

Kenya Country Report 2020

The African Seed Access Index

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TASAI
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LIST OF ACRONYMS:

AATF – African Agricultural Technology Foundation

ADC – Agricultural Development Corporation

AGRA – Alliance for a Green Revolution in Africa

COMESA – Common Market for Eastern and Southern Africa

CIMMYT – International Maize and Wheat Improvement Centre

DUS – Distinctness, Uniformity and Stability

EAC – East African Community

KALRO – Kenya Agricultural and Livestock Research Organization

KEPHIS – Kenya Plant Health Inspectorate service

HHI – Herfindahl-Hirschman Index

MALFC – Ministry of Agriculture, Livestock, Fisheries and Cooperatives

NBA – National Biosafety Authority

NPT – National Performance Trials

NPTC – National Performance Trials Committee

NVRC – National Variety Release Committee

OPV – Open Pollinated Variety

PBAK – Plant Breeders Association of Kenya

STAK – Seed Trade Association of Kenya

VCU – Value for Cultivation and Use

INTRODUCTION

The increased use of productivity-enhancing technologies, including mechanization, irrigation, fertilizer, and improved seed, are critical to improving food and nutritional security across Africa. For field crops, a competitive formal seed sector is key to ensuring the timely availability of high-quality seed of improved, appropriate varieties at affordable prices for smallholder farmers. Improved seed can deliver state-of-the-art technology to farmers, offering higher yields, disease and pest resistance, climate change adaptation, reduced post-harvest losses, and improved nutrition. To 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 a study conducted by TASAI in 2020 to appraise the structure and economic performance of Kenya's formal seed sector. TASAI studies focus on the four grain and legume crops important to a country's food and nutritional security (the "four focus crops"). In Kenya, these crops are maize, bean, sorghum, and cowpea. The cultivation of these four crops covers 84% of the country's harvested area under cereals and pulses (FAOSTAT, 2020). According to the Ministry of Agriculture, the area under the four crops in 2018 was 1,129,985 ha for bean, 362,939 ha for maize, 258,732 ha for cowpea and 228,733 ha for sorghum¹. Bean is the most widely grown legume in Kenya and follows maize in importance as a staple food crop (Otieno et al., 2019). Sorghum and cowpea are important crops in the marginal and semi-arid areas; sorghum is also gaining importance in industrial uses² (Njagi et al., 2019).

OVERVIEW OF KENYA'S FORMAL SEED INDUSTRY

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

The informal sector refers to a system in which seed is produced, maintained, and distributed through informal networks. These activities "tend to be decentralized and might revolve around local entrepreneurship, seed banking, community-based seed production, or seed villages" (McGuire & Sperling, 2016). In many cases, farmers keep seed from the harvest and exchange it with neighbors,

relatives, and through rural markets. Seed from this system is of variable varietal purity, and physical and sanitary quality³.

The formal sector is a structured and regulated value chain for the production of improved seed varieties. This process involves many actors and institutions, from breeding varieties to the multiplication, processing, and distribution of certified seed. The different stages of improved seed production are regulated by governments, based on approved regulations and standards. The sale of seed from this system takes place through limited distribution channels such as registered seed companies and agro-dealers. This system produces seed of the highest varietal purity and physical and sanitary quality. In Kenya, an estimated 22% of all seed used by farmers is certified seed obtained from the formal sector (Tegemeo, 2019). The corresponding percentages for the four focus crops are 66% for maize, 20% for bean, 15% for cowpea, and 13% for sorghum.

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



1 <http://food.agricultureauthority.go.ke/index.php/statistics/statistics>

2 https://www.kalro.org/csapp/index.php?option=com_content&view=article&id=14&Itemid=280



The Kenya Seed Policy of 2010 outlines the government's strategy to develop, promote, and regulate a modern and competitive seed industry. The Seeds and Plant Varieties Act of 2012 is the national seed law, and comprehensively addresses plant breeders' rights, variety evaluation and release processes, and harmonization with other related Acts of Parliament and regional and international agreements to which Kenya is a signatory. The industry is regulated by the Kenya Plant Health and Inspectorate Services (KEPHIS), the designated national authority on all seed matters. Table 1 lists the agencies in charge of various aspects of Kenya's formal seed industry.

Table 1: Key players in Kenya's formal seed sector

ROLE	KEY PLAYERS
Research and breeding	Kenya Agricultural and Livestock Research Institute (KALRO), universities, seed companies
Variety release and regulation	Kenya Plant Health Inspectorate Service (KEPHIS), National Biosafety Authority (NBA)
Seed production and processing	Seed companies (multinational, regional, domestic)
Education, training, and extension	Seed companies, Seed Trade Association of Kenya (STAK), KEPHIS, KALRO, extension agents, non-governmental organizations (NGOs), rural agro-dealers
Distribution and sales	Seed companies, rural agro-dealers, NGOs, national and county governments



METHODS

As listed in Table 2, TASAI studies cover 22 indicators divided into 5 categories: **Research and Development, Industry Competitiveness, Seed Policy and Regulations, Institutional Support, and Service to Smallholder Farmers**. 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 this is the most recent data available. Accordingly, the data reported in this Country Report primarily covers the 2019 calendar year; however, whenever 2020 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 Kenya’s formal seed sector, this Country Report draws comparisons with the findings of three previous TASAI Kenya studies conducted in 2014, 2016, and 2018 (using data from 2013, 2015, and 2017). 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 study’s primary source of information. For several indicators, TASAI supplements quantitative data with industry opinions, in which respondents were asked to rate various aspects of the seed sector in Kenya on a scale of 0-100. The interpretations of the average ratings is bracketed as follows: 0-19.99% **extremely poor**, 20-39.99% **poor**, 40-59.99% **fair**, 60-79.99% **good**, and 80-100% **excellent**.

In 2019, KEPHIS registered 22 seed companies⁴ to produce and market certified seed for at least one of the four focus crops. These included 7 government-owned, 11 private, and 4 foreign-owned entities (Table 3). All 22 seed companies were interviewed for the study. Due to the COVID-19 pandemic, 15 interviews were conducted in person; the rest were virtual.

In addition to the seed companies, the study also surveyed the main players and key informants in the seed sector, including KEPHIS, the Kenya Agricultural and Livestock Research Organization (KALRO), which is the national agricultural research institute, the Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MALFC), and the Seed Trade Association of Kenya (STAK), the platform representing the private sector in the seed industry. For secondary data, the research team reviewed relevant seed policy instruments, the 2019 National Variety List, and recent seed industry reports.

4 The term “seed merchant” is used in the Seed Regulations (2016). A seed merchant is registered to produce, process, and sell certified seed.

Table 3. Breakdown of respondents by activity and crop (2019)

Crop	Number of seed companies examined for the present study* (out of 22 respondents) who:			Total number of seed companies (KEPHIS data)
	Produced	Processed**	Sold**	
 Maize	14	13	15	17
 Bean	11	10	10	13
 Cowpea	3	3	4	9
 Sorghum	6	8	8	6
Total	22*			22*

* The same seed company may be listed under multiple crops.
** The number of those who processed and sold is higher than those who produced because a few companies may sell carry-over stocks from the previous year without producing seed in the year of data collection.



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 development⁵. In addition to tracking the number of breeders working on the four focus crops, this study also measures the level of satisfaction reported by seed companies with the public breeding programs. The latter can offer an indication of the ability of active breeders in public institutions to produce new varieties.

Table 4 shows the number and adequacy of active breeders in Kenya. There were 35 active breeders for the four focus crops – maize, bean, sorghum, and cowpea. The total

⁵ 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.

number of breeders has not changed since the last TASAI study in 2017/18 (Waithaka et al., 2019). Out of the 35 breeders, 26 public breeders who work in five institutions – KALRO employs 8 breeders, while the government-owned seed companies employ 13 breeders and public universities employ 5 breeders. There are 9 private breeders, 7 of whom work on maize while 2 work on sorghum.

The Plant Breeders Association of Kenya (PBAK) was registered in 1996 to incorporate breeders’ voices in the development of breeding regulatory frameworks and to address issues such as breeder royalties and representation in the variety release committee and in meetings. However, the association has not been effective in carrying out its mission; not all members pay the annual membership fee and the organization has not met regularly. Many breeders have become inactive members of PBAK, citing a lack of support from the association. The annual subscription fee is US\$ 10 for individual breeders and US\$ 100 for institutions/companies. According to PBAK, paid-up members receive a certificate of membership. This certificate gives members preferential access to some assignments and projects, and it also contributes to promotion at work.

Table 4: Number and adequacy of active breeders in Kenya

Crop	Number of breeders in 2019		Total number of breeders		Satisfaction rating (out of 100%)	
	Public	Private	2017	2019	2017	2019
 Maize	11	7	18	18	61	67
 Bean	6	0	6	6	56	58
 Cowpea	4	0	4	4	47	50
 Sorghum	6	2	6	8	48	65
Total⁶	26	9	34	35		

extremely poor poor fair good excellent

⁶ 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.

Table 4 shows the seed companies’ satisfaction with the adequacy of breeders in 2017 and 2019. In 2019, seed companies rated their satisfaction with the adequacy of breeders as “good” for maize (67%) and sorghum (65%), and “fair” for bean (58%) and cowpea (50%). The higher ratings for maize and sorghum correlate with the higher number of active breeders. The high rating for sorghum may also be due to the release and commercialization of malting varieties for the brewery industry. These varieties are highly marketable for their industrial purposes, contributing to a steady relationship between seed companies and the breeders who produce and maintain the varieties. The overall rating

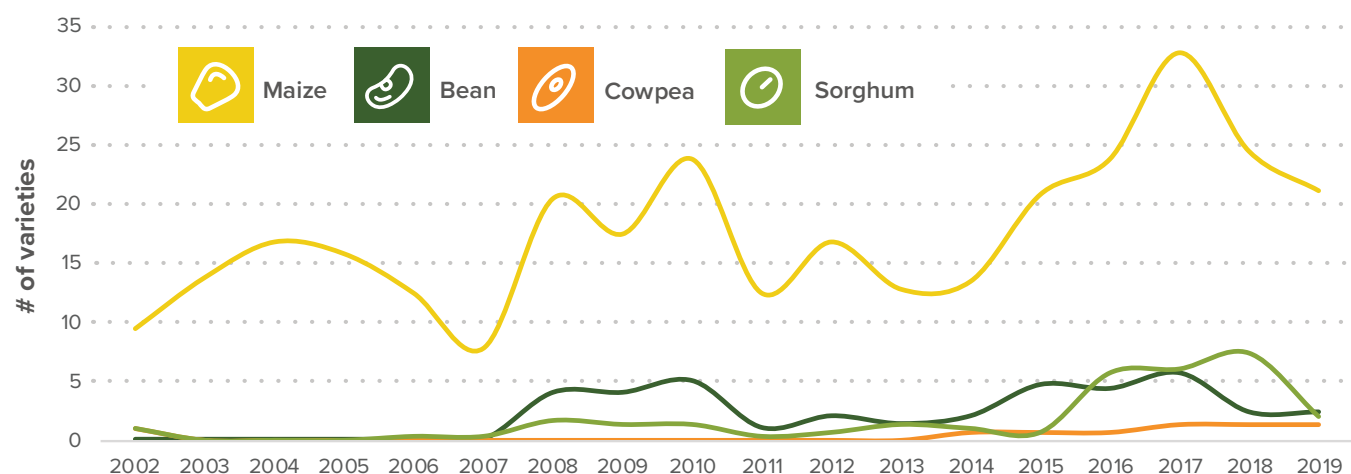
by seed companies in 2019 was “good” (63%) and was the highest across the past TASAI country studies, compared to “fair” at 59% in 2015 and 53% in 2017. By crop, the main notable difference was in the “good” rating for sorghum seed at 65% in 2019, compared to “fair” at 57% in 2015 and 48% in 2017. For bean, the rating improved in 2019, but remained “fair” as it was in 2015 and 2017. The rating for bean breeders is expected to improve in 2020 and 2021 due to the release and heavy promotion of high-iron bean varieties by KALRO. Across the four crops – and in all 3 studies – maize has consistently received higher satisfaction ratings due to the higher number of breeders working on that crop.

VARIETIES RELEASED IN THE LAST THREE YEARS

The number of varieties released measures crop-specific outputs from the variety development and release system. The greater the number of varieties released in a country – counted across the prior three years – the higher the chances of enhancing smallholders' access to improved seed. In addition to higher yields, new varieties often carry desired traits such as climate smartness, disease/pest resistance, and nutrition enhancements. However, TASAI recognizes that release of varieties needs to be supported by commercialization and bulking (of parental seed in the case of hybrids) before the varieties become accessible to farmers.

According to the national variety catalogue, 81 varieties of the four focus crops were released during the period 2017-2019: 63 varieties of maize, 7 of bean, 5 cowpea, and 6 sorghum (KEPHIS, 2020a). Figure 1 shows the trend of variety releases from 2002 through 2019. Maize dominates varieties released, due to the high number of maize breeders and seed companies' focus on maize, which is more profitable than other crops. The sharp increase in the number of maize varieties released in 2016-2017 reflects the efforts put to address the outbreak of Maize Lethal Necrosis Disease (MLND) in 2011 and led to increased funding to maize breeding programs. There were no serious disease and pest challenges in 2018-2019 period to drive more releases.

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



VARIETIES WITH SPECIAL FEATURES

Varieties may have special characteristics, for instance climate-smart, use-related (e.g., fast-cooking or 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. The 2017-2019 period witnessed a significant increase in the release of varieties with special attributes, especially those with drought tolerance, industrial suitability, and use-related responsiveness. As shown in Table 5, 51 (out of 63) maize varieties released were drought tolerant, accounting for 80% of total releases. All sorghum varieties had special features and recorded a high percentage in drought-tolerant releases (5 out of 6 varieties released), while brewing suitability accounted for 2 out of 6 varieties. The main attribute for beans was use-related, focusing on enhanced nutritional value (4 out of 8 varieties released) and fast cooking (3 out of 8 varieties released).

Based on the recent National Variety List, maize breeding programs have of late concentrated on drought tolerance and resistance to maize lethal necrotic disease (MLND) (KEPHIS 2020a). In addition, there has been some focus on breeding for mid-altitude and high-density tolerance driven by rampant land sub-division and reduction of cropland in maize growing areas (KEPHIS 2020a). Further, Kenya is part of a regional donor-funded TELA⁷ maize breeding program focused on developing genetically modified maize to resist the maize stem borer. TELA also has a breeding component for drought-tolerant maize, meant to develop seeds for drier parts of the country.

For sorghum, the current breeding focus is on drought tolerance and on low tannin, which makes sorghum more suitable for brewing. The main breeding interest for beans are micronutrient enhancement, ease of cooking, and disease resistance. For cowpea, recent focus is on yield, disease resistance, and dual usage (seed and leaves).

⁷ The word ‘TELA’ is derived from the Latin word TUTELA which means ‘Protection’. https://www.aatf-africa.org/aatf_projects/tela-maize/.

Use-related attributes may have a gendered component. Women, for example, may prefer varieties that are easy to cook or have enhanced nutritional value based on their domestic responsibilities. In areas where women participate in the formal production economy, they may be as interested as male growers in high-yielding varieties. Development of special attributes in response to both production and use demands can be expected to provide a competitive advantage across a range of changing markets for years to come.

Table 5: Number of varieties released that have special features

Feature	Description of feature	Number of varieties released 2017 - 2019				
		Maize	Bean	Cowpea	Sorghum	TOTAL
All varieties released		63	7	5	6	81
All varieties released with special features		51	5	3	6	65
Climate smart features	All climate-smart features	50	1	3	5	59
	Drought tolerant	50	1	1	5	57
	Early / extra-early maturing	6	1	2	0	9
Fast-cooking and nutrition-enhanced features	All fast-cooking and nutrition-enhanced features	0	4	0	0	4
	Fast-cooking	0	3	0	0	3
	Nutrition-enhanced features	0	4	0	0	4
Industry-demanded features	All industry-demanded features	2	0	0	2	4
	Grits for the breweries	2	0	0	2	4

Source: KEPHIS, 2020.

Note: The total number of varieties with special attributes includes varieties that have more than one "sub-attribute" in the same category. For instance, a variety can be both drought tolerant and early maturing. This variety will appear in the drought tolerance and early maturity rows



NUMBER OF VARIETIES SOLD IN 2019

An increase in the number of varieties sold in a country often results in increased choice of varieties available to farmers. A total of 67 maize varieties, 22 bean varieties, 6 cowpea varieties, and 9 sorghum varieties were sold in 2019 (Table 6). The high number of maize varieties reflects the status of maize as the main staple food crop, with high consumer

demand and high levels of investment from both public and private sectors. Government research institutions employ more breeders for maize than for any of the other three focus crops. Most seed companies have invested in developing their own varieties or have obtained exclusive licenses to market public varieties from the government institutions that developed them. Exclusive licenses granted by public research institutions are time-bound; when they expire, the varieties are licensed non-exclusively, and produced and sold competitively by several companies.

Table 6: Name and age of popular varieties sold

Crop	Number of varieties sold in 2019	Name of popular* variety sold	% of companies selling the variety**	Age of variety (years) in 2019	Average age of popular varieties (all varieties sold)
 Maize	67	DH04	13%	18	19 (13)
		H513	13%	24	
		H614D	13%	33	
		H6213	13%	17	
		KSH624	13%	15	
		H628	13%	20	
		PAN 15	13%	15	
		KDV1	13%	13	
 Bean	22	Chelalang	30%	11	21 (17)
		KK8	20%	22	
		KATB1	20%	32	
		KATX56	20%	24	
		GLP2	20%	37	
		Nyota	20%	2	
 Cowpea	6	K80	50%	19	20 (16)
		M66	50%	21	
 Sorghum	9	Seredo	38%	49	41 (22)
		Serena	25%	49	
		Gadam	63%	25	

* Popularity is based on the number of seed companies selling each variety

** The denominator is the count of seed companies that sold the crop varieties

AVERAGE AGE OF VARIETIES SOLD

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

In Kenya, the average age of popular maize varieties sold in 2019 was 19 years (not weighted by sales volume), while the average age for beans, cowpea, and sorghum was 21, 20, and 41 years, respectively (Table 6). These figures point out the degree to which old varieties persist. The oldest maize variety sold in 2019 was 33 years old, while the newest was one year old. For beans, the oldest was 37 years old, and the newest 2 years old. Sorghum had the oldest variety on the market: 49 years old. Across the four crops, some of these old varieties remain farmers' favorites due to traits such as good taste, low lodging, and relatively better performance in poor soils. Uptake of newer varieties is driven by traits such as resistance to MLND and drought tolerance.

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 may limit the ability of seed companies to scale up production. The process by which seed companies obtain basic seed differs by source. Generally, companies apply to the research institution that produces or supplies a particular basic seed, specifying the crop, variety, and quantity needed. The research institution invoices the company for the basic seed; upon payment, the company receives the seed. In Kenya, the process has the following steps:

- The list of available varieties is published on KEPHIS's website, and occasionally in the newspapers.
- A seed company submits an application form to the supplier. The form includes basic details about the variety and quantities of seed the company is requesting.
- The basic seed supplier assesses the company's capacity to produce certified seed and to commercialize the variety.
- The seed company and the supplier sign an agreement laying out each party's obligations, payment details, royalties to be paid, licensing arrangements, and conditions for termination, if applicable. If the seeds are offered on a royalty-free basis, the buyer would be expected to pay for at least the cost of producing the basic seed. In some cases, the supplier offers a testing license to the seed company, allowing it to first test the variety to verify its attributes before deciding to commercialize it.

- The seed company receives basic seed from the supplier and pays the license fee

Sources of basic seed: Table 7 shows public and private sources of basic seed for the focus crops in 2019. Seed companies obtain basic seed from four sources: (i) their own breeding programs, especially in the case of regional or multinational companies, (ii) KALRO, the government institution with the mandate for agricultural research in the country, (iii) other continental and international agricultural research institutions, e.g., the African Agricultural Technology Foundation (AATF) and the International Maize and Wheat Improvement Centre (CIMMYT), the International Centre for Tropical Agriculture (CIAT) and the International Crops Research Institute for Semi-Arid Tropics (ICRISAT), and (iv) private seed companies that specialize in production and supply of basic seed.

Not all these sources supply seed for all four focus crops. In the case of maize, 12 out of 20 seed companies relied on their own supply of basic seed (Table 7). In 2019 KALRO supplied 3 seed companies with maize basic seed, another 3 with bean basic seed, 1 with cowpea basic seed and 4 with sorghum basic seed.

Survey respondents were asked to assess three aspects of the availability of basic seed: quality of seed received, timeliness of delivery, and whether they had received the requested quantities. In addition, they provided a satisfaction rating on the overall availability of basic seed in the country.

Table 7. Source of basic seed

Source of basic seed	Maize		Bean		Cowpea		Sorghum	
	Number of transactions	% of total	Number of transactions	% of total	Number of transactions	% of total	Number of transactions	% of total
AATF	1	5	0	0	0	0	0	0
CIMMYT	2	9	0	0	0	0	0	0
KALRO	3	14	3	38	1	50	4	80
Own	12	64	4	50	1	50	1	20
Other seed company	0	0	1	13	0	0	0	0
QualiBasic Seed	2	9	0	0	0	0	0	0
Total	20	100%	8	100%	2	100%	5	100%

Seed companies' assessment of the quality of basic seed:

Overall, seed companies were very satisfied with the quality of basic seed for the focus crops across the various sources, rating most "excellent" with ratings ranging from 80-93% (Table 8). Only KALRO received lower ("fair") ratings for maize basic seed, because companies reported that sometimes they did not get the attributes they were looking for.

Seed companies' assessment of the quantity of basic seed:

All seed companies that requested basic seed for sorghum and cowpea received the quantities that they requested. However, out of the 20 requests for maize basic seed to KALRO, one seed company did not receive the quantities they requested. Out of 8 requests for bean seed to KALRO, one seed company did not receive the quantities requested (Table 8).

Seed companies' assessment of timeliness of delivery of basic seed:

Seed companies that produced bean, cowpea, and sorghum seed all received basic seed on time from the various sources they listed. However, 14% of requests for maize basic seed were not supplied on time (Table 8). These cases were reported by 3 different companies and pertained to requests made to KALRO and QBS, and to a seed company's own breeding program. The high rate of on-time delivery for bean, cowpea, and sorghum basic seed may be due to the

fact that some companies have made arrangements with the research organizations to obtain and maintain certain varieties of basic seed. These arrangements ensure that the seed company always has a steady and timely supply of basic seed for the three crops.

Late delivery of basic seed was caused by diverse factors. For the case of KALRO, they reported supplying only 2 out of 3 requests for maize basic seed on time. The delay was largely attributed to the lengthy internal process of processing requests for basic seed. In addition, some seed companies did not pay KALRO on time for the royalties on the varieties that they had produced and commercialized⁸. This led to delays when the companies sought to obtain more basic seed. In some cases, and depending on the licensing agreement, the seed companies may obtain the basic seed and commercialize it under their own names, while the variety is still licensed to the public breeder. Breeders and STAK argue that this practice becomes a disincentive for public and other organizations to maintain and make available adequate basic seed for the licensed varieties. However, KALRO has used non-exclusive licensing agreements with seed companies since the implementation of the institution's Strategic Plan (2005-2015). Under the non-exclusive agreements, KALRO can license multiple seed companies to produce and commercialize their varieties (New Markets Lab, 2020).

8 KALRO charges royalties on seed sales

Table 8: Evaluation of quality, quantity, and timeliness of basic seed by source organization

Crops		AATF	CIM-MYT	KALRO	Quali-Basic Seed	Own	Other Seed Company	Overall
 Maize (n=20)	Quality *	80	80	57	90	93	-	80
	Quantity **	100	100	67	100	100	-	95
	Timeliness ***	100	100	67	50	92	-	85
 Bean (n=8)	Quality *	-	-	90	-	80	100	83
	Quantity **	-	-	100	-	75	100	88
	Timeliness ***	-	-	100	-	100	100	100
 Cowpea (n=2)	Quality *	-	-	90	-	90	-	90
	Quantity **	-	-	100	-	100	-	100
	Timeliness ***	-	-	100	-	100	-	100
 Sorghum (n=5)	Quality *	-	-	85	-	90	-	86
	Quantity **	-	-	100	-	100	-	100
	Timeliness ***	-	-	100	-	100	-	100

*Quality of basic seed (opinion).

**Quantity of basic seed (% that received quantities requested)

***Timeliness of basic seed (% that received basic seed on time)

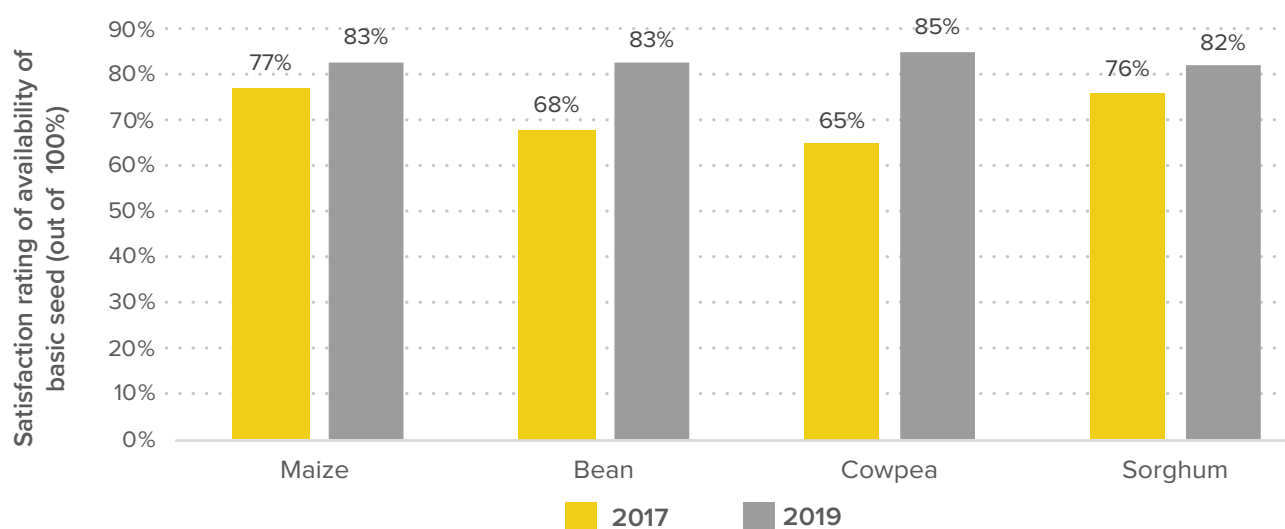
extremely poor poor fair good excellent



Seed companies' assessment of the availability of basic seed:

Overall, seed companies were very satisfied with the availability of basic seed, with an average rating of “excellent” for all crops, 85% for cowpea, 83% for bean, and 82% for maize and sorghum. The rating in 2019 was notably higher than the “good” rating in 2017 at 77% for maize, 76% for sorghum, 68% for bean, and 65% for cowpea (Figure 2). The higher ratings in 2019 were due to the entry of new players in the market who specialize in the production of basic seed and provide increased access by seed companies to non-exclusive licensing for various varieties. Although overall ratings were excellent, ratings on the availability of maize basic seed were lower for CIMMYT and KALRO (both “good”), and QBS (“fair”), because the basic seed from these sources was not always delivered on time or did not meet expectations for quality.

Figure 2: Overall assessment of availability of basic seed



INDUSTRY COMPETITIVENESS

NUMBER OF ACTIVE SEED COMPANIES

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

In Kenya a total of 22 active seed companies produced and/or sold seed for at least one of the four focus crops in 2019. As shown in Table 9, of the 22 seed companies surveyed, 15 sold maize seed, 10 sold bean seed, 8 sold sorghum seed, and 4 sold cowpea seed.

The number of companies producing versus selling may differ because some seed companies only import and sell seed. This applies to some of the regional and multinational companies that produce seed in other countries for varieties registered in Kenya. In addition, some seed companies produce seed on behalf of other seed companies who then market the seed. This dynamic suggests that the industry may be moving towards a higher degree of specialization, where seed companies opt to engage in different activities along the seed value chain.

Table 9: Active seed companies

Crop	Number of active seed companies in 2019		
	Producing seed	Selling seed	Total number
 Maize	14	15	17
 Bean	11	10	13
 Cowpea	3	4	6
 Sorghum	6	8	9
Total	22	22	22

Figure 3 shows trends in the number of active seed companies for the four focus crops across the four TASAI Kenya studies: 2013, 2015, 2017, and 2019. Overall, the number of seed companies for maize has declined steadily between 2013 (TASAI, 2015) and 2017 (Mabaya and Mburu, 2016). The main reason for this is that several companies, including two Ugandan-owned companies, exited from the Kenyan market due to its stiff competition. No company has closed down due to non-adherence to seed standards since 2017, when KEPHIS suspended one company.

For the other three crops, the number of seed companies increased steadily from 2013 to 2017, and then dropped in 2019. The number of seed companies for these crops increased as newly established seed companies that had started off producing and selling maize seed grew and diversified into other commodities like bean, cowpea, and sorghum seed. The sudden drop is attributed to decreased farmer demand for these crops. According to STAK, seed companies have been discouraged by low demand where farmers recycle seed or revert to buying seed from the informal markets.

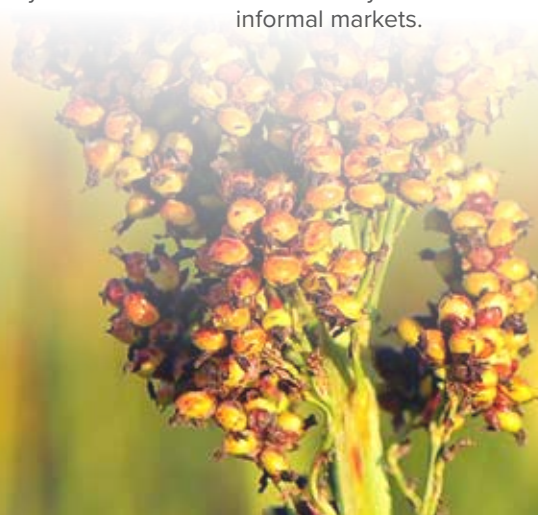
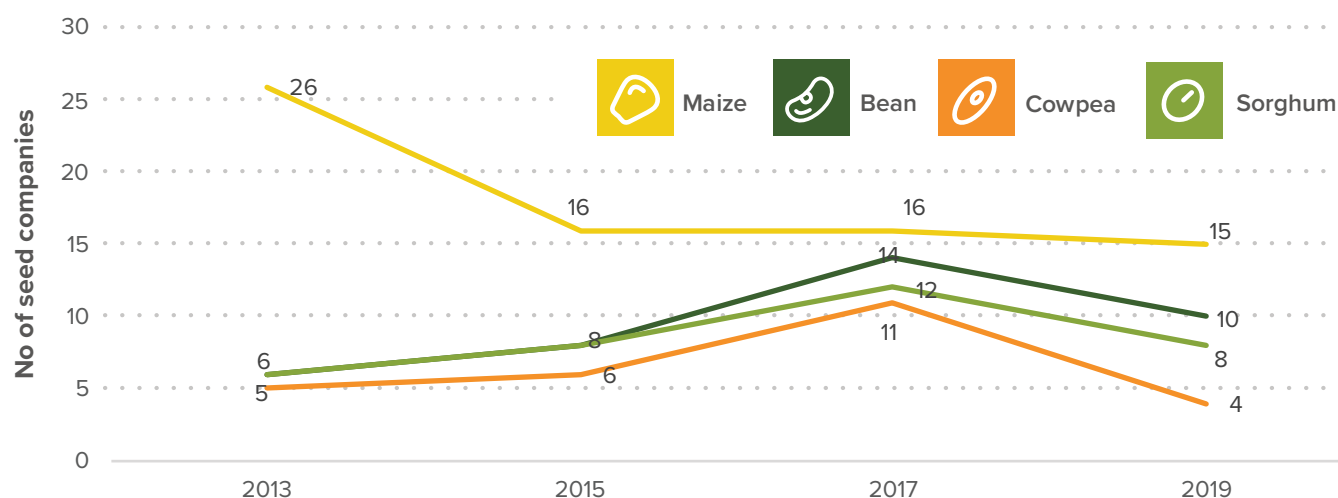


Figure 3: Trend in number of active seed companies



GENDER IN MANAGEMENT OF SEED BUSINESSES

TASAI also tracks the number of women in management and ownership positions in seed companies. Table 10 shows that, overall, women occupied 48% of the management positions in the seed companies surveyed, 45 out of 94 positions. Women occupied at least half of the management positions in 8 of the 15 seed companies that have a management structure.⁹ However, only 14% of the seed companies had a female “top” manager, such as managing director, country manager/director or chief executive officer. While women are reasonably well represented in lower-level management positions, only a small fraction have been able to rise to top-level positions

When it comes to ownership, women’s participation at 13% was nearly identical to their share of positions in top management. It is important to note that the question on ownership only applied to 8 of the 22 seed companies, where the ownership can be attributed to a single person. The question did not apply to government-owned seed companies, some family-owned businesses, and regional/multinational seed companies, which are owned by shareholders or a board. So specifically, only one out of eight single-owner companies was owned by a woman.

Table 10: Gender in management of seed companies

Gender indicator	Number	%
Women in management positions (n=94)	45	48
Companies where management consisted of at least 50% women (n=15)	8	53
Companies with female top manager (n=22)	3	14
Companies with female owner (n=8)	1	13

⁹ Some of the seed companies did not have a company management structure. These are research institutions and public universities. Though they are registered as seed merchants, they are run as research programs and do not have a management structure like privately-run companies.

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 MT¹⁰) of certified seed sold in the data collection year, as reported by active seed companies.

10 MT stands for metric ton; 1 MT=1,000 kg.

In 2019, the 22 seed companies surveyed produced 39,079 MT of maize, 1,523 MT of bean, 943 MT of sorghum and 439 MT of cowpea seed (Table 11). The table also compares TASAI's aggregate data on seed production with data from KEPHIS. The seed companies reported producing higher volumes of seed for all four crops than what was recorded by KEPHIS. The volume of maize seed produced is lower than the volume of maize seed sold because seed sales also included imports of seed not produced in Kenya.

Table 11: Seed production and sales

Crop	Seed production in MT by 22 seed companies (TASAI data)	Seed production in MT by 22 seed companies (KEPHIS data)	Seed sales in MT (TASAI data)
 Maize	39,079	35,736	45,822
 Bean	1,523	890	1,421
 Cowpea	439	342	400
 Sorghum	943	78	655

The 22 seed companies sold 45,822 MT of maize seed, 1,421 MT of bean seed, 400 MT of cowpea seed, and 655 MT of sorghum seed (Table 11). Maize was by far the dominant crop in seed sales, accounting for over 90% of combined sales of the four focus crops.

Table 12 shows the trend in aggregate seed sales over the four years of the TASAI studies in Kenya in 2013, 2015, 2017, and 2019. In all four years, maize was the dominant crop. In addition, maize seed sales have grown steadily from 35,671 MT in 2013 to 45,822 MT in 2019. Sales for bean, cowpea, and sorghum seed fluctuated over this period. The fluctuation was partly explained by the rise and decline in the number of seed companies producing and selling seed for these crops, as shown in Figure 3.

Table 12: Seed sales

Crop	Seed sales in MT ¹¹			
	2013	2015	2017	2018
 Maize	35,671	38,835	43,954	45,822
 Bean	428	1,332	1,165	1,421
 Cowpea	424	463	310	400
 Sorghum	274	1,075	887	655

¹¹ Sources: KEPHIS for 2013 data, TASAI for 2015, 2017 and 2019

MARKET CONCENTRATION

Competition among seed producers tends to benefit 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 producers, to calculate the market share of the four largest firms, also known as four-firm concentration ratio (CR4), and the Herfindahl-Hirschman Index (HHI).

Table 13 shows that the market shares of the top four companies were high for all four crops in 2019: 85% for maize, 84% for bean, 100% for cowpea and 83% for sorghum. The high market shares signal the dominance of a few seed companies in the markets. Calculating the HHI yielded the following scores: 3,261 for maize, 2,085 for bean, 3,797 for cowpea, and 3,334 for sorghum (Table 13). The scores indicate high concentration in the maize, cowpea, and sorghum markets. The high concentration in the cowpea and sorghum markets is mainly because there are very few players in these two markets. In contrast, 9 of the 13 maize seed companies collectively contribute 15% of the market. The market concentration for bean was moderate. Unlike the other three seed markets, each of the top four bean seed companies account for between 10% and 35% of the market. The HHI scores and the market shares point to the same conclusions. The maize, cowpea and sorghum seed markets are highly concentrated, with few dominant companies. The bean seed market is relatively less concentrated.

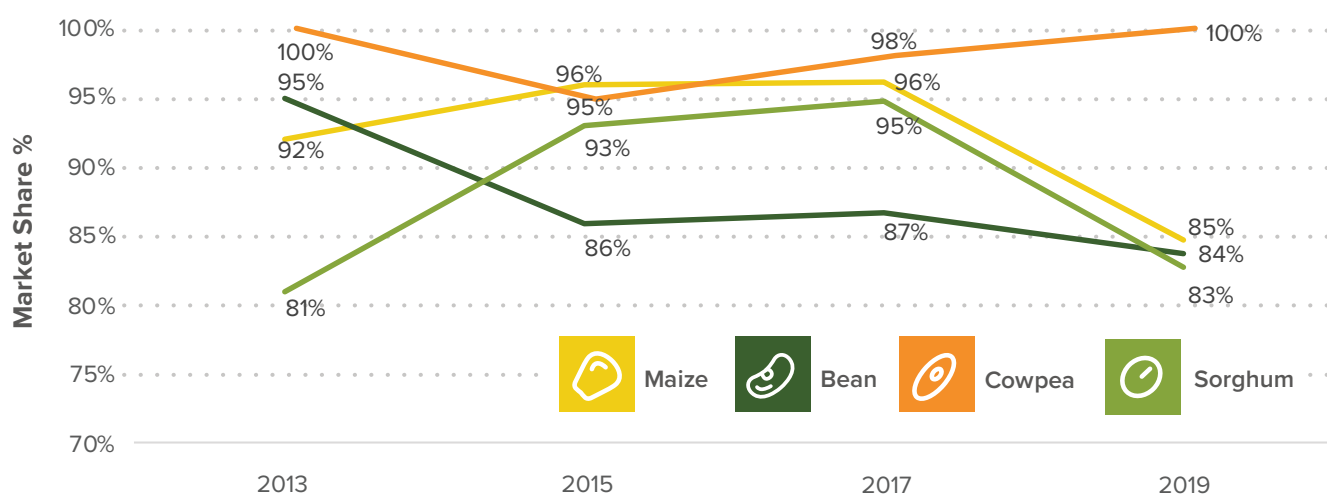
Table 13: HHI score and market share

Crop	Market share of top four companies (%) (CR4) in 2019	HHI (2019)
 Maize	85	3,261
 Bean	84	2,085
 Cowpea	100	3,797
 Sorghum	83	3,334

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

Figure 4 shows market shares of the top four seed companies in 2013, 2015, 2017, and 2019. Across the four crops, the market shares for the top four companies have been above 80% in all four studies. The year 2019 saw a downward trend in maize and sorghum (by 11 and 12 points, respectively), and a small decrease in beans (3 points), signaling a move towards a more competitive market. In the case of cowpea, the market share of the top four companies has consistently been near 100%.

Figure 4: Market share of top four seed companies



MARKET SHARE OF GOVERNMENT PARASTATALS

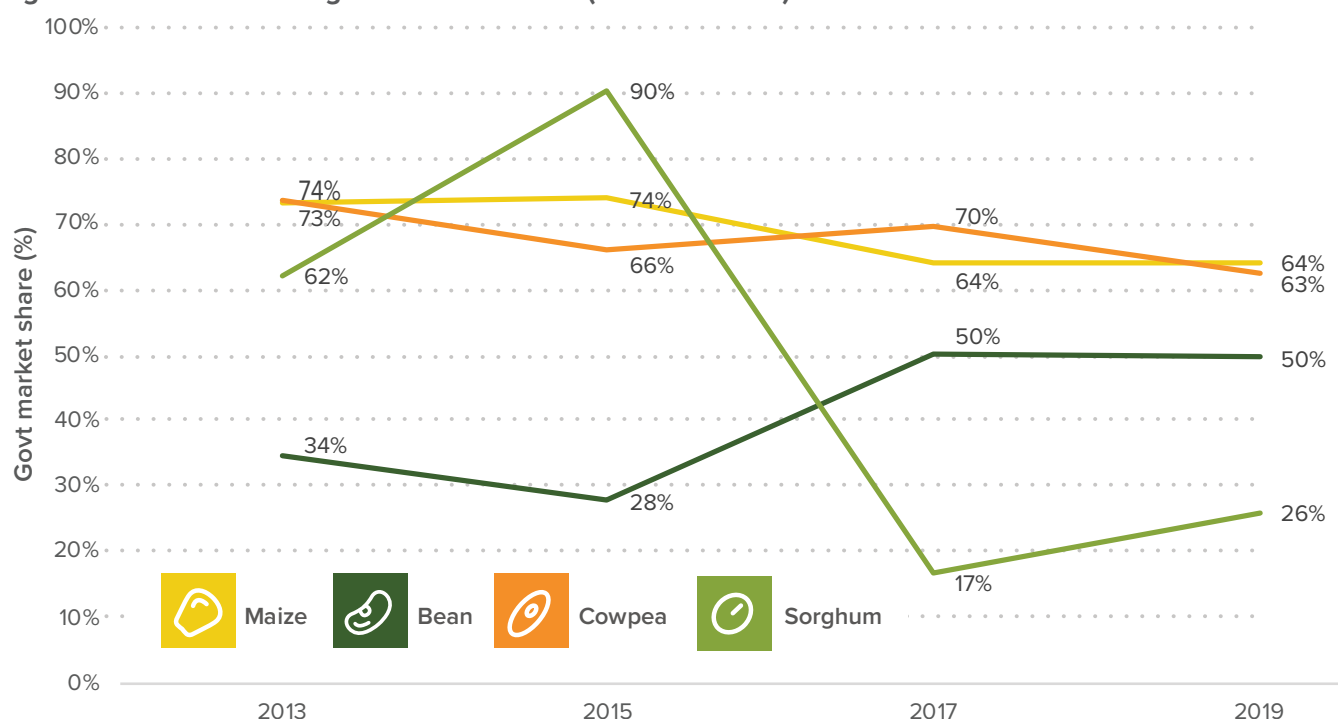
In some countries, public entities are still active players in the marketing of certified seed. Public seed companies can play a critical role in meeting farmer demand for varieties and crops that private seed companies deem less profitable. In addition to seed production, public companies may support other national objectives, such as university training and research. However, state-owned companies may benefit from preferential treatment, less stringent enforcement of regulations, access to competitor information, and indirect production subsidies. Collectively, these privileges can result in unfair competition against purely private seed companies.

Kenya has seven government-owned organizations involved in producing and marketing certified seed for the four focus crops: one agricultural research institute, four public universities, and two state-owned corporations. The primary role of the research institute and the universities is to produce

basic seed and to process certified seed, while the state-owned corporations mainly focus on the multiplication and sale of certified seed.

Figure 5 shows the share of government-owned entities in the seed market, as recorded in the four TASAI Kenya studies to date. In 2019, the government contributed at least 50% of the market share in three of the four focus crops – maize, cowpea, and beans. Maize and cowpea have shown similar trends since 2013, with the respective market shares of the government-owned entities decreasing from 73% and 74% to 64% and 63%, respectively. In contrast, in the case of beans, the market share of government-owned businesses has increased from the initial 34% in 2013 to 50% in the last two data collection years (2017 and 2019). The trend for sorghum has been unique: after an initial share of 62% in 2013, the share of government-owned businesses shot up to 90% in 2015, only to decrease to 17% in 2017 and then to increase to 26% in 2019. The different trajectories notwithstanding, unlike in other countries in Africa that have been fully privatized, government participation in the Kenyan seed market remains significant, raising the risk of unfair competition mentioned above.

Figure 5: Market share of government entities (2013 and 2019)



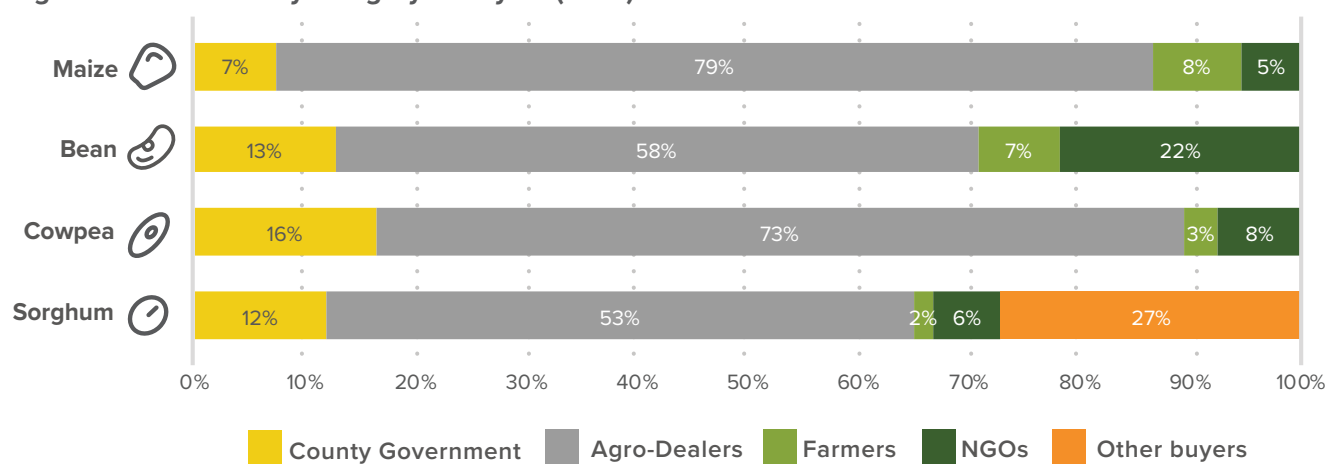
SEED SALES BY CATEGORY OF BUYERS

The TASAI study tracked five different categories of seed buyers in Kenya in 2019: county governments¹², agro-dealers, farmers, NGOs, and others. Figure 6 shows the breakdown of seed sales by the different categories of buyers. Agro-

dealers command a majority of seed company buys across all four focus crops: maize 79%, cowpea 73%, bean 58%, and sorghum 53%. Compared to most countries, this share of seed sold through agro-dealers is high, signifying industry maturity and independence from subsidy programs. Other important buyers are NGOs for bean seeds and county governments for cowpea seeds. Across the four crops, direct sales to farmers account for less than 10% of seed company sales.

¹² Kenya's devolved governance has 47 county governments. In this structure, key government agricultural functions are undertaken by the county governments.

Figure 6: Seed sales by category of buyers (2019)



SEED IMPORT AND EXPORT PROCESSES

Efficient seed import and export processes extend the seed market beyond national borders. While seed companies benefit from an expanded market, farmers can access a wider range of varieties from across the region. To import or export, a company must comply with import and export procedures outlined by various government ministries or departments, including registering with KEPHIS as a seed merchant. The next step is to apply for a plant import permit. Once the permit is obtained, the seed may be imported but must be cleared at the border of entry. The clearance may involve checks by other regulatory agencies such as the National Biosafety

Authority, to ensure that genetically modified crop varieties are not commercialized in the country¹³, and the Kenya Revenue Authority, which charges taxes and relevant levies.

Of the 22 seed companies surveyed, 5 imported seed in 2019. All five companies imported maize seed, while one company also imported sorghum seed (Table 14). The maize imports came from Zambia, Zimbabwe, and South Africa, while the sorghum imports came from Zimbabwe. Though about 81% of maize imports were from COMESA member states, only one seed company used the COMESA labels. This label enables companies to trade in seed that is registered in the COMESA catalogue without having to be subjected to more tests in any of the 21 COMESA Member States. There were no imports for bean and cowpea seed recorded in 2019.

¹³ The Kenya government has banned the importation of GMOs into the country since 2012.

Table 14: Overview of seed imports (2019)

Crop	No. of importing companies	Main country sources of imports	Seed imports in MT		
			Total	From COMESA countries	From COMESA with COMESA label
Maize	5	Zambia, Zimbabwe, South Africa	8,300	6,700	2,400
Sorghum	1	Zimbabwe	20	20	0

To export seed from Kenya, the exporter needs to obtain a no-objection permit from the importing country before KEPHIS can issue the export permit. Like imports, exports need to be cleared at the relevant border points upon exit. In 2019 seven companies exported maize seed to Burundi, Rwanda, Tanzania, and Uganda (Table 15), all but one of which (Tanzania) are COMESA countries. One company each exported bean and sorghum seed to Uganda. Only two of the seven companies used COMESA labels when exporting seed. There were no exports of cowpea seed in 2019.

A key data point tracked by TASAI is the length of the import (or export) process, measured as the sum of the number of days needed to obtain import (or export) documentation – import (or export) permit, phytosanitary certificates, and an International Orange Certificate¹⁴, if applicable – and the number of days to clear seed at the border. The count excludes transportation time. Seed companies reported that the import process range from 2-36 days, with an average of 10 days (Table 16). Companies reported, on average, it takes only 12 days to export seed.

¹⁴ The International Orange Certificate is issued by a laboratory accredited by the International Seed Testing Association (ISTA) when both sampling from the seed lot and testing of the sample are carried out by the same laboratory.

Table 15: Overview of seed exports

Crop	Number of exporting companies in 2019	Main country destinations of exports	Seed exports in MT		
			Total	To COMESA countries	To COMESA and w/ COMESA label
 Maize	7	Uganda, Rwanda, Burundi, Tanzania	4,168	3,668	1,500
 Bean	1	Uganda	5	5	0
 Sorghum	1	Uganda	150	150	0

Table 16: Seed import and export process

Import		Min	Max	Average
Import	Number of days to obtain relevant documents (import permit, phytosanitary certificate etc.)	1	15	5
	Number of days to clear seed at the border of entry	1	21	5
	Total number of days to import	2	36	10
	Satisfaction with import process (out of 100%)	40	80	66
Export	Total number of days for export	3	28	12
	Satisfaction with export process (out of 100%)	40	80	61

Seed companies were relatively satisfied with the import and export processes, rating them as “good”: 66% and 61%, respectively (Table 16). However, the companies highlighted three issues about the process.

- Some border officials were not fully aware of the differences between seed and grain:* The companies reported that obtaining the necessary documentation at the border (as opposed to from the seed regulator ahead of time) may delay the process because border officials were not always aware of the difference between seed and grain. This ignorance of the regulations and standards governing seed importation led to delays in clearing the seed at the point of entry.
- Additional government approval:* in addition to the import permit that KEPHIS issues, seed importers also needed import approval from the Crops Directorate in the Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MALFC). This only applies to maize seed which is a priority crop in the country. This additional clearance further delayed the process.
- Unrecorded trade:* One interesting finding is that there is informal seed trade that involves companies exporting certified seed to buyers in Uganda and Tanzania. While the seed is sold officially at the seed company’s point of sale on the Kenyan side, the border points do not conduct any formal seed clearance. This seed is not officially recorded in government trade statistics.

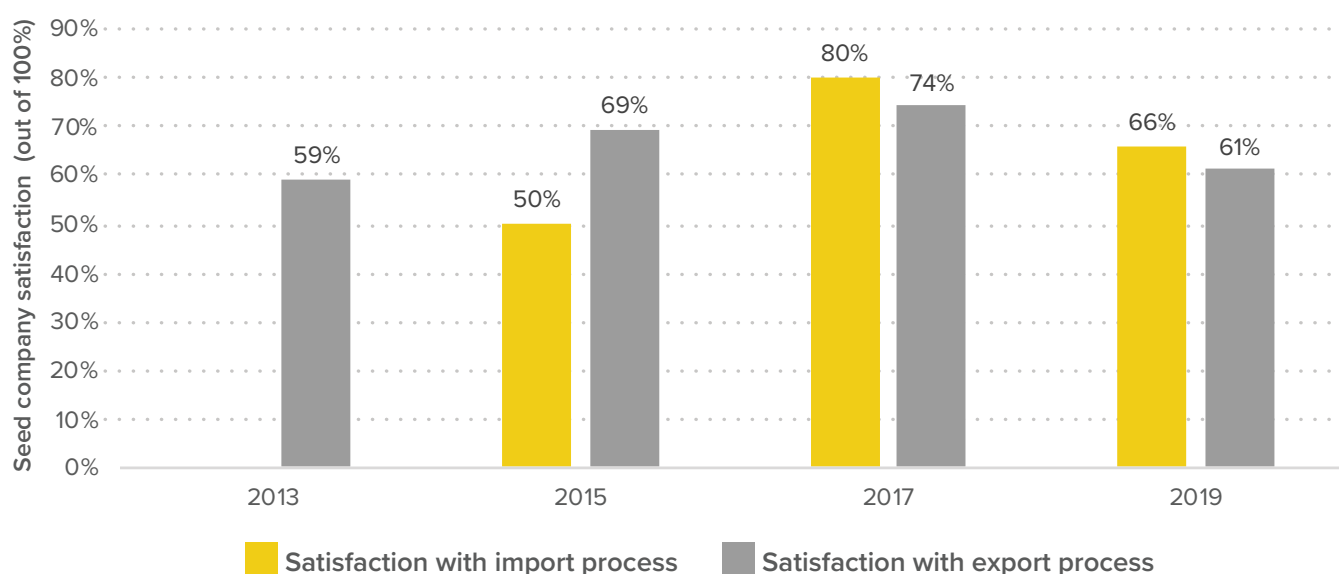
Figure 7 shows the trend in seed company satisfaction with the import and export process since 2013¹⁵. Over the four studies, seed companies recorded the highest satisfaction for both the import and export processes in 2017. In 2019 the import and export processes registered 14- and 13-point drops, respectively, attributed to an additional trade certificate requirement¹⁶ instituted by the government that year (and subsequently repealed).

¹⁵ Seed company satisfaction with export process was not recorded in 2013

¹⁶ This was a pre-import verification conformity to Kenya standards certificate that was introduced by the Kenya Bureau of Standards in late 2019 but was repealed in April 2020. The repeal was influenced by the lobby work led by STAK.



Figure 7: Trend in seed company satisfaction with import and export process



Seed trade under the COMESA Harmonization Seed Regulations: Except for South Africa and Tanzania, all of Kenya's trading partners are COMESA member states. These countries – Burundi, Rwanda, Uganda, Zambia, and Zimbabwe – have aligned their national seed regulations with the COMESA harmonization seed regulations (COMESA, 2014). TASAI's study finds divergence from the harmonization scheme:

- **Most companies do not use COMESA labels:** COMESA's goal is that all seed traded in the COMESA region should meet its standards, be listed in its Variety Catalogue, and carry a COMESA seed label. Only one out of five importing companies and two out of seven exporting companies used the COMESA seed label in 2019 (Table 17).
- **Requirement for DUS and NPT tests:** Seed companies reported that KEPHIS sometimes requires imported varieties to undergo Distinctness, Uniformity, and Stability (DUS) tests and National Performance Trials (NPTs) before being brought into the country, if they are not included in the national variety list. This was mainly a requirement for maize seed imports. This requirement should be waived under the COMESA arrangements.

Table 17: Seed trade under the COMESA regulations

Indicator	Imports	Exports
Number of companies using the COMESA seed label	1	2
Number of companies trading in the COMESA region	5	7
Number of transactions carrying the COMESA seed label	2	4
Total number of transactions	7	14
Volume of imports/exports bearing the COMESA label	2,400	1,500
% of import/export volume with COMESA label	41%	36%
Source countries (for imports) and destination countries (for exports) (COMESA and beyond)	Zambia, South Africa	Burundi, Rwanda, Uganda

SEED POLICY AND REGULATIONS

LENGTH OF VARIETY RELEASE PROCESS

Plant variety release is the process by which new varieties undergo various tests for yield, Value for Cultivation and Use (VCU), and Distinctness, Uniformity, and Stability (DUS). Varieties that perform satisfactorily in these tests are approved for release by the National Variety Release Committee (NVRC). A vibrant seed sector has a functional and consistent variety release system that is well understood by its stakeholders. Lengthy and/or costly variety release processes can limit the number of released varieties, adversely affecting farmer choice. Lengthy variety release processes also mean longer lags between the emergence of new threats to crops – such as pests, diseases, and extreme weather – and availability to farmers of varieties that mitigate the threats. The length of the variety release process is calculated from the date the variety is submitted to the NVRC to the date when it is approved for release. The calculation does not include the time the breeder spends developing the variety.

In Kenya, KEPHIS is in charge of variety release and registration. The variety release process follows five general steps:

Application: A breeder submits an application to KEPHIS for evaluation and registration of a new variety with sufficient attributes to compete in the market. The breeder also pays the required fees and supplies seed for the trials.

Conduct of NPT (VCU) and DUS tests: The variety release process centers around two main tests – the National Performance Trials (NPT, also known as VCU), and DUS tests. NPT and DUS tests are conducted for two seasons each. The breeder is required to provide enough seed for these tests in good time before its planting season.

- The goal of the NPT is to establish that the candidate variety has attributes that provide added advantage (value) to farmers. This is conducted to protect farmers from inferior varieties. The NPT involves comparison of the proposed variety to a relevant variety (known as a *check*) that is already released in Kenya. The main attribute of the comparison is yield, which must be superior to the currently available varieties. However, recently, KEPHIS developed a protocol for assessing special features, such as insect resistance and drought tolerance, that make the trial variety superior to existing varieties.
- DUS tests seek to establish whether the variety is new and different from previously released varieties. Some applicants prefer to wait for the variety to either pass the NPT stage or show promising trends before applying for DUS tests. Other applicants make concurrent applications for the NPT and DUS tests. TASAI found that some breeders opt for concurrent NPT and DUS tests to shorten the release time – to within two years – at the risk of having paid for DUS tests for a variety that may fail at the NPT stage.

Presentation of test results to the National Performance Trials committee (NPTC): Once adequate data from the two tests are available, they are presented to the NPTC. The NPTC is chaired by KEPHIS and includes representatives from STAK, crop experts appointed on own merit from KALRO, and the Plant Breeders Association of Kenya (PBAK), the MALFC, and the applicant. The applicant is given an opportunity to give a presentation of the attributes of their variety. The meeting of the NPTC is mostly technical and its purpose is to review the data from the two field tests while those of the NVRC are purely to make decisions on which varieties should be released.

Approval by the NVRC: Varieties recommended by the NPTC are submitted to the NVRC for approval. The NVRC is chaired by MALFC and includes representatives from STAK, Kenya National Farmers' Federation (KENAFF), the PBAK, Council of Governors, and research institutions. KEPHIS serves as the secretariat for this committee. When approving varieties for registration, the NVRC also takes into consideration other factors such as the need to respond to food security emergencies. For promising varieties, the applicant is given up to 7 days to effect changes that the NVRC deems necessary for approval and gazettment of a variety.

Registration of varieties: Once the NVRC approves a variety, the cabinet secretary in charge of agriculture officially launches the new variety and directs its gazettment by KEPHIS. KEPHIS then enters the variety into the National Variety Catalogue, thus paving the way for its commercialization.



Length of variety release process: The length of the variety release process ranged from 24 to 40 months. On average, the length is 31 months (for public breeders) and 35 months (for private breeders). For private breeders, the average length varies by crop, while this is not the case for public breeders (Table 18). It is important to note that KEPHIS does not employ different protocols for private and public breeders. The difference in the length of time is due to several factors such as the availability of funds to pay for both tests concurrently, which would shorten the processing time, the availability of land to conduct the DUS and NPT tests, and the availability of adequate amounts of breeder seed. In addition to the above reasons, several external factors may lengthen the release process, including crop failure due to weather, disease, or pests. In these cases, the applicant pays for additional seasons of testing. Kenya should strive to reduce the length of variety release process to be closer to those of Zimbabwe (18 months), South Africa and Uganda (both 20 months), and Mali and Zambia (both 24 months).

The overall satisfaction rating of the length of variety release by private breeders and public breeders was “good” (68% and 67% respectively). This means that, despite the challenges noted, breeders were relatively satisfied with the process.

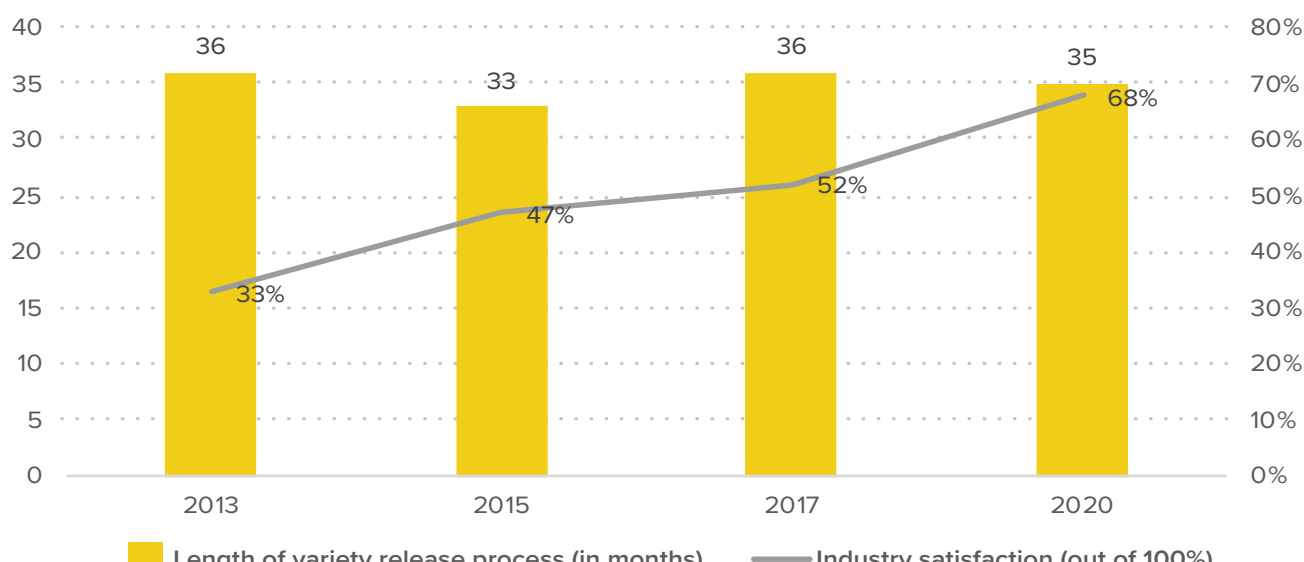
The satisfaction rating by private breeders was “good” for the three crops (maize, bean, and sorghum) that they work with. The ratings by public breeders were “excellent” for sorghum, “good” for maize and cowpea, but only “fair” (40%) for bean. To improve on the process for bean varieties, breeders proposed reducing the relatively high costs of the DUS and NPT tests, speeding up the process of analysis and provision of feedback on the results of the two tests, and reducing the time before gazettelement of approved varieties.

Figure 8 shows the trend in the average length of, and seed companies’ satisfaction with, the variety release process over the four TASAI data collection years. Seed company satisfaction with the process has increased steadily from 33% in 2013 to 68% in 2019, despite little change and an essentially flat trend in duration of variety release between 2013 and 2019. As such, satisfaction may be driven by other factors, including actions by KEPHIS to address challenges that do not directly affect the length of the release cycle, for instance clarifying the overall process, allowing concurrent applications for DUS and NPTs, and engaging private inspectors. In addition, seed companies, through STAK, now play a more active role in the two committees than they did in the past.

Table 18: Average length and rating of variety release process (2019)

Crop	Average length of variety release (in months)		Satisfaction rating (out of 100%)	
	Public breeders	Private breeders	Public breeders	Private breeders
 Maize	30	34	67	70
 Bean	30	40	40	60
 Cowpea	30	-	65	-
 Sorghum	33	30	80	75
Overall	31	35	67	68

Figure 8: Trend in length of and seed company satisfaction with the variety release process



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. As shown in Table 19, the two main expenses seed companies incur in the variety release process are the fees for the NPTs, which cost KES 120,000 (US\$ 1,200 in 2019) per entry per season (for two seasons). DUS tests cost KES 60,000 (US\$ 600). Thus, the total official cost of the variety release is KES 300,000 (US\$ 3,000), since NPTs are for a minimum of two seasons. However, applicants may incur additional costs depending on unique circumstances, such as transport during delivery of the material to KEPHIS offices. On average, such additional costs were estimated by private seed companies to be KES 30,000 (US\$ 300). In addition, the breeder is also expected to participate in each session of the NPTs with the KEPHIS inspector. This participation is at the breeder's own cost.

Although the total costs are affordable to large seed companies, small companies and public research institutions complained that they can only afford to submit a few varieties for trials. Also, high costs contribute to delays in the process when small companies or public research institutions are unable to pay for concurrent tests.

Table 19: Cost of variety release (2019)

Indicator	Costs incurred by private breeders (in US\$)				Costs incurred by public breeders			
	DUS	NPT	Other	Total	DUS	NPT	Other	Total
 Maize	600	2,400	-	3,000	600	2,400	-	3,000
 Bean	600	2,400	-	3,000	600	2,400	350	3,350
 Cowpea	-	-	-	-	600	2,400	250	3,250
 Sorghum	-	-	-	-	600	2,400	-	3,000
Average	600	2,400	-	3,000	600	2,400	300	3,105

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. Kenya's seed industry is governed by a national seed policy, supported by relevant laws and regulations. The seed policy, law, and key regulations are all fully operational.

The National Seed Policy of 2010 (ROK, 2010) provides the overall framework for seed industry development in Kenya. The Seeds and Plant Varieties Act, Cap 326 (ROK 2012a), the main law governing the sector, has three sets of regulations. The first set of regulations are the Seeds and Plant Varieties (Seeds) Regulations (2016) (MALFC, 2016a). They establish the Seed Regulations Committee, which advises the Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MALFC) on matters related to policy, regulations, and industry performance. In addition, the Seeds Regulations outline the requirements for registration for all seed sector players and the scope, requirements, and standards for seed inspection and certification.



The second set of regulations are the Seeds and Plant Varieties (Variety Evaluation and Release) Regulations (MALFC, 2016b). These regulations describe the procedures and requirements for variety evaluation, release, and registration. They establish the National Performance Trials Committee (NPTC) and the National Variety Release Committee (NVRC), and outline their functions, structures, and modes of operation.

The third set of regulations, the Seeds and Plant Varieties (Plant Breeder's Rights) Regulations (Cap. 326), establish the Plant Breeders' Rights Committee (ROK, 2012a). The functions of this committee include developing the plant breeders' rights policy, reviewing and recommending appropriate plant breeders' rights, and recommending the registration of owners of plant varieties.

In addition, there are three draft regulations that are at various stages of development: the draft Seeds and Plant Varieties Regulations (Conservation, Access, and Benefits Sharing of Plant Genetic Resources for Food and Agriculture) focus on access to plant genetic resources; the draft Forestry Seeds Regulations cover forest seeds; and the draft Vegetative Propagating Seeds Regulations cover vegetatively propagated crops (roots and tubers).

Alignment with COMESA Seed Trade Harmonization Regulations: Kenya is a member of the Common Market for Eastern and Southern Africa (COMESA). The country's regulations are officially aligned with the COMESA Seed Trade Harmonization Regulations (COMESA, 2014). This alignment is contained in two regulations – the Seeds Regulations and the Variety Evaluation and Release Regulations. While the legal instruments are in place, the seed companies surveyed report that their industry is still experiencing challenges related to the implementation of the COMESA regulations. Seed companies have also indicated that the cost of adding and maintaining a variety on the COMESA Variety Catalogue is high.

Harmonization with EAC Seed Bill: Kenya is also a member of the East African Community (EAC). The EAC is currently finalizing the EAC Seed Bill and the corresponding EAC Seed Regulations. The bill was referred to the EAC Sectoral Council of Legal and Judicial Affairs by the 38th EAC Council of Ministers in May 2019 to review and transmit to the East African Legislative Assembly (EALA).

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 to 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.

Seed sector development in Kenya is the mandate of MALFC. KEPHIS, the main seed regulatory agency under MALFC, handles all aspects of seed certification and plant protection. Kenya's national varieties list is publicly available and is updated each time a new batch of varieties is released, following meetings of the National Variety Release Committee (NVRC) once or twice a year.

Both KEPHIS and seed companies confirmed that regulations applicable to seed import and export are strictly and predictably observed. Seed companies rated the government's enforcement of laws and regulations as "excellent" at 83% (Table 20), a significant and steady improvement from the rating of 53% in 2013. The higher rating can be attributed to higher satisfaction with public seed inspection services. Also praised were the enforcement of punitive measures to combat the sale of counterfeit seed and the training and gazettement of 32 seed inspectors and 10 seed analysts by August 2021 (most have yet to start practicing, so their impact is not yet measurable). While seed companies rated the enforcement of seed regulations highly, they felt that the seed sector was over-regulated.

Table 20: Seed company satisfaction with enforcement of seed regulations

Indicator	Seed company satisfaction			
	2013	2015	2017	2019
Satisfaction with enforcement/ implementation of the seed regulations (out of 100%)	53	61	73	83
.....				
Interpretation of satisfaction	Fair	Good	Good	Excellent

Enforcement of COMESA regulations: The COMESA seed trade harmonization regulations are yet to be fully implemented in Kenya. Currently, all seed imports into Kenya follow the same import process (see Section on import/export), regardless of whether they are listed in the COMESA variety catalogue or not. An importer seeking to import a variety listed in the COMESA variety catalogue but not yet in the national variety catalogue notifies KEPHIS and the normal seed importation process is followed.

According to COMESA seed trade harmonization regulations (COMESA, 2014), once a variety is released in two member states, it qualifies for registration in any member state. However, according to KEPHIS, this provision only applies when the variety is also registered in the COMESA variety catalogue. This is partly because Kenya is suspicious of the seed inspection and certification standards used by other countries in the region, such as standards for isolation distances and seed sampling.

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 the government in each data collection year and asks seed companies to report their level of satisfaction with government efforts to eliminate counterfeit seed.

TASAI has been tracking the number of counterfeit seeds reported in Kenya since 2013. It is important to note that for the 2013-2017 period, the number of reported cases is based on information collected from seed companies only. In 2019, for the first time, TASAI was able to compare its data with official numbers from KEPHIS.

Fake seed reports recorded in the first three studies ranged from 6-36. In 2019, the number reported by seed companies was 6, while the official figure reported by KEPHIS was 12, including those reported by seed companies. KEPHIS tracks the incidence of counterfeit seed cases based on reports from members of the public, KEPHIS agents, and seed companies: seven cases were associated with agro-dealers, one with a seed company, and four with unauthorized individuals masquerading as seed sellers. According to seed companies, fake seed cases were driven by two factors: (1) companies packaged and sold seed that had been rejected by KEPHIS; and (2) employees of seed companies illegally supplied packaging material to traders who, in turn, filled them with grain disguised as seed. The 12 cases reported in 2019 represent a 30% decline from the prior year's count of 17 – which may be attributed to the use of seed sticker labels, introduced by the government in 2017 as the first of three anti-counterfeiting measures.

The KEPHIS seed sticker label has been hailed as a major breakthrough: it is nearly 100% effective in establishing whether seed in a particular package has been certified. The Seeds and Plant Varieties (Seeds) Regulations (MALFC, 2016b) make it mandatory for all certified seeds sold in packets of 5 kgs and below to have the label affixed to the seed packets. After buying seed, farmers can scratch the label, send a 12-digit code via toll-free SMS, and receive an instant message confirming if the seed is genuine or not. A study commissioned by the Seed Trade Association of Kenya (STAK) showed that, across eight counties, the level of awareness of the labels ranged from 65% to 100%, with an average of 85%. However, the level of utilization of seed labels was significantly lower, ranging from 9–50%, with an average of 35% (Agile Consulting, 2020). However, it is worth noting that the seed labels may still work as a deterrent to distributors of fake seed despite the low utilization. The study recommended increasing awareness of the seed sticker labels through agro dealers and use of media to convey the message to farmers of the benefits of seed labels.

As its second measure, KEPHIS joined forces with the Anti-Counterfeit Authority to punish offenders. The ability to jointly prosecute offenders means those found guilty may be charged with additional violations of the Anti-Counterfeit Act, which increases total fines from the current maximum of US\$ 10,000 to about US\$ 30,000.

The third measure deployed by KEPHIS is enhanced levels of inspection through impromptu visits to company warehouses to conduct random inspections on packaging of seed.

Seed companies rate their satisfaction with current government efforts as “good” (70%) (Table 21) – almost identical to the rating of 72% in 2017. Despite the “good” rating, seed companies recommend that the government should increase fines and penalties for violators.

Table 21: Cases of counterfeit seed and rating of government efforts to address issue

Indicator	2013	2015	2017	2019
Number of cases of fake seed	36	6	17	12
Seed company satisfaction with government efforts to address fake seed (%)	39%	50%	72%	70%
Interpretation of satisfaction (out of 100%)	Poor	Fair	Good	Good



USE OF GOVERNMENT SUBSIDIES

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

The Kenyan government did not implement a national seed subsidy program in 2019. However, subsidy programs exist at the county level: in 2019, 29 out of 47 counties had a subsidy program. Of the 22 seed companies, seven sold seed directly to county governments, which in turn supplied farmers at subsidized prices. Four companies each sold bean and sorghum seeds, while three sold cowpea seeds.

Seed companies surveyed by TASAI viewed the county governments as potential buyers of large volumes of seed. However, they had mixed views about the implementation of county government programs (Table 22). On the positive side, they rated the transparency of the procurement process by the county governments as “good” at 73%, which is a notable improvement from the “fair” rating in 2017 (51%). On the negative side, they were unhappy with the efficiency of payment arrangements by county governments, which they rated as “poor” at 30%. The rating was “fair” (41%) in 2017, indicating a persistent if not worsening problem. All companies reported that some county governments took up to 5 years to pay for seed supplied on credit. Given the importance of cash flow for small seed companies, the slow payment process is a disincentive for seed companies to supply seed to county governments. Delayed payments likely explain why only relatively few companies sold seed to county governments in 2019.

Table 22: Seed company rating of the county government seed procurement process

Opinion Indicator (satisfaction rating)	Rating (out of 100%)	
	2017	2019
Openness and transparency of the county seed procurement process	51	73
Predictability of the county seed procurement process	51	55
Efficiency of payments from county governments	41	30

extremely poor
poor
fair
good
excellent

INSTITUTIONAL SUPPORT

QUALITY OF THE NATIONAL SEED TRADE ASSOCIATION

Well-functioning national seed trade associations play a key role in representing the interests of the industry and engaging with the government. The membership of the national seed associations includes seed companies and at times agro-dealers.

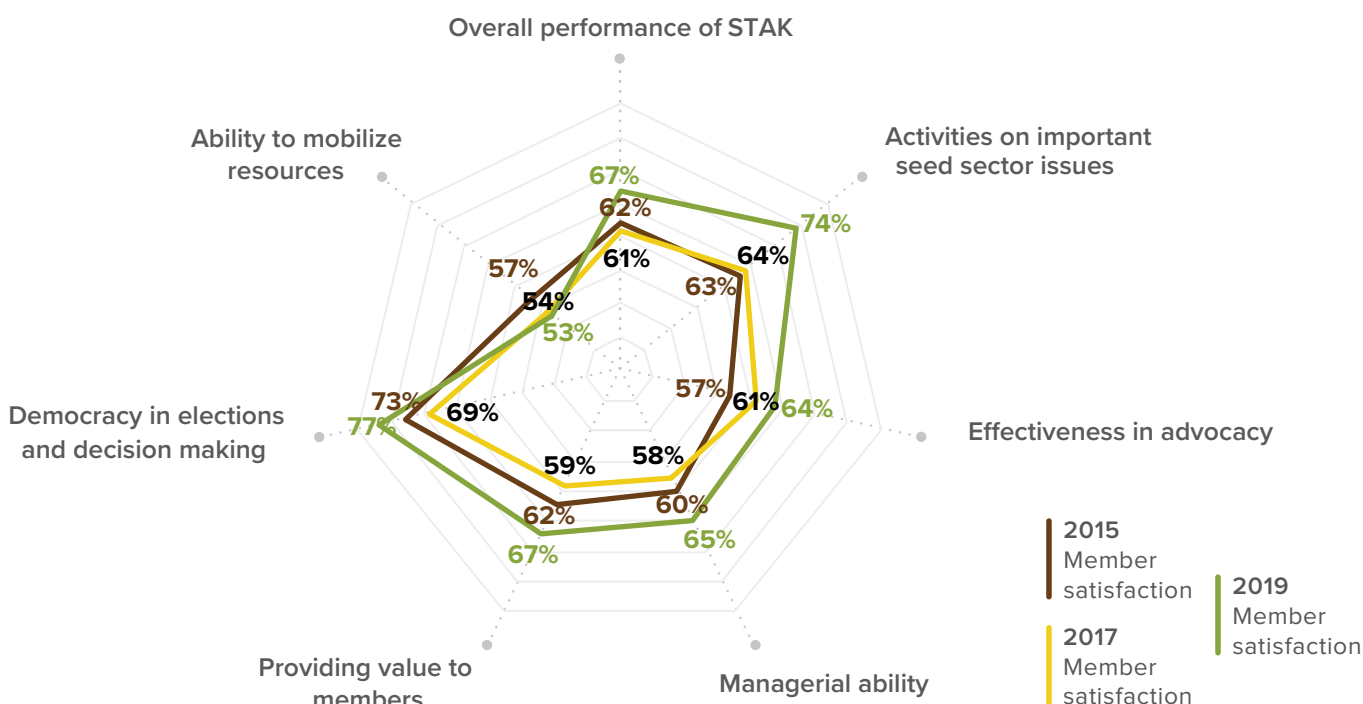
The Seed Trade Association of Kenya (STAK) was founded in 1982 to represent and promote the interests of registered seed companies. Currently, STAK has 44 members, of whom five are associate members who do not directly deal with seed production and marketing but have interests in seed trade in the country. The STAK Secretariat has four staff members (three women and one man). The board has twelve members (11 men/1 woman). This gender representation closely matches the leadership and ownership of seed companies in Kenya (see section on “Gender in management of seed businesses”).

Overall, the members were satisfied with STAK’s performance with an overall performance rating of “good” (67%). Out of the six service areas, the highest ratings were given on democracy in elections and decision-making (77%) and

STAK’s activities on important seed sector issues (74%) (Figure 9). The lowest rating – 53% (“fair”) – was given on “ability to mobilize resources,” while the other four indicators all scored reasonably well in the 60s.

Figure 9 compares the current ratings with those of 2015 and 2017, and it is clear that STAK’s approval ratings have been on the rise, with the exception of “ability to mobilize resources.” The positive change is likely due to two recent advocacy campaigns by STAK, including successful rollback of an official policy members found onerous. The Certificate of Conformity (COC), a new requirement for imports, including seeds, was introduced by the government in 2019. STAK led the seed industry’s effort against the requirement, which increased cost of, and delayed, seed imports. After multiple meetings with MALFC, the Ministry of Industrialization, Trade and Enterprise Development (MITED), and the Kenya Bureau of Standards (KEBS), the government issued a legal notice exempting imported seed and other agricultural inputs from the requirement (MITED, 2020). In the second campaign, STAK is lobbying the KEBS to classify vegetable seeds as seeds, not as spices, to ensure that vegetable seed imports are treated like other seed imports, and not subject to value added tax. In addition to these campaigns, STAK coordinated the efforts to ensure that the movement of vehicles owned by seed companies was not curtailed during the government movement lockdown which was caused by the Covid19 pandemic. The vehicles were issued with STAK labels.

Figure 9: Members’ opinion of STAK



STAK members identified the following priority issues that the association needs to address:

- *Tax-related reforms:* STAK members identified three tax-related challenges for which they are seeking reforms. The first is that seed exports are subject to value added tax (VAT). STAK members would like the exports to be exempted to remain competitive in the export market. The second challenge is that vegetable seeds, e.g., for coriander and pepper, are classified as spices and thus taxed. Members would like vegetable seeds to be categorized as seeds for planting, so that they are exempted from taxation. The third challenge is that seed is subject to cess tax¹⁷ when it is transported between and within counties in Kenya. Companies would like seed to be exempted from these taxes.
- *Implementing the COMESA Seed Trade Harmonization Regulations:* STAK members would like the government to fully implement the COMESA Seed Trade Harmonization Regulations to ease the movement of seed across and between COMESA Member States.
- *Pushing for self-regulation:* Seed companies would like STAK to promote self-regulation efforts by seed companies in seed inspection and certification.

Seed companies also mentioned that members should support STAK better by paying membership fees and by providing the organization with advice on important seed sector matters. According to STAK, members should be active in providing feedback on areas that require lobbying and be active in their assigned sub-committees; members should attend the Association's activities such as field days and the annual congress; and members should pay their annual subscriptions promptly.

Further, members outlined the following suggestions to improve STAK:

- *Replace conferences with customer engagement opportunities:* STAK should reduce the number of conferences it convenes and instead organize forums that link members to customers. These may include trade fairs, where the public can freely interact with seed companies.
- *Member recruitment:* STAK should have a deliberate strategy to recruit more members. This would improve the association's visibility on seed industry matters and enhance communication with the different seed sector actors. According to STAK, this is already being addressed by the opening up of membership to other categories of actors in the seed industry in Kenya.
- *Mandatory STAK membership for all registered seed companies:* All seed companies that KEPHIS registers should be required to be members of STAK.
- *Member interaction:* STAK should visit each member at least once a year.
- *Implementation of the strategy for financial stability:* STAK should implement the strategic plan, which outlines specific interventions to improve the association's financial position.

¹⁷ Cess tax is also charged on the movement of agricultural produce by road within counties in Kenya. Exemption from cess tax was granted in 2021.

Six out of the 22 seed companies surveyed were not members of STAK. These non-member companies outlined the following reasons why they were not members: (i) STAK not being effectively promoted to non-members, (ii) high membership fees, which are a limitation for newly established small seed companies, and (iii) perception that there are no immediate benefits of becoming a member.

ADEQUACY OF SEED INSPECTORS

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

In Kenya, seed inspection is the mandate of KEPHIS. Seed inspection is mandatory for all classes of seed and at the owner's costs. In addition, the cost of inspection is lower for companies that are located closer to KEPHIS. In 2020, there were 50 seed inspectors in the country. Of these, KEPHIS employed 33 seed inspectors (21 men and 12 women). In addition to the public inspectors employed by KEPHIS, 17 private seed inspectors (10 men and 7 women) were employed by nine seed companies (Table 23), with each company employing between 1-5 inspectors.¹⁸ Private seed inspection was launched in 2017 to strengthen the seed quality control system by permitting third parties to participate in seed inspection. The authorization of private seed inspectors is in compliance of section 3 of the Seeds and Plant Varieties Act of 2012. Further to this provision, in 2017, KEPHIS developed detailed guidelines for the authorization of competent private and public entities to perform specific seed certification activities (KEPHIS, 2017). The specified activities are seed field inspection, seed processing, seed sampling, seed testing and labeling and sealing. To implement these guidelines, the seed inspectors are trained and accredited in batches. The last batch of six seed inspectors was accredited on 15th January 2020.

KEPHIS has authorized five private entities to conduct field inspection, seed sampling and testing. These entities are all private seed companies. These entities will complement the private inspectors as well as the KEPHIS inspectors.

Table 23: Number and rating of the adequacy of seed inspectors (2019)

Indicator	Number of public inspectors	Number of private inspectors	Total number of inspectors
Male	21	10	31
Female	12	7	19
Total	33	17	50

Figure 10 shows the number of seed inspectors and seed companies' satisfaction ratings with the seed inspectors

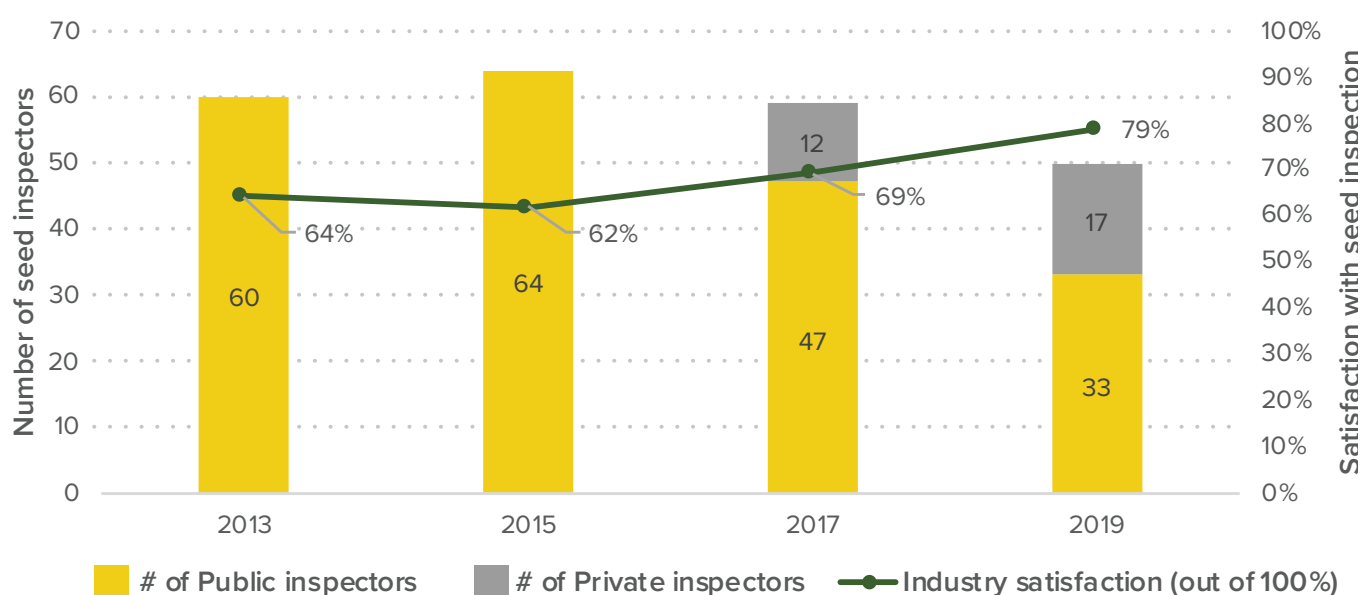
¹⁸ By August 2021, KEPHIS had trained and gazetted 32 private inspectors. The 17 inspectors quoted here were those working for seed companies that were surveyed.

during the period 2013-2019. The number of seed inspectors has declined from 64 in 2015 to 50 in 2019. This was due to inadequate funding of KEPHIS by the government, making it difficult for the organization to replace all those leaving the service due to retirement and other reasons. However, the reduction also coincided with the introduction and roll-out of the private seed inspection arrangement, which has helped close the gap (Figure 10). Over the same period (2015 to 2019), seed company satisfaction with the seed inspection services has steadily increased from 62% to 79%.

Over the last four years, KEPHIS has initiated and rolled out several information and communications technology (ICT) tools to enhance seed inspection efficiency and other services.

- **Automated Certification System.** KEPHIS has automated several seed services, including inspection and certification. Seed companies can now request these services online, and seed inspectors post the results of field inspections online, available to the requesting companies. Other online services include the registration of crop varieties for DUS tests and the annual registration of seed merchants. These automations were developed and launched in 2019 and 2020.
- **Seed sticker labels,** which seed consumers use to verify certification. The buyer scratches a label on the seed package to reveal a 12-digit code. When the code is sent to a toll-free SMS service (1393), the buyer receives a return notification confirming whether the seed has been inspected and certified. Sticker labels were launched in 2017 and became fully operational in 2018. KEPHIS requires that sticker labels be used for seed packaged in 5 kg or less sizes.
- **Electronic Certification System (ECS)** is designed to prepare the export documentation. ECS is used by KEPHIS staff to manage, maintain, and view data on the phytosanitary (plant health) certification and to generate both paper-based and paperless certificates for trade in plants and plant products. The certificate forms an integral part of overall KEPHIS regulatory activities that ensure products meet importing-country standards.
- **Plant Import and Quarantine Regulatory System (PIQRS)** is a web-based system designed to enhance plant import regulation efficiency. The system allows KEPHIS to ensure that imported plants, plant products and regulated articles entering the country pose minimal phytosanitary risk and environmental impact. The automated system is used by persons intending to bring plants, plant products, and regulated articles into Kenya. The importer logs in information on the plant material in order to obtain a Plant Import Permit (PIP) from KEPHIS before shipment from the country of origin. All plant materials for import go through this system regardless of whether they are for commercial, duty free, gifts, experimental, or research purposes.
- **Seed Card** is used for online seed labeling. Like a barcode, the card has vital information about a variety, including the company that produced the seed, year of release, and varietal characteristics, among other important pieces of information.

Figure 10: Number and rating of seed inspectors



SERVICE TO SMALLHOLDER FARMERS

ADEQUACY OF EXTENSION SERVICES

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

Agriculture, including public extension services was devolved to the counties in Kenya after the promulgation of the Constitution in 2010. Given the autonomy with which each county government hires or deploys extension staff, it is difficult to establish the exact number of extension agents at any given time. However, the Council of Governors' agricultural secretariat estimated that there are about 5,000 agricultural extension workers in the country. These extension workers serve about 5.6 million farmers (KNBS, 2019) implying a very high public extension agent to farmer ratio of about 1:1,120. Some county governments are partnering with the Alliance for a Green Revolution in Africa (AGRA) to implement its village-based advisor (VBA) model to reduce the ratio to 1:500¹⁹.

Seed companies provide extension services for the products and services they offer. Staff employed by the seed companies serve as sales agents and are generally not available to offer other extension services or guide farmers on general agronomic practices. The company-specific nature of extension by sales agents may not be the best for farmers because the sales agents are motivated to convince farmers to buy products exclusively from their companies. 12 out of the 22 seed companies interviewed employ a total of 190 extension agents: 122 men and 68 women (Table 24).

The total number of private (seed company) and public (county government) extension staff is 5,190, which translates to a ratio of one extension worker for every 1,078 farmers in the country, against the desired level of 1:400²⁰ (ROK 2012b). The ratio of 1:1,078 has not changed significantly from the ratio of 1:900 in 2015 and 1:950 in 2017. The seed companies opine that the number of extension agents is inadequate. The companies rated the adequacy of extension as "fair" (47%) close to the 48% rating in 2017 and 51% in 2015.

Table 24: Number and adequacy of agricultural extension agents

Indicator	2017	2019
Number of public extension agents employed by the government	5,000	5,000
Number of private extension agents employed by seed companies	-	190 (122 men and 68 women)
Total number of extension agents	5,000	5,190
Ratio of extension agents to agricultural households	1:950	1:1,078
Seed industry satisfaction with extension agents (out of 100%)	48%	47%

extremely poor poor fair good excellent

In their work, extension agents usually perform two categories of duties: general advisory, and creating awareness of new technologies, including new varieties and agronomic practices. To enhance outreach, private extension agents use ICT tools such as mobile SMS, apps, and radio to pass information to farmers and to receive inquiries from farmers on new and emerging concerns.

¹⁹ <https://agra.org/news/partnerships-aim-to-rebuild-kenyas-agriculture-extension-services/> Accessed 31 March 2020.

²⁰ Another study quoting the same range is Gichamba et al., 2017. <http://erepository.uonbi.ac.ke/bitstream/handle/11295/101139/IJISSET-030713.pdf?sequence=1&isAllowed=y> accessed 31 March 2021

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 registered from non-registered agro-dealers. This indicator is not crop specific.

In Kenya, agro-dealers, also called seed sellers, are registered by KEPHIS according to the Seeds and Plant Varieties (Seeds) Regulations of 2016. In addition, the agro-dealer outlet must be registered as a business. Currently, the businesses can be recognized under several laws: Fertilizer and Animal Foodstuff Act (CAP 345), Pest Control Products Act (Cap 346) and the Kenya Veterinary Surgeons and Veterinary Para-professionals Act (2011). To register, a seed seller must be appointed by a seed company (also called "seed merchant"). The seed seller's application for a license must specify whether the business will be a wholesaler (agent) or retailer (stockist), which determines the cost of registration. The application must include a letter from the seed company and a letter from the county agricultural committee (CAC) where the agro-dealer business is to be located. Before operations can begin, KEPHIS inspectors visit the premises to verify that they meet all requirements.

Despite these well-established procedures, county governments have been granting business permits to agro-dealers and seed shops that combine seed trade with other activities, without these entities obtaining a license from KEPHIS – a practice driven by the counties' role as buyers of seed and fertilizer. KEPHIS is aware of this practice and has noted the need to harmonize laws on registration of agro-dealers to ensure that supervision of seed sellers' operations is consistent and standardized.

In Kenya, agro-dealers are the most important market outlet for seed companies. All the seed companies surveyed sell seed through agro-dealers. Seed companies reported working with, on average, 590 agro-dealers, about 40% of which are women-owned businesses²¹. Depending on their size and scale of business, the number ranges from as few as 20 to as many as 3,000 agro-dealers per seed company. According to KEPHIS the country had 5,726 registered agro-dealers in 2019. With about 5.6 million farmers in Kenya, this gives an agro-dealer to farmer ratio of about 1:978, meaning one agro-dealer serves close to one thousand farmers (Table 25). This ratio was estimated to be 1:910 in 2017, showing a minor drop in 2019.

Table 25: Number agro-dealers and satisfaction with the agro-dealer network

Indicator	2017	2019
Number of registered agro-dealers	5,500	5,726
Ratio of agro-dealers to agriculture households	1:910	1:978
Seed industry satisfaction with agro-dealer network (out of 100%)	65%	73%

Source: TASAI data and KNBS (2019)

The main form of training agro-dealers receive from KEPHIS and other regulatory agencies during routine field visits are on the rules of operations. During such visits, the government officers guide agro-dealers on best practices. Those who deviate from these practices are warned or penalized according to the law. In some instances, agro-dealers are invited to attend relevant conferences to interact with public and private sector players and receive new knowledge on seed.

Currently, agro-dealers in Kenya have no national association, although several counties have county-based agro-dealer associations. A national association could foster some level of self-regulation and discipline among agro-dealers and could also enhance the vetting of potential agro-dealers before they are registered.

AVAILABILITY OF SEED IN SMALL PACKAGES

Because most farmers in Sub-Saharan Africa operate on a small scale, making seed available in small, more affordable packages is a good way to increase adoption rates of certified seed. TASAI tracks the percentage of seed sold in different package sizes, i.e., 2 kg or less, 2-10 kg, 10-25 kg, and above 25 kg. In Kenya, the 2 kg package is the smallest size for most cereal and legume crops²². However, seed companies package seed in smaller sizes for promotional purposes and not for sale. Seed in those package sizes are not tracked by KEPHIS.

The TASAI survey found that 82% or more of the seed sold in Kenya across the four focus crops is sold in packages weighing 2 kg or less. By crop, the percentages ranged from 82% for maize to up to 98% for cowpea seed (Figure 11). The data reflect the reality that most seed in Kenya is purchased by farmers who cultivate small plots. Companies also noted that customer preference is the main reason why they sell seed in small packages. In addition, companies mentioned that small packages are easier to store. None of the companies reported selling seed in packages larger than 25 kg.

²¹ CIMMYT (2020). Making seed systems work for men and women: Seed systems play a major role in Africa's agricultural transformation – but are they gender-friendly? Retrieved from: <https://www.cimmyt.org/news/making-seed-systems-work-for-men-and-women/>

²² Vegetable seed is usually sold in smaller package sizes

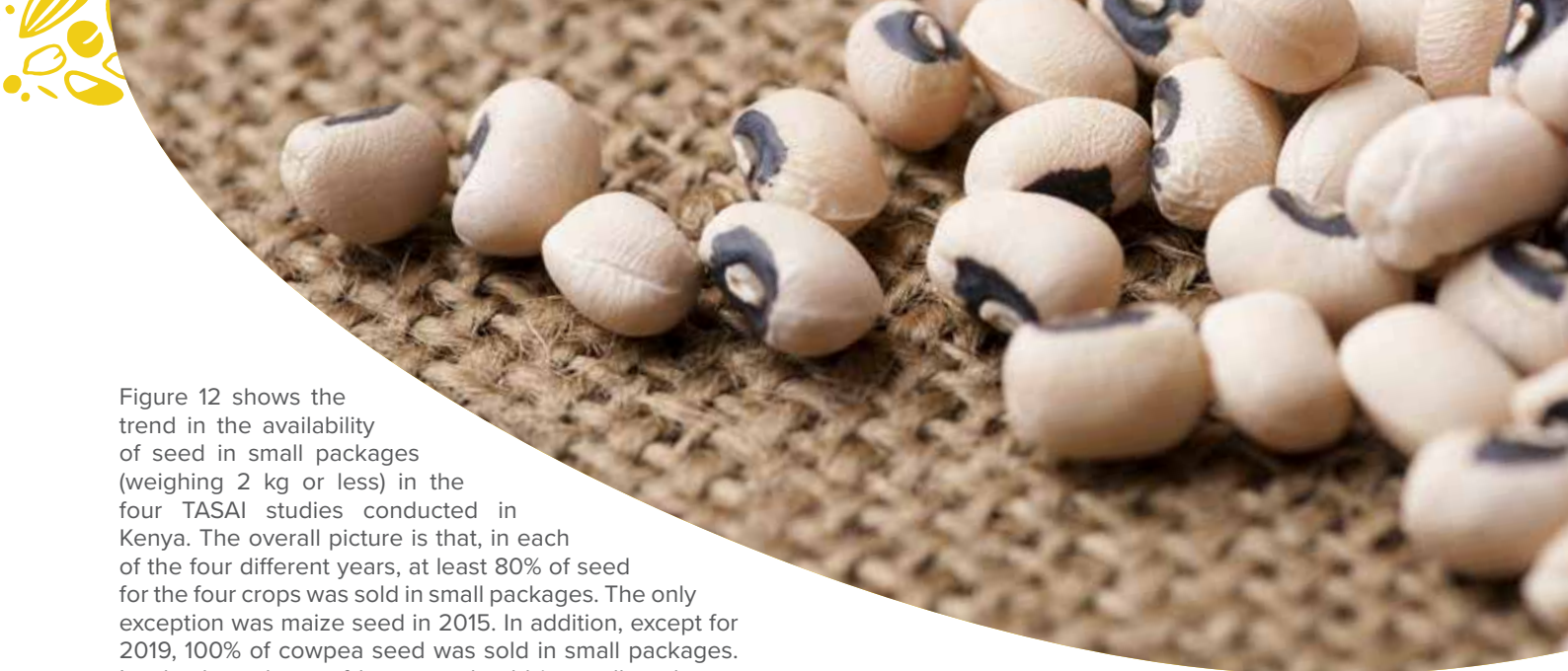


Figure 12 shows the trend in the availability of seed in small packages (weighing 2 kg or less) in the four TASAI studies conducted in Kenya. The overall picture is that, in each of the four different years, at least 80% of seed for the four crops was sold in small packages. The only exception was maize seed in 2015. In addition, except for 2019, 100% of cowpea seed was sold in small packages. Lastly, the volume of bean seed sold in small packages has declined steadily from 100% in 2013 to 84% in 2019.

Figure 11: Percentage of seed sold in different package sizes

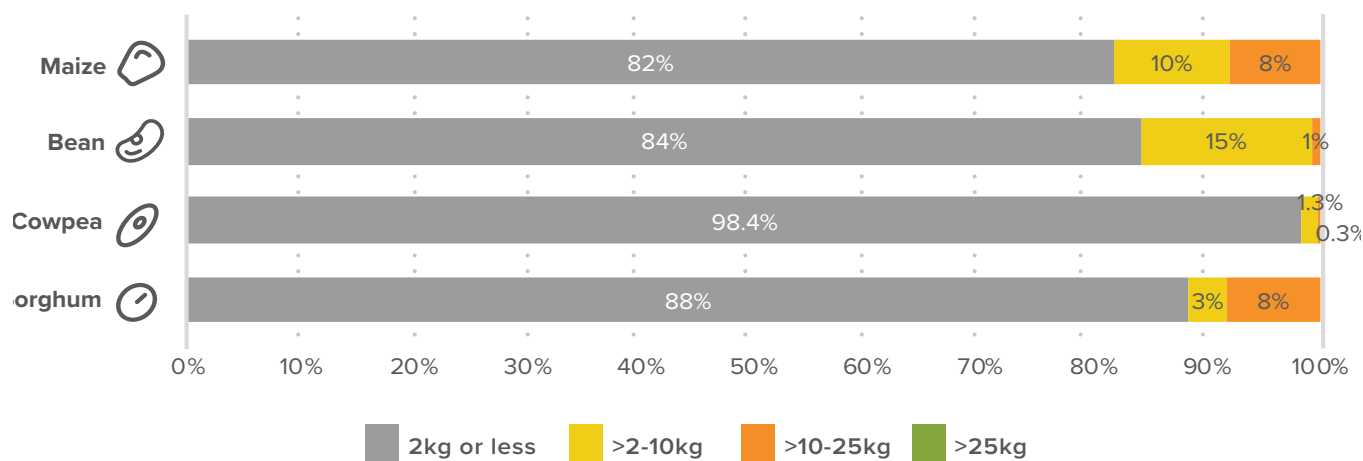
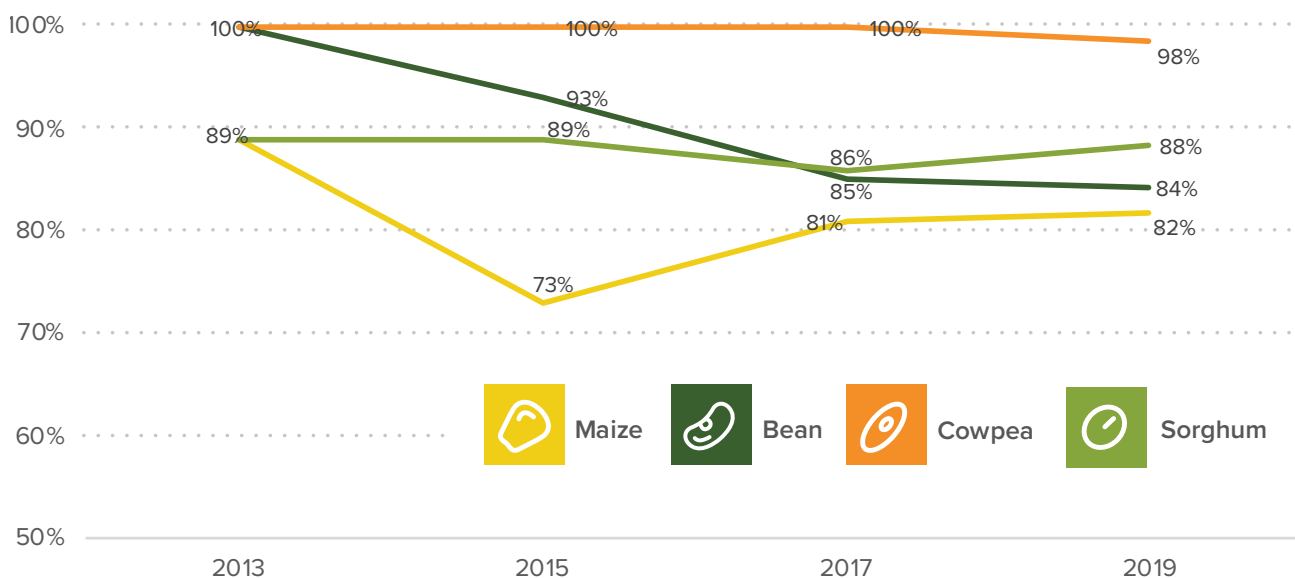


Figure 12: Trend in percentage of seed sold in packages weighing 2kg or less



SEED-TO-GRAIN PRICE RATIO

The seed-to-grain price ratio at the time of planting is a good measure of the affordability of improved seed. This data point is important, since many smallholder farmers end up making a choice between purchasing seed from the formal sector or planting grain. The greater the price difference between the two, the less likely that resource-poor farmers will purchase certified seed. This indicator tracks ratio of the retail price of seed (at agro-dealer level) vis-à-vis the market price of grain at the time of planting.

The seed-to-grain price ratios at planting time in 2019 were as follows: 5.6:1 for hybrid maize, 5.1:1 for Open Pollinated Variety (OPV) maize, 2.4:1 for bean, 2.6:1 for cowpea, and 3.6:1 for sorghum. The seed-to-grain price ratio was highest for hybrid maize (5.6:1) due to the high cost of producing and

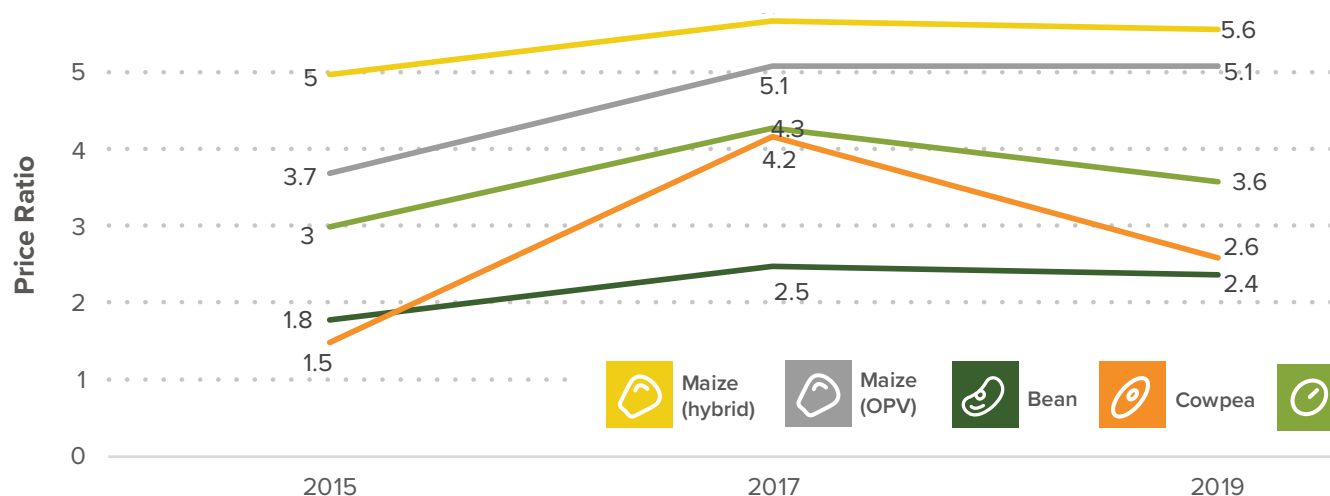
marketing hybrid varieties of seed. The high ratio for the OPV maize (5.1:1) is due to the high cost of marketing both OPV and hybrid varieties (Table 26). The low standard deviations for the retail maize prices (both OPV and hybrid) is also evidence of the high level of competition in the maize seed market. The maize seed prices charged by seed companies do not vary significantly by company.

Figure 13 shows the trend in the seed-to-grain price ratios for the four crops in three years – 2015, 2017 and 2019. First, the ratios for maize seed are consistently higher than the ratios for the other three crops, implying that both hybrid and OPV maize seed are usually higher-priced than seed for the other crops. Second, the ratios for bean and sorghum seed decreased (albeit only slightly for bean) between 2017 and 2019 mainly due to “special demand,” whereby organizations, large farms, and NGOs buy at bulk prices, driving down the rate of increase of seed prices, relative to that of grain.

Table 26: Seed-to-grain price ratios

Crop	Average retail seed price (USD/kg)	Average grain price (USD/kg)	Seed/grain price ratio 2019
 Maize (Hybrid)	2.11	0.38	5.6:1
 Maize (OPV)	1.93	0.38	5.1:1
 Bean	2.26	0.96	2.4:1
 Cowpea	1.69	0.66	2.6:1
 Sorghum	1.76	0.49	3.6:1

Figure 13: Seed-to-grain price ratios





CONCLUSION

Kenya's formal seed sector is in the growth stage of development (Ariga et al., 2019), which is characterized by well-established private companies that are supported by strong breeding programs. The policy environment is supportive of private-sector participation. The marketing environment is highly competitive, with multinational and local seed companies producing a wide range of high-quality seed. The agro-dealer network is strong and well-linked to seed companies. The present study is the fourth to be conducted by TASAI in Kenya and highlights recent changes and trends since the first study was conducted in 2013.

In **research and development**, the number of Kenya's active breeders for the four focus crops – maize, bean, sorghum, and cowpea – has not changed significantly since 2017. The overall rating of adequacy of active breeders by seed companies in 2019 was “good” and was comparatively highest; ratings for 2015 and 2017 were “fair”. The main notable difference was in the “good” rating for sorghum seed in 2019, compared to “fair” in 2015 and 2017. The number of varieties released between 2017 and 2019 reflects investments in the breeding programs, with maize leading the pack. A notable improvement is an increase in the number of varieties with special attributes, especially for nutrition-enhancement and to mitigate against drought. At the same time, varieties with use-related features are gaining prominence. In response to evolving needs, breeding programs concentrate on drought tolerance and on resistance to emerging diseases and varieties for mid-altitude areas, and on high-density tolerance driven by rampant land sub-division and reduction in cropland in maize-growing areas. Challenges that breeders face include the high cost and long duration of the variety release process.

The number of varieties sold saw an increase, implying expanding choice of varieties available to farmers. While the age of varieties has not changed much, it was notable that sales of newer varieties were mainly driven by demonstrated ability to overcome challenges such as droughts. A notable change in sources of basic seed is a growing reliance on specialized private seed suppliers and on seed companies' own sources of basic seed.

In the **industry competitiveness** category, the number of seed companies overall has declined for maize but has increased for bean and remained steady for cowpea and sorghum. Market shares of the four seed companies have remained high, except for bean. Kenya's seed industry is looking up, with growing sales of certified seed for all four focus crops. Although still dominant, the share of government parastatals in the seed sector has declined for maize, cowpea, and sorghum.

The satisfaction rating on seed import and export processes has fallen below the level reported in 2017. This decline was due to continued low awareness of and ability to identify seed by border post officials, and by requirements (subsequently withdrawn) for additional regulatory approvals. Failure to fully implement COMESA Seed Trade Harmonization Regulations, adopted in 2014, further complicates and delays imports. The average time required for variety release has stagnated at around 30 months; seed companies would like both time and cost reductions.

The **seed policy** environment in Kenya supports private sector growth by means of up-to-date policy instruments whose implementation is rated by seed companies as “excellent” in 2019, up from “fair” in 2013. Government efforts to eradicate counterfeit seed appear to be paying off and received a “good” rating from seed companies – the same as in 2017, and up from “fair” in 2015 and “poor” in 2013. Supportive developments include use of anti-counterfeiting verifiable sticker labels on seed packages.

While ratings of the openness and transparency of county seed procurement processes have improved since 2017, their predictability continued to be rated “fair,” and rating on the efficiency of payments remained “poor”. The continued low rating on predictability and efficiency of payments are major disincentives to seed companies' participation in county-level subsidy programs.

Institutional support for Kenya's seed sector is strong. The overall rating on the Seed Trade Association of Kenya's (STAK) performance has improved overall, and in the areas of advocacy, provision of value to members, and democracy in elections. On seed inspection, seed companies continued to raise their satisfaction rating, from 64% in 2013 to 79% in 2019, likely reflecting efforts to automate seed certification systems and the introduction of private-sector seed inspectors.

Service to smallholder farmers in Kenya has improved as a result of new investments by seed companies in private sector extension services. However, there is room for improvement to increase the number of extension agents serving farmers and the use of ICTs in extension services.

The number of agro-dealers serving farmers has also stagnated at the 2017 level. While county governments are involved in the registration of agro-dealers, this process needs to engage KEPHIS to improve on follow-up inspections and supervision in respect to handling of seed, and licensing at the county level.

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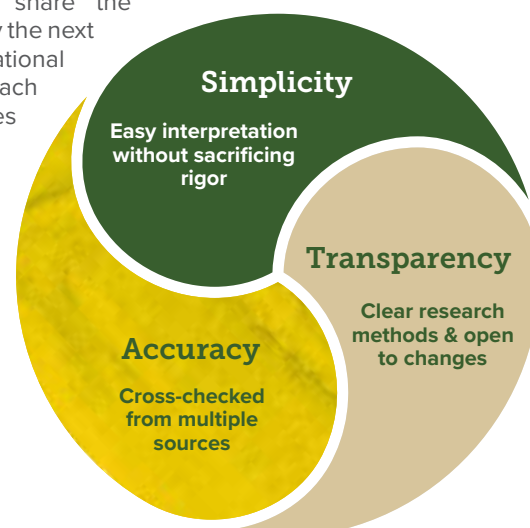


PILLARS OF COMPETITIVE SEED SECTORS

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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