version incorporates feedback from the meeting.

Cite as: Mabaya, E., Atwok, L., Tokwiny, S., Waithaka, M., Mugoya, M., Damba, B., Tihanyi, K. 2023. South Sudan Country Report 2022 - The African Seed Access Index (version Aug 2023)



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LIST OF ACRONYMS

ARC	Agricultural Research Corporation
CAD	County Agriculture Department
CBSP	Community-based Seed Production
COMESA	Common Market for Eastern and Southern Africa
DUS	Distinctness, Uniformity, and Stability
EAC	East African Community
FAO	Food and Agriculture Organization of the United Nations
IFDC	International Fertilizer Development Center
KALRO	Kenya Agriculture and Livestock Research Organization
MAFS	Ministry of Agriculture and Food Security
NARO	National Agricultural Research Organization
NGO	Non-Governmental Organization
NPT	National Performance Trial
NVRC	National Variety Release Committee
QDS	Quality Declared Seed
SSD4SS	Seed Sector Development for South Sudan
SSP	South Sudanese Pounds
STASS	Seed Trade Association of South Sudan
VCU	Value for Cultivation and Use



INTRODUCTION

The increased use of productivity-enhancing technologies, including mechanization, irrigation, fertilizer and improved seed¹, 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. Improved seed can deliver state-of-the-art technology to farmers, including higher yields, disease and pest resistance, climate-change adaptation, reduced post-harvest losses, and improved nutrition. To facilitate the delivery of these benefits to farmers, 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 2022 to appraise the structure and economic performance of South Sudan's formal seed sector. This is the first TASAI study conducted in the country. The study focused on maize, sorghum, cowpea, and groundnut (the "focus crops") - four grain and legume crops important to South Sudan's food and nutritional security. According to available data, sorghum and maize account for 70% and 21% of the land allocated to cereal cultivation, respectively (Access to Seeds Index 2019), (Japan International Cooperation Agency 2015a). Along with beans, rice, and cassava, the four crops form part of the country's priority food security crops.

Over 95% of the total area of South Sudan (64,688,300 ha) is considered suitable for agriculture, 50% of which is prime agricultural land. However, to date only 4% of the arable land has been cultivated continually² (Enterprise Incorporated Company Limited 2021). Formal seed production infrastructure was destroyed during the 1983-2004 civil war. Since gaining independence in 2011, much of the country has experienced ongoing civil strife, further constraining food production (Japan International Cooperation Agency 2015b). In addition, poor or non-existent road infrastructure further limits access to food and agricultural inputs. To date, the country has relied extensively on relief efforts driven by international NGOs and UN agencies. (Maguet 2014). Importantly for the country's seed sector, relief efforts have also been the main source of improved seed. In 2011, investment into building the formal seed sector started through AGRA's Seed Sector Development for South Sudan (SSD4SS) project. In 2019, the FAO launched the FNS REPRO Project³, while in 2021 the International Fertilizer Development Centre (IFDC) rolled out the A3SEED Project.⁴ Such efforts are complemented by work

by organizations like the Seed Systems Group (SSG), World Vision (WVI), and Ministry of Agriculture and Food Security, Directorate of Research, and they all aim to increase access to improved seeds by smallholder farmers in the country. South Sudan's recent and ongoing political and economic challenges make it unique among African countries with more stable political systems and more established seed sectors and they create a context that is important to keep in mind when analyzing the country's seed industry.

OVERVIEW OF SOUTH SUDAN'S FORMAL SEED INDUSTRY

Like most other African countries, South Sudan's seed industry consists of three systems: the informal, the semi-formal, and the formal systems. While we acknowledge the presence and role of pluralistic seed systems, due to challenges of measuring the informal sector TASAI country reports focus mainly on the formal seed systems.

The informal system 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 and 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, physical and sanitary quality.⁵ The informal system is not monitored or controlled by government policies and regulations. Instead, it is guided by local knowledge and standards and by local social structures and norms. In South Sudan it supplies an estimated 70% of the seed needs (Subedi *et al*, 2020).

The formal system is a structured and regulated value chain for the production and sale of early generation and certified seed varieties. This process involves many actors and institutions, and its activities range from breeding varieties to the multiplication, processing, and distribution of certified seed. The different stages of improved seed production are controlled 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 producers and agro-dealers. The formal system in South Sudan primarily produces crops with a steady demand, such as maize, sorghum, bean, groundnut, rice, cowpea, and cassava.

1 TASAI uses "improved seed" as the short form of "quality seed of improved varieties".

2 <https://www.fao.org/faostat/en/#data/QCL>

3 <https://fns-repro.com/>

4 <https://ifdc.org/projects/accelerating-agriculture-and-agribusiness-in-south-sudan-for-enhanced-economic-development-a3-seed/>

5 "Seed System Definitions," Agrilinks, USAID, accessed December 6, 2022 <https://www.agrilinks.org/post/seed-system-definitions>



In the southern part of South Sudan⁶, the formal seed system provides 20% of the annual seed supply (Maguet 2014). Key stakeholders in the formal system are the Ministry of Agriculture and Food Security (MAFS) and private seed companies (Table 1). The Directorate of Agricultural Research under the MAFS is supposed to oversee the activities in the industry. As the government is yet to pass the Seed Law and Seed Regulations, in practice many seed sector activities are not regulated. That said, the MAFS is able to oversee some activities related to the production and sale of certified seed of improved varieties, although it is important to note that, in the absence of a regulatory system for seed quality assurance, referring to this seed as “certified” may not be an accurate description.

South Sudan also has a **semi-formal system** that combines elements of the formal and informal seed sectors. According to a 2020 study, the semi-formal seed system accounts for about 5% of seed supplied to farmers annually (Subedi *et al*, 2020). An important initiative in this sector is Community-Based Seed Production (CBSP). Launched in 2007 by the MAFS in collaboration with the FAO and other partners, the initiative operates across the country (FAO and WFP 2022), empowering farmers and seed groups to produce quality seed for their own use and the market. As of 2020, more than 100 farmer groups operated under the semi-formal seed system for seed production and marketing in South Sudan (Subedi *et al*, 2020). The government recognizes seed that is produced through this system as Quality Declared Seed, even in the absence of a quality assurance system to confirm it as such. (Note that sometimes seed produced by seed companies is also referred to as Quality Declared Seed.)

Table 1: Role of key players in South Sudan’s formal seed sector

ROLE	KEY PLAYERS
Research and breeding	Ministry of Agriculture and Food Security (MAFS), University of Juba
Variety release and regulation	MAFS
Seed production and processing	Seed companies, MAFS, Universities
Education, training, and extension	MAFS, universities, Non-Governmental Organizations (NGOs), seed companies
Distribution and sales	Seed companies, seed producers, NGOs, agro-dealers

⁶ This part of the country receives more rainfall than the northern part and hence is more suitable for cropping.

METHODS

TASAI studies cover 22 indicators divided into five categories: **Research and Development**, **Industry Competitiveness**, **Seed Policy and Regulations**, **Institutional Support**, and **Service to Smallholder Farmers** (Table 2). In most TASAI studies, the bulk of the performance data reported comes from the year in which the study is conducted ("the study year") because that is the year for which the most recent data are available. Accordingly, the data reported in this country report pertain primarily to 2021; however, whenever more recent data were available, they are included in the report.

Table 2: TASAI Indicators

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

* A plus/negative sign signals a positive/negative correlation between the indicator and smallholder farmers' access to improved seed.



Since TASAI has conducted similar studies in 21 other African countries to date, this report also draws relevant cross-country comparisons. More detailed cross-sectional (across other African countries) comparisons are now available through an online dashboard available at <https://dashboard.tasai.org>.

Using TASAI survey tools, data collection focused on three key seed industry players: seed companies, plant breeders, and representatives of government entities active in the country's seed sector. Seed companies were the study's primary source of information. For several indicators, TASAI supplemented quantitative data with self-reported average levels of industry satisfaction on a 0-100 scale, with the following brackets: 0-19.99% **extremely poor**, 20-39.99% **poor**, 40-59.99% **fair**, 60-79.99% **good**, and 80-100% **excellent**.

TASAI studies target registered seed companies that produce and sell one or more of the four focus crops in the data collection year. Finding the correct number of seed companies operating in South Sudan proved challenging. According to the MAFS, in 2021 the country had 14 registered seed companies. For its part, the Seed Trade Association of South Sudan (STASS) had 15 seed company members in the same year. In addition, our research found five additional seed companies that were neither registered with the MAFS, nor were members of STASS. Thus, the number of seed companies in the country is estimated around 20; however, not all of these were active in 2021. According to STASS, 7 of their 15 members actively produced and marketed seed in 2021, while from the government list, the TASAI team identified 11 seed companies that met our selection criteria for production and sale of seed of one or more focus crops. All these companies were interviewed. In addition, the survey included four seed producer groups (also known as seed multiplication groups),⁷ namely Nok Myero, Alaro Kodi, Palotaka, and Loudo. In most cases, these groups produce low volumes of seed and operate as outgrowers for seed companies; however, these four were included because each produced more than 1 MT of either maize or sorghum in 2021. Table 3 shows the breakdown of the respondents.

In addition to the seed companies, key informant interviews were conducted with representatives from the MAFS, the University of Juba, the South Sudan National Bureau of Standards, local NGOs, international organizations including the Food and Agriculture Organization of the United Nations (FAO) and the International Fertilizer Development Centre (IFDC).

Table 3: Breakdown of respondents by crop (2021)

Crop	Number of seed companies surveyed (TASAI data)	Number of seed producers surveyed (TASAI data)	Total number of seed companies and seed producers surveyed
 Maize	10	4	14
 Sorghum	9	0	9
 Cowpea	4	0	4
 Groundnut	7	2	9
Total*	11	4	15

*The total differs from those by crops because some seed companies and producers may work on more than one crop.

⁷ All were based in Magwi County in Eastern Equatorial State.





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 the farmer and consumer needs. The number of active breeders is indicative of the level of investment in research and development.⁸ In addition to tracking the number of breeders working on the four focus crops, the study also measured the level of satisfaction reported by seed companies with public breeding programs. The latter reflects the ability of active breeders in public institutions to produce new varieties.

In 2021, South Sudan had five active breeders (4 men and 1 woman) for the four crops (Table 4). They were employed by two public institutions – the MAFS (four breeders) and the University of Juba (one breeder). In addition, one breeder employed by the NGO World Vision worked on sorghum and millet; however, this breeder is not included in the count as the TASAI study looks at public research institutions and private seed companies only. The country had no private breeders in 2021.

Breeding programs at the MAFS and the University of Juba received support from AGRA and the Seed Sector Development for South Sudan (SSD4SS). The activities included training in plant breeding techniques and building linkages with national research institutions in neighboring countries, such as the National Agricultural Research Organization (NARO) in Uganda, the Kenya Agricultural and Livestock Research Organization (KALRO), and the Agricultural Research Corporation (ARC) in Sudan. Through these connections, the breeding programs in South Sudan have mainly been involved in adaptive breeding as

opposed to variety development. Under this arrangement, the breeders obtained germplasm for OPV maize, cowpea, groundnut, and rice to select varieties adapted to conditions in South Sudan.

Seed companies' satisfaction with the adequacy of active breeders was "good" for the four crops. However, these ratings may not be an entirely accurate reflection of the situation because many seed companies do not work with breeders and therefore their opinion is based on limited knowledge. Further, only 7 of the 11 seed companies surveyed responded to this question, and not all of those had first-hand experience working with breeders. A likely interpretation of the high rating is that the number of breeders is adequate for now; however, seed companies voiced their concern about that inadequate volumes and quality of foundation seed and the fact that seed companies and farmers were largely unaware of the varieties the breeders were working on or had released.

Figure 1 compares the number of maize breeders and the number of breeders for the other three focus crops combined across six countries of the East African Community (EAC)⁹ surveyed by TASAI between 2020 and 2022. South Sudan's five breeders place it last among the six countries compared, reflecting its more nascent – and thus less advanced - research and development (R&D) space. On the plus side, through the use of adaptive research, the breeding programs have benefited from both expertise and germplasm available in other institutes in the region. A case in point is that six of seven focus crop varieties sold by the surveyed seed companies had been developed by the NARO in Uganda (Table 5).

8 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.

9 The EAC member countries are Burundi, Democratic Republic of Congo (DRC), Kenya, Rwanda, South Sudan, Tanzania and Uganda. The TASAI data for the DRC is for 2017 and is therefore not included in this comparison.

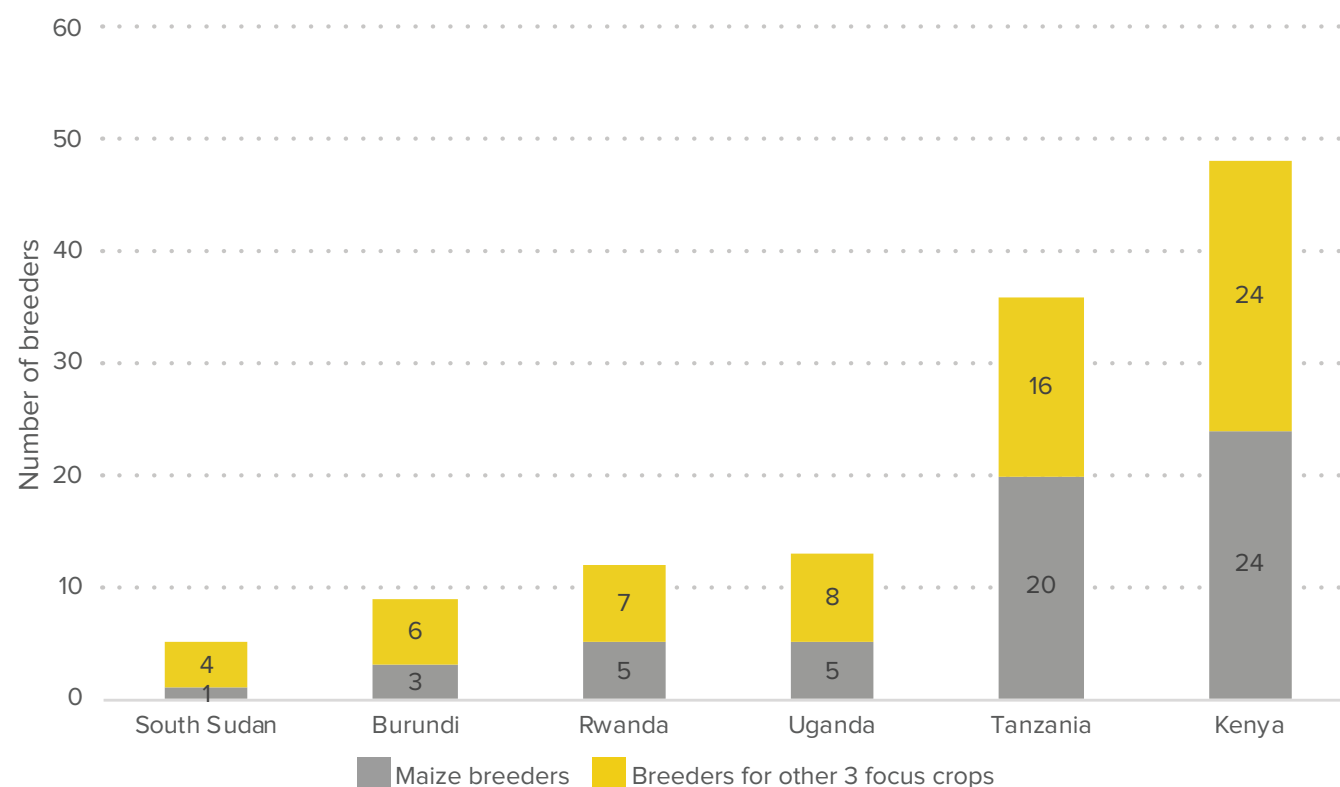


Table 4: Number and adequacy of active breeders in South Sudan (2021)

Crop	Number of public breeders	Number of private breeders	Total number of breeders	Satisfaction rating (out of 100%)
 Maize	1	0	1	71%
 Sorghum	1	0	1	63%
 Cowpea	1	0	1	75%
 Groundnut	2	0	2	69%
Total	5	0	5	



Figure 1: Number of active breeders for the four crops in the East African Community (2000 and 2022)



VARIETIES RELEASED IN THE LAST THREE YEARS

The number of varieties released in each period is a good measure of the functioning of the variety development and release system. The greater the number of varieties released in a country, 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/pest resistance, and nutrition enhancements. Importantly, the release of varieties also needs to be supported by the commercialization and bulking of early generation seed before the varieties can become more accessible to farmers.

In South Sudan, variety release is handled by the National Variety Release Committee (NVRC). The NVRC consists of seed experts from research institutions, seed companies, and the South Sudan Agricultural Producers Union (SSAPU).^{10,11} Its chairperson and secretary were elected by an ad-hoc committee of the members. Currently, the NVRC

is chaired by the Director General of Research under the MAFS, and a representative from the University of Juba serves as the secretary. During the three-year period of 2020-2022, a total of nine varieties of the four focus crops – four maize and five sorghum - were released (Figure 2). All of the releases occurred in 2022; no varieties of the focus crops were released in the first two years due to a lack of funding for variety testing, previously provided by donor-funded projects. The four maize varieties were all hybrid, and three were released by two private sector entities¹² and one by the MAFS. The two private entities obtained licenses from the International Maize and Wheat Improvement Centre (CIMMYT) to conduct national performance trials and then commercialized the varieties that successfully passed the trials. The five sorghum varieties were all released by World Vision.

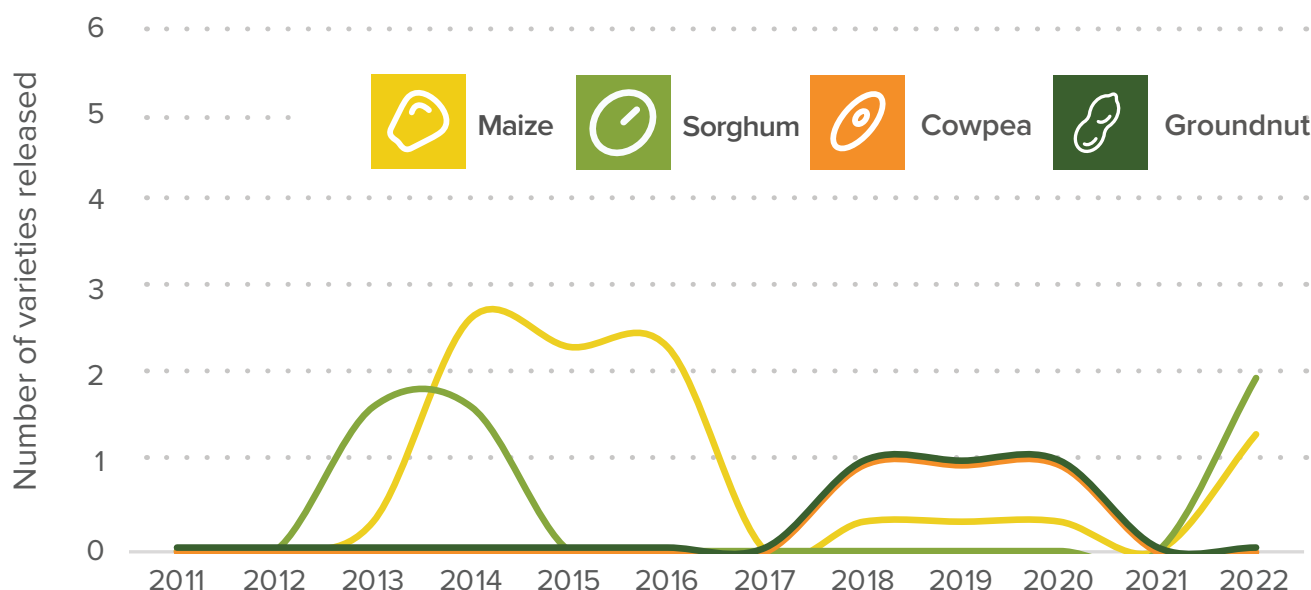
Prior to 2020, AGRA's SSD4SS project funded much of the variety release process in the country. Between 2012 and 2019, the MAFS breeders released a total of 32 varieties altogether, 17 for the four crops: 8 for maize, and 3 each for sorghum, cowpea, and groundnut.

10 SSAPU comprises of farmers and researchers and has 4,000 members.

11 "South Sudan Agricultural Producer's Union," SSAPUWeb, accessed on January 26, 2023, <https://ssapuweb.wixsite.com/ssapu>

12 The entities are a seed company and STASS.

Figure 2: Trend in the number of varieties released (3-year moving average)



NUMBER AND AGE OF VARIETIES SOLD

An increase in the number of varieties sold in a country often results in an increased choice of varieties available to farmers. The training provided them with technical knowledge of agricultural inputs and enterprise management.

Table 5 shows the number, name, and age of the varieties for the four focus crops sold in South Sudan in 2021. The ages ranged from 11 to 54 years, although it is important to note that 6 of the 7 varieties sold had originally been released in Uganda and have only been on the market in South Sudan since the country was established in 2011. Although 26 varieties have been released for the four focus crops since 2012, old varieties continue to dominate the market. In

fact, all seven varieties sold in 2021 by the seed companies surveyed originated from imported foundation seed, which the local seed companies multiplied, packaged, and sold.

Local commercialization efforts face multiple hurdles. One is that the MAFS is unable to provide sufficient quantities of foundation seed to meet the local commercial demand. In addition, the lack of a legal and regulatory environment in the seed sector poses its own challenges. For example, the NARIs from the neighboring countries have not availed parental lines for varieties that had been patented in their country of origin prior to their release in South Sudan for fear that intellectual property may be difficult to guard in the country. Similarly, having found that quality assurance was difficult to maintain in South Sudan's unregulated policy environment, regional seed companies have been reluctant to supply varieties for commercialization by local companies.

Table 5: Name and age of varieties sold (2021)

Crop	Number of varieties sold	Name of commonly sold variety	Age of variety*	Number of years sold in South Sudan (year of release)
 Maize	2	Longe 5	22	12 (2009)
		NARD1	-	8 (2013)
 Sorghum	2	SESO 3	11	11 (2010)
		SESO 2	11	11 (2010)
 Cowpea	1	SECOW 2	19	8 (2013)
 Groundnut	2	RED BEAUTY	54	9 (2012)
		SERENUT 4	20	9 (2012)

* Note: 6 of 7 varieties sold were originally released in Uganda, and age of variety is based on original release date. The last column provides the year of release in South Sudan.

SOURCES AND AVAILABILITY OF FOUNDATION (BASIC) SEED

Seed companies use foundation seed to produce certified seed for sale to farmers. In many African countries, limited access to foundation seed from public research institutions tends to constrict the ability of seed companies to scale up production. In South Sudan, foundation seed production is the responsibility of research institutions based at the MAFS and the University of Juba. Private seed companies can only produce foundation seed if they collaborate with these institutions. To obtain foundation seed, seed producers apply to the research institution that produces or supplies

the foundation seed, specifying the crop, the variety, and the quantity needed. The research institution invoices the seed producer, and, upon payment, the producer receives the foundation seed. When the foundation seed is imported from NARIs in the region and CGIAR centers, it must include a seed import permit issued by the MAFS, as well as a phytosanitary certificate from the source country.

Table 6 shows the sources of foundation seed and the number of transactions recorded for the four focus crops in 2021. The main sources of foundation seed were the public institutions (MAFS and the University of Juba), seed companies in Uganda, and the NARO of Uganda. In addition, one private seed company obtained foundation seed for maize (Longe 5), sorghum (Seso3), and cowpea (Secow 2WT) from the NARO in 2021 for multiplication and commercialization in 2022.



For the most part, the different sources supplied the same varieties of foundation seed for all four crops. As part of the SSD4SS project, one private seed company was trained in the production of foundation seed. However, due to a lack of seed processing equipment, this company has not been able to meet the existing demand for foundation seed.

Seed companies were asked to assess each source organization on three aspects related to the availability of foundation seed: the quality of foundation seed received, whether they received the quantity of foundation seed requested, and the timeliness of the seed delivery. As shown in Table 7, seed companies rated all three aspects highly, with scores ranging from 76-87%. This suggests that most seed companies surveyed are satisfied with the quality, quantity, and timeliness of the delivery of foundation seed they ordered

and received. However, other respondents questioned the validity of these ratings, including Justin Miteng of IFDC South Sudan, who felt that the ratings were too high and obscured the fact that a lack of access to foundation seed is one of the main factors hindering the growth of the seed industry in South Sudan. The respondent representing STASS echoed this sentiment, saying that the volumes of foundation seed available to seed companies were often inadequate, and, in the absence of protocols for seed quality assurance, the quality was also unreliable. Others mentioned that insufficient amounts of foundation seed and a failure to deliver the required amounts have led to an over-reliance on recycled seeds for sorghum, while in the case of maize, a key challenge cited was that many farmers still used Longe5, an old variety that is no longer maintained by any institution in the region.

Table 6: Sources of foundation seed by crop, number of transactions, and percentage of total transactions (2021)

Source of foundation seed	Maize		Sorghum		Cowpea		Groundnut	
	Number of transctions	% of total	Number of transctions	% of total	Number of transctions	% of total	Number of transctions	% of total
MAFS and UoJ	11	52%	4	33%	3	33%	5	31%
Seed company in Uganda	7	33%	4	33%	3	33%	7	44%
NARO (Uganda)	2	10%	4	33%	2	22%	4	25%
Other	1	5%	0	0%	1	11%	0	0%
	21	100%	12	100%*	9	100%	16	100%

* The % does not add up to 100% because of rounding to the nearest whole number

Table 7: Availability of foundation seed

	Maize	Sorghum	Cowpea	Groundnut
Quality of foundation seed (out of 100%)	80%	83%	87%	82%
Received quantity requested (out of 100%)	79%	78%	81%	78%
Timeliness of delivery (out of 100%)	82%	82%	76%	79%
Availability of foundation seed (out of 100%)	80%	81%	81%	80%

extremely poor poor fair good excellent

INDUSTRY COMPETITIVENESS

NUMBER OF ACTIVE SEED COMPANIES

Competition breeds excellence: the presence of more active seed companies¹³ increases competition and creates incentives for companies to innovate and improve. 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 companies that produced and marketed seed of one or more of the focus crops. In 2021, a total of 11 seed companies produced and marketed certified seed of at least one of the four focus crops. As shown in Table 8, out of the 11 active seed companies, 10 produced maize seed, 9 produced sorghum seed, 4 produced cowpea seed, and 7 produced groundnut seed.

Table 8. Number of active seed companies (2021)

Crop	Number of active seed companies
 Maize	10
 Sorghum	9
 Cowpea	4
 Groundnut	7
Total	11*

* The total stands for the number of seed companies that were interviewed

¹³ TASAI defines an “active seed company” as a company that produces and/or markets seed of one or more of the four focus crops.

GENDER IN THE MANAGEMENT OF SEED BUSINESSES

TASAI also tracks the number of women in the management and ownership of seed companies. For this study, management positions include managing director or chief executive officer, distribution manager, operations manager, finance and administration manager, research and development manager, country lead, and sales and marketing manager. Table 9 provides information about the representation of women in the management of seed companies in 2021. At the level of top managers and owners, the number of women is low: of the 11 seed companies surveyed, 2 had a woman top manager, who, in both cases, was also the owner. At the management level, all 11 seed companies had at least one woman in a management position. Furthermore, 41% of the management positions across the 11 seed companies were held by women. The relatively high level of women's participation in seed business management is due, in part, to the fact that the seed companies have received funding from development agencies, which often set a quota of at least 30% for women's participation.

Figure 3 compares the share of women's participation in seed company management in 13 countries surveyed by TASAI between 2020 and 2022. With its 41% participation by women, South Sudan ranks 5th among these countries, where the highest percentage recorded was 51%.

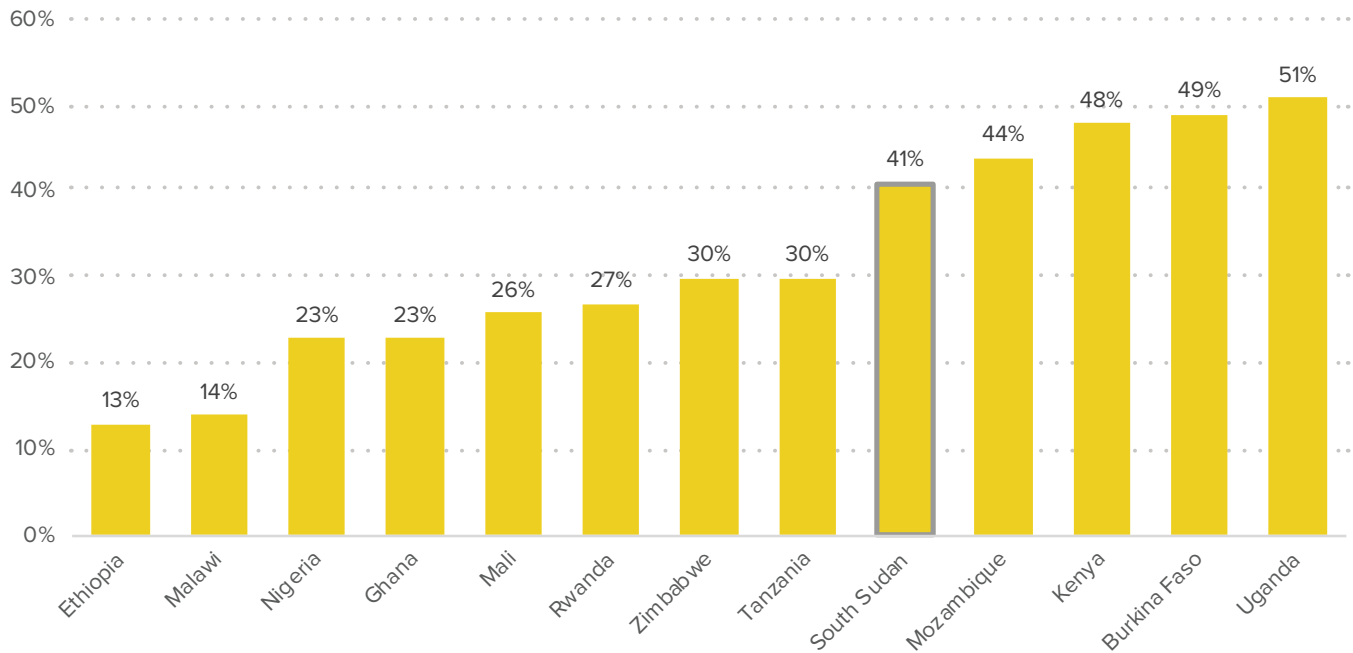
Table 9: Gender in seed company management (2021)

Gender indicator	Number	%
Women in management positions (n=111)	46	41%
Companies with at least one woman in management positions (n=11)	11	100%
Companies with a woman top manager (n = 11)	2	18%
Companies with a woman owner (n = 11)	2	18%





Figure 3: Comparison of gender in seed company management in countries studied by TASAI (2020 – 2022)



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 are presented as aggregate quantities in metric tons (MT) of certified produced and seed sold in the data collection year, as reported by the active seed companies surveyed. Accurate seed production data is virtually impossible to obtain in South Sudan, due to a lack of legal and regulatory frameworks and seed certification processes, as well as inadequate registration and inspection services and government record keeping. Indeed, according to the Enterprise Incorporated Company Limited (2021) the government does not have a system to record annual seed production; rather, it relies on data from STASS or voluntary individual seed declarations.

Against this backdrop, Table 10 nevertheless presents seed production and sales data for 2021 from three sources: the government, the TASAI study, and data obtained from IFDC, the latter providing a useful point of triangulation. Notably, data from TASAI and IFDC are more similar to each other than to the government data, but other than this, it is difficult to find a pattern to the differences. The following examples illustrate the challenges of finding accurate seed production data in South Sudan. Some NGOs, including FAO and Caritas (Luxemburg), operate seed out-grower schemes. The out-growers are trained by the NGOs and produce seed solely for the NGOs’ operations. The volumes produced under this arrangement may not be included in the volumes produced by the registered seed companies and are thus omitted from data collected from seed companies. There is also evidence of companies inflating production volumes. According to the SSD4SS project evaluation report, some seed companies

source grain and supply it as seed to NGO buyers. This action, which would be illegal under a seed law, inflates the production volumes of the seed companies. In addition, the same report notes that some seed companies inflate their production figures by sourcing seed from out-growers who are producing seed for NGOs. This seed is then repackaged by the seed companies and sold as their own output.

Overall, the absence of accurate data illustrates the broader challenge of lack of oversight of the seed sector. Importantly, the absence of accurate data makes it difficult to use evidence-based decision-making to develop the seed sector.

MARKET SHARE OF TOP SEED COMPANIES

Competition among seed companies benefits farmers via lower prices, wider choices, increased innovation, and better customer service. To assess the level of industry market concentration, TASAI uses seed sales data for each crop, as reported by seed companies, to calculate the market share of the four largest firms, also known as the four-firm concentration ratio (CR4), as well as the Herfindahl-Hirschman Index (HHI).¹⁴ Table 11 shows the HHI and CR4 scores for 2021. The HHI scores show that for all four crops, the seed markets were concentrated, with few seed companies dominating the markets. This dominance was most pronounced for cowpea seed, which had only four active seed companies. The CR4 scores also confirm the high level of concentration. This is to be expected in a country where the formal seed sector is in the infancy stage. The dominance of the seed market by a few seed companies will likely decline as the number of active seed companies grows.

¹⁴ See below Table 11

Table 10: Seed production and sales (2021)

Crop	Seed production in MT (Government data)	Seed production in MT (IFDC data)	Seed production in MT (TASAI data)	Seed sales in MT (TASAI data)
 Maize	1,811	2,231	2,660	1,516
 Sorghum	2,965	3,254	1,167	630
 Cowpea	667	385	516	280
 Groundnut	2,242	537	555	282

Table 11: Market concentration (HHI) and market share of top four seed companies (CR4) (2021)

Crop	HHI	CR4
 Maize	2,633	81%
 Sorghum	3,399	94%
 Cowpea	5,511	100%
 Groundnut	2,360	88%

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.

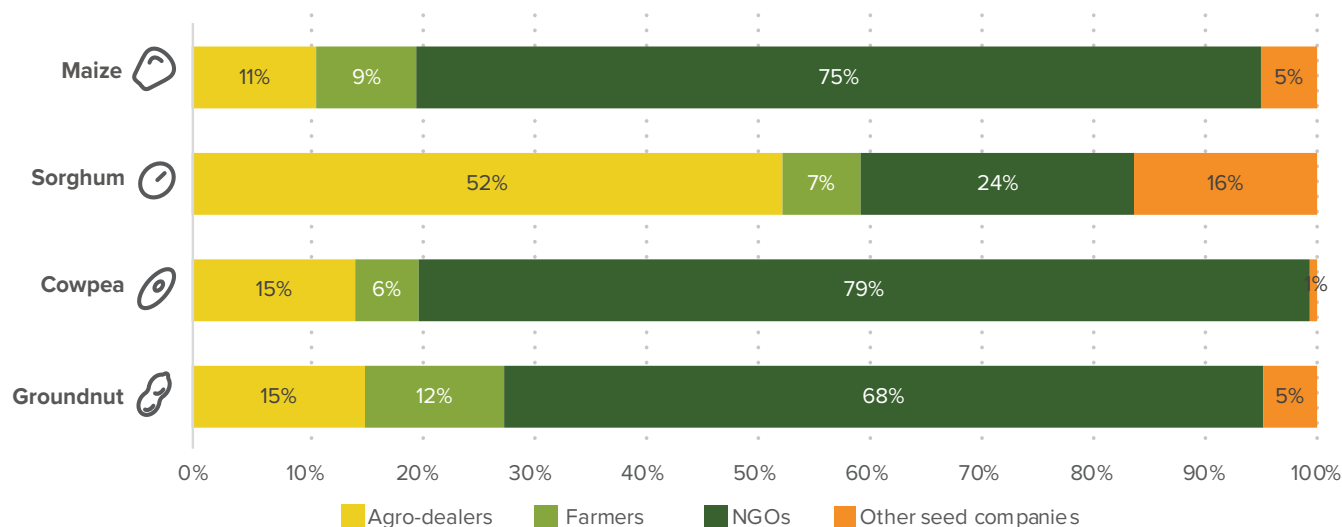
MARKET SHARE OF GOVERNMENT PARASTATAL

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 meeting farmer demand for varieties that private seed companies deem less profitable. In addition to seed production, public companies may support other national objectives, such as university training and research. 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 South Sudan, there is no government entity involved in the production and sale of certified seed.

SEED SALES TO DIFFERENT CATEGORIES OF BUYERS

The TASAI study tracked four categories of seed buyers in South Sudan in 2021, namely agro-dealers, farmers (who purchase seed directly from seed companies), NGOs, and other seed companies (Figure 4). NGOs, which supply seed to the relief programs operating in the country, are the main buyers of maize, cowpea, and groundnut seed from seed companies, accounting for 68%-79% of seed company sales. The relief programs distribute seed to farmers to revive agricultural production while encouraging the use of improved seed. Agro-dealers were the main buyers of sorghum seed, accounting for 52% of seed company sales; this was primarily because 2 of the 4 companies surveyed sold 80% and 95% of their sorghum seed to agro-dealers, respectively. It is also important to note that South Sudan has a wide range of sorghum varieties grown locally by farmers, most of whom recycle seed and do not source it from agro-dealers.

Figure 4: Seed sales to different categories of buyers (2021)



SCOPE OF NGO ENGAGEMENT IN THE SEED INDUSTRY

In South Sudan, NGOs and international organizations play a key role in the seed industry as buyers of seed. Their primary activity is procuring seed to supply farmers for relief purposes. Other NGO activities include training farmers and farmer groups on how to produce and multiply seeds, linking seed companies to farmers, facilitating the formation of cooperatives for seed production, strengthening quality control efforts, and supporting the development of policy frameworks through the design and implementation of seed standards as well as manuals on seed production, processing, and handling.

The TASAI study surveyed seven NGOs: Base Net, Caritas Luxembourg South Sudan, Catholic Relief Services, Farm Stew South Sudan, Gesellschaft für Internationale Zusammenarbeit (GIZ), IFDC through the A3 seed project, and World Vision. Five of the seven NGOs surveyed procured seed from seed producers, cooperatives and community groups in 2021; GIZ and IFDC did not procure seed that year. Several NGOs mentioned that they first survey farmers to map out the need and then contract seed companies to produce the seed. After the seed is harvested, processed, and packaged, the NGOs collect and distribute it to farmers. Two of the NGOs reported that they conduct germination tests on the seed they receive before distributing it to farmers. Further, IFDC reported that, through the A3 project, it began building capacity in 10 seed companies for seed production and seed distribution through agro-dealer networks.

Most of the seed distributed was maize, sorghum, and cowpea. Most of the NGOs surveyed sourced seed locally, while one reported importing significant quantities of seed in 2021 (see below for detail). When sourcing seed locally,

NGOs rely on two sources – local seed companies and cooperatives/ community-based seed producers. The latter produced seed locally, while seed companies either produced the seed locally or imported certified seed from neighboring countries, primarily from Uganda. In terms of quality, seed produced in South Sudan, whether by companies or producers, at best meets the quality of QDS, because seed certification is not yet available in the country due to a lack of seed policy instruments. Although seed is sometimes referred to as “certified seed,” this label should only be applied to seed sourced from a country that has a formal certification process.

The NGOs surveyed were asked to rate their satisfaction with the quality of the locally produced seeds. As shown in Table 12, respondents rated maize and cowpea seed “excellent” and sorghum and groundnut seed “good” (Table 12). The likely reason for the lower rating (60%) for groundnut is that the varieties are mainly local landraces rather than improved varieties, and they are often contaminated due to poor isolation in the farmers’ fields.

Community-based seed producers also produce seed. However, since the MAFS does not have the capacity to inspect this seed and there is no seed regulatory framework, the seed cannot be classified as either certified or QDS. To ensure some measure of quality control, NGOs have their internal procedures to test the quality of seed before distributing it to farmers.

Seed importation by NGOs. Only one of the surveyed NGOs imported seed in 2021. This entity imported 300 MT of maize, 300 MT of sorghum, and 300 MT of cowpea seed from Uganda in 2021. The imports were processed through agents who received import permits from the MAFS. According to the NGO, the duration of the import process was one month. Two NGOs that procure and distribute large volumes of seed – the International Committee of the Red Cross (ICRC) and FAO were not interviewed for this survey.

Table 12: Local procurement of seed by sample of NGOs (2021)

Crop	Sample of NGOs procuring locally produced seed (n=5)	Volume of seed procured locally by sample of NGOs (MT)	NGO satisfaction rating of the quality of locally produced seed (out of 100%)
 Maize	5	313	80%
 Sorghum	4	329	70%
 Cowpea	4	271	80%
 Groundnut	2	40	60%
Total	5	953	

extremely poor
poor
fair
good
excellent

SEED IMPORT AND EXPORT PROCESS

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. The length of the import process in days is measured as the sum of the number of days used to obtain import documentation (import permit, phytosanitary certificates, and an International Orange Certificate,¹⁵ if applicable) and the number of days to clear seed at the border. It excludes transportation time.

The MAFS is the government agency responsible for facilitating seed importation and exportation in South Sudan. On paper, the first step is for the importing company or agent to apply for a seed import permit, specifying the quantity, crop variety, maturity period, yield potentials, the county where the seed will be sold, and the port of entry (Juba International

Airport, Kaya, Nimule, or Nadapal). Requests should be reviewed and approved by a designated officer within the MAFS after verifying that the varieties to be imported have been tested and approved for cultivation in the country and confirming that the importer is registered as a producer or an NGO in South Sudan. Once approved, permits are issued by the Directorate of Plant Protection at the MAFS. However, our study found that most NGOs that import seed do not adhere to this process.

Imported seed is required to be clearly labeled, sealed, and accompanied by the original phytosanitary certificates and the results of the seed inspection and germination test. Consignments are kept in customs-bonded quarantine stores¹⁶, from which seed inspectors draw samples for laboratory analyses. At the county level,¹⁷ the local agriculture inspectors plant a sample of each consignment in the county agriculture demonstration plots during the active seed distribution season.

Based on data reported to TASAI, in 2021, three seed companies and one NGO imported seed into South Sudan.

¹⁵ 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.

¹⁶ Bonded warehouses are often run under the supervision of the customs agency and allow storage of goods whose duty is payable when the goods are released into the market.

¹⁷ Administratively, South Sudan is divided into 10 States, which are further subdivided into 79 counties.

(In contrast, STASS reported that most seed companies imported seed.) All three seed imports came from Uganda. In terms of volume, most imports were for maize seed, followed by sorghum, cowpea, and groundnut (Table 13).

Table 13: Overview of seed imports (2021)

Crop	No. of importing companies	Total volume of seed imports (MT)
 Maize	3	681
 Sorghum	3	414
 Cowpea	2	409
 Groundnut	2	80

According to the three importing seed companies, the length of the process depends on whether they are required to clarify any details in the import permit request and if the relevant customs officials are in the office when the documents are submitted. Respondents indicated that obtaining an import permit takes about 10-20 days, although one company was able to get the permit in only one day. The three companies were satisfied with the import process for the four focus crops (Table 14).

Table 14: Average length of import process (2021)

Crop	Average length of import process (days)	Satisfaction with import process (%)
 Maize	16	78%
 Sorghum	10	80%
 Cowpea	10	80%
 Groundnut	20	80%

extremely poor poor fair good excellent

To export seed, the official process stipulates that a seed company obtain a phytosanitary certificate from the Directorate of Plant Protection at the MAFS. In 2021, there were no recorded seed exports, although some respondents indicated that they suspected that seed was exported informally through unregulated border points.





SEED POLICY AND REGULATIONS

LENGTH OF VARIETY RELEASE PROCESS

Plant variety release is the process during 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 National Variety Release Committee. 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 from the date the variety is submitted to the variety release committee to the date when the variety is approved for release. The calculation does not include the time the breeder spends developing the variety.

Most research activities in South Sudan concentrate on adaptive trials of varieties already released in Kenya, Sudan, and Uganda. In adaptive trials, selected varieties are tested in National Performance Trials (NPT) across six locations for two growing seasons¹⁸ as dictated by the COMESA Seed Trade Harmonization Regulations (Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA) 2014). For example, World Vision, in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), worked with sorghum farmers to test 16 sorghum varieties to see if they would be locally-adapted and acceptable to farmers. 14 varieties were sourced from ICRISAT, while the other two came from local communities. Of the 16, the farmers recommended five varieties to the MAFS for release and commercialization. Although the NVRC is mandated to oversee variety release in the country, in practice DUS and VCU tests are not carried out due to a lack of procedures and guiding law. As an interim solution, in 2014 the MAFS developed the South Sudan Variety Release Guidelines, which were amended in 2019 (MAFS 2019). The Guidelines outline the minimum testing requirements, the process and relevant procedures of the variety release application, as well as the composition of the variety release committee. However, based on interviews conducted by TASAI, the Guidelines are not followed closely.

In practice, the breeder first obtains parent materials and conducts multi-locational trials. Next, the breeder submits a variety release application to the NVRC, whose members review each application independently and only meet if all members agree that the variety is ready for release. If any member disagrees, the comments are sent back to the

breeder for response and the meeting is put on hold. When all members are in agreement, the NVRC meets to approve the release of the variety, and the breeder is permitted to multiply the breeder seed. The overall length of the variety release process ranges from 12-18 months, including the required two seasons of field trials. Excluding the field trials, the rest of the process takes 1-2 months, based on data about the 2013-2018 period, when 32 new varieties were released, and 2022, when 9 new varieties were released.

COST OF VARIETY RELEASE PROCESS

In well-functioning seed systems, the costs of releasing a variety should not be so high as to disincentivize variety releases altogether. In South Sudan, the costs for variety release are based on expenses related to the organization of the NVRC meetings. These include transport costs and refreshments or meals for the NVRC members. The public breeders estimated the cost to be about US\$ 1,500, a figure that does not include the costs of the adaptation trials.

STATUS AND IMPLEMENTATION OF 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. Currently, South Sudan does not have any seed policy instruments. The MAFS has been leading efforts to draft policy instruments with input from seed sector stakeholders; at the time of publication, these instruments were at preliminary stages. When completed, the national seed and plant varieties policy will strengthen the existing seed-related regulatory environment inside the MAFS. The policy will focus on areas with the potential to rapidly transform South Sudan's seed industry to meet the needs of a modern agriculture sector and to ensure national food security. The seed and plant varieties bill that is currently being developed will assign responsibility for regulatory oversight to various seed industry actors and will outline and establish procedures for the following:

¹⁸ South Sudan has two growing seasons in a year. In case one season fails due to say a lack of rain, the second test is planted in the second year.

- testing and certification of seed,
- establishing an index of plant varieties,
- restricting the introduction of new varieties,
- control over the importation and exportation of seed,
- granting of proprietary rights to developers of new varieties,
- the establishment of a national center for plant genetic resources.

QUALITY AND ENFORCEMENT OF SEED REGULATIONS

Seed regulations give structure to the formal seed sector. The TASAI study assesses stakeholder perspectives on various aspects of seed regulations, including whether they are supportive of the growth of the seed sector, the role stakeholders play in their design and implementation, stakeholders' awareness of the laws and regulations, the presence of an enforcement agency, the costs of regulation, and the effectiveness of punitive measures. As mentioned above, the national seed policy and the seed bill are currently being developed. In the meantime, the country's seed industry is not regulated formally.

EFFORTS TO ERADICATE COUNTERFEIT SEED

Counterfeit seed threatens the seed sector in two important ways: first, it reduces farmers' confidence in certified seed after farmers unknowingly plant inferior quality grain labeled as certified seed. Secondly, 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 figure is likely to be an underestimate, as selling counterfeit seed is illegal and, as is the case with illegal activities, it is difficult to observe and track.

In South Sudan, the government does not have sufficient capacity to monitor the sale of counterfeit seed in the markets, nor does it have a system to track cases of counterfeit seed reported by the public (e.g., by seed companies, consumers, etc.). The 2021 TASAI survey recorded 13 cases of counterfeit seed based on responses by the seed companies and producers surveyed (Table 15). According to the MAFS, some efforts have been made to eradicate the sale of counterfeit seed, including the establishment of a seed-testing laboratory at the National Ministry of Agriculture and Food Security. The lab tests seed for viability and issues certificates before seed is distributed to farmers. In addition,

the state Ministry of Agriculture, Forestry and Environment in Eastern Equatorial State has a seed-testing lab, and the Seed Quality Control Boards in some counties are also actively involved in seed testing and certification for seed that NGOs and seed companies intend to distribute or sell in the county. Despite these efforts, the companies surveyed rated their level of satisfaction with government efforts to address the problem of counterfeit seed as "very poor" at 19%, pointing to a lack of a formal regulatory structure to tackle the problem.

Table 15: Industry satisfaction rating of government efforts to address counterfeit seed

Indicators	2021
Number of cases of counterfeit seed (seed companies)	13
Number of cases of counterfeit seed (government)	-
Seed industry satisfaction with government effort to address counterfeit seed (out of 100%)	19%
extremely poor poor fair good excellent	

TASAI studies have shown that counterfeit seeds pose a serious challenge even in countries with more developed seed sectors. Therefore, anti-counterfeit seed measures that have worked elsewhere may be useful examples for South Sudan to consider as its seed sector formalizes. Some are government measures, while others involve the private sector. For example, in Rwanda, the government seed subsidy scheme only buys seed that has undergone quality testing, and seed companies must obtain a quality testing certificate for all seed sold to the government seed subsidy scheme. Kenya and Tanzania have both introduced mandatory labeling requirements for seed packages. Yet other solutions include training agricultural extension officers to recognize counterfeit seed more easily and the use of heavy fines for offenders, including prison time.

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 or it may be disruptive to market forces. There was no seed subsidy program in South Sudan in 2021 or 2022.



INSTITUTIONAL SUPPORT

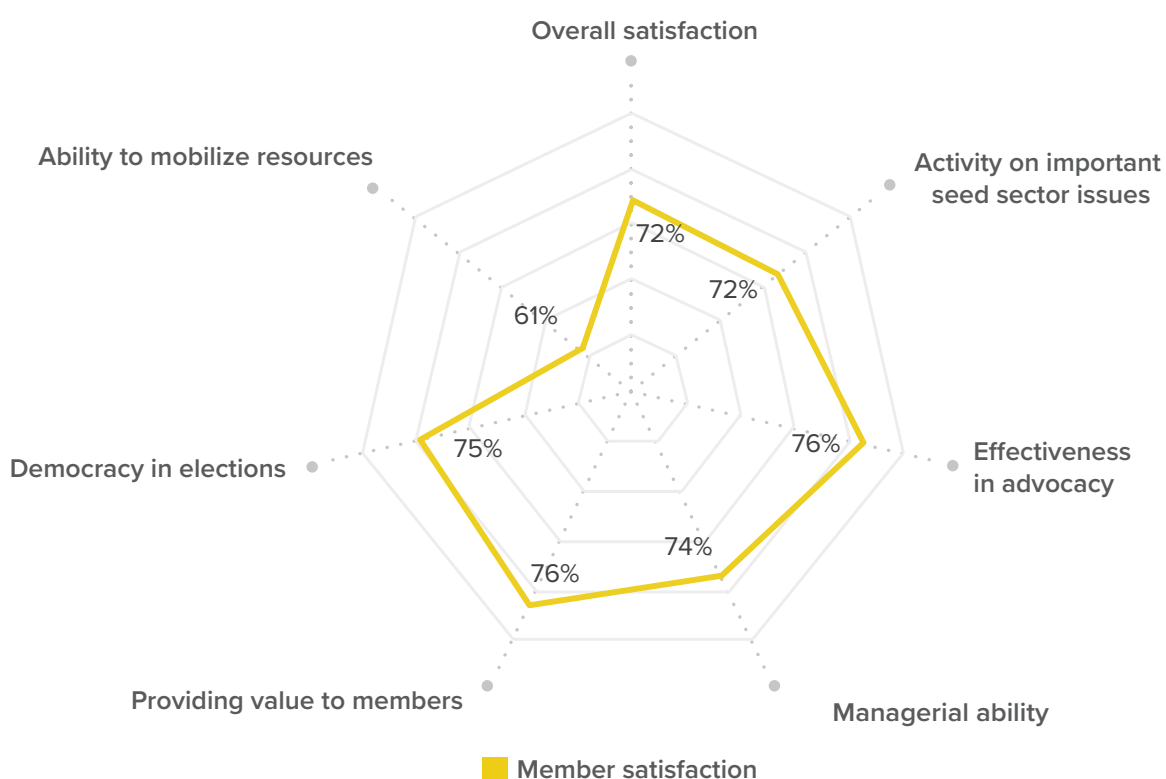
QUALITY OF THE NATIONAL SEED TRADE ASSOCIATION

Well-functioning national seed trade associations play a key role in representing the interests of the industry and engaging with the government. The membership of the national seed associations includes seed companies, seed producers, seed cooperatives, seed associations, and, at times, agro-dealers. The Seed Trade Association of South Sudan (STASS) is the main association for the seed industry in the country. STASS was established in 2018, and its membership consists of seed companies, seed importers, NGOs, and agro-dealers. The association's main functions are to oversee seed production and trade, to build capacity among local seed producers and agro-dealers, to mobilize resources for seed sector development, and to create awareness and networking with national and regional seed partners. STASS is a member of the African Seed Trade Association (AFSTA) and has also built linkages with associations in neighboring countries.

In 2022, STASS had 14 members. All 11 seed companies surveyed were members of STASS. The day-to-day management of the organization is run by a secretariat, led by a coordinator, who reports to a 7-member executive board. Members of the board are CEOs or Managing Directors of member seed companies. The current board was elected in 2020.

The survey sought members' opinions on the performance of STASS in six service areas (Figure 5). Seed companies' overall satisfaction rating for STASS was "good" at 72%, signaling that STASS is performing its expected functions. Furthermore, members rated STASS "good" (above 70%) in five out of the six assessment areas (Figure 5). The lowest rating was given in the area of resource mobilization (61%). Survey respondents identified the following three priorities for STASS: to enhance the coordination of active seed companies and agro-dealers in the country, to advocate for the enactment of the seed law and seed regulations currently being drafted, and to engage breeders at the MAFS to develop varieties that respond to farmers' preferences.

Figure 5: Members' opinion of the Seed Trade Association of South Sudan (2022)



ADEQUACY OF SEED INSPECTORS

Seed inspection services ensure that certified commercial seed meets the regulatory quality standards. To provide adequate inspection services requires sufficient numbers of well-resourced inspectors. TASAI studies track the number of inspectors and other information pertinent to their effectiveness, such as the availability of resources and the use of digital tools that enhance inspectors' productivity. In 2021, South Sudan had 15 public seed inspectors, 10 men and 5 women, all employed by the Directorates of Research and Plant Protection under the MAFS (Table 16). In theory, the inspectors should oversee the registration of seed producers and seed dealers and conduct field inspections and laboratory testing of seeds, two functions that conform to the seed regulations and guidelines applicable in East Africa (Eastern and Central Africa Programme for Agricultural Policy Analysis 2002) as well as the COMESA Harmonized Seed Trade Regulations (ACTESA 2014). However, in practice, resource limitations prevent the inspectors from carrying out their duties fully. A basic limitation is that the MAFS does not have a seed unit to oversee seed inspection, so inspections are not routine, and, in the absence of regulations, nor are they mandatory. Seed companies have to request for their seed fields to be inspected.

In 2021, among the seed companies surveyed a total of 39 employees had been trained as seed inspectors under the SSD4SS project. However, due to a lack of seed law and regulations, they were not officially authorized to carry out seed inspection. The passing of the seed policy and seed law should ease this bottleneck, as both have provisions for the authorization of private seed inspectors.

Seed companies' satisfaction rating of the government's seed inspection services was "fair" at 42% (Table 16), pointing to weak seed inspection services due to the lack of a seed policy, seed law, and regulations.

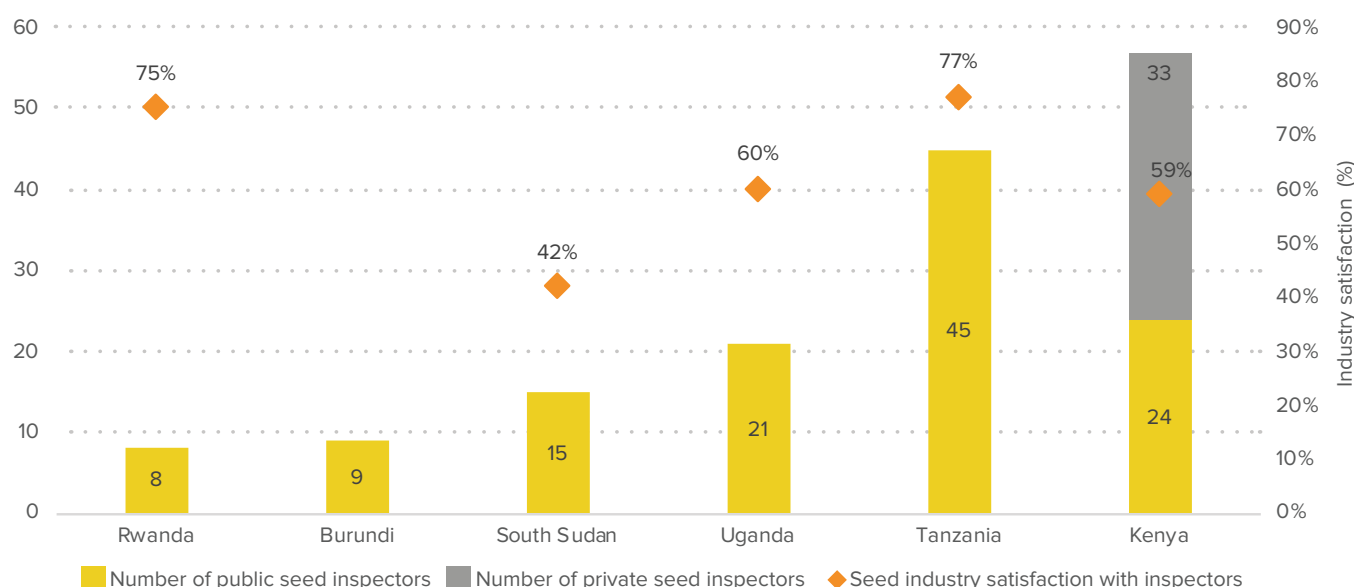
Table 16: Number and rating of the adequacy of seed inspectors

Indicators	2021
Number of public seed inspectors	15
Seed industry satisfaction with seed inspectors (out of 100%)	42%

extremely poor poor fair good excellent

Figure 6 shows the number and rating of seed inspectors in the EAC countries studied by TASAI between 2020 and 2022. South Sudan, with its 15 public inspectors, ranks fourth in the region in the number of public inspectors after Kenya, Tanzania, and Uganda. (The 39 private inspectors are not included because they did not carry out inspections.) Burundi and Rwanda both have fewer inspectors than South Sudan, but they are also significantly smaller in terms of land area. When it comes to private inspection services, only Kenya has an active regime for authorized private seed inspectors, although both Rwanda and Burundi are in the process of accrediting private seed inspectors. Meanwhile, in Uganda, the Ministry of Agriculture, Animal Industry and Fisheries has trained and deployed 140 agricultural extension officers to work as para-inspectors to support the work of government inspectors. Of the countries in the region, seed company satisfaction with seed inspection services is lowest in South Sudan.

Figure 6: Number of seed inspectors in EAC member states and satisfaction ratings by companies surveyed¹⁹



¹⁹ Rating for seed inspection services in Burundi was not available.

SERVICE TO SMALLHOLDER FARMERS

ADEQUACY OF EXTENSION SERVICES

Well-functioning agricultural extension services are critical to the successful adoption of improved seeds 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 the number of extension officers by sector (public and private) and gender; it is not crop-specific.

In South Sudan, the MAFS and the County Agriculture Departments (CAD) are responsible for the promotion and dissemination of seed technologies to the farming community. The extension service system is decentralized to local government levels so as to be located near the farmer. In 2021, the country had 15 public and 74 private extension officers, which translates to a ratio of one extension officer for every 13,065 agricultural households (Table 17).^{20,21} The ratio in South Sudan is high, which is also evident when comparing to other countries in the region (Figure 7). The MAFS has indicated that, although at present funding for extension services is inadequate, it intends to improve the situation by employing more extension staff and enhancing agricultural extension services using IT tools. Seed companies rated the adequacy of the extension services as “poor” at 27%.

Table 17: Number and adequacy of agricultural extension services

Indicators	2021
Number of public extension officers employed by the government	15
Number of private extension officers employed by seed companies	74
Total number of extension officers	89
Ratio of extension officers to agricultural households	1:13,065
Seed industry satisfaction with extension officers (out of 100%)	27%

extremely poor

poor

fair

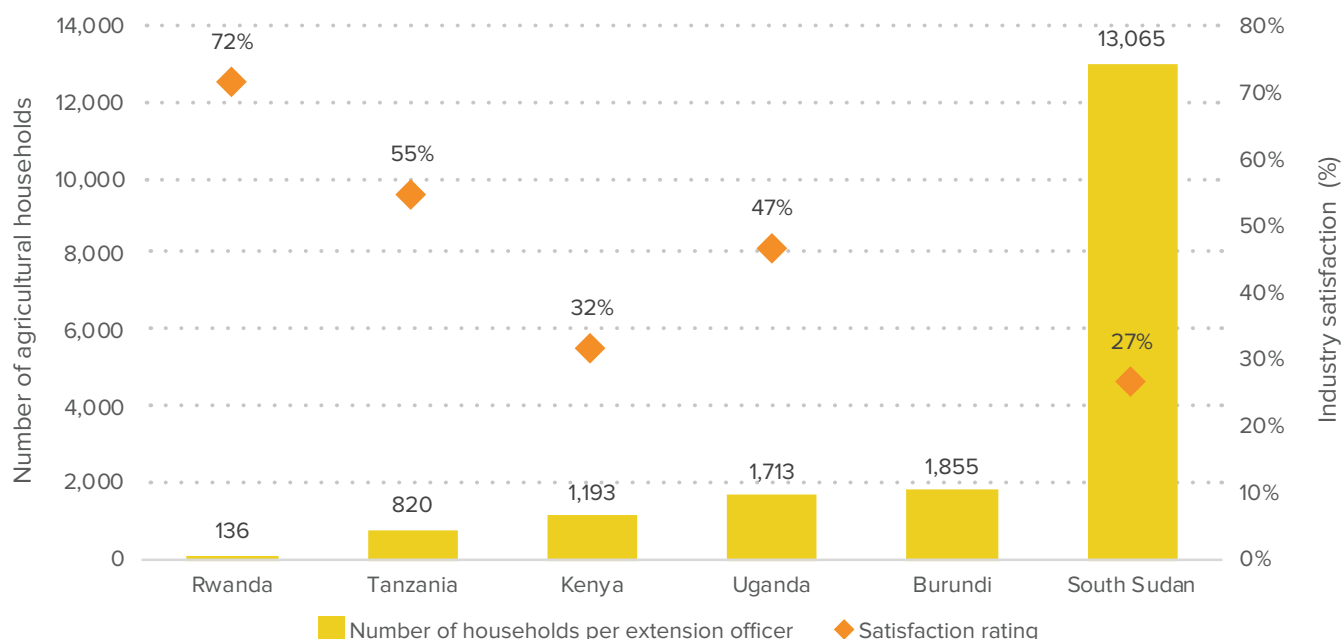
good

excellent

²⁰ While there is no authoritative literature on the ideal ratio, the lowest ratio TASAI has come across is 1:136 in Rwanda (Mabaya et al. 2021). In addition, the Uganda's National extension strategy 2016/17-2020/21 recommends a ratio of 1:500 ((Republic of Uganda - Ministry of Agriculture, Animal Industry, and Fisheries 2016).

²¹ The calculation uses the estimate of 1,162,806 agricultural households in South Sudan (FAO and WFP 2022).

Figure 7: Number of agricultural households served by one extension officer in EAC member states and satisfaction ratings reported by seed companies surveyed



CONCENTRATION OF THE AGRO-DEALER NETWORK

Agro-dealers play a key role in expanding the reach of Africa's seed distribution systems, connecting seed companies 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 from non-registered agro-dealers. This indicator is not crop specific.

The Ministry of Trade is responsible for issuing trading licenses, while the Ministry of Agriculture and Food Security registers agro-dealers in South Sudan. In 2021, the country had 35 registered agro-dealers in the Rumbek, Bor, Torit/Magwi, Yambio, and Juba areas (IFDC 2022). However, it is likely that there are many more unregistered active agro-dealer. On average, each seed company works with two agro-dealers, and more than half of the seed companies (56%) reported working with their own agro-dealers.

By the end of 2019, the SSD4SS project had provided agro-dealer training to 74 individuals. The trainees were a combination of owners/CEOs and sales staff. The training provided them with technical knowledge of agricultural inputs and enterprise management, and they were equipped with technical knowledge of agricultural inputs and enterprise management. In addition, they were linked to village-based advisers (VBAs), a key link to farmers. Further, the MAFS has worked with AGRA, IFDC, and other NGOs to build the capacity of agro-dealers. However, most agro-dealers in South Sudan are based in towns and, as a result, their reach does not extend to enough rural farming communities (Enterprise Incorporated Company Limited 2021). Despite interventions to increase the number of agro-dealers, few are registered to date.

With only 35 registered agro-dealers, the ratio of agro-dealers to agricultural households is 1:33,223. Reflecting the low number of agro-dealers, seed companies rated their satisfaction with the agro-dealer network as "poor", at 24% (Table 18).



Table 18: Number of agro-dealers and satisfaction with the agro-dealer network

Indicator	2021
Number of registered agro-dealers	35
Average number of agro-dealers per seed company	1.5
% of companies with exclusive agro-dealers	56%
Seed industry satisfaction with agro-dealer network (out of 100%)	24%

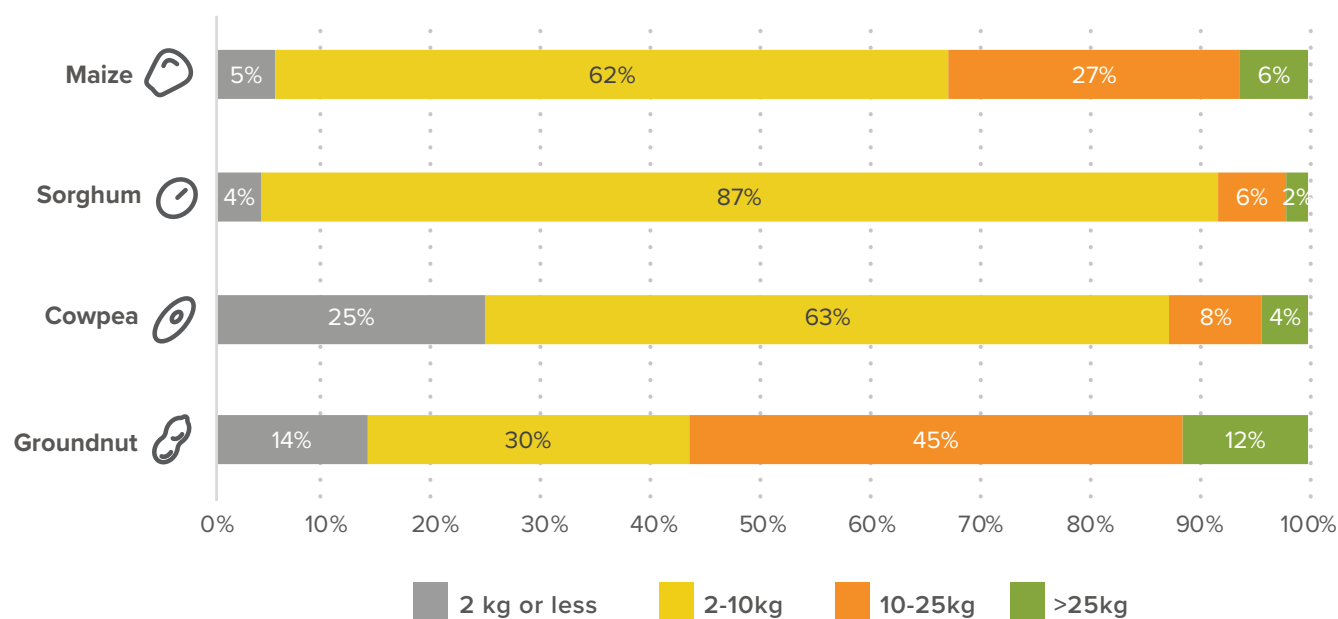
extremely poor poor fair good excellent

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 improved seed. TASAI tracks the percentage of seed sold in different package sizes, i.e., 2 kg and below, 2-10 kg, 10-25 kg, and above 25 kg. In South Sudan, most maize, sorghum,

and cowpea seeds are distributed in package sizes of 5 kg (Figure 8). Farmers who buy seed prefer this package size as it corresponds to their relatively large tracks of land (average smallholder land holding is 0.4-1.7 ha (African Development Bank (AfDB) Group 2013). Groundnut seed is mostly sold in even larger packages of 10-25 kg, because the seed is usually not shelled. Seed packs weighing more than 25 kg were not favored, as they are difficult for small-scale farmers to transport. All the surveyed seed companies packaged their seed and their contact details were included either on or inside the seed packages.

Figure 8: Percentage of seed sold in different package sizes (2021)



SEED AND GRAIN PRICES

The seed and grain prices at the time of planting are a good measure of the affordability of improved seed. These data points are important, as many smallholder farmers end up choosing between purchasing seed from the formal sector or planting grain. The greater the price difference between the two, the less likely it is that resource-poor farmers will purchase certified seed. This indicator tracks the retail price of seed (at the agro-dealer level) vis-à-vis the market price of grain at the time of planting. Although NGOs are an important source of seed for farmers, the data in this section is based on price data available from seed companies and/or agro-dealers, as NGOs provide seed for free.

Of the four crops, the prices for hybrid maize seed and cowpea seed were the highest, followed by sorghum, groundnut, and OPV maize (Table 19). The price of OPV maize seed is nearly double that of hybrid maize seed, which explains why seed companies reported selling significantly greater quantities of

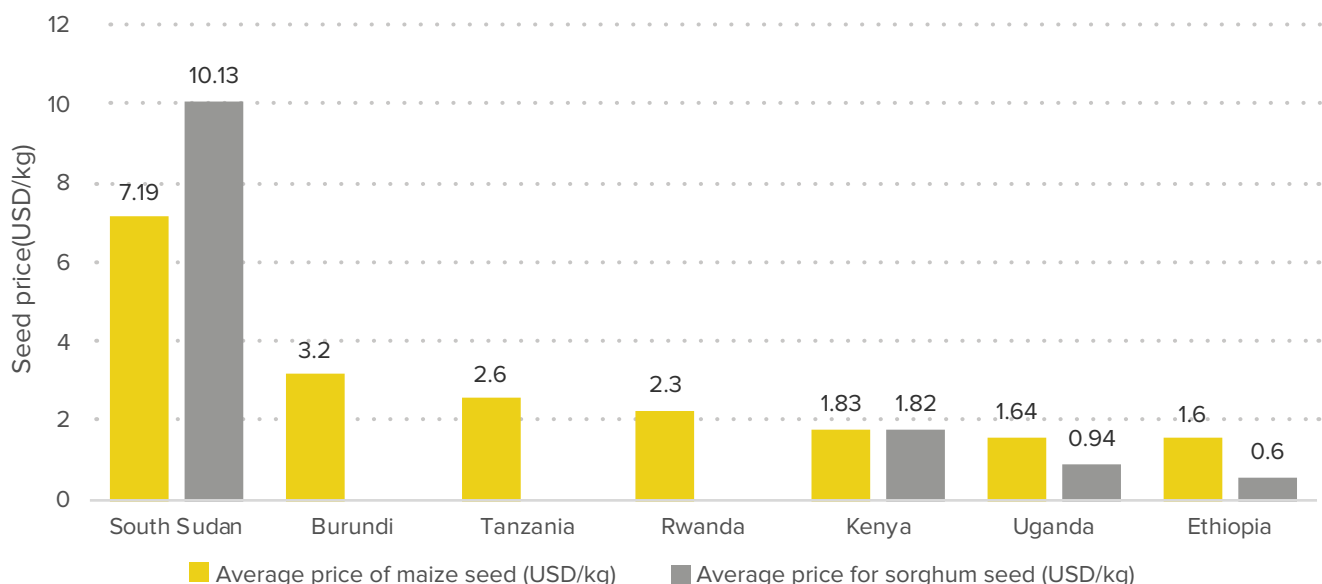
OPV than hybrid maize seed. A point of note is the pattern of difference between seed and grain prices. For maize and sorghum, the price of seed exceeds the price of grain. This is to be expected and matches the trend observed in other countries. However, in the case of cowpea and groundnut, the cost of grain is higher than the cost of seed. We do not have a reason for these diverging figures; however, given that collecting high quality data and sampling all areas of the country were not possible, the prices of grains need to be interpreted with caution.

Figure 9 compares the average price of maize and sorghum seed across countries in eastern Africa studied by TASAI between 2020 and 2022. For both crops, the price of seed was notably higher in South Sudan than in other countries, which is likely due to the high cost of importing foundation seed from Uganda as well as the cost of storage, as most companies do not own their own storage facilities and need to rent them (TANGO International 2020). In addition, most inputs for seed production are imported (usually from Uganda and Kenya), further adding to the cost.

Table 19: Seed and grain prices (2021)

Crop	Average seed price (SSP/kg)	Average grain price (SSP/kg)
 Maize (Hybrid)	1,550	500
 Maize (OPV)	936	500
 Sorghum	1,320	600
 Cowpea	2,088	2,400
 Groundnut	1,307	1,600

Figure 9: Comparison of average seed prices for maize and sorghum in Eastern Africa





CONCLUSION

The seed sector in South Sudan is in the nascent stage of growth (Ariga et al. 2019). It is characterized by a seed supply system that is largely dominated by NGOs and international relief organizations that distribute free seed to farmers, a young private sector, the absence of a legal and regulatory framework, a lack of formal variety release process, weak national breeding programs, and inadequacies in the seed distribution system. Amidst these challenges, the Seed Trade Association of South Sudan (STASS) is fairly vibrant and active. The conclusions below provide a more detailed summary of the status of the seed sector for each of the TASAI indicator categories.

Several constraints on the seed sector were identified under the **research and development** category. At the moment, there is no active breeding program in the country. Most research activities in the country concentrate on adaptive trials of superior varieties that have already been released in neighboring countries. Materials are tested under National Performance Trials (NPTs) to fast-track their release. While this is useful for countries with nascent seed sectors, the ability to develop varieties locally is an important milestone in the development of the sector. Further, seed companies are dependent on neighboring countries and the Ministry of Agriculture and Food Security (MAFS) for foundation seed. Nevertheless, 26 varieties for the focus crops have been released since 2012.

A key finding under **industry competitiveness** is the relatively low level of competition with only 14 active seed companies recognized and registered by the government. These companies produce and market seed of improved varieties. NGOs and international organizations are key buyers of seed, accounting for more than 60% of aggregate company sales for maize, cowpea, and groundnut seed in 2021. This implies that there is room for the seed sector in South Sudan's growth. Another important finding is the narrow range of varieties on the market: our study found that only seven varieties of the four focus crops were sold in 2021. Importantly, all 7 varieties on the market were imported from other countries.

South Sudan's **seed policy and regulatory framework** are virtually nonexistent, presenting a major weakness in the seed sector. A promising development is that the MAFS, in collaboration with other stakeholders, is drafting the key seed policy instruments. The enactment of the seed law and the passing of the regulations will go a long way towards formalizing all aspects of the seed sector.

Two positive developments can be noted under **institutional support**. The first is the existence of the national seed trade association (STASS), which is actively engaged in the development of the seed sector in the country. STASS has also developed networks with its counterparts in the neighboring countries and is a member of the Africa Seed Trade Association (AFSTA). Second, despite not having a seed law, the MAFS has employed and deployed 15 public seed inspectors and has trained and deployed to seed companies 39 additional seed inspectors. Although they are not yet authorized to carry out inspections, once the seed bill passes and provides the required authorization, they will be able to jump-start private inspection services.

Several challenges are noted under the category of **service to smallholder farmers**. First, the government's agricultural extension services are inadequate due to insufficient funding both at the level of the MAFS and the County Agricultural Departments. Second, the number of registered and active agro-dealers is extremely low. These two challenges significantly hinder the effectiveness of the last-mile seed distribution systems. Finally, the high prices of certified seed in the country are a deterrent to the adoption of improved seed by farmers.

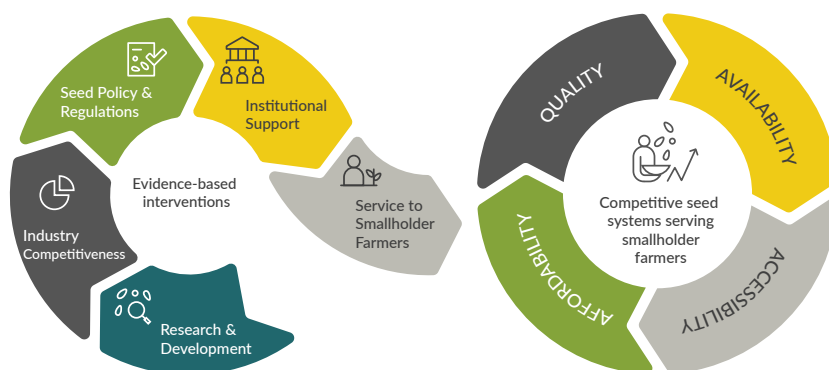
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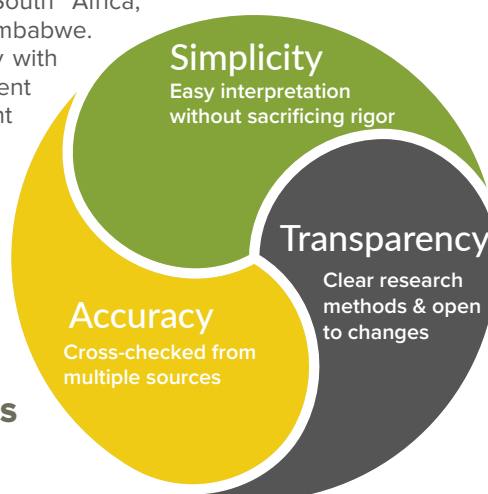
ABOUT TASAI



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 2022, TASAI studies will have been completed in 22 African countries: Burkina Faso, Burundi, the Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, 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

BROWSE TASAI DATA ONLINE:

For a comparison of TASAI Indicators across different countries and years, please visit the TASAI Dashboard online: <https://dashboard.tasai.org>

READ TASAI REPORTS ONLINE:

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The African Seed Access Index



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