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Performance of the formal seed sector in Africa: Findings from the African Seed Access Index

Edward Mabaya

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**Performance of the formal seed sector in Africa: Findings from the African
Seed Access Index**

by

Edward Mabaya

Cornell University
B75 Mann Library
Ithaca, NY 14853, USA
Email: em37@cornell.edu
Mobile: +16072800264

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Abstract

For most Sub-Saharan African countries, the deregulation of formal seed systems in the early 1990s, in principle, ended state-owned monopolies in seed production, marketing, and distribution. In the last decade, significant investments have been made to liberalize seed sectors, resulting in increased participation of private seed. However, the transition towards competitive seed systems has been slow due to weak enabling environments. The objective of this paper is to evaluate the performance of the formal seed sector in Africa. Utilizing data collected from pilot studies, this paper reports key findings from The African Seed Access Index (TASAI). TASAI seeks to promote the creation and maintenance of enabling environments that will accelerate the development of competitive seed systems serving smallholder farmers. Sixteen key indicators under the five categories – Research and Development, Industry Competitiveness, Seed Policy and Regulations, Institutional Support and Service to Smallholder Farmers – are monitored and compared across African countries. Results from the four pilot countries (Kenya, Uganda, South Africa and Zimbabwe) reveal uneven—though in many places promising—progress towards competitive seed sectors that can supply famers with a wider menu of seed options.

1. Introduction

Agriculture is the mainstay in most Sub-Saharan African economies, contributing 70% of employment, 33% of gross domestic product, and 40% of export earnings (World Bank, 2014). Agriculture's central economic role makes its development and growth a key component for overall economic growth and the eradication of food insecurity. Despite its prominent role, African agriculture is characterized by low productivity attributed to biophysical constraints of plant growth, large agro-ecological variation, the absence of policies that encourage crop improvement, low and declining soil fertility, and the underdeveloped state of the seed sector in most countries. Given these realities, improved seeds are an important part of the solution to agricultural development. However, improving access to new high-yielding and hybrid varieties requires increasing seed production and expanding distribution through increased competition in the seed system.

The deregulation of seed markets in the early 1990s, in principle, ended state-owned monopolies in seed production, marketing, and distribution. In the last decade, significant investments have been made to liberalize seed sectors in most African countries, resulting in increased participation of private seed enterprises (both multinational corporations and emerging domestic companies). However, the transition towards competitive seed systems has been slow due to weak enabling environments. Enabling business environments are the "set of policies, institutions, support services, and other conditions that collectively improve or create a general business setting where business activities can start, develop and thrive" (Christy et al., 2009).

The critical role of government in regulating the seed sector notwithstanding, the reluctance by many public sector agencies to liberalize the seed sector points to poor policy environments arising from governments' competing interests of generating revenue and safeguarding the public interest. In most African countries government entities continue to produce and sell seed, especially in cases when NGOs either buy or subsidize seed. Further, the use of seed distribution as a political tool may incentivize governments to retain some controls of the seed sector beyond what can be publicly justified. Lastly, some aspects of the weak enabling environment for seed enterprises reflects a general absence of support for private sector development that is often both the cause and effect of weak economies.

The African Seed Access Index (TASAI) is a new tool developed to monitor the development and competitiveness of national seed sectors in Africa. The central objective of TASAI is to encourage African governments and development agencies to create and maintain enabling environments that will accelerate the development of local private sector-led seed systems serving smallholder farmers. The intended outcome of this index is improved access to locally adapted, affordable, and high-quality seeds of improved varieties by smallholder farmers in Sub-Saharan Africa. TASAI provides an objective and easy-to-access tool that helps identify chokepoints in the seed delivery systems and track their progress over time.

2. How Indices Influence Policy

Over the past few years, an increased demand for measurements, benchmarking, and comparisons has spurred the creation of dozens of new indices designed to measure and compare the performance of countries across various policy spheres. Examples include the

World Bank's Ease of Doing Business Index, Transparency International's Perceptions of Corruption Index, and the World Economic Forum's World Competitiveness Index. Multinational businesses, in particular insurance companies, routinely use such indices when creating risk assessments for major companies Swenja and Williamson (2012). More recently, an area where the use of indices has gained popularity is policy monitoring and evaluation, as decision makers are looking for ways to quantify and compare the performance of governments along various policy dimensions (Bandura, 2008).

Perhaps the most well-known index, the World Bank's Ease of Doing Business Index (EDB) was founded on the idea that more effective business regulation promotes economic growth. As such, the index uses a benchmarking process to rank countries according to the business environment they foster. The World Bank reports that over the last ten years, many governments have relied on the index to gain information about and improve on their regulatory environments (BizShifts – Trends 2013). Often countries refer to the success stories and best practices found in the index to inform their own processes. For example, Saudi Arabia used France's Company Law as a model to revise its own (World Bank 2014). The index makes sharing best practices easier, as it creates a common language for comparing business environments across countries (World Bank, 2014).

The fact that indices rely on ranking systems appears to be one of the main factors responsible for their success, as the rankings promote self-regulation within countries in order to meet the external expectations. Highlighting either the positive or negative achievement gap of a country relative to its peers is a strong motivating factor that can trigger political pressure and, as a result, policy change (Swenja and Williamson 2012). In fact, according to the World Bank countries often request not general regulatory advice suggestions on "how to improve their standings," illustrating "the main advantage of showing a single rank: it is easily understood by politicians, journalists, and development experts and therefore create[s] pressure to reform" (Kelley and Simmons 2015). Figure 1 illustrates the pathways through which indexes and other indicators can influence policy change.

Policy indices tend to be most effective when engaging not only policy makers but the private and public sectors as well, including civil society, all of which can exert pressure on governments to adopt or modify policies. Simple rankings grab media attention and foster explicit comparisons that can allow for ease of public access and utilization (Kelley and Simmons 2015). The OECD (2008) states that these types of cross-country comparative measures are useful tools in policy analysis and for raising awareness and discussion with the public in general.

In sum, a successful index allows for the objective collection, analysis, and dissemination of data, including not only measurements of output performance, but also the effects of inputs such as policy formulation and research. Presenting the data concisely and consistently helps the decision makers, both in the private and public spheres, to make effective decisions in order to improve policies.

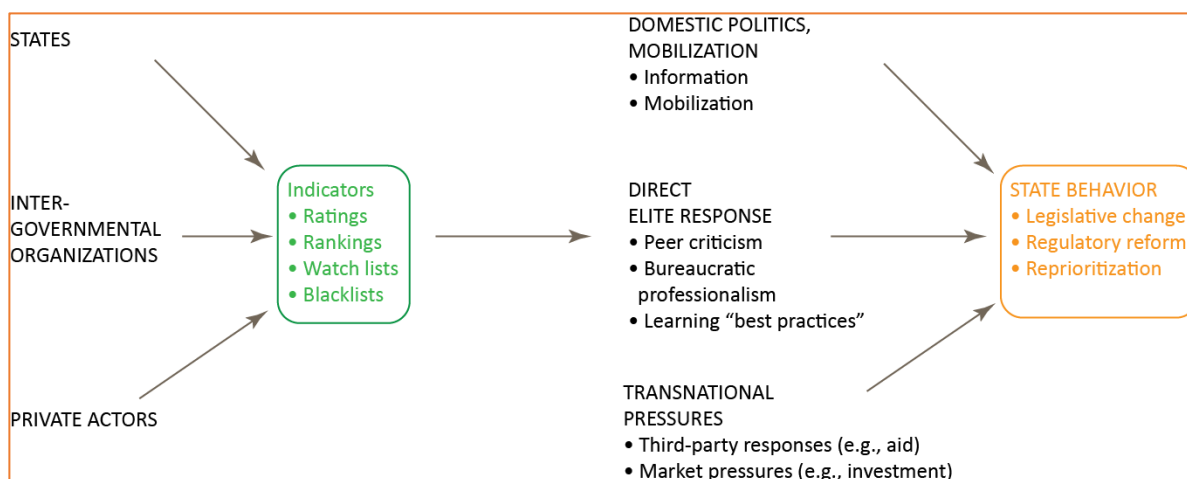


Figure 1: How indicators influence policy change (adapted from Kelley and Simmons, 2015)

3. Selection of TASAI Indicators

Factoring data limitations and statistical considerations, the set of variables include in TASAI’s indicator list is based on three considerations. First, the underlying economic theory should determine the outer bounds of potential variables. Second, expert opinions can be used to evaluate the importance of each variable resulting in a smaller subset of key indicators. Third, statistical tools can be used to maximize efficiency of the index (i.e., getting the most output from the least data requirements).

Once a list of variables was developed, in order to determine their relative importance, a survey of industry experts was conducted in August 2012. The survey was sent out to a total of 414 seed industry experts working in Africa’s seed sector, of which 167 completed the survey representing a 40 percent response rate. The respondents identified themselves as representing the following types of institutions private seed companies (53.9%), non-governmental organizations (6.5%), government department (15%) and research institutions (18.6) and other (6%).

On a Likert scale, respondents were asked to evaluate the importance of 16 variables in improving seed access for smallholder farmers across Sub-Saharan African countries. By looking at the mean scores of each of the variables, the importance of each variable to seed access in Africa can be evaluated. Using a spider chart, Figure 2 shows the scoring of each variable by private companies, NGOs, government representatives, researchers and throughout the entire sample. Analyzing the results, nearly all variables were ranked as important across all types of institutions. The standard deviations were generally low and fairly consistent across most of the variables, indicating an overall consensus among the respondents.

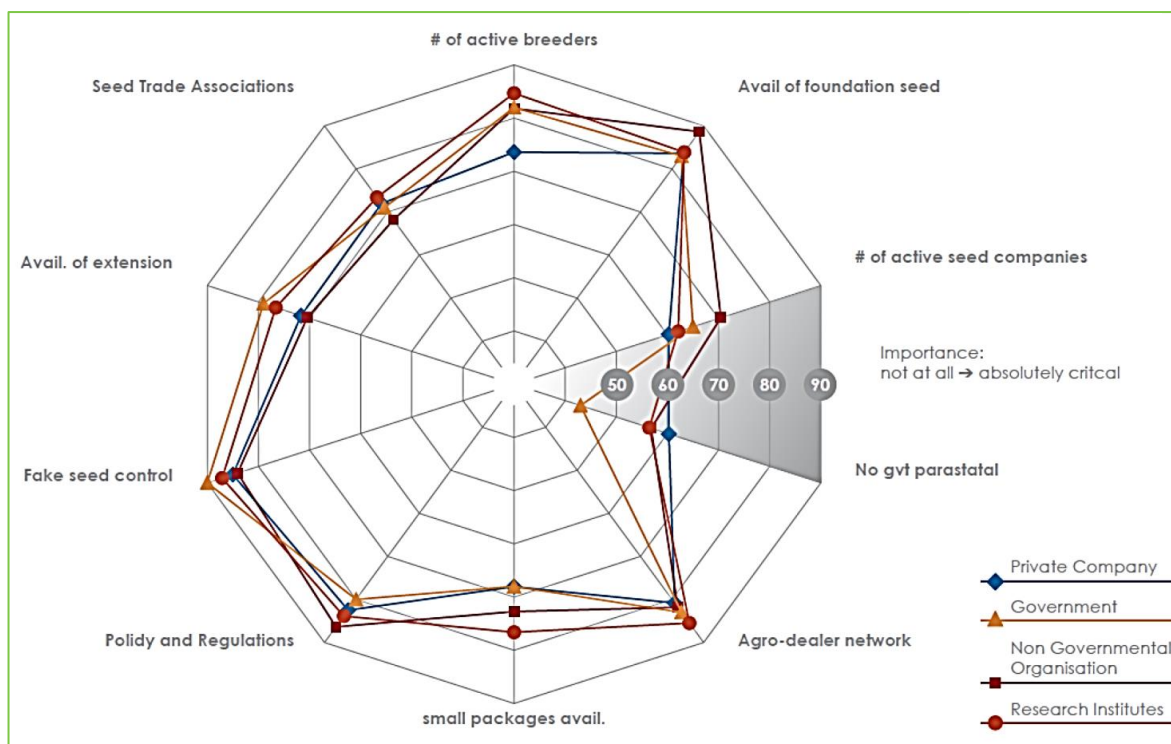


Figure 2: Industry scoring of the importance of different indicators

Based on the survey responses, 16 indicators were selected as the basis of TASAI. Table 1 shows the classification of TASAI's final 16 indicators into five broad categories. The last column shows the hypothesized impact of each indicator to seed access by smallholder farmers.

Table 1. Current TASAI indicators

A. REASEARCH AND DEVELOPMENT	Crop Specific	Impact on Seed Access
1. Number of active breeders	Yes	+
2. Number of varieties released in the last 3 years	Yes	+
3. Availability of foundation seed	Yes	+
B. INDUSTRY COMPETITIVENESS		
4. Number of active crop seed companies	Yes	+
5. Time it takes to import seed from neighboring countries	No	-
6. Market share of top 4 companies	Yes	-
7. Market share of current or past government parastatal	Yes	-
C. SEED AND POLICY REGULATIONS		
8. Length of variety release process	Yes	-
9. Quality of seed policy framework	No	+
10. Quality of regulatory system	No	+
11. Adequacy of seed inspectors	No	+
12. Efforts to stamp out fake seed	No	+

D. INSTITUTIONAL SUPPORT		
13. Availability of extension services for smallholder farmers	No	+
14. Quality of national seed trade association	No	+
E. SERVICE TO SMALLHOLDER FARMERS		
15. Concentration of rural agro-dealer network	No	+
16. Availability of seed in small packages	Yes	+

TASAI Audience

As a tool to determine that is designed to monitor and evaluate the structure, conduct, and performance of formal seed systems serving smallholder farmers in Africa. TASAI is intended to be utilized by practitioners in the public sector, private sector, and development aid agencies to both inform and compel change.

Public Sector: The primary audience for TASAI is public policy makers, regulators, and law enforcement agencies involved in the seed system value chain. Implementing institutions such as ministries of agriculture, seed inspection services, and agricultural research institutions can also use TASAI to benchmark their performance.

Private Sector: TASAI can be used by seed companies and other value chain players to identify investment opportunities in the African seed value chain. Key stakeholders may also use this tool to potentially advocate for a better enabling environment.

Development Aid Agencies: For NGOs and other development agencies working in rural agricultural development, TASAI can highlight issues that need to be addressed in order to ensure access to improved seed by smallholder farmers. TASAI can serve as a tool for donors to highlight critical areas within the seed value chain in which improvements and actions can be focused on.

4. Research Methods

TASAI is built on in-depth country studies that are conducted by country research teams consisting of leading academics paired with seed industry professionals. This combination ensures both rigor in our research methods and access to the right information sources and data. For each country, TASAI focuses on four crops that are important to smallholder farmers (excluding vegetatively propagated crops as these are hard to quantify). Under supervision and close consultation with the core research team, in-country research teams produce detailed annual reports on the 16 indicators and other current information that is important to the seed sector.

Focusing on the 2013 calendar year, TASAI has recently completed studies in four pilot countries—Kenya, Uganda, South Africa, and Zimbabwe. For easy comparison, Table 2 gives a quick profile of the pilot countries. The studies, conducted in 2014, utilized various tools and methods suitable to generate the required comprehensive data within each country’s context. Purposive sampling was used to target key informants and decision makers along the formal seed value chain. Open-ended questionnaires were used during intensive interviews and/or focus groups with relevant key informants. Much of the primary data was gathered through an administered survey instrument targeting seed producers. To allow for cross country comparisons, all key questions were standardized across the four countries. Efforts

were made to ensure that most, if not all, of the relevant seed producers (i.e., those producing the focus crops) in each country were interviewed. Secondary data was obtained from various relevant documents from seed industry stakeholders and government institutions.

Table 2: Profile of TASAI pilot countries

COUNTRY PROFILE	KENYA	SOUTH AFRICA	UGANDA	ZIMBABWE
Focus crop 1	Maize	Maize	Maize	Maize
Focus crop 2	Sorghum	Soybean	Beans	Cotton
Focus crop 3	Beans	Sunflower	Millet	Soybean
Focus crop 4	Cowpeas	Wheat	Sorghum	Sorghum
Population (Million)	43	51	36	13
Size (KM ²)	569,250	1,214,470	197,100	390,760
Arable land (Million Ha) (% of size)	4.89	14.8	5.3	3.58
2014 Ease of Doing Business rank	136	43	150	171
Stage of seed sector development	Growth	Mature	Growth	Decline

Source: FAO stats; World Bank, Mabaya et al.

4. Results

This section summarizes the key findings of TASAI under the five broad categories – Research and Development, Industry Competitiveness, Seed Policy and Regulations, Institutional Support and Service to Smallholder Farmers. For brevity, only nine of the 16 indicators are discussed under these five categories.

4.1 Research and Development

Research and development is a key segment of the seed industry and directly impacts the availability of foundation seeds and the number, as well as quality, of improved varieties that can be released. Agricultural research is one of the main factors contributing to shifts in agricultural production systems (ROSA, 2013). Since a majority of small seed companies cannot afford their own research facilities, they rely on both public research institutions including National Agricultural Research Institutions, (e.g., National Crops Resource Research Institute in Uganda, and Kenya Agriculture Research and Livestock Organization in Kenya), the CGAIR centers (e.g., The International Maize and Wheat Improvement Center, International Institute of Tropical Agriculture, International Crops Research Institute for the Semi-Arid Tropics). Without adequate investment in research, the flow of new improved varieties remains thin thereby limiting the choices farmers have when selecting seeds to best meet their needs.

Number of active breeders

Kenya has a limited numbers of breeders, only about 40 public and 28 private breeding programs are active for over 6 million farming households. There is an acute scarcity of breeders outside of the four focus crops, and as a result, several scientists are engaged in the breeding of more than one crop, often in areas outside their core specialization. Uganda, similarly to Kenya often lacks an adequate number of breeders. For the four focus crops, there are only 11 active breeders. National Crops Resource Research Institute (NaCCRRI).

By contrast, South African and Zimbabwean breeding programs are dominated by private companies. However, Zimbabwe still maintains some national breeding institutions and international organizations like CIMMYT and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), which are actively involved in providing seeds needed by the smaller seed companies.

Number of varieties released

The number of varieties released within a country is a key measure of research output and determines the final choice set in both formal and informal seed systems. A high and consistent number of varieties release also indicate the ability of agricultural research to meet the changing needs of the farmers. As is seen in Table 2, South Africa has Africa has a robust research and development program for all key crops. The average number of varieties that were developed and released for each crop during 2010-2013 (3 year rolling average) is 74 for maize, 12 for sunflower, 9 for soybean, and 9 for wheat. Of the varieties released in the past 3 years, 162 maize varieties and 21 soybean varieties are genetically modified (GM). Over the same three-year period, South Africa released 221 varieties of maize, while Kenya released 35, Uganda 12, and Zimbabwe 28. For each country, maize was by far was the crop with the most varieties released. This is in part because maize is the most widely cultivated crop in the country, given its importance for food security. Also, the productivity of hybrid maize declines significantly whenever seed is recycled, unlike the beans and cowpeas that are openly pollinated. Such “ability to recycle” lowers demand for bean and cowpea seed thereby discouraging investment in pulses.

Table 2. Number of varieties release annually

	Crop	2011	2012	2013	3 year average
Kenya	Maize	8	15	15	12.7
	Sorghum	1	0	2	1
	Bean	0	0	1	0.33
	Cowpea	0	0	0	0
South Africa	Maize	40	107	74	73.67
	Soybean	0	5	21	78
	Sunflower	0	22	15	12.33
	Wheat	0	20	6	8.67
Uganda	Maize	0	0	12	4
	Beans	0	7	0	2.33
	Millet	0	0	0	0
	Sorghum	0	0	0	0
Zimbabwe	Maize	13	4	11	9.33
	Cotton	0	1	0	0.33
	Soybean	0	1	2	1
	Sorghum	0	0	3	1

Source: Survey results and variety registration lists.

4.2 Industry Competitiveness

The need for a diverse range of seed companies allows for increased focus on the consumer, in this case smallholder farmers. Thus, industry competitiveness helps promote improved access to quality seed. In this sub-section we discuss the number of registered seed companies dealing in the four key crops as well as the market concentration for each crop.

Number of registered seed companies

Kenya: The number of registered seed companies in Kenya has grown from one (the Kenya Seed Company registered in 1956) to 116 since liberalization of the seed subsector in 1996. However, the number of active seed companies involved in the production and distribution of seed for the focus crops is only 17. The majority of the registered seed companies are actually seed merchants that are not involved in seed production or any breeding activities. They import seed, often for their own commercial agriculture activities, and do not distribute seed outside of their own commercial production enterprises. Maize seed is currently being produced by 16 companies (four being parastatals), sorghum by eight companies (three being parastatals), beans by eight companies (four being parastatals) and cowpea by six companies (two being parastatals). All seed companies surveyed thought that there was still room for more seed companies.

South Africa: There are 72 registered seed companies that are full members of the South African National Seed Organization (SANSOR). Thirty-seven (37) companies deal in the four focal crops: 17 maize seed, 11 soybeans, 9 sell sunflowers, and 7 wheat. The other 35 companies work with other crops, including a large number (27) producing vegetable seeds, indicating more competition in the vegetable sector than in the field crops cluster. As the industry matures, the number of companies dealing in grain crops is likely to decline through mergers and acquisitions. For now it is fair to say that there is healthy competition in the production and distribution of improved seed in South Africa.

Zimbabwe: The number of new seed company registrations over the last decade showed that registrations were stagnant from year 2006 and 2010 when Zimbabwe's economy was in hyperinflation. Currently, there are 38 registered seed companies in Zimbabwe. Of the 20 that are involved in the focus crops, 15 and 11 are active in the production and supply of maize and sorghum seed, respectively. Only 7 of the companies produce soybean seed, while only 3 produce cotton seed. Cotton has the lowest number of active seed companies. The underlying reason for this is that, for a long time, Quton had the sole right to multiply and market Cotton Research Institute varieties for domestic and international trade. Because of the exclusivity of cotton varieties, no other company could venture into the cotton seed business. The recent expiry of the exclusivity of cotton varieties by Quton has attracted two other companies (Cargill and Alliance Ginnerie) to join the cotton seed business and is likely to result in a more competitive cotton seed market.

Uganda: The first seed company in Uganda was registered in 1996 and since then the number of seed companies has grown to over 25 in 2013. Out of the 25 seed companies, 23 are members of the Uganda Seed Trade Association (USTA). An assessment of the seed

companies indicated that 14 (54%) are active in the focus crops. Despite the steady growth in the number of registered seed companies in the last 10 years, the number of active seed companies is still low. Despite efforts by local entrepreneurs to start seed enterprises in the country, almost half of them have experienced limited growth due to low financial base and low management skills in the seed business.

Market shares of the top four companies

As a measure of competitiveness, Table 3 shows the market shares of the top four companies producing the four key crops. The last column shows the Herfindahl-Hirschman Index, a way to quantify industry competitiveness, which ranges from near zero for perfect competition to 10,000 for pure monopoly. Looking at the overall market shares show and industry with high market concentration. For all crops in all countries, the top four companies control half of the market or more. In most cases, the formal seed market is characterized by low levels of competitiveness with nearly half of the market controlled by one company. In the case of maize seed in Kenya, one company commands 80% market share (a government parastatal). As measured by the Herfindahl-Hirschman Index per crop, Uganda is the most competitive of all the four countries. However, unlike the other countries, the same four companies are the top 4 largest companies for all crops. As a result, when one looks at the overall seed market across crops, Uganda is not very competitive.

Table 3. Market shares of top four companies per crop

Country	Crop	1st	2nd	3rd	4th	Others	HH4
Kenya	Maize	80%	5%	4%	3%	8%	6,450
	Sorghum	31%	28%	12%	10%	19%	1,989
	Bean	49%	22%	17%	7%	5%	3,223
	Cowpea	48%	22%	16%	14%	0%	3,240
South Africa	Maize	30%	30%	25%	8%	7%	2,489
	Soybean	55%	20%	10%	10%	5%	3,625
	Sunflower	40%	18%	18%	15%	9%	2,473
	Wheat	64%	24%	12%	0%	0%	4,816
Uganda	Maize	22%	20%	20%	15%	23%	1,509
	Beans	20%	15%	15%	10%	40%	950
	Millet	30%	10%	5%	5%	50%	1,050
	Sorghum	25%	20%	15%	10%	30%	1,350
Zimbabwe	Maize	47%	16%	13%	10%	14%	2,734
	Cotton	100%	0%	0%	0%	0%	10,000
	Soybean	67%	30%	2%	0%	1%	5,393
	Sorghum	39%	35%	16%	5%	5%	3,027

Source: TASAI survey

4.3 Seed Policies and Regulations

Seed policies and regulations govern the production and distribution of certified seed. The reasoning behind such regulation is to act in protection and support for the main consumers and producers including, agro-dealers, seed companies, and farmers (Lemonius, 2005). Since liberalization, efforts have been underway to redesign regulations that would stimulate the development of the private sector. Additionally, over the last 10-15 years, the focus has also

switched to an increasing emphasis on intellectual property rights, and the regional harmonization of regulations to allow for cross-border seed trade (Langyintuo, 2010). However, despite efforts by government to improve regulations and policies, there are still challenges that adversely affect the seed environment for companies.

Availability of seed inspectors

To ensure farmers are receiving quality seed governments will often inspect seed during the growing and processing periods. The cost and availability of seed inspectors can become a serious impediment to private sector growth since certified seed cannot be sold unless it meet all inspection requirements. TASAI survey asked seed producers to rate their satisfaction with the availability of seed inspection services. Private seed companies put satisfaction with the availability of inspection services at an average of 63.8% in Kenya. KEPHIS employs hundreds of staff, about 60 (15%) of whom are involved in seed inspections. To ensure effectiveness and efficiency in service delivery, KEPHIS has distributed inspectors to various sites, including all formal border points and international airports. In Zimbabwe, the availability of seed inspection services is regarded as excellent with an average score of 83%. Private inspectors from the larger seed companies are, on average, better resourced in terms of vehicles for mobility compared to the public ones. As such, public inspectors depend on transport from seed companies, which can compromise the impartiality of inspectors. Whilst seed companies inspect 90% of their fields, public inspectors inspect the remaining 10% as a quality control measure. In Uganda, seed inspection services are provided by the National Seed Certification Services (NSCS). This section is understaffed with only four seed inspectors covering 25 seed companies and over 900 seed growers. Seed producers in Uganda rated the their satisfaction with availability of inspection services at 43.5%.

Government efforts to stamp out fake seed

A key threat to the formal seed sector in each and South Africa is the increase proliferation of fake or counterfeit seeds. In this study, fake seed is generally described as seed that has not been certified by the responsible regulatory institution(s) but is available in the market. According to various stakeholders, the main source of fake seed in Kenya is forged packaging of popular seed brands by unscrupulous traders. This mainly happens during periods of seed shortages when desperate farmers are likely to scramble for available seed without much scrutiny of the quality. For each country, TASAI survey asked seed companies to rate government efforts to stamp out fake seed. In Kenya, government efforts to stamp out fake seed are rated by the industry as poor with a score of only 38.5%. Of the sampled agro-dealers, 23% had been directly affected by the fake seed problem. Maize is the crop most affected by the fake seed problem. It has been difficult for KEPHIS and other stakeholders to deal with the incidences of fake seed because detection of source is difficult.

Across the boarder in Uganda Fake seeds have become a national concern in Uganda. Addressing this challenge requires a common purpose, strategy, and resources by all stakeholders. The average score for the government efforts to stamp out fake seed was rated at barely “fair” at 40.6%. The low rating is attributed to a number of factors including inadequate staff at the ministry level to monitor and apprehend those involved in dealing in

fake seeds in the market. Corruption is also blamed for the high levels of fake seeds on the market. Zimbabwe and South Africa are doing much better on the issues of fake seed. Government efforts for stamping out fake seed are rated by seed companies good with a score of 67% in Zimbabwe and 60% in South Africa.

4.4 Institutional Support:

Availability of extension services for smallholder farmers

Governments and NGOs, can provide essential support through extension services to help promote seed adoption by farmers. In Kenya, the ratio of public sector frontline extension workers to farmers is about 1:1000, compared to the targeted and desired level of 1:400. This drop in number and quality of public extension services has in recent years attracted entry of other extension service providers, such NGOs, CBOs, FBOs and private companies that either sell their agricultural inputs or provide free extension services. However, supplementation by the private sector is limited and not able to reach all farmers in need. Private sector extension services favor commercial farmers and high-value crops while neglecting smallholder farmers and low-value crops such as maize and sorghum.

In South Africa, approximately 2155 government extension officers serve about 7,139,397 agricultural households. The concentration of extension officers and the quality of services offered varies widely by province. When it comes to extension services offered by private companies, the data indicate very few extension services available for the four focal crops, as opposed to vegetable seeds, for which more services are offered. Overall, satisfaction with the adequacy of extension support for smallholder farmers is at 35% by the seed companies interviewed.

In Uganda there are 2,354 sub-county extension officers under the NAADS program, and each of the 112 districts in Uganda has at least a district NAADS coordinator, district production coordinator, a district agricultural officer, and a district veterinary officer. This brings the number overall to about 2,802 extension workers directly interacting with farmers. The ratio of extension workers to farmers to 1:3,140. This number excludes extension workers from the private sector, NGOs, donors, farmer organizations, and cooperatives. Uganda's extension system has various challenges including inadequate funding to facilitate extension work, inadequate numbers of trained professionals, and low salaries.

Zimbabwe has a well-developed extension service system serving smallholder farmers. With an extension officer to farmer ratio of about 1 to 300, Zimbabwe outperforms Kenya Uganda and South Africa on this measure. The seed industry rated the availability of extension services as good, with an average score of 63.60%. Private seed companies keep a highly active relationship with government extension officers especially during the planting and growing season. However, access to government extension workers by private seed companies can be unequal. Large seed companies like Seed-Co, Pioneer and Pannar often run meetings where they award grower of the year and extension worker of the year, through

which they provide motorbikes for extension staff to increase their mobility. Smaller seed companies with limited incentives to lure extension officers are less pleased with extension services.

4.5 Service to Smallholder farmers

Concentration of rural agro-dealer network

Concentration of rural agro-dealer network There are two key aspects when reflecting on the seed industry's service to smallholder farmers. The first is the extension of the agro-dealer network, in order to reach and effectively aid rural farmers even in some of the most remote places in the country; and the second is the availability of seed in small packages, which tend to be more affordable for smallholder farmers to purchase.

In Kenya, the recently launched Seed Sector Platform lists over 6,700 agro-dealer shops, many of which are licensed by KEPHIS. It is estimated that there are over 12,000 agricultural input stockists in total, but many of these are not licensed. Despite the relatively high number of agro-dealers in the country, farmers often travel 3 to 10 km to access agricultural inputs (AGRA, 2010). While South Africa boasts an extensive and efficient road network and transport infrastructure, the agro-dealer network in rural areas is thin. Key informants and seed companies estimated that on average, seed is available within an 80km radius for most farmers. The seed is distributed through cooperatives and rural retail shops within the communities. Sales representatives from seed companies also assist farmers and cooperatives to transport seed especially when large quantities are purchased. To encourage adoption of improved seed by smallholder farmers, a better distribution system is needed in rural areas.

In Zimbabwe, rural farmers often access seeds through a variety of channels including, regional seed company distributors or seed company depots, government programs, farmer groups, NGOs and relief programs, rural stockists, and contractors. Respondents scored the concentration of rural agro-dealer networks within the country as good with an average score of 70%. In Uganda, the estimated number of agro-dealers was around 2,600 in 2013. Considering the number of farmers in the country, this number is quite small with a ratio of 1:3,400 or more. Additionally, access to seed in many rural areas of Uganda is still limited because of high transport costs affecting both farmers and agro-dealers.

Availability of seed in small packages

Kenyan seed companies outshine other countries in their ability to availing seed in small packages suitable for smallholder farmers, with 94.4% of the total volume of seed sold in Kenya sold in packages less than 5 kg. While South Africa stands out for having developed a large, mature and diverse commercial seed sector, it scores poorly compared to the other countries when it comes to making seeds available to farmers in small packages. However, this may be due to the fact that a large share of sales in the seed market are to commercial farmers who order in bulk. Only around 10 % of maize seed is sold in packages that are 2kg or less and another 10% is sold in 5kg bags in South Africa. It is nearly impossible to get seed in packages that are less than 25kg for the other three focus crops. In Zimbabwe, TASAI uncovered a growing trend among seed companies to distribute seeds in smaller packages

suitable for smallholder farmers. Much of the maize and sorghum seed is packed in small bags of 2, 5 & 10kg. This allows for a stronger adoption rate of improved seeds by farmers.

6. Conclusion

TASAI provides an innovative new tool that can be used in a monitoring and evaluation function to support agricultural development in Africa. For NGOs, public agencies, and government departments working in rural agricultural development, the index can highlight critical areas for improvement in order to ensure increased adoption of improved seed by farmers. The index can also be used to monitor and compare across years the progress in building the seed sector. Additionally, like any other investment climate index, TASAI can be used by financial investors and private seed companies to identify suitable geographical targets for investment in the African seed value chain. Below we highlight the key conclusions for each of the four countries covered in the pilot study.

Kenya: It has been nearly two decades since Kenya's seed sector has been liberalized. For a country with excellent private sector reputation in so many sectors (air travel, tourism, information and communication technologies, banking, flower production, horticulture for export, retailing, etc), privatization of the crop seed sector seems to be lagging behind. Compared to three other African countries, Kenya scored the highest in availability of seed in small packages. The country also performs relatively well on the quality of the seed policy and regulations, maize varieties released, and adequacy of seed inspectors. Overall, the government has set up good legislation but implementation lags behind. A key weakness in Kenya's seed sector is the strong dominance of government parastatals that stifles competition. While there are some challenges with Kenya's seed sector, given the country's strong performance in so many other private sector-led industries, there is great room for optimism. A level playing field, smart and efficient regulations, greater enforcement against fake seed and more, can improve the enabling environment for the seed industry that will ensure timely availability of high quality seeds of improved, appropriate varieties at affordable prices to smallholder farmers in Kenya.

Uganda: Uganda's seed sector is fully liberalized but is still in the early stages of growth. Per focus crop, Uganda is more competitive than all of the other three countries. Without a single company dominating the market, price competition is fierce, leading to lower prices for farmers. However, the seed sector still relies on a poorly performing public sector breeding program. The number of active breeders is very low and access to foundation seed is limited. With serious staff shortages, government department are unable to cope with the growing demands of the private sector. This has led to a weak seed policy and regulatory framework. A clear sign of this is the problem of fake seed, which continues to grow and could derail the industry if left unchecked. However, the private sector has a strong momentum and is pushing towards more self-regulation and self-reliance. There are strategies in place to address most of the key choke points along the seed value chain. In short, despite its challenges, Uganda's seed sector shows great promise for a vibrant, private sector-led seed

system that will guarantee timely availability of appropriate, improved varieties to smallholder farmers at affordable prices.

Zimbabwe: The seed industry in Zimbabwe is mature and dominated by private seed companies. Most of the indicators discussed in above show the dominance and importance of maize seed to the seed sector in Zimbabwe as evidenced by the number of breeders, varieties released, quantities sold per season and the number of active companies producing and marketing the seed. As measured by market share, the industry is dominated by four companies that control more than half of the market. Based on well established seed policies and regulations, the seed sector is generally well functioning with the necessary mechanisms and controls for each stage in the seed value chain to ensure supply of certified seed to the farmers. However, the economic hardships facing the Zimbabwean economy over the last decade seem to be taking a toll on the overall performance of the sector. Weak demand by smallholder farmers (largely attributed to lower purchasing power by smallholder farmers) has justified government participation as a big buyer and distributor of seed. This could affect the long-term vibrancy of the industry. The seed traders association – ZSTA – is weak and unable satisfactorily meet the needs of its members.

South Africa: The South African seed industry has had a long and successful evolution from its embryonic inception in the 1890s to a strong and well-established private sector-led industry. Part of the key to its success has been the close interaction between private sector managers and government representatives. Its competitive environment ensures maintenance of seed quality, private seed testing laboratories expertise, and efficient management of seed certification schemes. The national seed traders association (SANSOR) is highly effective in representing the interests of its members. However, due to a highly commercialized agricultural sector, the seed sector has evolved to primarily serve the needs of large-scale commercial farmers. The industry performs poorly on measures that are specific to seed access for smallholder farmers such as availability of seed in small packages, presence of a rural-agro-dealer network, and the availability of extension services. There is still great scope for improving access to seed for smallholder farmers in rural areas.

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