



Mozambique Country Report 2021

The African Seed Access Index

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TASAI
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LIST OF ACRONYMS

AGRA	Aliança para a Revolução Verde em África / Alliance for a Green Revolution in Africa	IITA	Instituto Internacional de Agricultura Tropical/ International Institute of Tropical Agriculture
ANS	Autoridade Nacional de Sementes/ National Seed Authority	InovAgro	Inovação para o Agronegócio/ Innovation for Agribusiness
APOSE	Associação para a Promoção do Sector de Sementes / Association for the Promotion of the Seed Sector	IRRI	Instituto Internacional de Investigação de Arroz / International Rice Research Institute
CGIAR	Grupo Consultivo sobre Pesquisa Agrícola Internacional/ Consultative Group on International Agricultural Research	MADER	Ministério da Agricultura e Desenvolvimento Rural/ Ministry of Agriculture and Rural Development
CIMMYT	Centro Internacional de Melhoramento do Milho e Trigo/ International Maize and Wheat Improvement Center	MDG1c	Programa de Desenvolvimento do Milénio Objectivo 1C/ Millenium Development Goal 1C Program
CNS	Comitê Nacional de Sementes/ National Seed Committee	MOSTA	Associação Moçambicana das Empresas de Comércio de Sementes/ Mozambique Seed Trade Association
DFDTT	Direcção de Formação, Documentação e Transferência de Tecnologia/ Directorate of Training, Documentation, and Technology Transfer	PACE	Pequeno Agricultor Comercial e Emergente/ Emerging Commercial Producer
DINAS	Direcção Nacional de Agricultura e Silvicultura/ National Directorate of Agriculture and Silviculture	SADC	Comunidade de Desenvolvimento da África Austral/ Southern Africa Development Community
DNAAF	Direcção Nacional de Assistência à Agricultura Familiar/ National Directorate for Family Agriculture Assistance	SCRLV	Subcomitê de Registo e Libertação de Variedades/ Sub-committee of Variety Registration and Release
DNDAF	Direcção Nacional de Desenvolvimento da Agricultura Familiar/ National Directorate for Family Agriculture Development	SDAE	Serviços Distritais de Actividades Económicas/ District Services of Economic Activities
DNEA	Direcção Nacional de Extensão Agrária/ National Directorate of Agricultural Extension	SEMEAR	Sementes Melhoradas para uma Agricultura Renovada/ Improved Seeds for Better Agriculture
DNSAB	Direcção Nacional de Sanidade Agro-pecuária e Biossegurança/ National Directorate of Agricultural Health and Biosafety	SRHSS	Sistema Regulatório Harmonizado de Sementes da SADC/ SADC Harmonized Seed Regulatory System
DUS	Distinção, Uniformidade e Estabilidade/ Distinctness, Uniformity, and Stability	UNAC	União Nacional de Camponeses/ National Union of Farmers
FAO	Organização para a Alimentação e Agricultura/ Food and Agriculture Organization	USEBA	Unidade de Semente Básica/ Unit of Basic Seed
IIAM	Instituto de Investigação Agrária de Moçambique/ Mozambique Institute of Agricultural Research	USAID	A Agência dos Estados Unidos para o Desenvolvimento Internacional/ United States Agency for International Development
		VCU	Valor para Cultivo e Uso/ Value for Cultivation and Use



INTRODUCTION

The increased use of productivity-enhancing technologies, including mechanization, irrigation, fertilizer, and improved seed,¹ 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 deliver these benefits, 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 2021 to appraise the structure and economic performance of Mozambique's formal seed sector. TASAI studies focus on the four grain, cereal, and legume crops important to a country's food and nutritional security (the "four focus crops"). In Mozambique, these crops are maize, rice, cowpea, and soya bean. Maize is produced by 84% of small- and medium-scale farmers, while rice is produced by 13% of small- and medium-scale farmers (MADER 2021a). Cowpea is produced by 42% of small- and medium-scale farmers (MADER 2021a). Soya bean is an emerging cash crop with multiple uses - as a staple food for human consumption as well as an input in the poultry and breweries industries.

OVERVIEW OF MOZAMBIQUE'S FORMAL SEED INDUSTRY

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

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 & Sperling 2016). In many cases, farmers keep seed from the harvest and exchange it with neighbors, and relatives, and through rural markets. Seed from this system is of variable varietal purity, physical and sanitary quality.² The

informal seed system is the most prominent source of seed in Mozambique. According to the country's *Ministério da Agricultura e Desenvolvimento Rural* (Ministry of Agriculture and Rural Development) (MADER), in the 2019/2020 cropping season, only 9% and 5% of small- and medium-scale farmers used certified seed of maize and rice, respectively (MADER 2021a).

The formal system is a structured and regulated value chain for the production of improved seed varieties. This process involves many actors and institutions, whose activities range 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 policies, laws, regulations, and standards. The sale of seed from this system takes place through limited distribution channels such as registered seed companies and agro-dealers. In Mozambique, the government has stated that it is committed to expanding the availability, use, and commercialization of certified seed as one of the priority actions for the development of smallholder farming and the promotion of commercial agriculture (MADER 2020).

In the 2019/2020 cropping season, only 9% of small- and medium-scale farmers used improved maize seed (MADER 2021a). The underlying reasons for the slow adoption of improved seed are farmers' low levels of awareness of the importance of improved seed, weak diffusion of knowledge of new and improved varieties, and a lack of market channels for selling surplus grain.

Table 1 lists the key players in Mozambique's formal seed sector. The *Instituto de Investigação Agrária de Moçambique* (Mozambique Institute of Agricultural Research) (IIAM) is responsible for carrying out research and development activities in agriculture. To promote the use of its released varieties, the IIAM created the *Unidade de Semente Básica* (Unit of Basic Seed) (USEBA), which promotes, multiplies, and sells basic seed of varieties developed by IIAM. Education, training, and extension activities are mainly carried out by the public sector, specifically the *Direcção Nacional de Extensão Agrária* (National Directorate of Agricultural Extension) (DNEA) under MADER and the *Direcção de Formação, Documentação e Transferência de Tecnologia* (Directorate of Training, Documentation, and Technology Transfer) (DFDTT) under the IIAM. In addition, seed companies and non-governmental organizations (NGOs) also carry out education, training, and extension activities. The production, processing, and marketing of certified seed is carried out mainly by the private sector, which consists of international, regional, and local seed companies and agro-dealers. Certified seed is produced directly by the seed companies and/or indirectly through contracts with individual farmers or farmers' associations that can produce quality seed. Seed distribution is handled by seed companies and agro-dealers.

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

2 See seed system definitions at <https://www.agrilinks.org/post/seed-system-definitions>



The two associations that bring together seed industry entities in the formal seed sector are the *Associação Moçambicana das Empresas de Comércio de Sementes* (Mozambican Association of Seed Trade Companies) (MOSTA) and the *Associação para a Promoção do Sector de Sementes* (Association for the Promotion of the Seed Sector) (APROSE). MOSTA's aims are to create a favorable business environment for agricultural inputs, including seed, and to ensure the growth and stability of input markets in the country (Rutgers and AGRA 2016). APROSE is a multi-sectoral initiative that advocates for the development of the formal seed sector. APROSE engages with seed value chain actors and relevant development partners to promote a dynamic and commercially competitive seed value chain to increase farmers' availability and access to seed.

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

ROLE	KEY PLAYERS
Research and breeding	Instituto de Investigação Agrária de Moçambique (IIAM), International Maize and Wheat Improvement Center (CIMMYT), International Institute of Tropical Agriculture (IITA), International Rice Research Institute (IRRI), and International Potato Centre (CIP)
Variety release and regulation	Autoridade Nacional de Sementes (ANS) in the Ministério da Agricultura e Desenvolvimento Rural (MADER), Phytosanitary Department in MADER, Comitê Nacional de Sementes (CNS) in MADER, and Subcomitê de Registro e Libertação de Variedades (SCRLV)
Seed production and processing	Seed companies, producers, and Unidade de Semente Básica (USEBA)
Education, training, and extension	Direcção Nacional de Extensão Agrária (DNEA) in MADER, Direcção de Formação Documentação e Transferência de Tecnologia (DFDTT) in IIAM, seed companies, and NGOs
Distribution and sales	Seed companies, seed agro-dealers/retailers, and USEBA
Advocacy	Mozambican Association of Seed Trade Companies (MOSTA) and Associação para a Promoção Sector Sementes (APROSE)



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 before 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 2020; however, whenever 2021 data are available, they are included in the report.

Table 2: TASAI Indicators

	Crop-specific	Impact on seed access
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-to-grain price ratio at planting time	Yes	-

To assess the progress of Mozambique's formal seed sector, this Country Report draws comparisons with the 2017 TASAI country study of Mozambique (with performance data primarily from 2016). 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 companies, plant breeders, and representatives of government entities active in the country's seed sector. Of these, seed companies were the primary source of information for the study. For several indicators, TASAI supplemented quantitative data with self-reported industry satisfaction ratings on a 0-100 scale, 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**.

In 2020, the *Autoridade Nacional de Sementes* (National Seed Authority) (ANS) registered 34 seed companies to produce and market seed of at least one of the four focus crops. Out of the 34 seed companies, 9 seed companies were not included in the present study: 3 were no longer active in the seed business, while the other 6 had shifted from seed production to agro-dealership. In contrast, the study identified four companies that were not registered with the ANS but met the selection criteria for respondents and thus were included in the study. Further, three seed companies did not respond to the survey, despite repeated requests to participate, citing a lack of benefit from the previous (2017) study for their company. Altogether, the study reached 26 respondents, of whom 24 produced maize seed, 12 produced rice seed, 18 produced cowpea seed, and 14 produced soya bean seed (Table 3). The 26 companies included all the major seed companies in Mozambique.

The timing of the interviews posed a challenge for data collection, as it coincided with the seed production season and seed companies were busy with field activities. However, the delay did not affect the quality of the data collected, as eventually all 26 respondents were reached.

In addition to the seed companies, the study surveyed other key stakeholders within the seed sector. These were breeders working with the four focus crops, officers from MADER, the Mozambique Organization (FAO), APROSE, MOSTA, and the NGO *União Nacional de Camponeses* (National Union of Farmers) (UNAC) (Table 4).

Table 3: Breakdown of respondents by crop (2020)

Crop	Number of seed companies surveyed (TASAI data)	Number of registered seed producers (government data)
 Maize	24	26
 Rice	12	12
 Cowpea	18	20
 Soya bean	14	14

Table 4: Other surveyed seed sector actors

Category of actors	Actors
National Agricultural Research Institutes	Instituto de Investigação Agrária de Moçambique (IIAM)
Other public institutions	Direção Nacional de Sanidade Agropecuária e Biossegurança (DNSAB)
Regulator	Autoridade Nacional de Sementes (ANS), Subcomitê de Registro e Liberação de Variedades (SCRLV), and Comitê Nacional de Sementes (CNS)
Ministry of Agriculture	Ministério da Agricultura e Desenvolvimento Rural (MADER), Autoridade Nacional de Sementes (ANS), Direcção Nacional de Sanidade Agropecuária e Biossegurança (DNSAB), Direcção Nacional de Assistência à Agricultura Familiar (DNAAF), SUSTENTA, the Programa Nacional de Subsídios de baixo de Direcção Nacional de Desenvolvimento da Agricultura Familiar (DNDAAF), and DFDTT in MADER
Private sector	Associação para a Promoção Sector Sementes (APROSE) and the Mozambique Seed Trade Association (MOSTA)
Other institutions	Food and Agriculture Organization (FAO) and União Nacional de Camponeses (UNAC)

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.³ 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 the public breeding programs. The latter often reflects the ability of active breeders in public institutions to produce new varieties.

In 2020, Mozambique had a total of 22 public active breeders (3 women and 19 men) for the four focus crops (Table 5). Of the 22 breeders, 21 were employed by the IIAM. Among the 22 public breeders, 7 worked on maize, 10 worked on rice, 2 worked on cowpea, and 3 worked on soya bean. In 2020, only 2 breeders were employed in the private sector by a regional seed company and they each worked on both rice and maize.

³ 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.

Most regional and multinational seed companies in the country market varieties suited for Mozambique but developed by breeders in their sister companies in other countries. However, they rely on the IIAM to test and release their varieties in Mozambique. The Consultative Group on International Agricultural Research (CGIAR) centers supply new, improved varieties in collaboration with the IIAM, although their breeders are based in CGIAR centers located in other countries. At present, the IIAM collaborates with the International Institute of Tropical Agriculture (IITA) on soya bean and cowpea breeding through the *Sementes Melhoradas para uma Agricultura Renovada* (Improved Seeds for Better Agriculture) (SEMEAR) project that was led by the IITA to provide pre-basic and basic grain legume seed⁴ in the country. The IITA breeders are based in Nigeria for cowpea and in Zambia for soya bean. The International Rice Research Institute (IRRI) works on rice and the International Maize and Wheat Improvement Center (CIMMYT) works on maize. The breeders working with these two institutions are likewise based outside of Mozambique.

Between 2016 and 2020, the number of public maize breeders did not change. There was a slight increase in the number of rice and soya bean seed breeders and a reduction in the number of cowpea seed breeders.

⁴ SEMEAR ended in 2021; it focused on six crops: soya bean, sesame, common bean, pigeon pea, cowpea, and groundnut.

Table 5: Number and adequacy of active breeders in Mozambique

Crop	Number of active breeders in 2016		Number of active breeders in 2020		Satisfaction rating (out of 100%)	
	Public	Private	Public	Private	2016	2020
 Maize	6	0	7	2	90%	71%
 Rice	8	0	10	2	90%	70%
 Cowpea	4	0	2	0	63%	65%
 Soya bean	2	0	3	0	68%	64%
Total	20	0	22	2		

a In some cases, the same breeder may work on multiple crops, so the total number of breeders may not equal the sum of breeders by crop.

extremely poor poor fair good excellent



Breeders reported that they encountered the following constraints: inadequate facilities to ensure off-season breeding activities (e.g., irrigation); insufficient land to ensure adequate isolation distances (especially in the case of maize) and crop rotation needed for healthy soil; limited seed processing facilities; dispersed fields for seed production, adding to the cost of breeding activities; a lack of resources for the maintenance of breeder seed; a lack of transparency in the use of the proceeds from the sale of basic seed in breeding activities; limited post-harvest quality control, resulting in poor quality basic seed; and unpredictable demand, which makes it hard to plan how much basic seed to produce to satisfy demand.

As shown in Table 5, in the 2016 and 2020 studies, seed producers' rating of their satisfaction with the adequacy of breeders was "good" for all four focus crops, ranging from 64% for soya bean to 71% for maize.

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.

Mozambique belongs to the Southern Africa Development Community (SADC), which is directly relevant to the variety release process, because, as per the SADC Harmonized Seed Regulatory System, varieties released in two SADC countries may be listed in the SADC Catalogue and can be commercialized in other SADC countries without a need to undergo further DUS and VCU tests (SADC 2008a). In principle, the advantages of adding varieties to the SADC catalogue are that (i) it allows for the free release of seed varieties in SADC country members without the need to re-test for adaptability, agricultural value, and use, or DUS; (ii) it promotes competitiveness among the seed companies; and (iii) it promotes the availability of high-quality seed in the SADC country members.

In Mozambique, a total of 160 varieties of the focus crops were released between 2000-2020: 130 maize varieties, 14 rice varieties, 3 cowpea varieties, and 13 soya bean varieties. Out of the 160 varieties, 111 varieties were public varieties released by the IIAM: 83 maize varieties, 14 rice varieties, 3 cowpea varieties, and 11 soya bean varieties. In addition, between 2018 and 2020, Mozambique added 47 maize and 2 soya bean varieties from the SADC Seed Variety Catalogue⁵ to its official list.

Of the 111 varieties, only 19 (all of them maize) have been included in the Lista Oficial de Variedades/ Official List of Varieties to date, allowing them to be released in other SADC countries. The remaining varieties are not on the official list because the ANS has not yet carried out DUS and VCU tests required by the Seed Regulation (Decreto nº 12/2013) (Conselho de Ministros 2013). Instead, the DUS and VCU tests are carried out by the breeders for two consecutive seasons in the same cropping periods, as required under Diploma Ministerial nº116/2011 (Ministério da Agricultura 2011), and the varieties are entered in a simplified variety release list. The goal of this simplified variety release process is to increase the availability of quality seed to farmers (Rutgers and AGRA 2016).

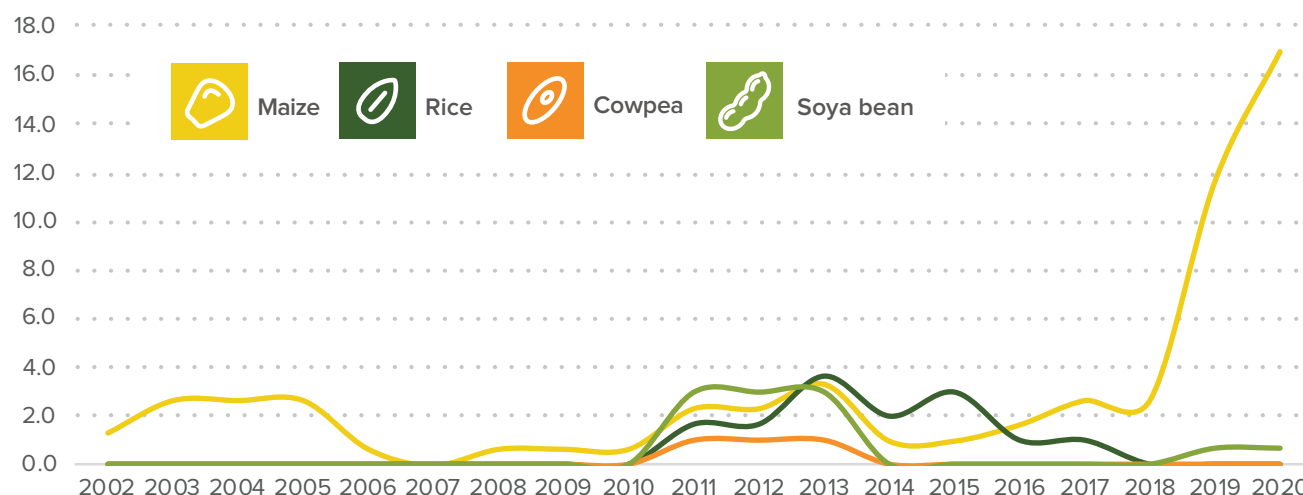
Most of the regional or multi-national seed companies that work on the four focus crops do not use the variety registration process in Mozambique. Instead, they use their varieties bred outside the country and released in the SADC region through the harmonized seed regulation agreement. Currently, CGIAR centers breed varieties and transfer them to SADC member states to test their adaptability and assess their agricultural value.

Figure 1 shows the 3-year moving average of the varieties of the four developed and released in Mozambique between 2000 and 2020. Between 2002 and 2010 only 14 maize varieties were released. However, there was a sharp increase in the release of varieties of the four focus crops between 2011 and 2014, when 10 maize, 11 rice, 3 cowpea, and 9 soya bean varieties were released. This was the result of a new ministerial directive, the Diploma Ministerial nº 116/2011 (Ministério da Agricultura 2011), which allowed for the simplified varietal release process mentioned earlier. Between 2015 to 2020, and following the new process, a total of 59 maize varieties, 3 rice varieties, and 2 soya bean varieties were released; however, no cowpea varieties were released.

⁵ <https://www.sadcseedcentre.com/index.php/variety-catalog>



Figure 1: Trend in the number of varieties released (3-year moving average)



VARIETIES WITH SPECIAL FEATURES

Varieties may have special characteristics, such as climate-smart, fast-cooking, nutrition-enhanced, or industry-demanded features. While acknowledging the increase in biotic stresses (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.

Of the 23 maize varieties developed and released in Mozambique between 2018 and 2020, none had climate-smart features. In contrast, over the same period (2019-2020), all the 47 maize and 2 soya bean varieties from the SADC catalogue had climate-smart features. According to the SADC catalogue, these varieties are medium- to late-maturing and are tolerant to diseases such as maize streak virus, grey leaf spot, and blight.

NUMBER OF VARIETIES SOLD

An increase in the number of varieties sold in a country often reflects an increased choice of varieties available to farmers. In vibrant seed systems, farmers regularly replace old varieties with new ones. However, in many African countries, old varieties persist, despite the fact that newer varieties often outperform older varieties as they are bred for traits that respond to demands by farmers, consumers, and industry.

In Mozambique, the average age of varieties sold in 2020 ranged from 4 to 24 years old (Table 6). By crop, the average age (in years) of commonly sold varieties was 13 for maize, 6 for rice, 24 for cowpea, and 11 for soya bean. Based on the average ages of all varieties sold for the four focus crops, rice and cowpea have the oldest varieties, which reflects, in part, the low number of variety releases for these crops. Farmers, for their part, continue to use old varieties that they know and like. For example, the Matuba maize variety and the IT-18 cowpea variety are commonly sold to farmers, even though they are both 24 years old. However, farmers like Matuba because it is early-maturing (120 days) and still gives reasonable yields with minimal use of inputs (up to 4 MT/ha, somewhat less than other OPV whose yield exceeds 5 MT/ha). For its part, the IT 18 cowpea variety has a yield of 2.5 MT/ha, which is lower than newer cowpea varieties; however, farmers continue to buy it because it matures in 85 days (thus classified as early maturing), is semi-erect, and is well adapted to most regions of the country.

Table 6 shows the number and age of commonly sold varieties in 2020. A total of 52 varieties were sold: 34 maize varieties, 6 rice varieties, 5 cowpea varieties, and 7 soya bean varieties. The most commonly sold varieties were: ZM523, Matuba and PAN 53 for maize; Macassane and Simao for rice; IT 18, and IT 16 for cowpea; and TGX-1904-6F. It should be noted that all of these commonly sold varieties were released locally, except for IT 16.



Table 6: Name and age of commonly sold varieties (2020)

Crop	Number of varieties sold in 2020	Name of commonly sold variety	% of companies selling the variety	Age of variety (years) in 2019
 Maize	34	ZM523	63%	8
		Matuba	50%	24
		PAN 53	38%	8
 Rice	6	Macassane	92%	8
		Simao	50%	4
 Cowpea	5	TI 18	78%	24
		TI 16 ^a	72%	24
 Soya bean	7	TGX-1904-6F (Zamboane)	50%	8
		TGX-1908-8F	29%	8
		Safari	29%	14
		Serenade	29%	14

a Although IT 16 is the same age as IT 18, it is not officially listed in Mozambique.

Importantly, the number of improved varieties released has increased since 2011, particularly for soya bean (11) and maize (69) which are all local releases. However, among the nine soya bean varieties released from 2011 to 2020, only TGX 1904-6F and TGX 1908-8F (both local varieties) were sold in 2020. Three factors contribute to the low rates of commercialization.

First, seed companies often do not have access to adequate volumes of basic seed to produce sufficient quantities to satisfy the demand for certified seed for sale to farmers.

Second, even when quantities are sufficient, farmers may not adopt a newly released variety due to a lack of awareness of its benefits. One way to counter this is through awareness raising campaigns, as illustrated by the rice variety Macassane, which was the most popular rice variety in 2020, sold by 92% of seed companies. It has high yields (7-8 MT/ha) and extra-long grain length. The variety was developed by the IRRI and was evaluated, selected, and released by the IIAM in Mozambique. Prior to and after its release, Macassane was highly publicized, especially in the country's southern region. Likewise, Matuba, one of the oldest maize varieties, gained popularity due to extensive diffusion efforts; although it is 24 years old, it was still sold by 50% of seed companies in 2020.

Third, more than 50% of all the maize varieties sold in 2020 in Mozambique were released in the SADC region and accessed through the SADC harmonized seed system. Seed suppliers operating in Mozambique take advantage of the harmonized regulations to satisfy the excess demand for seed in the country.

While some released varieties have not been commercialized, yet other varieties are being sold that are in fact not in the official variety list. Some SADC varieties sold in Mozambique are not on the country's official variety list. Of the 52 varieties sold in 2020, 3 cowpea varieties (Brown mix, IT 16, and IT-97k-390-2), and 6 soya bean varieties (Dina, Safari, Serenade, TGX 1835-10E, TGX 1808-E, and TGX1937-7F) had not been officially released in Mozambique, even though cowpea variety IT 16 and soya bean varieties Serenade and Safari were among the most commonly sold varieties in 2020. According to the seed companies surveyed, the sale of unofficial varieties may create loopholes that facilitate the introduction of counterfeit seed, because seed of these varieties is not subjected to inspection and quality certification.

SOURCES AND AVAILABILITY OF FOUNDATION (BASIC) SEED

Seed companies use basic seed to produce certified seed for sale to farmers. In many African countries, limited access to basic seed from public research institutions often limits seed companies' ability to scale up production. In Mozambique, seed companies obtain basic seed from public research institutions: after specifying the variety and quantity of seed needed, the research institution invoices the seed company and, upon payment, the seed company collects the seed.

Sources of basic seed: Table 7 shows the sources of basic seed by crop as well as the number of transactions completed with each institution in 2020. In general, seed

companies obtain basic seed from more than one source. Based on the number of transactions, the IIAM and the CGIAR centers are the main sources of basic seed of the focus crops in Mozambique. Most of the maize basic seed transactions (58%) and all rice basic seed were fulfilled by the IIAM. The IIAM and the IITA also accounted for most of the cowpea basic seed transactions under the SEMEAR project. Quali Basic Seed, a regional seed company specializing in the production and sale of basic seed, headquartered in Kenya and with subsidiaries in Zambia and South Africa, supplied two seed companies with basic seed for hybrid maize. Further, some of the regional and multinational seed companies provided basic seed from their own regional breeding centers based outside Mozambique. These transactions are captured under other seed companies.

Seed companies were asked to assess their level of satisfaction with each source organization on three aspects of their basic seed orders: the quality of basic seed received, whether they had received the quantity requested, and the timeliness of the delivery. Table 8 presents their responses.

Table 7: Source of basic seed by crop, number of transactions, and percentage of total transactions (2020)

Source of basic seed	Maize		Rice		Cowpea		Soya bean	
	Number of transactions	% of total	Number of transactions	% of total	Number of transactions	% of total	Number of transactions	% of total
IIAM	11	58%	6	100%	5	36%	1	8%
CIMMYT	1	5%						
IITA					7	50%	5	42%
Own	1	5%					1	8%
QualiBasic Seed	2	10%						
Other seed companies	4	22%			2	14%	5	42%
Total	19	100%	6	100%	14	100%	12	100%



Table 8: Satisfaction rating of the quality, quantity, and timeliness of basic seed received by source organization (2020)

Crops		IIAM	IITA	QualiBasic Seed ^a	Other	Overall
 Maize (n=19)	Quality	66%	-	80%	90%	75%
	Quantity	65%	-	95%	85%	75%
	Timeliness	78%	-	95%	90%	83%
 Rice (n=6)	Quality	93%	-	-	-	93%
	Quantity	78%	-	-	-	78%
	Timeliness	97%	-	-	-	97%
 Cowpea (n=14)	Quality	58%	70%	-	-	63%
	Quantity	54%	61%	-	-	55%
	Timeliness	68%	66%	-	-	63%
 Soya bean (n=12)	Quality	-	84%	-	86%	88%
	Quantity	-	94%	-	80%	87%
	Timeliness ^b	-	78%	-	92%	86%

extremely poor
poor
fair
good
excellent

a Note that ratings on availability of basic seed are only provided for organizations that had a minimum of 5 transactions (and thus a minimum of 5 ratings). The exception to this is Quali Basic Seed, a private company which supplies basic seed.

b Quality, quantity and timeliness of basic seed are all opinion ratings and reflect how satisfied seed companies were with these attributes for the basic seed that they received.

Quality of basic seed received: The ratings assigned to quality of basic ranged from “good” to “excellent.” Although the IIAm was responsible for 58% of maize basic seed orders, the quality of maize seed from the IIAm was rated lower than other sources. Respondents noted that the quality of maize basic seed from the IIAm was constrained by poor varietal maintenance, which results in the degeneration of the old popular varieties (e.g., Matuba). As a result, most seed producers screened the seed to see if the quality was acceptable, and, if not, were forced to sell it as grain. In contrast, another supplier of maize basic seed, QualiBasic Seed, and “other” sources were rated “excellent.”

In the case of rice basic seed, the only provider in the country is the IIAm. In contrast to maize basic seed, the quality of basic seed for rice from the IIAm was rated “excellent” by seed companies. The organization’s ability to produce such a high-quality product is partly a reflection of ongoing initiatives that support the development of the rice sub-sector in the country. These include lobbies at high political

levels advocating for rice import substitution, innovations in the Regional Centre of Leadership on Rice⁶, and investments in rice processing infrastructure.

Cowpea basic seed were provided primarily by the IIAm and the IITA; basic seed from the IIAm was rated quite low at 58%, while the same from the IITA was rated “good.” Soya bean basic seed, provided by the IITA and other sources, were both rated “excellent.”

Quantity of basic seed received: The ratings for the quantity of basic seed received ranged from “good” to “excellent” for maize, rice and soya bean basic seed. The IITA was rated “excellent” for soya bean basic seed and “good” for cowpea basic seed. Quali Basic Seed was rated “excellent” for maize. Other sources of basic seed were rated “excellent” for maize basic seed and soya bean basic seed. The quantity of

⁶ <https://www.ccardesa.org/sadc-delegates-admires-newly-constructed-regional-centre-leadership-rice> Accessed 9 March 2022



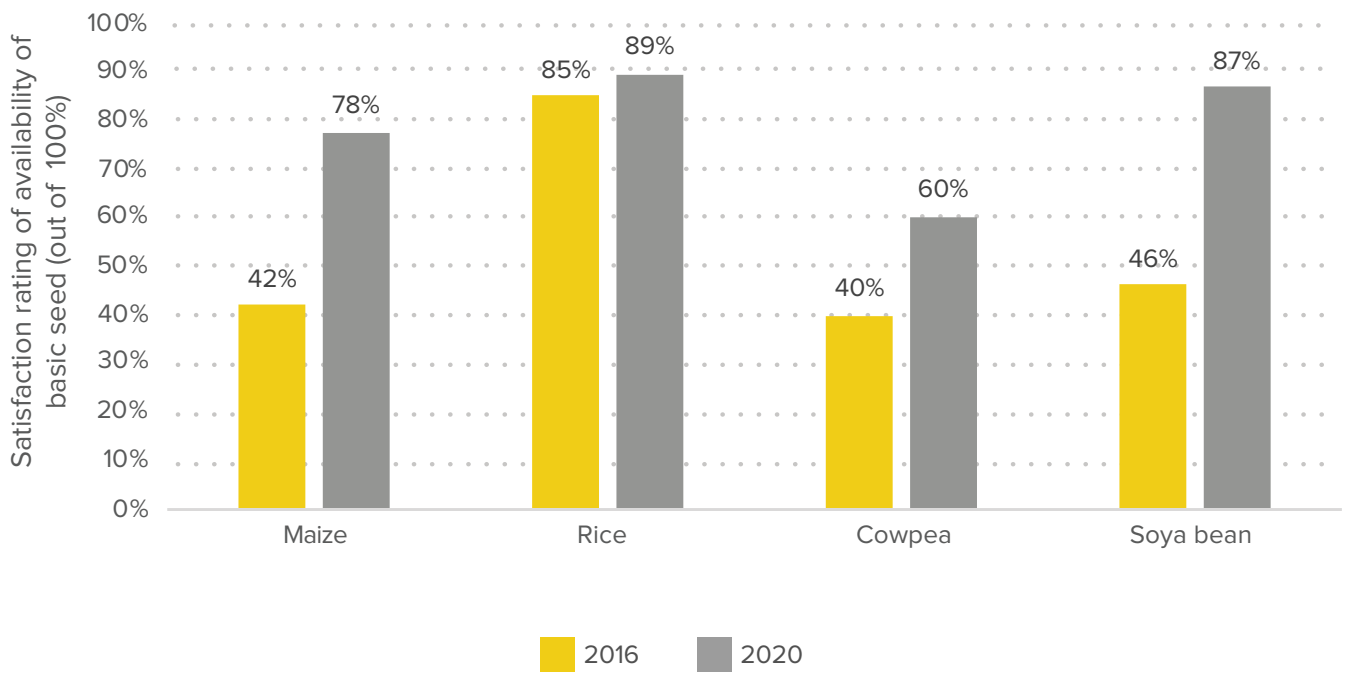
cowpea from the IIAM and other sources, was rated “fair”. The supply of cowpea basic seed was limited, whereas the supply of rice and soya bean basic seed was quite good. A few seed companies that did not have access to basic seed of at least one of these four crops were forced to use certified seed to produce the second generation of certified seed known as class 2 (C2).⁷

Timeliness of delivery of basic seed: The ratings for the timeliness of delivery ranged from “good” to “excellent”. The availability of rice seed from the IIAM was rated “excellent” for timeliness of delivery of rice basic seed and “good” for maize and cowpea basic seed. IITA was rated “excellent” for soya bean basic seed and “good” for cowpea basic seed. Quali Basic Seed was rated “excellent” for the timeliness of delivery of maize basic seed. Other basic sources of basic seed were rated “excellent” for both maize and soya bean basic seed.

⁷ C2 is the product of certified seed (produced from basic seed) and 1st generation seed (produced from pre-basic or breeder's seed) (Kuhlmann et al., 2019).

Availability of basic seed: Figure 2 shows the comparison of seed companies’ overall satisfaction with the availability of basic seed between 2016 and 2020 (calculated as the average of the three “overall” ratings in Table 8). In 2020, the levels of satisfaction recorded were “excellent” for rice (89%) and soya bean (87%) and “good” for maize (78%) and cowpea (60%). Overall, the satisfaction ratings increased across all four focus crops, with the greatest positive change recorded for maize and soya bean. The high rating for the availability of soya bean seed was associated with the impact of the SEMEAR program. While the increases across the board are encouraging, there is room for improvement, especially in the case of cowpea seed. The rating on the overall availability of cowpea seed across all organizations was quite low, plagued by issues of low levels of varietal purity, and the degeneration of old varieties.

Figure 2: Overall satisfaction rating of availability of basic seed





INDUSTRY COMPETITIVENESS

NUMBER OF ACTIVE SEED COMPANIES

A concorrência gera excelência: a presença de empresas Competition breeds excellence: the presence of more active seed companies increases competition and creates incentives for companies to innovate and improve. A vibrant seed sector depends on a robust private sector where seed companies invest in developing, producing, processing, and marketing improved varieties to farmers. This section tracks the number of registered seed growers and companies that produced and marketed seed of one or more of the focus crops.

As outlined in the Methods section, a total of 29 registered seed companies worked on at least one of the four focus crops. Table 9 shows the breakdown of the number of active seed companies by crop in 2016 and 2020. In 2020, out of

the 29 active seed companies, 26 produced maize seed, 12 produced rice seed, 20 produced cowpea seed, and 14 produced soya bean seed.

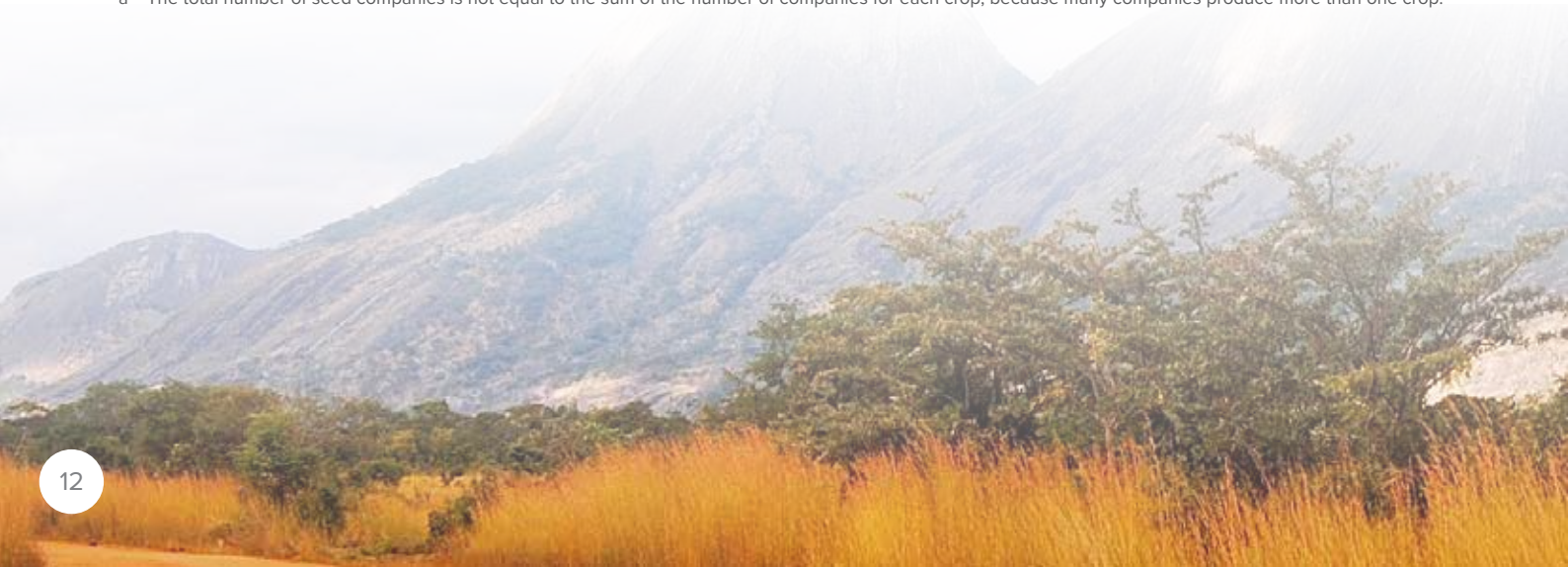
The number of active seed companies increased significantly between 2016 and 2020 for all four crops. The increase in maize, rice, and cowpea was driven by the increased demand for staple crops, which were promoted by emergency and development programs, such as the Millennium Development Programme 1c (MDG1c)⁸ for seed input and the government's subsidy program called the Agriculture and Natural Resources Landscapes Management Project, SUSTENTA. The increased demand for soya bean was stimulated by the growing poultry feed industry, which has created incentives for companies to produce soya bean seed.

8 <https://www.fao.org/mozambique/news/detail-events/en/c/356703/>. Accessed 29 April 2022

Table 9: Breakdown of active seed companies

Crop	Number of active seed companies in 2016	Number of active seed companies in 2020
 Maize	15	26
 Rice	3	12
 Cowpea	11	20
 Soya bean	6	14
TOTAL ^a	15	29

a The total number of seed companies is not equal to the sum of the number of companies for each crop, because many companies produce more than one crop.



GENDER IN MANAGEMENT OF SEED BUSINESSES

TASAI also tracks the number of women in management and ownership positions in seed companies. Article 6 of the Southern Africa Development Community (SADC) Protocol on Gender and Development requires that member states ensure that women and men have equal employment and economic opportunities (SADC 2008b). Table 10 shows that 3 of the 26 surveyed seed companies (12%) had a woman top manager. Of the 117 senior management positions recorded across the 26 seed companies, 44% were held by women. None of the 11 companies for which ownership could be disaggregated by gender were owned by women⁹. While the share of women's participation in the senior management of seed companies is relatively high, they are poorly represented in when it comes to ownership or top management, such as managing director, country manager/director, or chief executive officer of companies. The situation observed in the seed industry reflects the broader societal context in Mozambique, where, on average, women tend to have fewer rights, resources, and opportunities than their men counterparts (MSI 2019).

⁹ Some companies such as research and public institutions do not have company management structures like privately-run companies.

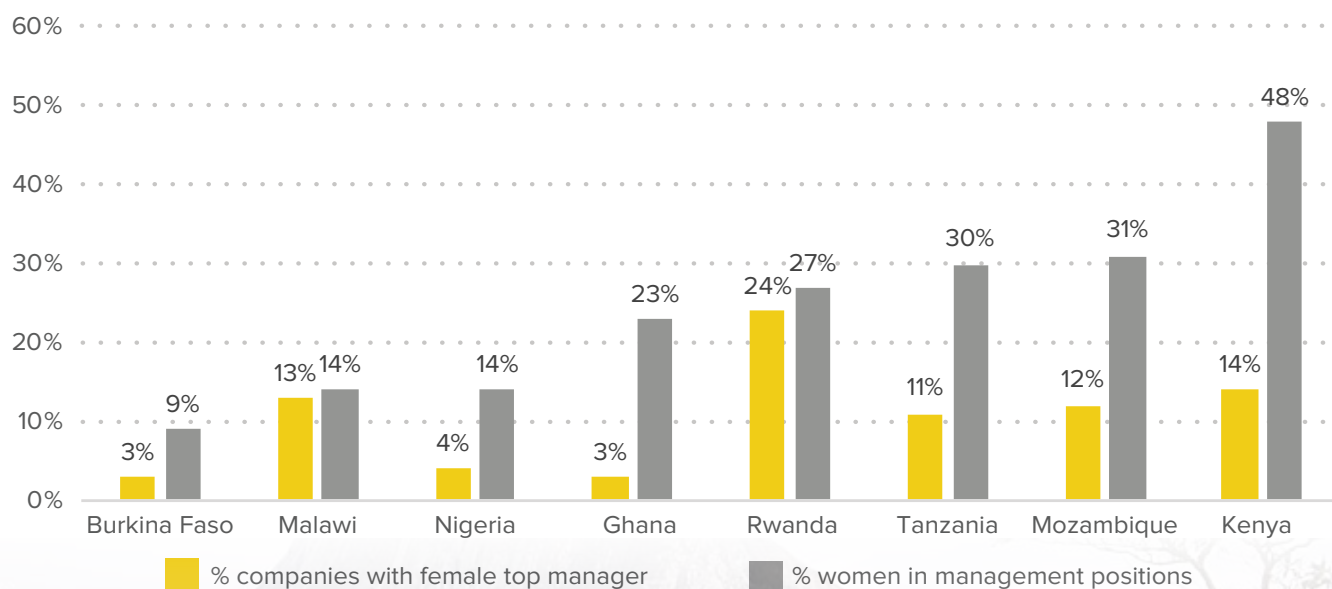
Table 10: Gender in management of seed businesses (2020)^a

Gender indicator	Number	%
Women in management positions (n=117)	52	44%
Companies with a woman top manager (n=26)	3	12%
Companies with a woman owner (n=11)	0	0%

^a TASAI first collected data for this indicator in 2020; in Mozambique, it was first collected in the 2021 study. As such there is no comparison with earlier data.

That said, Mozambique compares favorably with other African countries when it comes to women's participation in seed company management. Figure 3 shows that, while women's overall participation in seed company management in African countries is low, Mozambique ranks second after Kenya on this issue, among the countries surveyed by TASAI. The country is fourth in the number of companies with women top managers.

Figure 3: Comparison of women in seed company management in selected countries surveyed by TASAI



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 MT) of certified seed sold in the data collection year, as reported by active seed companies. Table 11 presents the aggregate quantities of certified seed produced and sold 2020, as reported to TASAI by the 26 seed companies surveyed, against seed production data from field inspections sourced from the government, the ANS. According to TASAI data, seed companies produced 3,923 MT of maize seed, 1,386 MT of rice seed, 411 MT of cowpea seed, and 645 MT of soya bean seed in 2020. However, TASAI data on seed production differ from government estimates. For maize and cowpea, the quantities reported by the seed companies are notably higher than the figures reflected in the ANS records. According to the breeders and seed inspectors surveyed,

this discrepancy implies that a significant portion of seed produced by the seed companies is not inspected, primarily due to a lack of human and financial resources. On the other hand, for rice and soya bean seed, the quantities reported by the seed companies are lower than those registered by the ANS. In this case, the reason for the difference is that the government data also includes other sources of seed production, i.e., individual producers and NGOs, while TASAI data comes from seed companies only.

When we compare sales data from 2016, the year when the most recent TASAI study was conducted in the country, the results show increases in seed sales across the four crops. The highest percentage increases were registered for rice, cowpea, and soya bean seed (Table 11). This makes sense given the increase in the number of active seed companies between 2018 and 2020 from 15 seed companies to 26 seed companies. While rice is not yet a major commercial crop in Mozambique, it is strategic for the country's food security. In addition, soya bean is an emerging commercial crop.

Table 11: Seed production and sales

Crop	Seed production in 2020 in MT (TASAI data)	Seed production in 2020 in MT (government data)	Seed sales in MT (TASAI data)	
			2016	2020
 Maize	3,923	2,640	4,375	6,015
 Rice	1,386	2,398	650	1,386
 Cowpea	411	101	364	954
 Soya bean	645	742	689	2,065

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).

Table 12 shows the CR4 and HHI scores in 2016 and 2020. In 2020, the top four seed companies accounted for 50% of the maize seed market, 87% of the rice seed market, 76% of the cowpea seed market, and 89% of the soya bean seed market. Overall, the market shares of the top four companies for each of the four focus seed markets declined from 2016 to 2020. These findings indicate that the seed market for the four focus crops is growing more competitive.



Table 12: Market Concentration (CR4 and HHI)

Crop	Market share of top four companies % (CR4) in 2016	Market share of top four companies % (CR4) in 2020	HHI (2016)	HHI (2020) ^a
 Maize	80%	50%	2,623	948
 Rice	100%	87%	- ^b	3,359
 Cowpea	96%	76%	4,379	1,838
 Soya bean	97%	89%	4,218	3,003

a 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 **average**, 3,000-3,999 is **high**, and greater than 4,000 is **extremely high**, i.e., monopoly or near monopoly.

b HHI score was not possible to calculate in 2016, as two of the 3 companies producing rice did not provide data for rice sales.

Another way to measure market concentration is using HHI; the lower the HHI scores, the more competitive a market. The HHI scores for the four focus crops in 2020 were: 948 for maize, 3,359 for rice, 1,838 for cowpea, and 3,003 for soya bean. These results suggest that the level of concentration of the maize seed market is extremely low, making it the most competitive seed market among the four crops. The seed markets are highly concentrated for rice and soya bean, and lowly concentrated for cowpea. The HHI for 2016 could not be calculated since only one company provided data for rice seed sales.

Both the four-firm concentration ratio CR4 and HHI scores indicate that the markets for maize and cowpea seed are competitive, with no single producer dominating the market. Instead, there are many small seed companies, each accounting for a small market share. In contrast, the rice and soya bean seed markets are highly concentrated, with a small number of players dominating the market. The changes in the CR4 and HHI scores from 2016 to 2020 point to a more competitive seed sector across the four focus crops, which is due to several initiatives that promote market opportunities, including:

- **SUSTENTA** - a government program to integrate smallholder farmers in the production of crops such as rice and soya bean that are part of the productive value chains. It promotes private sector investment in the production of crops in "The Strategic National Value Chains" (MADER 2021). See more about this program in the section on us of government subsidies.
- **MDG1c** was an FAO program designed to accelerate progress towards the achievement of Millennium Development Goals – Challenge 1 (MDG1c). The program was implemented between 2013 and 2019.¹⁰ The program included input subsidies through a voucher scheme and distributed seed in the northern and central regions of Mozambique. See more about this program in the section on us of government subsidies.
- The *Sementes Melhoradas para uma Agricultura Renovada* (SEMEAR) project is supported by the United States Agency for International Development (USAID) Feed the Future program. Scheduled to end in 2020, the project was extended to 2021. It consists of a partnership between the IIAM and the IITA. The goals of the project are to strengthen the IIAM's capacity to develop legume varieties and to promote technology transfer in the production of basic seed to seed companies. Soya bean and cowpea are two of the six focus crops of this program.
- The Innovation for Agribusiness (InovAgro) is funded by Swiss Agency for Development and implemented by DAI in Mozambique in three phases from 2010 to 2021. The initiative facilitated the inclusion of smallholder farmers in the development of the country's agricultural markets in Cabo Delgado, Nampula, and Zambezia provinces. InovAgro facilitated the development of sustainable markets for certified seed by building commercial links between smallholder farmers and suppliers of certified seed. The initiative also helped create an enabling environment for the development of the seed industry by improving the capacity of the ANS to offer public seed services and by supporting APPROSE to facilitate dialogue and coordination among seed sector actors.
- **Feed the Future Southern Africa Seed Trade Project (FtF-STP)** was funded by USAID and was implemented in Zambia, Malawi, and Mozambique from 2015 to 2020 (Feed the Future 2021). The project supported the SADC Secretariat to harmonize, domesticate, and implement policies and regulations for seed trade in SADC member states. In Mozambique, the project was implemented from 2017 to 2021 and focused on the domestication and implementation of harmonized seed regulations. Its activities included awareness-raising about the harmonized regulatory system, capacity building in the ANS, the development of an online seed certification facility, and support for APROSE and the private sector to facilitate the movement of certified seed among SADC member states.

¹⁰ <https://www.wfp.org/publications/mozambique-accelerate-progress-towards-millennium-development-goal-1c-joint-evaluation> Accessed 29 April 2022

- The Alliance for a Green Revolution in Africa (AGRA) contributed to the Seed Research Systems Development program which ended in 2021. The program focused on the following: (1) Early Generation Supply Seed quality and expanding certified markets (including strengthening regulatory agencies, producing quality certified seed, supporting access to seed processing facilities, and building the capacity of seed companies); (2) linking seed companies to NARS and CG; (3) agro-dealer network development; (4) raising farmer awareness on improved seed (extension service, VBAs Demo-plots); and (5) improved seed policies at the national level.

in unfair competition against purely private seed companies. In Mozambique, the only parastatal seed company, *Sementes de Moçambique* (Seed Company of Mozambique) (SEMOC), is no longer active in the production or sale of seed. The private sector has dominated the marketing and sales of certified seed since the liberalization of the commercial seed industry in 2000.

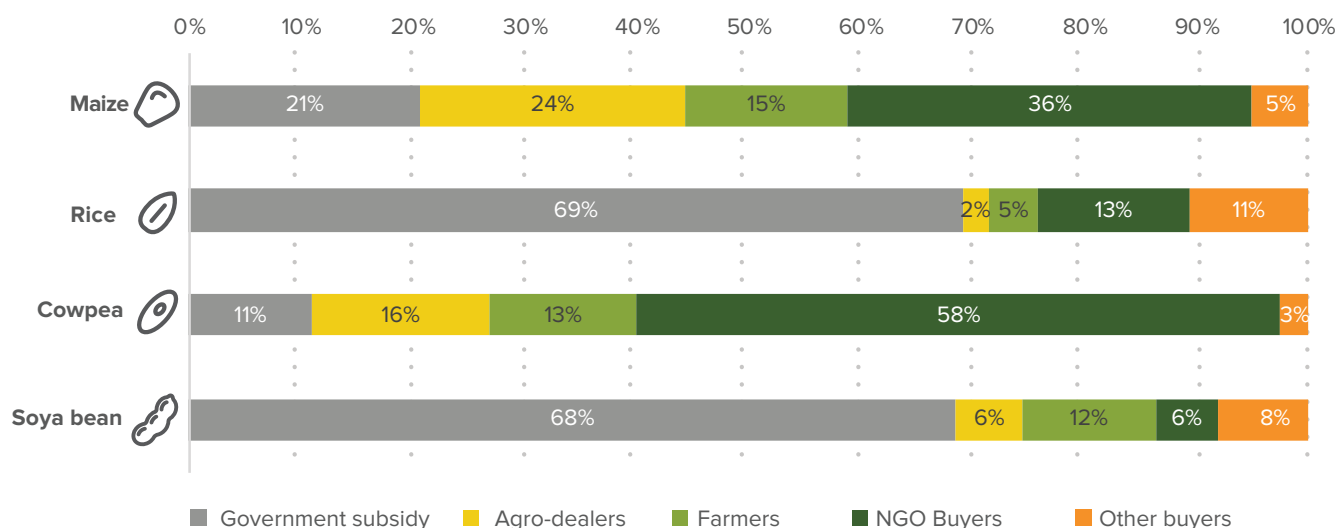
MARKET SHARE OF GOVERNMENT PARASTATAL

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

SEED SALES TO DIFFERENT CATEGORIES OF BUYERS

The TASAI study tracked five different categories of seed buyers in Mozambique in 2020: the SUSTENTA government subsidy program, agro-dealers, farmers who bought seed directly from seed companies, NGOs, and other buyers. Figure 4 shows seed sales for each category of buyers. The government subsidy program was the main buyer of rice seed (69% of all sales) and soya bean seed (68% of all sales), and the third most important buyer of maize seed, accounting for 21% of maize seed purchases. NGOs were the most important buyers of cowpea and maize seed, accounting for about 58% and 36% of sales, respectively. Seed sales through agro-dealers were substantial for maize and cowpea, accounting for 24% and 16% of all sales, respectively. Direct seed sales to farmers were also significant outlets, accounting for 15% of maize seed sales, 13% of cowpea seed sales, and 12% of soya bean seed sales.

Figure 4: Seed sales by category of buyers (2020)



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. In Mozambique, the ANS, commonly known as the Seed Department, is responsible for the coordination of seed imports, in collaboration with the Phytosanitary Department. Only companies registered for seed trade are permitted to import seed. The process of seed importation starts with the submission of the import application, specifying the varieties, quantities, and origin of the seed. The approval process varies depending on whether the seed varieties to be imported are included in the official variety list.

For officially registered varieties, the imports are approved by the *Direcção Nacional de Sanidade Agro-pecuária e Biossegurança* (DNSAB), under the supervision of the ANS, before the Phytosanitary Department issues the phytosanitary certificate. If the import is approved, the seed is inspected jointly by the ANS and the Phytosanitary Department at the point of entry (Conselho de Ministros 2013). The import permitting process for seed varieties not included in the official variety list is similar, except that the permit is authorized by the Minister of Agriculture instead of DNSAB.

In 2020, 10 out of the 26 seed companies surveyed imported maize seed, 3 imported cowpea seed, and 2 imported soya bean seed. None imported rice seed. A total of 3,604 MT of seed was imported: 2,485 MT maize seed from Zambia, Malawi, Zimbabwe, and South Africa, 915 MT soya bean seed from Zimbabwe and Malawi, and 204 MT cowpea seed from South Africa (Table 13). Only two seed companies exported a total of 30 MT of maize seed in 2020. It is not possible to compare to earlier data, as the 2017 TASAI study did not collect data on volumes of imports or exports.

In 2020, Mozambique was a net importer of seed for the four focus crops. The country has benefited from the regional seed harmonization agreement, which provides a relatively easy seed importation process to satisfy the excess demand for seed generated by initiatives such as SUSTENTA, emergency seed distribution programs, and other emerging seed distribution programs. All reported seed imports came from the SADC region. Some varieties in the SADC seed catalogue were sold in Mozambique in 2020. However, the data does not reveal how much of the reported import volumes consisted of those varieties.

The length of the export/import process was calculated as the number of days it takes to apply for import/export permits and to clear the seed at the border. According to the ANS internal procedures and regulations, issuing the permits should take no more than two weeks, and clearing the seed at the border should take even less time. According to the ANS, if a company has the necessary documents and Phytosanitary certificate, the inspector can verify the consignments in 30 minutes to 1 hour. As Table 13 shows, the average duration of the import process was close to the expected length (15 days), an increase from the 7 days recorded in 2016.

In contrast, the duration of the export process is shorter than the import process.¹¹ Seed companies surveyed were highly satisfied with both the import and export processes, rating both as “excellent,” with an average rating of 86% for imports and 95% for exports. The rating on imports was an improvement from the 74% recorded in 2016.

Table 13: Seed import and export process

Indicators	2016	2020
Imports		
Number of seed companies importing seed	7	15
Volume of imports, reported by seed companies (in MT)	N / A	3,604
Volume of imports, recorded by the government (in MT)	N / A	3,037
Average length of the import process (in days)	21	15
Satisfaction with import process (out of 100%)	74%	86%
Exports		
Number of seed companies exporting seed	0	2
Volume of exports (in MT)	0	30
Average length of the export process (in days)	N / A	9
Satisfaction with export process (out of 100%)	N / A	95%

extremely poor poor fair good excellent

¹¹ In 2016, we did not collect data on volumes of imports, the focus was on duration and satisfaction.



SEED POLICY AND REGULATIONS

LENGTH OF VARIETY RELEASE PROCESS

Plant variety release is the process during which new varieties undergo tests for yield, Value for Cultivation and Use (VCU), and Distinctness, Uniformity, and Stability (DUS). 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. TASAI calculates the length of the variety release process from the date the variety is submitted to the ANS to the date when it is approved for release. The calculation does not include the time the breeder spends developing the variety. This section begins with an overview of the variety release process before delving into the data collected.

Guided by the Seed Regulation Decree nº 12/2013 (Conselho de Ministros 2013), the variety release process should take the following steps:

1. Submission of proposal: The applicant submits the proposal to the ANS, whose staff reviews it and, in case of an incomplete application, returns it to the applicant, or forwards it to the *Subcomitê de Registo e Libertação de Variedades* (Sub-committee of Variety Registration and Release) (SCRLV)
2. Review by SCRLV: This step should take 15 days.
3. Presentation of proposal to SCRLV: Following the review, the applicant is invited to present their proposal to the 11-member committee. The audience also includes experts for the target crop invited by the ANS.
4. Approval: Assuming the SCRLV supports the application, they recommend the new variety to the CNS for approval. The CNS then submits a recommendation to the Minister of Agriculture for the variety to be released.
5. Release: Once the Minister of Agriculture releases the variety, it is entered in the *Lista Oficial de Variedades* (Official List of Varieties) and is published through an official gazette.

While the process of variety release may be clearly laid out, in practice it faces multiple challenges, which in turn often delay the process, as the TASAI study has uncovered. Some breeders felt that the guidelines provided by the ANS were not clear/detailed enough and that technical guidance is needed for both the ANS and the breeders. Breeders also reported that, on occasion, ANS staff had misinterpreted information in their applications, leading to delays. Further, some breeders shared that, while the ANS is supposed to send applicants all remaining questions during the initial review, in practice, questions arise during the presentation of the proposal that in turn require further data collection by the breeder. In contrast, the ANS felt that the delays were caused by the applicants not being familiar enough with the process, leading to incorrect/incomplete submissions to the ANS.

When it comes to the approval process, one challenge is that SCRLV members are not always available to meet. At least three-quarters of the SCRLV members must be available for the meeting to have the legal quorum (Conselho de Ministros 2013). Further, the CNS has not met for over 20 years.

TASAI studies ask breeders and seed companies who have released varieties to provide information on the length of the variety release process based on their experience. Based on this data, in 2020, the average length of the variety release process was 12.5 months (Table 14). This is a notable improvement from 2016 when the process took an average of 24 months.

In addition to the length of the variety release process, TASAI also tracks seed companies' opinion ratings about the variety registration and release process. For both 2016 and 2020, the ratings by seed companies were "fair" (53% and 57%, respectively). The reason behind this moderate level of satisfaction is the lack of field monitoring for DUS and VCU tests, as a result of which varieties released in Mozambique are not eligible to be sold in other SADC countries. Further, the lack of monitoring means that it is not possible to verify whether the varieties circulating in the market conform to the characteristics described by the breeder to be included in the Official List of Varieties. Some seed companies interested releasing varieties in Mozambique have reported that they find the process to be challenging.

Table 14: Average length of the variety release process

Indicators	2016	2020
Average length of variety release process (in months)	24	12,5
Satisfaction with variety release process (out of 100%)	53%	57%

extremely poor
poor
fair
good
excellent

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.

According to the seed regulation Decree n° 12/2013 (MADER 2013), the official cost of DUS and VCU is set at MZN 31,600, equivalent to US\$ 500.¹² However, since the ANS does not conduct the tests at present, these fees are not charged. The IIAM incurs institutional costs related to the variety release process, such as the costs for breeders to travel to Maputo to present their proposal to the SCRLV. Travel costs will vary depending on the location of the breeders, but in 2020, the average cost of travel expenses for the five breeders who were interviewed was MZN 50,000 (US\$ 791).

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. In most African countries, the seed sectors are regulated by seed policies and or strategies that are implemented through seed laws which are operationalized through regulations or decrees. However, in Mozambique, the regulatory framework for the seed sector is guided by decrees and diplomas (Table 15). This section provides an overview of the relevant legal instruments, while the next section discusses the current level of enforcement.

The formal seed sector in Mozambique is regulated by Decree n° 12/2013 of 10 April 2013, (Conselho de Ministros 2013). The Decree mandates the ANS to regulate the formal sector. The responsibilities of the ANS include the registration of seed producers, processors, and traders, seed regulation, variety registration, seed quality control and certification, as

well as monitoring the quality of imported and exported seed in collaboration with the Phytosanitary Department.

The ANS has been supported by various development projects, including The Southern Seed Trade Project, funded by USAID, for example in online certification, strengthening the capacity of the seed laboratories, and training ANS officers and technicians. In addition, besides establishing the ANS website, Innovation for Agribusiness (InovAgro)¹³ helped license private seed inspectors that are critical for seed quality control. Private seed inspectors only carry out field inspection, while certification is done by the ANS.

Activities in the formal seed sector are aided by two consultative advisory bodies, the CNS and the SCRLV. They two bodies are multi-sectoral and include all key stakeholders in the seed value chain. The CNS, which is under the Ministry of Agriculture, advises on issues related to the seed sector, including the investment programs and projects the Ministry should prioritize, planning for annual seed supply, resolving disputes arising from the interpretation and application of seed legislation; the CNS is also responsible for the periodic publication of the updated national variety list. The operational rules and procedures of the CNS and the SCRLV are guided by Diploma Ministerial n° 115/2014 (Ministério da Agricultura 2014) and Diploma Ministerial n° 82/2015 (República de Moçambique 2015), respectively, and n° 116/2011 (Ministério da Agricultura 2011). The purpose of the Diploma Ministerial n° 115/2014 and Diploma Ministerial n° 82/2015 is to ensure the quality of both nationally produced and imported seed.

Besides the above instruments, the seed sector is governed by other decrees and diplomas on seed certification, the licensing of inspectors, phytosanitary rules, and plant breeders' rights. Table 15 lists the key seed instruments.

Besides the local legal instruments, another important regulatory instrument is the **SADC Harmonized Seed Regulatory System (SRHSS)** (SADC 2008a), which governs the harmonization with SADC regulations. Mozambique's seed regulations have been aligned with the SRHSS since 2013 in the areas of plant variety release, seed certification, quality assurance, and quarantine measures (Feed the Future 2016).

¹³ This program is funded by the Swiss Agency for Development and Cooperation. <https://www.dai.com/our-work/projects/mozambique-innovation-agribusiness-inovagro> Accessed 29 April 2022.

¹² In December 2021, 1 US\$ was equivalent to MZN 63.20.



Table 15: Key seed instruments in Mozambique

Instrument	Description
National Seed Policy	Mozambique does not have a national seed policy.
Decree nº 12/2013, of 10 of April - Seed Regulation	Guides key aspects of the formal seed sector in Mozambique that include introduction of new plant varieties.
Diploma Ministerial nº 115/2014, de 28 de Abril - Comité Nacional de Sementes	Prescribes internal rules for the CNS.
Diploma Ministerial nº 82/2015 de 19 de Junho - Subcomité de Registo e Libertação de Variedades (SCRLV)	Prescribes internal rules for the SCRLV.
Diploma Ministerial nº 116/2011 de 28 de Abril (Ministério da Agricultura 2011) – pre-release of new varieties	Guides the pre-release of new varieties.
Diploma Ministerial nº 58/2017 de 3 de Novembro (Conselho de Ministros 2017) – licensing of private seed inspectors and private laboratories	Provides norms for the licensing of private seed inspectors and seed laboratories. The diploma aims to strengthen the capacity of the ANS to provide adequate seed inspection services for the growing seed sector.
Decree nº 5/2009, de 1 de Junho (Conselho de Ministros 2009) – phytosanitary inspection and quarantine regulation	Sets rules for phytosanitary inspection and quarantine regulations for crops.
Decree nº 26/2014, de 28 de Maio (Conselho de Ministros 2014) - Plant Breeders Rights	Establishes rules for the protection of new plant varieties (plant breeders' rights).

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.

While **Decree nº 12/2013** mandates the ANS to regulate a host of seed sector-related activities, in practice it is not effective in the implementation and enforcement of the seed regulations. This is due to an increase in demand for services as more varieties are released, as well as an increase in the number of seed companies and agro-dealers. In addition, the demand for ANS's services has increased due to improved knowledge by farmers about quality seed, and initiatives by government programs and NGOs to improve Mozambique's seed supply and distribution of quality seed. Due to the low degree of seed market supervision, the Seed Regulation is not fully implemented. In 2021 a request was sent to FAO for financial support, in the revision of the seed regulation.

Although **Diploma Ministerial nº 115/2014** sets forth the operational rules and procedures of the CNS and the SCRLV, these are not followed strictly. This has posed challenges with the variety release process, including the conduct of DUS and CVU tests, as well as the application and release. Although the SCRLV has been set up and is operational, the requirements for testing for DUS and VCU to confirm submissions from the breeders are yet to be carried out. Further, as a result of poor financial, human, and technical facilities, the quality control system has weakened.

While **Decree nº 26/2014** established rules for the protection of plant breeders' rights, it is yet to be implemented, because the norms and procedures to operationalize the protection of national plant varieties are awaiting approval by the legal officer at MADER.

On a positive note, **Decree nº 5/2009**, which sets rules for phytosanitary inspection and quarantine regulation of crops, and **Diploma Ministerial nº 58/2017**, which regulates the licensing of private seed inspectors are being implemented.

Finally, the ANS has been supported by various development projects, including The Southern Seed Trade Project, funded by USAID, to domesticate and implement the **SRHSS**. However, for effective implementation of the SRHSS, Decree 12/2013 needs to be amended in several areas, so

that it is well aligned with the SRHSS. These areas include: (i) requiring for the submission and verification of DUS and VCU data from other countries so as to facilitate the regional release of varieties and resolution of conflicts arising due to the regional variety release system; (ii) licensing or registering of field inspectors, samplers, and seed analysts; (iii) licensing, registering, and accrediting laboratories (public and private) under the SADC Quality Assurance and Certification System and; (iv) integrating the use of SADC seed quality seals and labels (Feed the Future 2019a; Feed the Future 2019b)

To gain insight into the effectiveness of regulations from the point of view of seed companies, TASAI surveys gauge seed companies' level of satisfaction with the enforcement of seed regulations. In 2020, the satisfaction rating by the companies surveyed was "good" at 63%, a slight decline from 64% in 2016. The ratings reflect the challenges mentioned above.

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 falsely 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, if available, by the government in each data collection year. In addition, it asks seed companies to report their level of satisfaction with government efforts to eliminate counterfeit seed.

In 2020, seed companies interviewed reported a total of 49 cases of counterfeit seed (Table 16). This represents a substantial increase from the 11 cases reported to TASAI in 2016. It also stands in contrast to the 4 cases reported to the government in 2020, which, according to the ANS, involved soya bean, pigeon pea, common bean, and cowpea seed. The counterfeit seed was tracked and confirmed through the monitoring of the seed lot certificates issued by the ANS's Seed Department and regional laboratories. According to the ANS, the main source of counterfeit seed was seed acquired by NGOs and the government to promote the use of quality seed among small producers.

Table 16: Industry satisfaction with government efforts to address counterfeit seed

Indicators	2016	2020
Number of cases of counterfeit seed reported by seed companies	11	49
Number of cases of counterfeit seed reported to government	0	4
Seed industry satisfaction with government efforts to address counterfeit seed (out of 100%)	52%	47%

extremely poor
poor
fair
good
excellent

Both seed companies and retailers are concerned with the growing number of cases of counterfeit seed, but, at this point, the government's efforts to combat the problem are constrained by its fragile quality control system. This may explain why seed companies' satisfaction with government efforts to combat counterfeit seed declined from 52% to 47% between 2016 and 2020. Seed companies indicate that they have not seen any clear evidence that the government is working to address the challenge of counterfeit seed. According to the companies, the government may ignore some sources of counterfeit seed, and cases that are reported are not addressed effectively. Due to a lack of resources to monitor the seed system effectively, many infractions are not detected in the first place. When they are detected, the response is slow because the infractions are most likely to be caught when demand for inspection services is at its highest. In addition, the ANS's lack of resources has hampered efforts to raise awareness on issues related to seed quality. Article 59 of the Seed Regulation 12/2013 (Conselho de Ministros 2013) specifies the offenses punishable by law, including importing and exporting seed without meeting the requirements, falsifying the name of varieties or seed lot certificates, and selling seed of unregistered varieties. The fines are specified in terms of days in minimum wages in civil service, punishment under the criminal procedure in force, destruction of lots without compensation, and withdrawal of licenses. The failure to enforce punitive measures and low fines create opportunities for the proliferation of counterfeit seed. The ANS is not able to compel offenders to pay the fines charged for infringements, because it does not have a legal officer to follow up on the processes.

According to the seed companies, the government should increase human and financial capacity for seed quality control and the supervision of the seed value chain. In addition, the government should pay close attention to the mechanisms and procedures of purchasing seed under subsidy programs, as the demand for large volumes of seed tends to generate opportunities for unscrupulous traders to supply seed. Subsidy programs should require that seed being supplied is certified before they commit to any procurement. Another critical issue is transparency in handling cases of counterfeit seed. Further, seed companies noted that fines for offenses are too low to act as a deterrent. In addition, the fees for seed inspection are also low, which results in a situation where seed inspectors do not have sufficient budget to carry out their work. Without significant changes, the current conditions cannot deter the sale 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 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. Two seed subsidy programs operate in Mozambique: SUSTENTA, under MADER and the Millenium Development Goal 1C (MDG1c) Program, run by the Food and Agriculture Organization of the United Nations (FAO).

The SUSTENTA Program (MADER)

The first phase of SUSTENTA was implemented between 2015-2019 in the Zambezia and Nampula provinces. In 2020, SUSTENTA became a national program and expanded to all provinces. It is scheduled to end in 2024. SUSTENTA, which “aims to improve the quality of life of rural families through the promotion of sustainable agriculture” (MADER 2020). SUSTENTA focuses on maize, rice, common bean, cowpea, sesame, pigeon pea, and soya bean and supports smallholder farming and targets seven areas: (i) subsidies or incentives for production; (ii) technology transfer; (iii) production financing; (iv) processing; (v) marketing; (vi) infrastructure for irrigation storage; and (vii) agro-processing.

In contrast to other subsidy programs, SUSTENTA is not administered as a price subsidy but provides credit ranging from 25% to 75% of the cost of the inputs. The main aggregators are emerging commercial producers, the *Pequenos Agricultores Comerciais e Emergentes* (PACES), and anchored companies. Small-scale producers (PA in Portuguese), also known as “integrated producers,” are provided with subsidy credit up to 18,000 MZN to purchase inputs. The credit is payable at the end of the agricultural year. PAs may produce either cash or food security crops on an area up to 1.5 ha and may use either/or newly released and existing varieties, depending on seed availability and interest.

The PACEs are leading farmers and are selected by the District Services of Economic Activities (SDAE). The PACEs work on an average of 50 ha and with 200 PAs each and are expected to have storage and primary processing capacity. PACEs operate from a business plan, which is approved by a committee comprising of SUSTENTA staff and local agricultural officers. During trade fairs, PACEs choose seed and other inputs they need, and the quotations are submitted to the SDAE for approval. In the implementation process, 3 companies are selected according to the number of PAs and the technical package (*Pacote Tecnológico*) suitable for the agro/ecological conditions. The selected companies organize the number of kits required and deliver them directly to the PACEs who further distribute them to the PAs. PACE and PAs should pay the cost of input which includes seed, fertilizer, and pesticides at the end of the season.

The price from the supplier company includes the delivery of the seed to SDAE, where the PACES are obliged to purchase production and bulk seed for sale to 15 companies that are selected to sell seed.

The third category of participants are “anchored companies,” also called “main aggregators.” They work on large-scale processing and trade.

According to an evaluation of the program by da Costa and Castigo (2021), SUSTENTA had not resulted in significant increases in production and productivity. The reasons identified were a lack of transparency in the selection of beneficiaries, a lack of monitoring and evaluation of the program, and inadequate funding. These constraints have been further exacerbated by the emergence of the COVID-19 pandemic.

Seed companies’ opinions of the program reflect the findings of the above study. Namely, companies rated their satisfaction with the openness and transparency of SUSTENTA’s seed procurement process and efficiency in payments as “fair” (45%). The satisfaction ratings regarding the predictability of the seed procurement process were “poor” at 37% and 35%, respectively (Table 17).

Seed companies noted many challenges with the subsidy program. For example, in the absence of coordinated planning, it is difficult for seed companies to determine how much to produce for SUSTENTA. This uncertainty creates a favorable environment for the proliferation of counterfeit seed when there is not enough certified seed, and varieties that were not on the official list ended up being sold by the selected seed companies to SUSTENTA. Further, there is a lack of timely and clear information on tenders as well as a lack of competition in the selection process, with some companies being awarded tenders without competition. This lack of transparency leads to conflicts and feelings of unfairness among seed companies.

Seed companies reported long delays in payments from SUSTENTA, leading to a “poor” (35%) rating. Seed companies noted that these delays force them to increase the prices of seed sold, which makes inputs unaffordable to many farmers. In addition, delays in payments cause cash flow problems for seed companies and may impact the companies’ profits, resulting in low investment by seed companies in the sector, which negatively impacts the overall development and competitiveness of the seed sector. This affects small seed companies in particular as they depend heavily on payments from SUSTENTA.

Overall, most of the seed companies that were interviewed perceived that the subsidy program has had a negative effect on the seed sector. Respondents felt that the program does not align with the long-term development vision of the seed sector. According to some respondents, for the subsidies to work, procurement should be assigned to seed companies that can supply seed to agro-dealers, who in turn would supply provincial governments.

Table 17: Seed companies’ opinion of the implementation of the SUSTENTA government subsidy program (2020)

Aspect of the SUSTENTA government seed subsidy program	Opinion rating out of 100%
Openness and transparency of the seed procurement process	45%
Predictability of the seed procurement process	37%
Efficiency of payments	35%



The use of a national subsidy program over protracted periods is not sustainable (Baltzer and Hansen 2011). Subsidy programs tend to distort the seed market and creates dependency among smallholder farmers, who are not motivated to buy seed in the seed market but wait for the subsidized seed. Further, the seed companies do not develop a robust commercial network, because they wait for government tenders to sell their seed. To the extent that subsidy programs may be needed in the short term, to ensure the success of these programs and create a vibrant and sustainable seed sector in the long-term, there is a need to improve the management and coordination of the subsidy programs, to share information across all seed sector actors, and to offer all actors equal opportunities to participate in the subsidy programs.

The MDG1c Program (FAO)

In collaboration with the Mozambican government, the FAO implemented the MDG1c subsidy program from 2016 to 2019. The new program, PROMOVE Agribiz¹⁴ with a total budget of US\$ 32,735,035 is ongoing and is scheduled to end in 2024, is subdivided into initiatives on emergency and development support. In both initiatives, seed subsidies are included. The program's target crops are maize, rice, and cowpea. Its beneficiaries are emerging farmers affected by natural and human disasters (floods, droughts, and displacement due to insecurity). The beneficiaries can select any variety available on the market, they are encouraged to focus on those that have been released recently.

Under MDG1c's emergency initiative, farmers received a 100% subsidy on all inputs to allow them to resume their agricultural activities. Under the program's development support initiative, producers paid part of the costs and access an electronic password to acquire the inputs of their choice from a list of eligible inputs selected by the FAO. Farmers are supported at one of three levels:

- Emerging commercial farmers paid 4,000 MZN (46%) to access a total value of 8,600 MZN in inputs (subsidy of 4,600 MZN);
- Subsistence farmers paid 900 MZN (25.7%) to access a total value of 3,500 MZN in inputs (subsidy of 2,600 MZN);
- Vulnerable individuals paid 300 MZN (14.3%) to access a total value of 2,100 MZN in inputs (subsidy of 1,800 MZN).

As a result of the subsidy, smallholders have greater access to improved seed, and the number of points of sale of high-quality agricultural inputs has expanded substantially (DAI 2020). There are clear criteria for the selection of beneficiaries and the FAO team involved in voucher programs verifies that the seed companies selling seed to agro-dealers exist. However, the limited expansion of quality seed production compared to growing demand, the lack of a system for seed tracking, and limited quality control and handling capacity may limit the gains the program will achieve by the end of its term.

Although we include the MDG1c program in our report, we did not collect opinion ratings about the program because it does not work directly with seed companies.

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¹⁴ According to ANS, this is an extension of an extension of MDG-1, is being implemented in Nampula and Zambezia and ends 2024 and is being implemented under the same terms in Nampula and Zambezia provinces.

INSTITUTIONAL SUPPORT

QUALITY OF THE NATIONAL SEED TRADE ASSOCIATIONS

Well-functioning national seed trade associations play a key role in representing the interests of the industry and engaging with the government. Members of the national seed associations include seed companies and, at times, agro-dealers. Mozambique has two associations, MOSTA and APROSE.

MOSTA was established in 2013 by a group of seed companies with the support from InovAgro. The purpose of MOSTA was to facilitate the development of a robust and competitive agricultural input sector, including seeds, and to ensure the growth and stability of input markets throughout the country. MOSTA was inactive for many years but was revived in 2019 and has a governance structure with an elected president. It has 32 members who are engaged in the seed sector as seed companies and/or agro-dealers and is governed by a management committee of 11 men and 3 women.

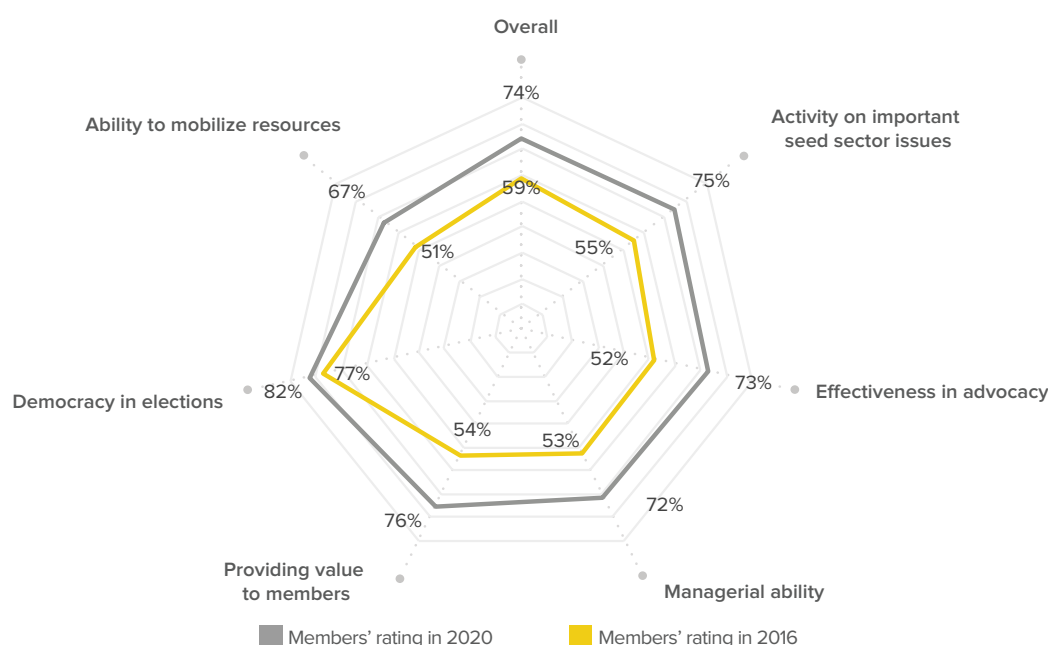
In 2014, the *Direcção Nacional de Agricultura e Silvicultura* (National Directorate of Agriculture and Silviculture) (DINAS) (in collaboration with several strategic development partners) established the National Platform for Seed Sector Dialogue

(PNDS). In 2015, this association became APROSE. APROSE is a platform for dialogue for seed value chain actors and other relevant development partners to promote a dynamic and commercially competitive seed sector.

APROSE started its activities in 2017. Its head office is in Maputo, with representations in the Southern, Central, and Northern regions of Mozambique. APROSE's operations are managed through the General Meeting/Assembly, the Board of Directors, and the Fiscal Council. Members of these bodies are elected for three-year terms. Currently, APROSE has 50 members engaged in the seed sector and three staff members (two women and one man). Out of the 12 Board of Directors, 11 are men.

Of the 26 seed companies surveyed as part of the TASAI study, 21 are members of APROSE. As displayed in Figure 5, the 21 seed companies rated their overall satisfaction with APROSE as “good” (74%). The “excellent” (82%) rating for “democracy in elections” suggests that seed companies were highly satisfied with this performance area. Ratings in other areas were somewhat lower but still “good”: “activity on important seed sector issues” (75%), “effectiveness in advocacy” (73%), “providing value for members” (76%), and “ability to mobilize resources” (67%). Between 2016 and 2020, ratings for all performance areas increased by between 5 and 22 percentage points.

Figure 5: Members’ opinion of APROSE





Despite the positive opinions of APROSE members, the association faces challenges. Some member seed companies argue that it is not clear how APROSE creates a healthy seed business environment and adds value to its members' seed companies. Further, many seed companies located in rural areas are not aware of APROSE's activities. In addition, seed companies expressed that APROSE is not intervening enough to ensure fairness and competitiveness in the procurement processes of large-scale opportunities such as SUSTENTA, where a lack of transparency and competitiveness have been reported by several seed companies. APROSE still lags in terms of resource mobilization. In fact, a large share of APROSE funds is spent on staff salaries. Since many APROSE members are not paying their membership fees, the association currently depends on external sources of support. According to some seed companies, APROSE should strengthen its efforts to mobilize resources. In addition, seed companies expressed that APROSE should invest in the members' companies by enforcing a preferential list of companies through which APROSE members can have better access to seed sector business opportunities that are promoted by the government and NGOs.

Five out of the 29 seed companies that were interviewed were not members of APROSE. Three companies indicated they were in the process of joining the association. These other two indicated that they were not members due to a lack of awareness of the activities of APROSE. They also indicated that the visibility of APROSE in the districts was low.

ADEQUACY OF SEED INSPECTORS

Seed inspection services ensure that certified commercial seed meets the regulatory quality standards. To provide adequate inspection services, well-resourced inspectors are required. TASAI tracks the number of inspectors as well as the information pertinent to their effectiveness, such as the availability of resources and the use of (new) digital tools.

In Mozambique, the ANS oversees seed quality control and certification. Quality control is carried out by licensed seed inspectors and laboratories. Inspectors are responsible for inspecting seed fields, harvests, and processing operations, and reporting the corresponding results to the ANS. In addition, seed inspectors oversee sealing, labeling, sampling, and verifying pre-basic, basic, and certified seed. They also take official samples from each seed lot for laboratory testing and certification.

Currently, Mozambique has 42 seed inspectors, 18 of whom are public inspectors (7 women and 11 men) working under the ANS. To complement the public inspectors, the ANS has licensed 20 private seed inspectors. Six inspectors were licensed in 2020, and 14 inspectors were licensed in 2021

(Ribeiro 2021; MADER 2021b). The licensed inspectors are drawn from private seed companies, educational institutes, and NGOs, and are based in the major seed production areas. Most private inspectors are not active because they belong to academic institutions and were trained in the implementation process of Integrated Developments of Seed Sector and others were trained by FAO. Only 8 private inspectors are working under seed companies.

The ANS also has 27 laboratory technicians distributed across the major seed production areas: the central seed laboratory in Maputo, three regional seed laboratories - the Southern Regional Seed Laboratory in Gaza province, the Central Regional Seed Laboratory in Manica province, and the Northern Regional Seed Laboratory in Nampula province, and a provincial laboratory in Zambezia province. These technicians work on seed variety registration and release as well as in seed quality control and certification.

Table 18 indicates seed companies' satisfaction with inspection services in 2016 and 2021. In 2021, seed companies rated their level of satisfaction with public seed inspection services as "good" (63%), an improvement from the 2016 rating of "fair" (59%). According to seed companies, the challenges of seed inspection stem from the need for: (i) strengthened capacity for seed quality control and certification to ensure the implementation and enforcement of the Seed Regulation; (ii) ongoing staff training on quality control amidst changing seed technology; and (iii) strengthened capacity to monitor the commercial seed value chain.

Table 18: Number and rating of the adequacy of seed inspectors

Indicators	2016	2021
Number of public seed inspectors	25	18
Number of private seed inspectors	0	8
Seed industry satisfaction with inspectors (out of 100%)	59%	63%

extremely poor

poor

fair

good

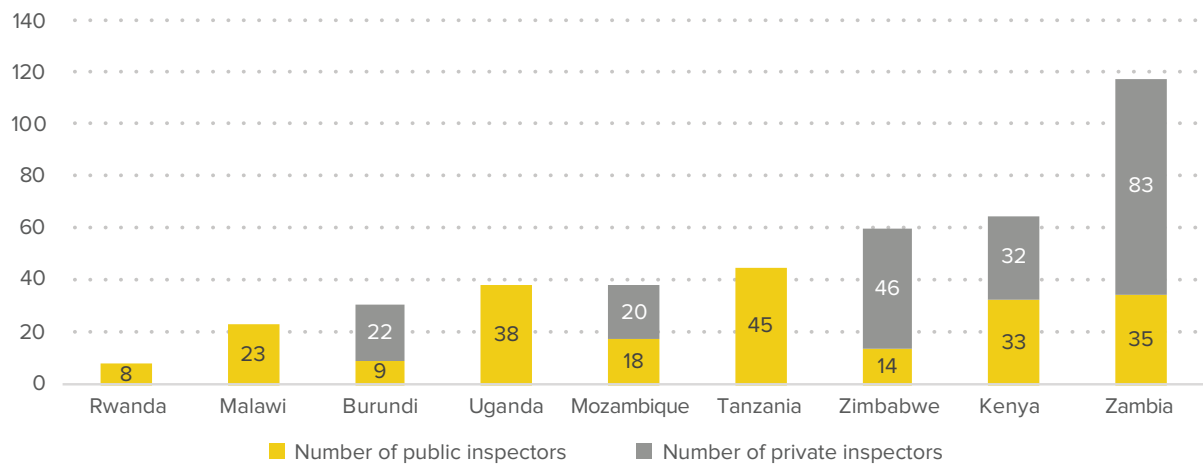
excellent

Figure 6 shows the number of seed inspectors in nine eastern and southern African countries in 2021. Mozambique ranks close to countries with the highest number of seed inspectors and is also among the countries that have authorized private seed inspectors. Mozambique is among the four countries that have more private inspectors than public inspectors. However, seed inspection in Mozambique is plagued by insufficient capacity to carry out quality control activities. The inspectors are not being trained to keep up with changing technologies Overall there is insufficient capacity to monitor the commercial seed value chain in Mozambique.





Figure 6: Number of seed inspectors in eastern and southern Africa countries (2021)^a



^a All data for 2021, except Zambia and Zimbabwe

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 more likely farmers are able to access expert information and advice on acquiring and using 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.

Table 19 presents the number and adequacy of public agricultural extension officers in Mozambique. In 2020, there were 3,942 public agricultural extension officers distributed across the country's 154 districts, 70% of whom were men (MADER 2020). The same year MADER contracted 2,158 extension officers under the SUSTENTA program for two years. After this period, the extension officers will serve the broader community of farmers. In addition to public extension officers, seed companies employed 109 private extension officers. Given Mozambique's 4.3 million agricultural households in 2020, (MADER, 2021a) the ratio

of extension officers to households is 1:693. In contrast, MADER's Extension Master Plan recommends one extension officer for every 250 agricultural households (agregados families) (MADER 2021a), suggesting a need to continue to improve the adequacy of Mozambique's extension services.

In terms of activities, at the provincial level, seed companies and ANS' regional seed laboratories collaborate with the IIAM to set up demonstration plots for farmers. At the district level, local extension officers provide and coordinate seed inputs for demonstration plots. To enable extension officers to carry out their work effectively, each officer is provided with a motorcycle, a uniform for easy identification, and an electronic tablet to ease the collection and sharing of information.

Table 19 also provides comparative data with the 2016 TASAI Mozambique study, when the number of extension officers was much smaller at 1,487. Given the increase in the number of extension officers, the ratio of extension officers to agricultural households improved significantly from 1:1,045 to 1:693, moving in the direction of the target set by MADER. The average satisfaction ratings reported by seed companies also improved during this four-year period from "fair" (at 56%) in 2016 to "good" (at 61%) in 2020.

Table 19: Number and adequacy of agricultural extension services

Indicators	2016	2020
Number of public extension officers employed by the government	1.487	6.100
Number of private extension officers employed by seed companies	49	109
Total number of extension officers	3.035 ^a	6.209
Ratio of extension officers to agricultural households	1:1.045	1:693
Seed industry satisfaction with extension officers (out of 100%)	56%	61%
Interpretation of satisfaction	Fair	Good

a The total includes extension officers employed by private entities other than seed companies. Only 49 extension officers were employed by the seed companies working on the four focus crops.

CONCENTRATION OF THE AGRO-DEALER NETWORK

Agro-dealers play a key role in 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 those who are registered from those who are non-registered. This indicator is not crop specific.

There were 145 active agro-dealers in Mozambique in 2020 (MADER 2021b). In compliance with Article 41 of the Seed Regulation, agro-dealers first apply for a permit from the Ministry of Industry and Trade, after which they are registered by the local state bodies that oversee agriculture. Seed companies are responsible for ensuring that agro-dealers store seed properly and use valid seed lot certificates, copies of which must be kept by the agro-dealers. The seed companies (or distributors) must update their agro-dealer list with the ANS in every March. As shown in Table 20, the average number of agro-dealers per seed company is 27, and 39% of seed companies work with exclusive agro-dealers (Table 20).

Table 20: Number of agro-dealers and satisfaction with the agro-dealer network

Indicator	2016	2020
Number of agro-dealers	211	145
Ratio of agro-dealers to agricultural household	1:15,000	1:29,655
Average number of agro-dealers per seed company	N / A ^a	27
% of companies with exclusive agro-dealers	N / A	39
Seed industry satisfaction with agro-dealer network (out of 100%)	57%	52%

a N / A This information was not collected in 2016.

According to the seed companies surveyed, nearly all agro-dealers are not well trained in handling seed. Seed companies and the ANS agree that the 145 agro-dealers are not sufficient. In addition, the agro-dealers are not distributed to match the demand since most are based in urban centers and towns, not in the rural areas where most farmers live. In other words, the network's reach does not allow farmers to reach an agro-dealer within short distances. Instead, farmers must walk long distances to access agricultural inputs.

Besides the challenge of uneven distribution across the country, many agro-dealers lack sufficient training in business management, and the handling of seeds. A lack of business training means that many agro-dealers are less likely to make medium-to-long-term marketing plans, they often shift between selling seed and other agricultural inputs and make no consistent effort to reach out to the farmers – their potential customers.

Given Mozambique's 4.3 million agricultural households in 2020, the ratio of agro-dealers to farming households was estimated at 1:29,655. A significant amount of work was accomplished with NGOs on recruiting and training agro-dealers, mainly in the country's central and northern regions. The ratio of seed agro-dealers to farming households in 2020 represents a significant decline from the ratio in 2016 (1: 15,000) (Table 20).





AVAILABILITY OF SEED IN SMALL PACKAGES

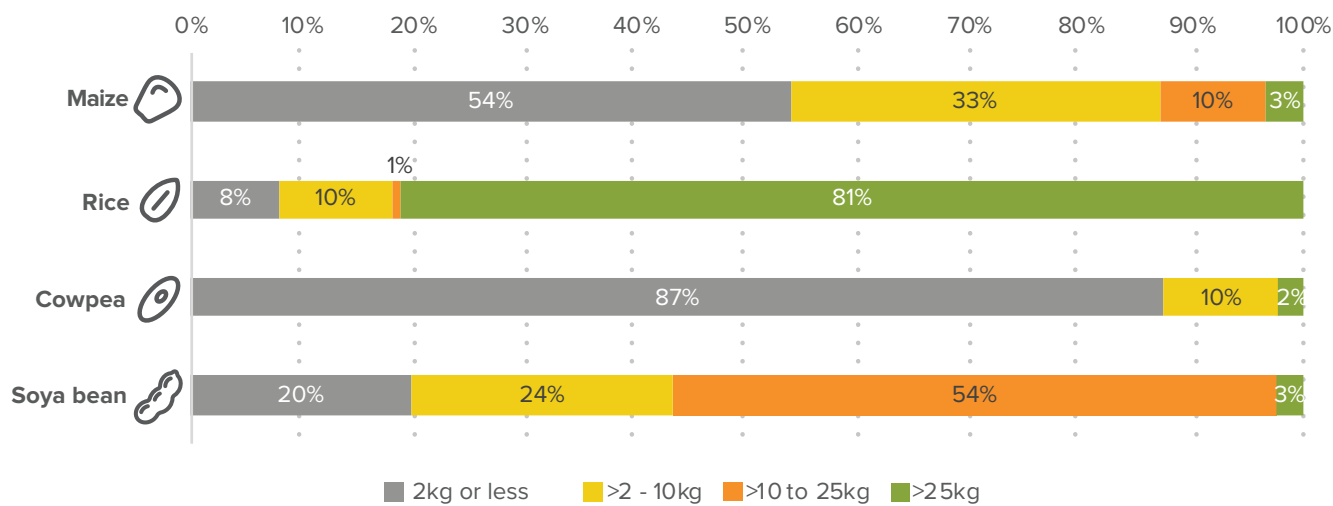
Since most farmers in sub-Saharan Africa operate on a small scale, making seed available in small, more affordable packages is a good way to increase adoption rates of certified seed. TASAI tracks the percentage of seed sold in different package sizes, i.e., 2 kg and below, 2-10 kg, 10-25 kg, and above 25 kg.

Figure 7 shows the percentage of seed sold in different package sizes in Mozambique. The package sizes vary significantly by crop. Fifty-four percent of maize and 87% of cowpea seed were sold in small packages of 2 kg or less, which reflects the fact that both maize and cowpea are commonly sold to small-scale farmers, who own small

parcels of land. Most of the sales of seed for these crops were made directly to farmers or sold through agro-dealers, retailers, or distributed through NGOs. In contrast, much of soya bean seed and rice seed (which were mostly sold under the government subsidy program) were sold in larger packages: 81% of rice seed was sold in packages of 25 kg or more, while 57% of soya bean seed was sold in packages of 10 kg or more, although it is important to note that both of these crops have high sowing rates,¹⁵ so the size of the target farms or programs only partly explains the larger package sizes.

15 Estimated sowing rates are 100 kg/ha for rice and 60 kg/ha for soya bean; in contrast, the corresponding numbers for maize are 10-25 kg/ha, depending on the seed size. See chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.seedcogroup.com/zw/sites/default/files/Maize%20Growers%20Guide_0.pdf Accessed 26 May 2022

Figure 7: Percentage of seed sold in different package sizes (2020)



SEED AND GRAIN PRICES

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 making a choice between purchasing seed from the formal sector or planting grain. The greater the price difference between the two, the less likely resource-poor farmers will purchase certified seed. This indicator tracks the prices of the retail price of seed (at the agro-dealer level) vis-à-vis the market price of grain at the time of planting.

Table 21 presents seed and grain prices in 2020 and compares them with those from 2016. Grain prices are based on the average retail prices for grain (MADER 2021). The average seed price is based on prices reported by surveyed

seed companies. In 2020, hybrid maize seed registered the highest seed price (US\$ 2.7), followed by cow pea and soya bean (US\$ 1.8), rice (US\$ 1.6) and OPV maize (US\$ 1.5). Rice and cowpea had the highest grain prices, which signals that these crops are becoming commercial crops, with high demand. Between 2016 and 2020, seed prices increased for all crops except OPV maize. Between 2016 and 2020, grain prices were nearly unchanged for hybrid maize, OPV maize and cowpea. However, they increased sharply for rice and declined for soya bean. Soya bean was promoted by SUSTENTA in the central and northern regions of Mozambique as one of the crops of the SUSTENTA program; it is also one of the legume crops promoted by the SEMEAR Project. Soya bean is an emerging cash demanded by the poultry and breweries industries and it is also processed as food for human consumption.

Table 21: Seed and grain prices

Crop	Prices in 2016 (US\$/kg)		Prices in 2020 (US\$/kg)	
	Average seed price	Average grain price	Average seed price	Average grain price
 Maize (hybrid)	1.9	0.4	2.7	0.5
 Maize (OPV)	1.5	0.4	1.5	0.5
 Rice	0.7	0.2	1.6	0.9
 Cowpea	1.3	0.9	1.8	1.1
 Soya bean	1.1	0.7	1.8	0.5

CONCLUSION

Mozambique's formal seed system is in the early growth stage of development. This growth is characterized by well-established breeding programs, evolving seed policy environments, many small and medium seed companies, and a growing agro-dealer network (Ariga et al. 2019). In Mozambique, seed companies produce and sell a limited range of staple crops and the government and NGOs are still significant players in the sector. The number of local and regional seed companies that are entering the seed market is increasing. The agro-dealer network that supports the distribution of seed to smallholder farmers is also growing. Government and development partner initiatives have contributed to a favorable environment for seed business competition. However, the use of certified maize seed (the main cereal food crop in Mozambique) is still very low at 9% (MADER 2021a).

Under the **research and development** category, the TASAI study found that most research (breeding) efforts in Mozambique are carried out by public institutions. Private, local seed companies do not have breeding programs. Twenty three maize varieties were released in the last three years, and none had climate-smart features. Research and development are constrained by a lack of breeders, seed production facilities, and financial resources. Reflecting the situation, the satisfaction ratings for the adequacy of breeders for the four focus crops were "excellent" or "good" in 2016, they declined for maize (from 90% to 71%), rice (from 90% to 70%), and soya bean (from 68% to 64%) but remained "good" in 2020. The rating only increased marginally for cowpea by two percentage points from 63%.

In the **industry competitiveness** category, the number of seed companies working with one or more of the focus crops increased between 2016 and 2020. In 2020, according to TASAI data, the national seed production of the four focus crops was estimated at 6,365 MT, while sales were estimated to be 10,420 MT. The notable difference between quantities of seed reported by the ANS and TASAI suggests that a significant portion of seed was not inspected due to a lack

of resources. The maize seed market enjoys relatively high levels of competition. Many seed companies share the cowpea seed market, however, the rice and soya bean seed markets were dominated by few seed companies.

The government subsidy program, SUSTENTA, was the main buyer of rice seed (69%) and soya bean seed (68%) and was the third most important buyer of maize seed (21%). NGOs are the most important buyers of cowpea and maize seed, accounting for about 58% and 36% of purchases, respectively. In 2020, Mozambique was a net importer of seed for maize, cowpea, and soya bean. With regard to seed import and export processes, Mozambique has benefited from the regional seed harmonization agreement. Seed companies rated both import and export processes as "excellent", 86% and 95%, respectively.

Mozambique's **seed policy** environment is guided by Decrees and Diplomas Ministerial. However, the decree on the protection of new plant varieties is not operational. Between 2016 and 2020, the length of the variety release process decreased.

Despite efforts to improve the formal seed system, notable challenges still exist. Breeders are only fairly satisfied with the variety release process (57%) and seed companies are fairly satisfied with the government's efforts to eradicate counterfeit seed (47%). Moreover, satisfaction ratings on the enforcement of the seed legislation have declined slightly since 2016 (64%). Several reasons have been cited for this poor performance, including the lack of effective implementation of the seed regulation (DUS, VCU, seed labeling, pre/post control), limited resources, an inability to monitor counterfeit seed, and a lack of harmonization of seed regulation with SADC requirements. Satisfaction rates with the government subsidy programs are "fair" (45%) on openness and transparency of the seed procurement process, "poor" (37%) on the predictability of the seed procurement process, and "poor" (35%) on the efficiency



of payments. The reasons behind this were reported as the lack of prior information on the invitations of tenders for the supply of seed, unclear criteria for selecting the winners, and long delays in payments.

Institutional support for the seed sector in Mozambique is good. Overall, the level of satisfaction with APROSE was considered “good” (74%) and there was marked improvement across all performance areas from the levels in 2016. In 2021, the ANS implemented an online seed certification process and licensed 20 private inspectors. However, only 8 private

inspectors are actively working under seed companies. The others are based in educational institutions and are not active in seed inspection.

Under **service to smallholder farmers**, there was a significant improvement between 2016 and 2020 in the total number of extension officers, and, accordingly, in the corresponding ratio of extension officers to agricultural households. While this is a step in the right direction, the number of extension officers remains inadequate to meet the needs of Mozambique’s smallholder farmers.

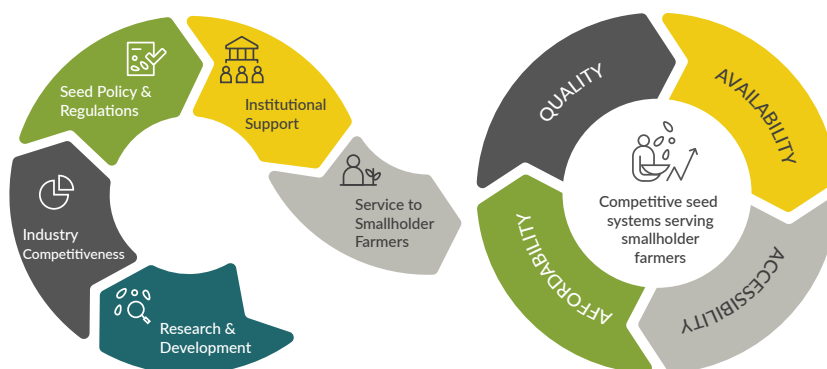
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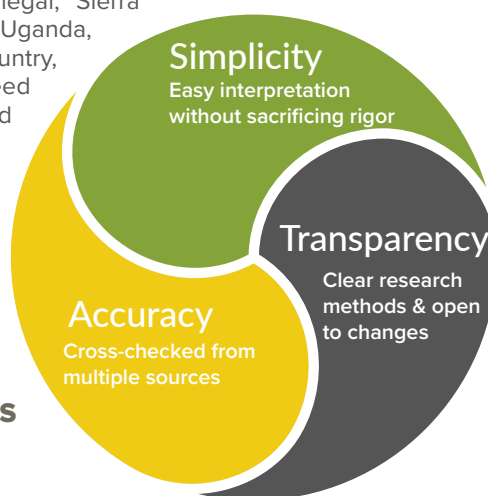


PILLARS OF COMPETITIVE SEED SECTORS

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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