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The U.S. Government's Global Hunger & Food Security Initiative



INCENTIVIZING SEED COMPANIES TO EXPAND CROP-SEED PORTFOLIO: AN EVALUATIVE LEARNING



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Author's names: Justus Ochieng, Losira Nasirumbi Sanya, Joseph Rajabu Kangile, Marcia Croft, Bhramar Dey.

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Submitted by: Nikaj van Wees, Chief of Party S34D activity
Catholic Relief Services
228 West Lexington Street, Baltimore, MD 21201
Nikaj.vanwees@crs.org

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About the authors:

- Justus Ochieng is a Scientist, Social Science and Impact at Bayesian Consulting Group (BCG) based in Nairobi, Kenya. Email: Ochieng.justus1@gmail.com.
- Losira Nasirumbi Sanya is a Senior Lecturer Extension and Innovation Studies, Makerere University, in Kampala, Uganda. Email: losirasfm@gmail.com
- Joseph Rajabu Kangile is a Research Officer/Agricultural Economist at the Tanzania Agricultural Research Institute (TARI) in Tanzania. Email: kangilej@gmail.com.
- Marcia Croft is the Private Sector Engagement Lead for Catholic Relief Services Haiti. Email: Marcia.Croft@crs.org
- Bhramar Dey is the Senior Technical Advisor – Monitoring, Evaluation, Learning, Policy, Advocacy, and Strategy for the Feed the Future Global Supporting Seed Systems for Development activity (S34D) with Catholic Relief Services (CRS). Email: bhramar.dey@crs.org

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¹ <https://foodtank.com/news/2016/09/global-alliance-report-highlights-seed-diversity/>

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Abbreviations

AGRA	Alliance for a Green Revolution in Africa
Alliance	the Alliance for Bioversity International and CIAT
EGS	Early Generation Seed
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture
CSO	Civil Society Organization
CIMMYT	International Maize and Wheat Improvement Center
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IITA	International Institute of Tropical Agriculture
KEPHIS	Kenya Plant Health Inspectorate Services
MNLD	Maize Lethal Necrosis Disease
MOH	Ministry of Health
NARI	National Agriculture Research Institute
NARO	National Agriculture Research Organization
NGO	Non-governmental Organization
NSCS	Uganda National Seed Certification Services Division
QDS	Quality Declared Seed
SDG	Sustainable Development Goals
SSA	Sub-Saharan Africa
TASAI	The African Seed Access Index
TOSCI	Tanzania Official Seed Certification Institute

Executive Summary

Smallholder farmers in Sub-Saharan Africa (SSA) need sustainable access to high-quality seeds to not only improve their incomes, food and nutrition security, but also to help absorb shocks, adapt to shocks, and build transformative capacity. The formal seed system is often unable to meet the demand for quality seeds since seed companies face bottlenecks to introducing new seed varieties, particularly in SSA. Seed companies often consider a wide range of factors before introducing a new crop-variety into their product portfolio for commercialization. This study investigates the incentives that could encourage seed companies to broaden their crop portfolio.

The current report shows that seed companies in Kenya, Uganda and Tanzania consider seed demand, competition in the seed industry and crops with higher nutritional content, resilience to emerging diseases, and promoted varieties by other organizations among other factors, before introducing a new variety into their portfolio. Enabling factors such as government policies and availability of suitable areas for producing and availability of Early Generation Seeds (EGS) for the identified variety are other key factors that affect the production portfolio of the private seed companies. The most important challenges preventing seed companies, particularly small seed companies, from expanding crop-seed portfolio include high cost of seed certification, persistent incidence of fake seeds, lack of enforcement of regulations and policies, poor business environments and limited internal capacity (such as market development strategies) of the seed companies.

Partnership can support seed companies to expand crop-variety portfolios for the benefit of farmers, and also to cope with the impact of pandemics and shocks. Commercializing new varieties could benefit from partnerships between local and international research centers and private companies. The COVID-19 pandemic has disrupted seed sector because of the control measures undertaken by the government as indicated by 76% of the seed companies in our study sample. These measures have led to disruption in flow of inputs and output to markets which include reduced production and traded seed volumes, (due to lack of customers), low cash flow, and inability to promote seed products due to restricted mobility of human and goods.

Based on the findings, several types of incentives could encourage seed enterprises to diversify their crop-variety portfolios. Partnerships with relevant research centers, Non-Governmental Organizations (NGOs), and Civil Society Organizations (CSOs), and government bodies could help connect seed enterprises to a wide range of adapted seed varieties. In addition, these partnerships could connect enterprises to important business development services, including market development strategy planning and other capacity strengthening options. These efforts may help seed enterprises expand sales points at the last mile, including connecting to youth and women entrepreneurs.

Diversifying crop-variety portfolios can help seed enterprises expand their customer base and better respond to smallholder farmer demand however one major constraint to diversification is the high cost of certification. More streamlined government policies on seed certification, including an increased number of licensed inspectors, both public and private, would help create an enabling environment of accountability and transparent enforcement to promote private sector growth. Improving cross-border trade of certified seed and EGS would also enhance the diversity of seed available to enterprises and farmers but would require changes to government policies that currently slow the exchange of seed across Kenya, Tanzania, and Uganda.

Finally, the COVID-19 pandemic has had a strong impact on 76% of the seed companies interviewed. This suggests that seed enterprises may not currently be ready to take on additional risk by offering a

wider selection of crop-varieties and interventions may be necessary to reduce risk. Governments, donors, and other stakeholders can help mitigate or share risk with seed enterprises by carrying out market studies, subsidizing the cost of research and development for new varieties, creating greater awareness of the benefits of certified seed, and/or facilitating greater access to finance, as necessary.

1. Introduction

Smallholder farmers need sustainable access to quality seeds from a variety of crops to improve their incomes, food and nutrition, security. Diversity in crop portfolio at the last mile also helps to absorb shocks, adapt to shocks, and build transformative capacity in the long run. Due to underdeveloped seed system in developing countries, farmers are grappling with limited access to quality seeds of a variety of crops.

Literature shows only a small fraction of seed supply is met by the formal seed system in developing countries (Almekinders, 2000; McGuire & Sperling, 2013; Sperling, 2001; Sperling & McGuire, 2010). Smallholder farmers obtain more than 90% of their seed from informal seed sector (McGuire & Sperling, 2016). A primary reason for this is because seed companies produce a small range of market-oriented commercial crop seeds (e.g., hybrid maize, horticulture crops, vegetables, etc.). Seed companies consider a wide range of factors before introducing a new crop-variety into their product portfolio for commercialization. Some companies specialize in certain seeds while others diversify their range of products to spread the business risk, achieve better utilization of their assets, or smooth out seasonal cash flows and capture as many customers as possible. The formal seed system in East Africa plays a crucial role in the production and dissemination of modern varieties and certified seed to farmers, but its contribution to the seed market is minimal (less than 20%) while the informal seed system accounts for the lion's share of the seed market (Sperling and McGuire, 2010). While the role for informal seed system remains crucial, formal seed system – especially the seed companies – will need to ensure new modern varieties, that are biotic and abiotic stress-tolerant, move from research centers to farmers' fields.

This study explores how seed companies could be incentivized to broaden their crop portfolio. Once a seed company has experience with a few seed products, it is fairly easy to expand its portfolio (Tripp, 2003). Most seed companies are reluctant to expand their crop portfolio and continue to produce a particular seed for many years disregarding available new varieties of crops with potential to increase the resilience of farming households due the costs of including new varieties. A seed company may specialize or try to offer a wide range of seeds to capture as much of the customers' business as possible. On the other hand, national and international research organizations are producing research products that are awaiting commercialization. Due to challenges in sub-Saharan Africa (SSA), some seed companies venture into producing seeds whose demand is highly unpredictable and quantities produced are often very low (Van Mele et al., 2011²).

The specific research questions addressed in this study are as follows:

1. What do seed companies consider before expanding their crop portfolio?
2. What are key challenges influencing seed company's decision to expand their portfolio?
3. What are the opportunities/business models required for seed companies to improve their seed business?
4. What are the key policy implications that would incentivize seed companies to broaden their crop portfolio? What are the enablers that facilitate broadening crop portfolios?

² African seed enterprises – Sowing the seeds of food security <https://www.cabi.org/bookshop/book/9781845938437/>

Section 2 below discusses the study design, while Section 3 presents the relevant literature about the seed industry in East Africa. Results are discussed in Section 4 while Sections 5 provides concluding remarks.

2. Study Design

The authors interviewed twenty seed companies in Kenya, Uganda and Tanzania and one company from the United States. This study used an exploratory research design combining both qualitative and quantitative methods to generate qualitative and quantitative data, respectively. The methods include: (a) in-depth interviews with selected seed companies in the USA and East Africa; and (b) a cross-sectional survey involving a short semi-structured questionnaire. The questionnaire was administered face to face³ and follow up questions were included using telephone, skype interviews and emails. The primary data was complemented with desk-based research using publicly available information on indices and metrics. Qualitative data was transcribed verbatim, and the transcripts analyzed to generate themes. Quantitative data was analyzed using Microsoft Excel.

The study interviewed twenty-one seed companies in East Africa, seven in each country (Table 1). The goal was to have a sample with various company sizes to distill learnings for our research questions. Out of the twenty-one seed companies, two were international, ten regional and nine local companies⁴. The number of employees in the study country varied by type of company with international companies having on average thirty-three, regional fifty-five and local thirty-eight employees. International companies had more branches or offices compared to regional seed companies while all the companies had at least two offices within the study countries.

Countries were selected based on current activities under the S34D portfolio and to further contribute to established work by partners on formal and informal seed systems. The East Africa regional corridor also includes Kenya, Tanzania, and Uganda, the three countries selected for this study. Seed enterprises were selected to include a variety of both international, regional, and local companies to include diverse perspectives. Inter-regional trade also allows for the flow of formal and EGS seed between the three countries selected and was captured by including the three selected countries and their seed enterprises.

Table 1. Distribution of seed companies by type and country.

Country	Type of company			Total
	International	Regional	Local	
Kenya	1	3	3	7
Uganda	0	4	3	7
Tanzania	1	3	3	7
Total	2	10	9	21
Mean number of employees	33	55	38	42
Mean number of branches outside the country	16	3	0	3
Mean number of branches in the country	2	3	2	2

³ Due to COVID-19, virtual interviews were combined with face-to-face interviews. All interviews in Uganda and Tanzania were face to face, while two interviews in Kenya were virtual. During the data collection, all the COVID-19 spread reduction strategies were followed as provided by the Ministry of Health (MOH) such as social and physical distancing, wearing facemasks, and use of hand sanitizers.

⁴ International company was defined as company that has branches or offices in more than one continent, regional has branches or offices in more than one country, while local companies are based in one country.

3. Relevant literature

This study focuses on four grain and legume crops that are important for food security in Kenya, Uganda and Tanzania. The main food crops and legumes considered are maize, sorghum, bean, and cowpea based on existing literature. Kenya has the highest number of registered seed companies followed by Tanzania (Table 2). The number of registered companies are 171 in Kenya, 104 in Tanzania and thirty-four in Uganda (Waithaka et al., 2019; Mubaya et al., 2018 and 2019). The literature review of this study focused on seed companies' satisfaction with breeders, foundation seed, variety release process and seed regulation and enforcement.

Table 2. Seed companies research and development.

Details	Kenya	Uganda	Tanzania	Total
Number of registered seed companies	171	34	104	309
Number of active seed companies for food crops	26	20	30	76
Number of active breeders	34	15	46	95
Number of varieties released in last three years (for maize, beans, sorghum and cowpeas)	136	40	50	226
Availability of foundation seed (score out 100)	71	62	67	67
Average age of varieties sold (years)**:				
-Maize	12 (1-34)	7 (1-17)	10 (5-48)	10
-Beans	14 (nd)	12 (1-23)	18 (8-39)	16
Number of varieties sold	115	68	58	241
Number of rural-agro dealers	5,500	2,500	2,000	10,000
Households per rural-agro dealer	910	1,580	2,900	1,797
Availability of seed in small packages (% of seed sold in packages of 2kgs or less)	72	75	80	76
Seed price (USD per kg):				
-Maize OPV	2	1	1	1.3
-Maize Hybrid	2	2	2	2
-Beans	2	1	1	1.3

Data Source: TASA briefs for Kenya, Uganda, and Tanzania. ** Youngest to oldest variety in parenthesis and nd =no data

Similarly, the number of seed companies engaged in production and marketing of food crops and legume seeds varies by country with Tanzania having the highest followed by Kenya. Not all registered companies are active. For example, Tanzania has 104 registered seed companies but only 60 are actively engaged in seed production and marketing.

Seed companies are generally satisfied with the work of **breeders**; however, they recommend increasing the number of public breeders (Waithaka et al, 2019; Mubaya et al 2018 and 2019). Uganda has the lowest number of public breeders; with only fifteen breeders for food crops (e.g., maize, sorghum and legumes) followed by forty-six in Tanzania and sixty in Kenya (Table 2). More new varieties have been released for maize and beans than for other crops in all the countries. Kenya ranks the highest in terms of released varieties at 136 varieties in the last three years. Maize and beans dominate the market because breeding programs have focused upon developing varieties of maize that are resistant to maize lethal necrosis disease (MLND), are drought tolerant and are tolerant or resistant to maize streak virus and varieties of bean are nutrient-enriched through bio-fortification with iron and zinc.

Seed companies in Kenya, Uganda, and Tanzania are satisfied with the access to **foundation seeds** (Waithaka et al, 2019; Mubaya et al 2018 and 2019). Multinational seed companies, most of which maintain their own foundation seed, are very content with the availability of foundation seed (88% average rating). Seed companies, most of which rely on public institutions (e.g. Agricultural Research Institute (ARI), Universities, other private companies, and CGIAR centers) are also satisfied with the current situation (70% average rating). Other sources of foundation seeds are from Brazil, Mexico, the USA, and private companies in the region, such as QualiBasic Seed Company Ltd. in Kenya. Supply side constraints for access to foundation seeds include lengthy certification processes, a lack of adequate demand forecasts, insufficient land for seed production, and limited irrigation for seed production. The public seed companies rated access to foundation seed as excellent since they maintain their own early generation seeds (EGS).

The varieties currently being produced are generally old, ranging from seven to thirteen years (Table 2). Although, some are as old as forty years (Waithaka et al, 2019; Mubaya et al 2018 and 2019). The persistent production of old varieties is attributed to farmer loyalty and a lack of superior newer varieties. Thus, seed companies should be encouraged to produce new improved varieties if they outperform older varieties, while farmers will need to be convinced to adopt the new varieties as well. There are seven government-owned organizations (one agricultural research institute, four public universities and two state-owned corporations) involved in the production and marketing of certified seed for the target crops in Kenya; none in Uganda, and two in Tanzania (one agricultural institute and one state owned corporation) (Waithaka et al, 2019; Mubaya et al 2018 and 2019a and Mubaya et al 2019b). Seed companies reported that, on average, it takes seven days to import seed into Kenya while it takes fifteen and twelve days in Uganda and Tanzania respectively (Waithaka et al, 2019; Mubaya et al 2018 and 2019a). The price of seeds varies by country and range from USD 1.5-2 per kg for hybrid maize and USD 0.8-1.8 for open pollinated varieties (OPV) of maize. Beans range in price from USD 0.8-2.20 per kg.

Seed companies are not very satisfied with the **variety release process** and rated it “fair” in Kenya (52%) but higher in Uganda and Tanzania (Table 3). While seeds companies are satisfied with the release process in Uganda (75%) and Tanzania (70%). The main reasons for the relatively low satisfaction level in Kenya are the high cost of the process and the unpredictable weather. Several companies view the release process as too time-consuming, bureaucratic, and needing a complete overhaul. In Kenya varietal release takes 46 months, 28 in Uganda and 31 in Tanzania (Table 3) (Waithaka et. al., 2019; Mubaya et. al. 2018 and 2019a and Mubaya et. al. 2019b).

Table 3. Seed policy and regulation.

Details	Kenya	Uganda	Tanzania	Total
Length of variety release process (months)	46	28	31	35
Satisfaction with variety release process (score out of 100)	52	75	70	66
Seed Policy (year)	2,010	2,016	Agric policy	-
Latest amendment to Seed Law (year)	2015	2006	2014	-
Regional harmonization	COMESA	COMESA	SADC	-
Number of public seed inspectors	35	7	48	90
Number of private seed inspectors	12	-	-	12
Reported cases of fake seeds per year	17	14	18	49

The seed companies are not satisfied with the **seed regulation and enforcement** in the region. This is due to very limited number of seed inspectors. In Kenya, there are 47 seed inspectors, 7 in Uganda and 48 in Tanzania (Table 4). Kenya has about 12 private seed inspectors while there are no private seed inspectors in Uganda and Tanzania. Thus, there is need to license inspectors to complement the seed inspection services provided by public regulatory authority (e.g., KEPHIS; TOSCI, NSCS). However, the private inspectors should obtain letters of commitment from their employers to safeguard their independence without undue influence or threats. These perspectives were further investigated in the interviews and surveys.

4. Results and discussion

4.1. Crop-variety portfolio

The seed companies included in our study produced maize, beans, sorghum, soyabean, cowpeas and other crops (Table 4). Maize was produced by both large and small companies in all the countries followed by beans and sorghum. The number of varieties produced varied by country and type of company. Overall, seed companies in Uganda and Tanzania dealt with more varieties of maize, beans and sorghum varieties than Kenya (21 maize varieties in Kenya, 30 in Uganda and 31 in Tanzania). However, Uganda dominated the rice seed industry and produced about 19 varieties followed by one variety in Tanzania, while no seed company was engaged in rice seed in Kenya. Small seed companies generally had a wider range of minor crop seeds. Small companies produced 82 varieties of beans, sorghum, soyabeans, cowpeas, green grams while also producing about 40% of all maize varieties in East Africa.

Table 4. Crops and seed varieties produced by seed companies in East Africa.

Crop	% of companies	Total number of varieties traded					
		Country			Company size		
		Kenya	Uganda	Tanzania	Large (International and Regional)	Small (Local companies)	Total
Maize	23.3	21	30	31	50	32	82
Beans	18.6	14	34	14	27	35	62
Sorghum	14.0	11	14	2	9	9	18
Soyabean	9.3	2	14	2	7	11	18
Cowpeas	8.1	4	6	-	2	8	10
Rice	8.1	-	19	1	6	14	20
Sunflower	8.1	-	1	7	4	4	8
Ground nuts	3.5	-	6	-	6	0	6
Sesame	2.3	-	1	1	1	1	2
Canola	1.2	3	-	-	3	0	3
Green grams	1.2	1	-	-	-	1	1
Pigeon Pea	1.2	1	1	-	-	2	2
Potato	1.2	-	-	5	-	5	5
Total		57	126	63	123	125	248

4.2. Export and import of seeds.

None of the seed companies in Tanzania exported any seeds in the region which is consistent with the reports from The African Seed Access Index (TASAI)⁵ (Mabaya et al 2018; Waithaka et al 2018). Kenya and Uganda exported only 33% and 23% of all the maize varieties respectively. Uganda exported their beans to South Sudan, Burundi, Democratic Republic of Congo (DRC) while Kenya exported to Uganda, Rwanda, Tanzania, Zambia, Zimbabwe, Malawi, Mozambique, South Africa. Soyabean, sorghum and cowpeas are also exported to South Sudan, Rwanda and DRC (Table 5). All the seeds exported are certified seeds.

⁵ The African Seed Access Index (TASAI). <https://tasai.org/>

Table 5. Seed export trade in East Africa.

Kenya				Uganda		
Do you export? % (N)	71.4 (5)			100 (7)		
Local company exporting %	2			3		
Crops exported	<i>Number of varieties exported #</i>	<i>Variety type (%)</i>	<i>Countries exporting to</i>	<i>Number of varieties exported #</i>	<i>Variety type (%)</i>	<i>Countries exporting to</i>
Maize	7	Certified**	Uganda, Rwanda, Tanzania, Zambia, Zimbabwe, Malawi, Mozambique, South Africa.	7	Certified**	South Sudan, Burundi, DRC
Green grams	1	Certified	Uganda and South Sudan	-	Certified	
Beans	1	Certified	South Sudan	5	Certified	South Sudan and DRC
Soyabeans	2	Certified	Uganda and Rwanda	1	Certified	South Sudan and Rwanda
Sorghum	2	Certified	Uganda and Rwanda	5	Certified	South Sudan, DRC
Groundnuts	-	Certified	-	2	Certified	South Sudan, DRC & Rwanda
Sesame	-	Certified	-	1	Certified	South Sudan, DRC
Cowpeas	1	Certified	Uganda and South Sudan	3	Certified	South Sudan

Seed importation takes on average seven days in Kenya. This is a significant improvement from thirty-eight days in 2016 and twenty-six days in 2014 (Waithaka et al., 2019; Mubaya et al., 2018 and 2019). On average importation takes fifteen and twelve days in Uganda and Tanzania respectively (Waithaka et al., 2019; Mubaya et al., 2018 and 2019a). The importation process can be improved by enhancing the capacity of the customs officials at various border points. Generally, in most countries, the seed import/export process takes, on average, less than thirty days. Kenya ranks high in volume of certified seeds traded. Kenya sold about 43,954 MT of maize seed, followed by 17,013 MT in Uganda, 80 MT in Tanzania (Waithaka et al., 2019; Mubaya et al., 2018 and 2019).

Table 6. Seed import in East Africa.

Kenya				Uganda			Tanzania		
Do you import? % (N)	57.14 (4)			28.6 (2)			85.7 (6)		
Local companies importing%	0			1			2		
Crops imported	<i>No. of varieties imported #</i>	<i>Variety type (%)</i>	<i>Countries importing from</i>	<i>No. of varieties imported #</i>	<i>Variety type (%)</i>	<i>Countries importing from</i>	<i>No. of varieties imported #</i>	<i>Variety type (%)</i>	<i>Countries importing from</i>
Maize	4	Certified* *	Zambia, Tanzania, South Africa	4	Certified* *	Kenya, Zambia, South Africa, India	16	Certified* *	Kenya, Zambia, Taiwan
Sorghum	2	Certified	USA	-	Certified		-	Certified	
Canola	2	Certified	USA	-	Certified		-	Certified	
Sunflower	2	Certified	USA	1	Certified	Kenya, Zambia, South Africa, India	3	Certified	Kenya and Zambia

4.3. Dynamics of crop-seed portfolio

All companies added new varieties to select crops in the last seven years while 62% of companies decreased the number of varieties for some of their crops (Table 7). The top crop varieties that companies increased was maize, while companies also removed some maize varieties as well as beans and cowpea. This suggests that maize varieties have high turnover with potentially new varieties being introduced, while this is somewhat true for beans and cowpea. Very few new varieties appear to be added to other minor crop portfolios. The reasons for introducing new varieties include high demand (58%), expanding seed business (42%), easy to produce (13%), and attract higher prices (13%) (Annex Table 1A). Reasons for removing varieties included: low demand or sales (45%), replacing old varieties (27%), and expensive to produce (9%) (Annex Table 1A). Crops increased or dropped from the portfolio varied by country and size of the company (Table 7). Over 50% of new varieties were introduced by small companies and on average, seven and thirteen bean and maize varieties were dropped from company portfolio respectively (Annex Table 1B).

Table 7. Percentage of companies increasing or decreasing crop-seed portfolio.

	Country			Type of company		Total
	Kenya	Uganda	Tanzania	Large	Small	
Crop-seed portfolio increased in the last 7 years	100 (7)	100 (7)	100 (7)	100 (12)	100 (9)	100 (21)
Crop-seed portfolio decreased in the last 7 years	42.86 (3)	71.43 (5)	71.43 (5)	50 (6)	77.78 (7)	61.9 (13)
<i>Crops increased from Company portfolio</i>						
Beans	17.4	27.0	27.6	22.42	27.5	24.72
Cowpea	-	2.7	-	0	2.5	1.12
Maize	60.9	40.5	48.3	55.1	40	48.31
Rice	-	13.5	-	4.08	7.5	5.62
Sorghum	13.0	10.8	6.9	8.16	12.5	10.11
Soybeans	-	5.4	6.9	2.04	7.5	4.5
Sunflower	8.7	-	10.3	8.16	2.5	5.62
<i>Crops decreased from company portfolio</i>						
Beans	20.0	37.5	25.0	23.1	35.0	30.3
Cowpea	60.0	-	-	-	15.0	9.1
Green grams	-	6.3	-	7.7	-	3.0
Groundnuts	-	6.3	-	7.7	-	3.0
Maize	20.0	37.5	50.0	46.2	35.0	39.4
Rice	-	6.3	-	7.7	-	3.0
Sorghum	-	-	8.3	-	5.0	3.0
Soybeans	-	-	16.7	-	10.0	6.1
Sunflower	-	6.3	-	7.7	-	3.0

Note: Frequencies in parenthesis

4.4. Factors seed companies consider before expanding crop-seed portfolio

Seed companies operate in a dynamic business environment and have profit-oriented motives, but they face challenges in identifying and establishing viable market linkages to achieve their profit objectives. Their profit motive compels them not to take up a new variety for commercialization without considering a wide range of factors. The findings show that market and agronomic research through demonstration trials, promotions, and consumer surveys helps to assess the acceptability of the new variety by the target farmers in addition to demand and competition in the seed industry (local and regional markets). For instance, most of the high iron beans are early maturing and are drought tolerant (short duration growing period) and being promoted by research organizations, such as the Alliance for Bioversity International and CIAT (the Alliance), Harvest Plus, National Research Organizations (NAROs) and other NGOs, has made some companies in Kenya, Tanzania and Uganda to include high iron bean in their portfolio. Previous research shows when demand for a crop and variety is highly unpredictable, the quantities produced are often relatively low (Bentley et al, 2011).

Companies also indicated that they assess the resilience of the new varieties against pest and diseases. For example, resistant to emerging diseases such as Maize Lethal Necrosis Disease (MNLN) is vital

since farmers are demanding these types of varieties (Table 8). Seed companies indicated that any variety that is resistant to MNLD would be easily included in production portfolio.

Regional and international seed companies considered the country government policy on seeds and varietal preservation before introducing a new variety. For instance, Tanzanian government have formalized sesame and sunflower production and seed companies are motivated to produce these seeds while in Kenya, bean has now been recognized as food security crop in addition to maize. Seed companies also consider other factors such as production costs, climate change and weather variability, suitable areas for seed production and availability of early generation seeds (EGS) for the new crop (Table 8).

Table 8. Factors seed companies consider before expanding crop-variety portfolio.

Factors to consider before expanding crop-portfolio	Kenya	Uganda	Tanzania	Total
Conduct market research with farmers to establish demand	100.0	57.1	57.1	71.4
Conduct cost benefit analysis through gross margins	71.4	0.0	57.1	42.9
Resilience of varieties against pest and diseases (e.g. MNLD)	42.9	42.9	42.9	42.9
Resistant to drought/climate change/harsh weather	42.9	42.9	42.9	42.9
Seed production costs	71.4	28.6	28.6	42.9
Farmer/customer demand	42.9	57.1	14.3	38.1
Yield potential of the varieties	42.9	42.9	14.3	33.3
Availability of Basic seeds and EGS	14.3	28.6	14.3	19.0
Government policy	14.3	28.6	14.3	19.0
Area suitability for seed production	28.6	14.3	14.3	19.0
Germination (e.g 99% and 99.9% purity and vigor)	14.3	0.0	14.3	9.5

While this is not a comprehensive list, it provides a picture of the wide variety of considerations that seed companies take into account in their crop-variety portfolio decisions. The most common factor is the necessity to conduct market research, which suggests an opportunity for governments or NGOs to expand access to market research on priority crops by co-funding or collaborating on market studies. While information on biotic and abiotic stress resistance may be easily available, the costs of conducting market research or determining costs and benefits may be a significant burden, especially for smaller seed companies. If key stakeholders hope to expand the diversity of seed available to farmers, market research in collaboration with the private sector would be an excellent place to start.

4.5 Challenges for expanding crop-seed portfolio

Seed certification and registration is a major challenge to companies, especially in Tanzania (Table 9). Seed production zones are far from inspectors such as Kenya Plant Health Inspectorate Services (KEPHIS), Tanzania Official Seed Certification Institute (TOSCI), and the Uganda National Seed Certification Services Division (NSCS) These distances contribute to the higher costs for seed inspection, as seed companies contract many smallholder farmers with sparsely located fields to produce seeds. This is consistent with the past studies which recommended outsourcing certain seed

certification steps, (Gamba, 2016), as provided for in the Seeds and Variety Act, CAP 326 of laws of Kenya (Seed Regulations)⁶ and proposed in the seed harmonization policy of the East Africa Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA) Countries (Kuhlmann and Zhou, 2015). This should include pragmatic measures for moving towards self-regulation or decentralized regulation so that seed companies can be free to develop their own cost-effective and efficient quality control measures. This will allow the regulatory authority such as KEPHIS, TOSCI, and NSCS to determine overall quality, and improved channels for farmer feedback about low quality seed can also play an important role in identifying seed companies not meeting quality standards.

Persistent presence of fake seeds in the market disincentivizes the seed companies from expanding the crop portfolio. Previous studies reported multiple cases of fake seeds per year: 7 in Kenya, 18 in Tanzania and 14 in Uganda (Waithaka et al., 2019; Mubaya et al., 2018 and 2019). Seed companies avoid crops which have too many reports of fake seeds. This is a risk-averse measure to protect their brand and market share. Seed companies were dissatisfied with government efforts to address the challenge of fake seed, suggesting that greater enforcement measures are needed to encourage private sector growth.

In addition, high incidence of pest and diseases was mentioned by seed companies in Tanzania. Seed companies were not satisfied with the public extension officers to market their seeds as they are not well facilitated by the government, even though this is not the role of public extension agents. Seed companies in Kenya, Uganda and Tanzania rated public extension service as fair or poor (Waithaka et al., 2019; Mubaya et al., 2018 and 2019). The same companies recommended that they employ their own extension officers to operate as marketers or agronomists rather than relying on the public or NGOs extension workers. Thus, seed companies would be able to sustain their farmer awareness and outreach efforts by continuing to hold seed field days and demonstrations.

About 56% of small seed companies mentioned that they have limited access to Early generation seeds (EGS) for new varieties. Poor business environment is a major challenge due to high taxes and lack of supportive policies from the government to encourage use of improved seeds by farmers. Weaker internal management and technical capacity of the seed companies was also a challenge, particularly in marketing of the seeds. The seed companies requested support in market development strategies to increase sales. This can be achieved through partnerships with CGIAR, National Agriculture Research Institutes (NARIs), development partners, and national and regional entities that support the small seed companies with business development services.

⁶ The Seeds and Plant Varieties (Seeds Regulations) 1991. Amended in 2012.
<http://faolex.fao.org/docs/pdf/ken37549.pdf>

Table 9. Challenges facing seed companies in expanding their business.

Challenges in expanding crop portfolio	Average (%)	Country (%)			Type of companies (%)	
		Kenya	Uganda	Tanzania	Large	Small
Weak internal capacity (e.g. human capacity)	52.38	57.14	71.43	28.57	50.00	55.56
Weak legal regulatory and policy enforcement	47.62	28.57	71.43	42.86	66.67	22.22
Poor business environment	42.86	28.57	71.43	28.57	41.67	44.44
Climate change	38.10	14.29	57.14	42.86	16.67	66.67
Limited access to Early generation seeds	33.33	28.57	28.57	42.86	16.67	55.56
High cost of seed certification	28.57	28.57	14.29	42.86	-	66.67
High incidence of fake seeds	28.57	14.29	57.14	14.29	25.00	33.33
Limited demand by consumers and farmers	23.81	14.29	14.29	42.86	33.33	11.11
Seed registration	19.05	14.29	14.29	28.57	-	44.44
Limited suitable production sites/land	9.52	28.57	-	-	16.67	-
High pest and disease incidence	4.76	-	-	14.29	8.33	-
Unfavorable Plant Variety Protection Acts.	4.76	-	14.29	-	8.33	-
Poor access to breeder seeds	4.76	14.29	-	-	8.33	-

4.5. Seed demand forecasting

Low profitability of cereals and legumes seeds is the main obstacle to private sector participation in EGS and certified seed production. Lack of seed demand forecasting system has been identified as one of the causes of low profitability of seed business (Ojiewo, et al., 2018)⁷ particular to small seed companies. The demand for certified and EGS seed exhibits intra-annual and seasonal fluctuations depending on weather, prices, and the amount of seed saved from the past previous season. Demand forecasting is the process of making projections of demand for seed by examining past and present quantities purchased, combined with assessment of competition and market characteristics. Demand forecasting is important for determining quantities of seed required by each crop and variety during a particular season and helps companies to plan production and distribution of seeds.

The results show that fourteen companies (5 in Uganda, 5 in Kenya and 4 in Tanzania) reported that they conduct seed forecasting through market research surveys, contacting farmers/customers and agro-dealers to confirm their periodic seed needs (orders). This is complimented by doing SWOT analysis to know the company competitiveness, strength, opportunities, challenges and threats. Secondly, a seed company in Tanzania established a management information system (MIS) to send messages to famers and received feedback on the acceptability of the varieties and seed demand. MIS is a mobile based platform where farmers are required to dial USSD code (*148*43#) on their mobile⁸ and select the product (mainly a particular maize variety) and then ask questions and get recommendations or answers immediately. The system is funded by the company as part of their marketing strategy.

In addition, thirteen seed companies used historical sales data complemented with own evaluation of market growth and demand. The companies use previous year sales level to forecast future level of sales and often forecast a 10-20% increase. This analysis is often performed by production and

⁷ <https://cgspace.cgiar.org/handle/10568/98358>

⁸ USSD (Unstructured Supplementary Service Data) is a Global System for Mobile Communications (GSM) protocol that is used to send text messages.

marketing teams. Other companies followed government trends, for example in promoting use of hybrid seeds, to predict how much the farmers would need over a period of time. Some companies rely on the seed demand estimates provided by the government for each crop while one seed company in Kenya hired a consultancy firm to estimate seed demand.

Seed companies faced several challenges in forecasting seed demand in East Africa (Fig 1). It is difficult to obtain accurate demand estimates because of limited reliable data on the number of farmers, demand, area under cultivation, and lack of national data on seed distribution and demand to help in forecasting seed demand. Climate change is another factor that curtails seed forecasting and yield is unpredictable. Moreover, large companies (both regional and international) mentioned lack of information on country specific policy and weak enforcement of regulations by the government. Corruption affects the transparency in the seed industry. To address these challenges, collaboration between public and private sector actors can help ensure accurate seed demand forecast data is available.

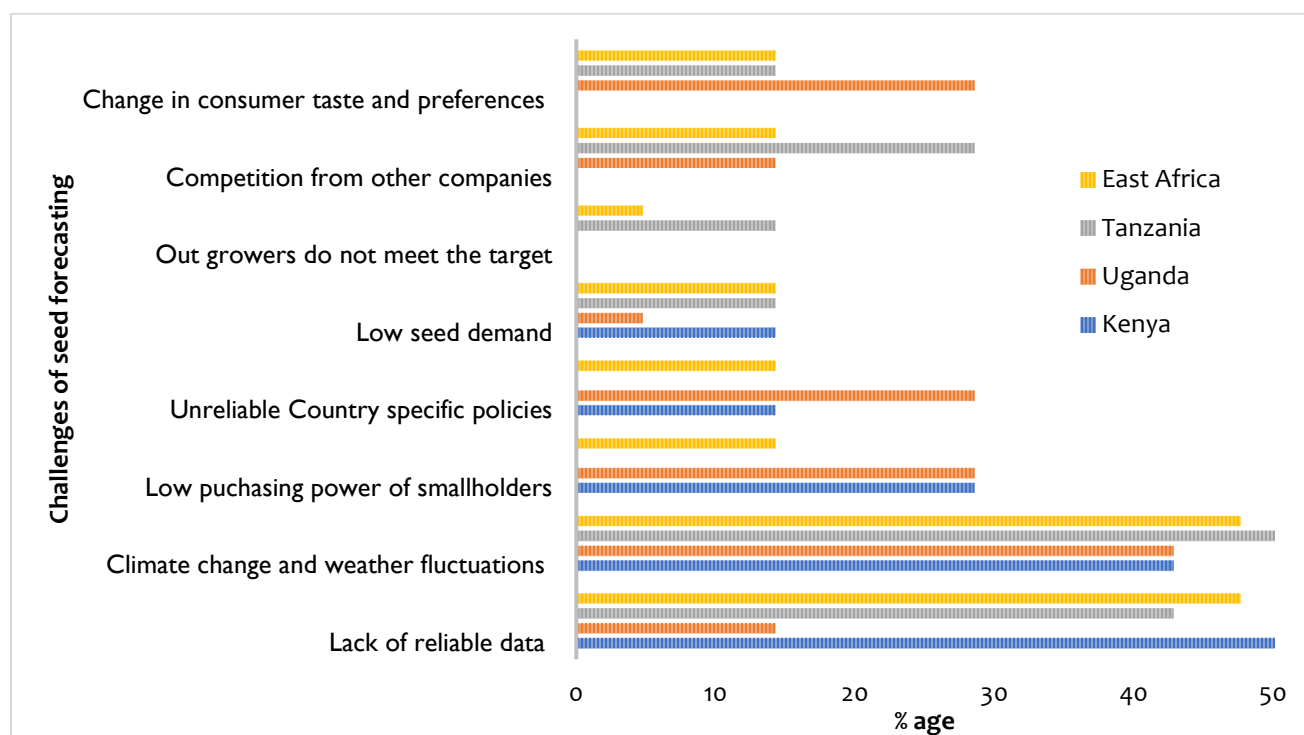


Fig.1. Challenges in seed forecasting in Kenya, Uganda, and Tanzania.

The interviewed seed companies shared recommendations to improve the efficiency of seed demand forecasting as presented in Fig 1A in Annex I. Eleven seed companies indicated that they collect annual demand data through seed trade association (STA) in East Africa. One of the seed companies indicated that East Africa should learn from South Africa where seed association conduct periodic market surveys. This compliments data collected from pre-sales or orders requests from agro-dealers and national data on demand and supply of seed to guide analysis of seed demand and forecasting. Partnering with other stakeholders to conduct market survey to increase accuracy of seed demand forecasting. The seed demand forecasting can be done better when seed companies conduct market research/analysis about farmer use and intentions for seed companies; increased awareness of policy

change in the country as mentioned by regional and international companies. Identification of serious and committed out-growers who have the capacity produce seeds and having contracts with the buyers would help seed companies to establish seed demand forecasting system.

4.6. Incentives needed by seed companies to expand their crop-seed portfolio

The seed companies were also asked to mention the incentives they need to expand crop seed-portfolio (Fig 2). Of the companies interviewed, 19% mentioned that government should reduce non-tariff barriers (NTB) that restrict trade such as licenses, embargoes, roadblocks, sanctions (long clearing procedures at the port and levies etc.). This was largely mentioned by large companies (international and regional companies) that exports seeds. There is need for favorable government policies in reducing long bureaucratic importation process of seeds into the region. Similar concerns were reported in Kenya by Gamba, 2016. Moreover, 90% of seed companies interviewed asserted that they need support on-market development to help them to efficiently market their seeds and reach smallholder farmers in the region, incentivizing farmers to use certified seeds through training, extension services, and ensuring availability of EGS. Partnership with NGOs and government ministries to support seed companies with scaling, extension, training services, and breeding was mentioned by 57% of the companies. Other incentives include favorable loan products from financial institutions and reducing the amount of royalties demanded by breeders and improving protection of property rights especially for companies with own varieties.

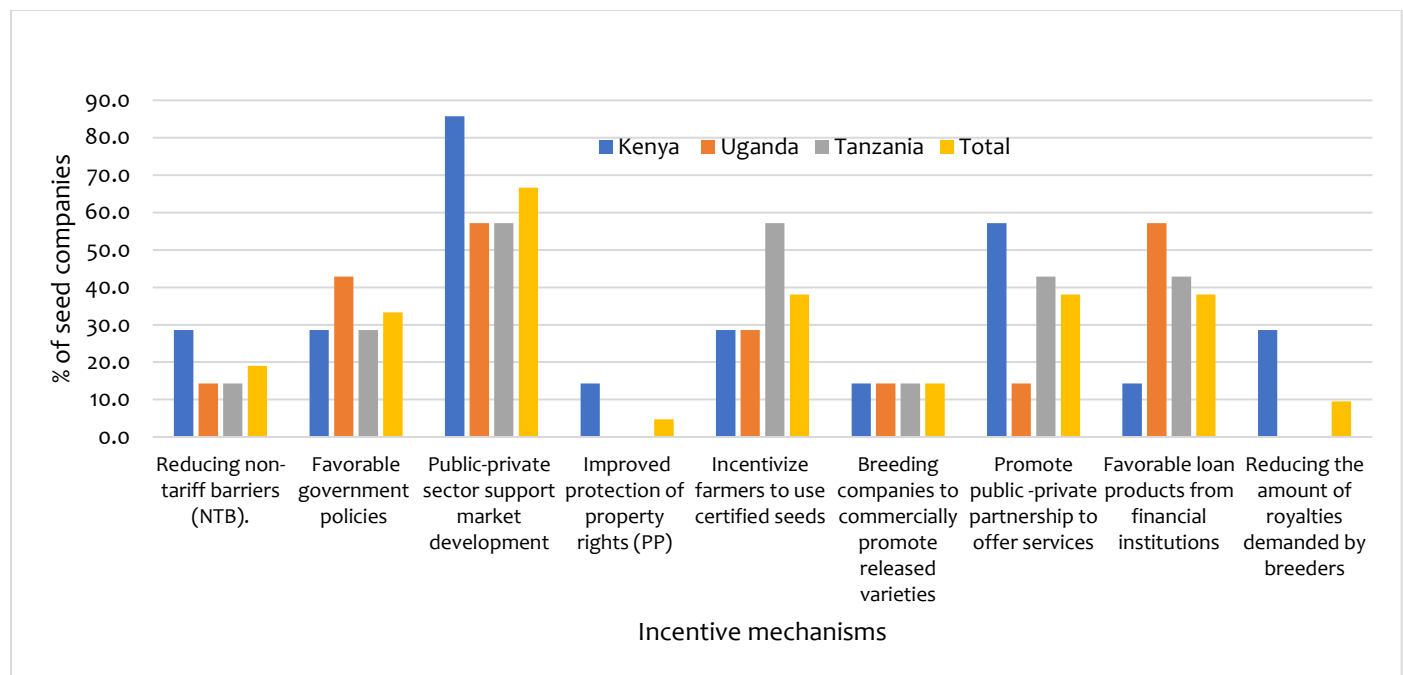


Fig. 2. Incentives needed by seed companies to expand crop-seed portfolio.

4.7. Impact of COVID-19 on seed business

Globally, the COVID-19 pandemic has disrupted the agriculture sector value chains because of the control measures undertaken by the government as indicated by 76% of the seed companies (Fig 3).

These measures have led to disruption in flow of inputs and output to markets. This section assesses the impact of COVID-19 and the accompanying government containment and control policies on seed business in East Africa. In addition, about 67% of seed companies alluded that COVID-19 reduced the production and traded seed volumes due to lack of customers.

In addition, the pandemic reduced the likelihood of obtaining financial credit for expanding seed businesses. Financial institutions are hesitant to lend, especially to sectors considered more vulnerable to the pandemic such as seed industry participants. Seed companies indicated that they had experienced a reduced cash flow (67%), increased cost of production (62%), inability to promote products due to restricted movement in the country and reduced government support to agriculture (10%). About 30% of the seed companies experienced shortages of productive inputs (e.g., fertilizers, improved seeds, crop chemicals etc.) and labor since COVID-19 pandemic directly affected sourcing of inputs, planting, and harvesting and raising wages for workers engaged in seed production. The casual farm labor force was reduced significantly due to measures to contain the virus, such as travel restrictions, bans and quarantines (Fig. 3).

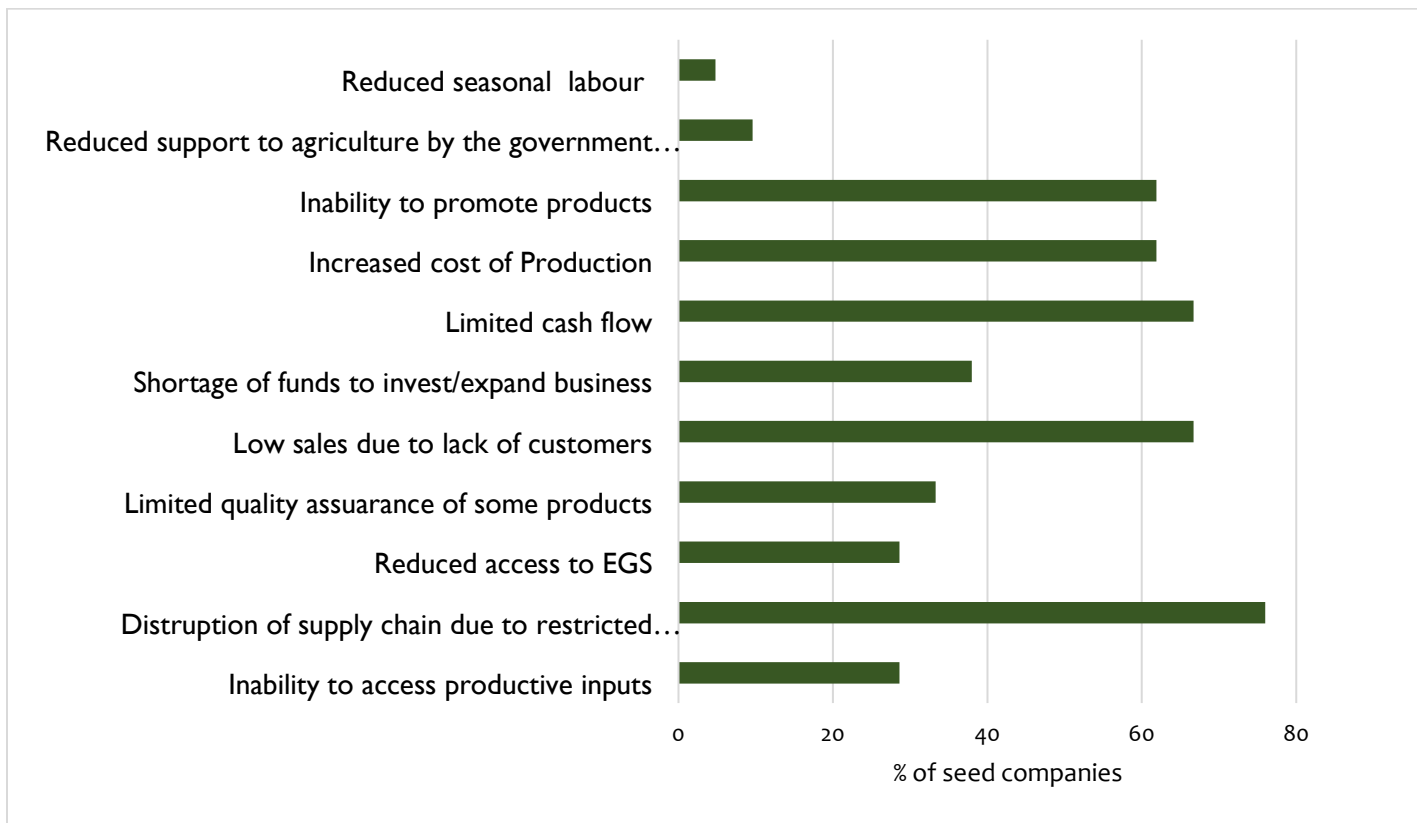


Fig. 3. Impact of COVID-19 on seed business in East Africa.

Several companies employed various means of coping with the impact of Covid-19. Most companies followed ministry of health (MOH) guidelines, such as social distancing, masks to staff and sanitizers, staff shift work, and working from home while leveraging remote and virtual technology (e.g., Microsoft Teams, Skype, video conferencing) to engage with customers, and working with intermediaries such as agro-dealers more closely (Fig 4). Some companies postponed unnecessary expenditures, for example some companies stopped recruiting new staff to expand the business

operations during Covid-19. Such investments have been pushed to the future to reduce operation costs and reduce the number of staff.

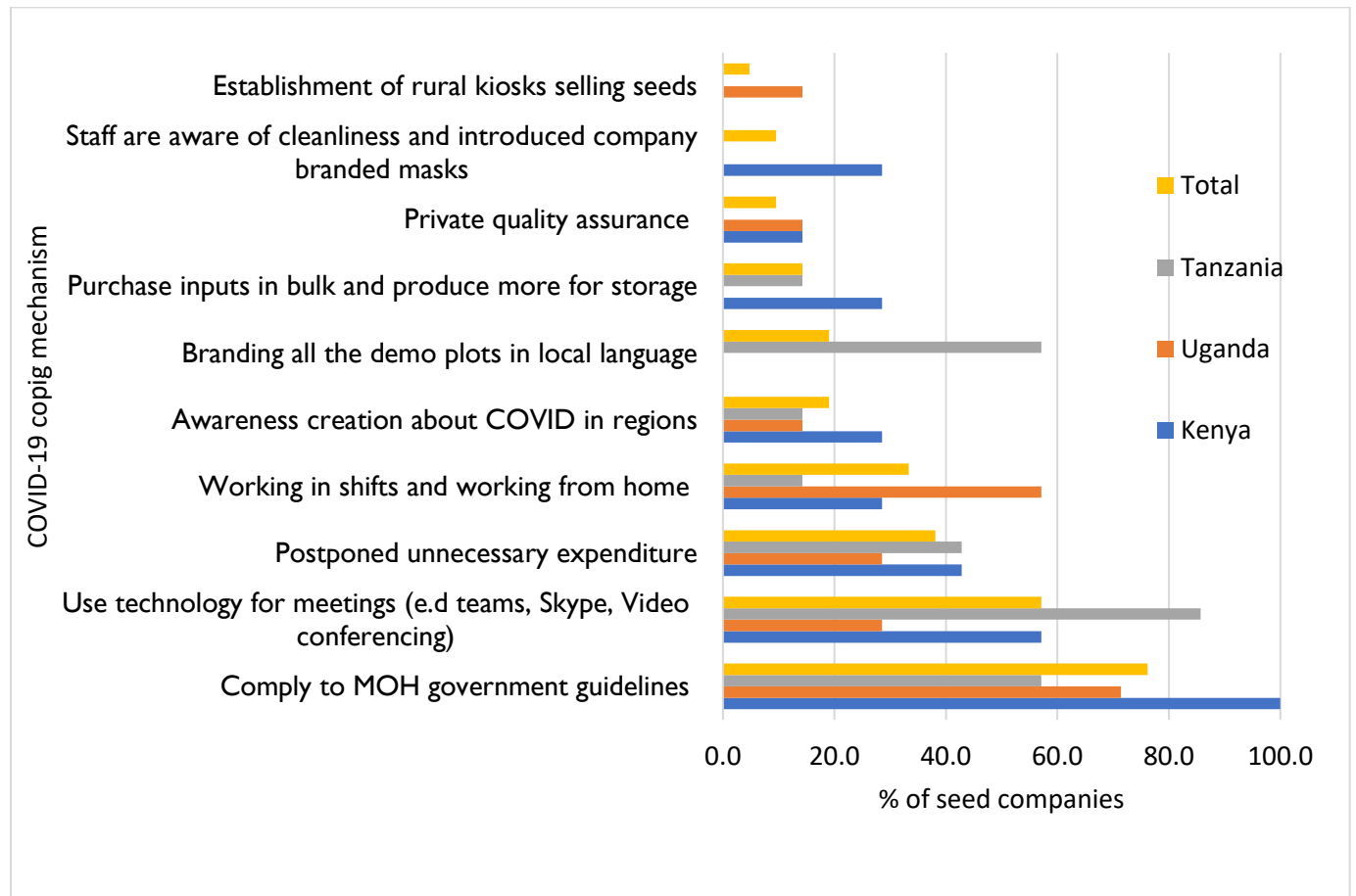


Fig 4. Covid-19 coping mechanisms used by seed enterprises in Kenya, Uganda, and Tanzania.

Four regional seed companies in Tanzania branded all the demonstration plots in the local language. The branding contained all the information about the variety and company staff did not need to explain to the public/farmers visiting the demonstration plots and helped to reduce contact with the farmers/public during COVID 19 pandemic. Branding helped seed companies save cost and the time required of employing staff standing at the demo plots all the time. While in Uganda, a large local company⁹ established seed kiosks in rural areas with limited access to input sellers to increase access to seed by rural farmers. The kiosks were semi-permanent structures fabricated by the seed companies and distributed in the rural areas and stocked with mainly maize and beans seeds. The kiosks were mainly operated by female youth selected by the farming communities and contracted by seed company to sell certified seeds and other inputs to farmers located within their communities. The youth and women operating kiosks were trained in agronomy, business management skills and product knowledge before the kiosks were permanently transferred to them. This a promising model to increase seed access at last mile for increased crop productivity and enhance food insecurity.

⁹ Equator Seeds Ltd.

4.8. Partnership to achieve impact in seed sector

Partnership is recognized in sustainable development goal (SDG) 17 as a way to realize prosperity and fight poverty and food insecurity in the world. Seed companies emphasized partnerships among seed sector stakeholders to enhance the efficiency and deliver quality seeds to smallholder farmers in SSA. The partnerships are needed not only to incentivize seed companies to expand crop-seed portfolio for the benefit of farmers but also to be able to cope up with the impact of pandemics and shocks. The partnerships needed by seed companies are summarized in Table 10.

Partnerships are needed to commercialize released varieties, link farmers to insurance and financial institutions, support market development strategies, and for developing and releasing new varieties. Most seed companies are not able to release varieties on their own because the process of is cumbersome and expensive especially to small seed companies with limited capacity or knowledge. This requires partnerships with local and international agricultural research centers (CIMMYT, ICRISAT, CIAT, IITA, etc.). Seed companies expressed desires to strengthen collaboration with Alliance for a Green Revolution in Africa (AGRA) on policy matters, and with NGOs and private organizations to support their market development strategies with county and national governments as well as NGOs for farmer training and extension services and to provide information about biotic and abiotic stresses.

Table 10. Partnerships needed by seed companies to improve seed system.

Partnerships needed by seed companies	Kenya	Uganda	Tanzania	Average	Rank
Local and international research centers (NARS, CIAT, ICRISAT, CIMMYT) to commercialize released varieties	100.0	57.1	14.3	57.1	1
Insurance and finance institutions	71.4	57.1	14.3	47.6	2
Organizations and NGOs to support market development, scaling of varieties and work with women farmers (e.g., AGRA, Kenya Market Trust, CGIAR etc.).	85.7	28.6	14.3	42.9	3
Local and international research centers to develop, trial and release new varieties	42.9	42.9	28.6	38.1	4
Government to provide extension and training services to farmers	28.6	14.3	57.1	33.3	5
Government to provide information about pandemics and shocks (Covid-19, desert locusts)	42.9	14.3	28.6	28.6	6
Organization working on national and regional policy	42.9	0.0	0.0	14.3	7
Seed companies partner to share experience	0.0	14.3	28.6	14.3	7

5. Conclusion

Smallholder farmers in Sub-Saharan Africa (SSA) need sustainable access to quality seeds of a variety of crops to not only improve their incomes, food, and nutrition security, but also to help them absorb shocks, adapt to shocks, and build transformative capacity. The formal seed system is often unable to meet the demand for quality seeds. Seed companies often consider a wide range of factors before introducing a new crop-variety into their product portfolio for commercialization. This study attempts to better understand how seed companies could be incentivized to broaden their crop portfolio to increase access to quality seeds at the last mile. Based on the study findings, the following recommendations are suggested:

1. Seed companies should collaborate with other actors to develop market development strategies, provide training and extension services to stimulate demand for certified seeds among small scale farmers. These partnerships can be done with CGIAR (e.g., CIMMYT, ICRISAT, CIAT, IITA), AGRA, and CSOs and NGOs working on market development, among others.
2. Seed companies can diversify their crop-seed portfolio to increase access to quality seeds at the last mile with appropriate incentives. The seeds companies would be motivated to expand their portfolio if varieties are able to respond to the needs of the clients e.g., availability of early maturing, drought resistant/tolerant, highly nutritious varieties, and resistance to emerging pests, such as MNLD.
3. Seed companies and other seed industry stakeholders should strive to remove barriers to expand crop-seed portfolio and increase access to quality seeds at the last mile. Major barriers include high cost of seed certification, lack of enforcement of regulations and policies, poor business environment and limited internal capacity of the seed companies, as well as seed companies' internal capacity and costs to conduct market research.
4. Seed companies should expand delivery options to reach new customers at the last mile e.g., supporting establishing seed kiosks in remote rural areas, targeting youth and women entrepreneurs for job and income opportunities.
5. The seed import and export system should be enhanced by reviewing policies that limit seed exchange across borders. Cross-border trade is curtailed by long wait times and high costs of processing export documents. Currently, the seed importation process takes on average seven days to import seed into Kenya, fifteen days into Uganda, and twelve days into Tanzania. These factors mean that few traders directly venture beyond the borders and would rather stop at the border points.
6. COVID-19 negatively affected the seed business in East Africa and the government should support seed companies to bounce back by providing tax incentives. At the same time, seed companies should prioritize in-country seed production, integrate technology into seed businesses, diversify into other businesses, range products to spread risks, achieve better utilization of their assets, or smooth out seasonal cash flows; all of which will make them better prepared for future pandemics and shocks.

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7. Annexes

Annex I. Tables and figure

Table 1A. Reasons for changing crop portfolio

	Country			Type of company %		Total
	Kenya	Uganda	Tanzania	Large	Small	
Increasing crop -seed portfolio						
High demand/sales	43%	62%	66%	44%	74%	58%
Easy to produce	4%	23%	10%	2%	26%	13%
Attract higher prices	0%	27%	3%	0%	23%	10%
Low competition	4%	4%	14%	5%	11%	8%
Company is expanding its portfolio	39%	27%	59%	28%	60%	42%
Decreasing crop-seed portfolio						
Low demand/sales	80%	19%	67%	38%	50%	45%
Expensive to produce	20%	6%	8%	8%	10%	9%
Attract low prices	0%	0%	17%	0%	10%	6%
Many competitors	0%	0%	8%	8%	0%	3%
Company is down sizing	0%	0%	0%	0%	0%	0%
Replacing old varieties	0%	56%	0%	54%	10%	27%

Table 1B. Number of varieties decreased or increased in the company's portfolio #.

	Country			Type of company		Total
	Kenya	Uganda	Tanzania	Large	Small	
<i>Crops increased in the company portfolio</i>						
Beans	3	19	8	10	20	30
Cowpea	0	1	0	0	1	1
Maize	11	16	14	23	18	41
Rice	0	7	0	2	5	7
Sorghum	3	5	1	4	5	9
Soybeans	0	2	2	1	3	4
Sunflower	2	0	3	4	1	5
<i>Crops decreased from the company portfolio</i>						
Beans	1	3	3	1	6	7
Cowpea	2	-	-	0	2	2
Green gram	-	1	-	1	0	1
Groundnuts	-	1	-	1	0	1
Maize	1	6	6	6	7	13
Rice	-	3	-	3	0	1
Sorghum	-	-	1	0	1	1
Soybeans	-	-	2	0	2	2
Sunflower	-	1	-	1	0	1

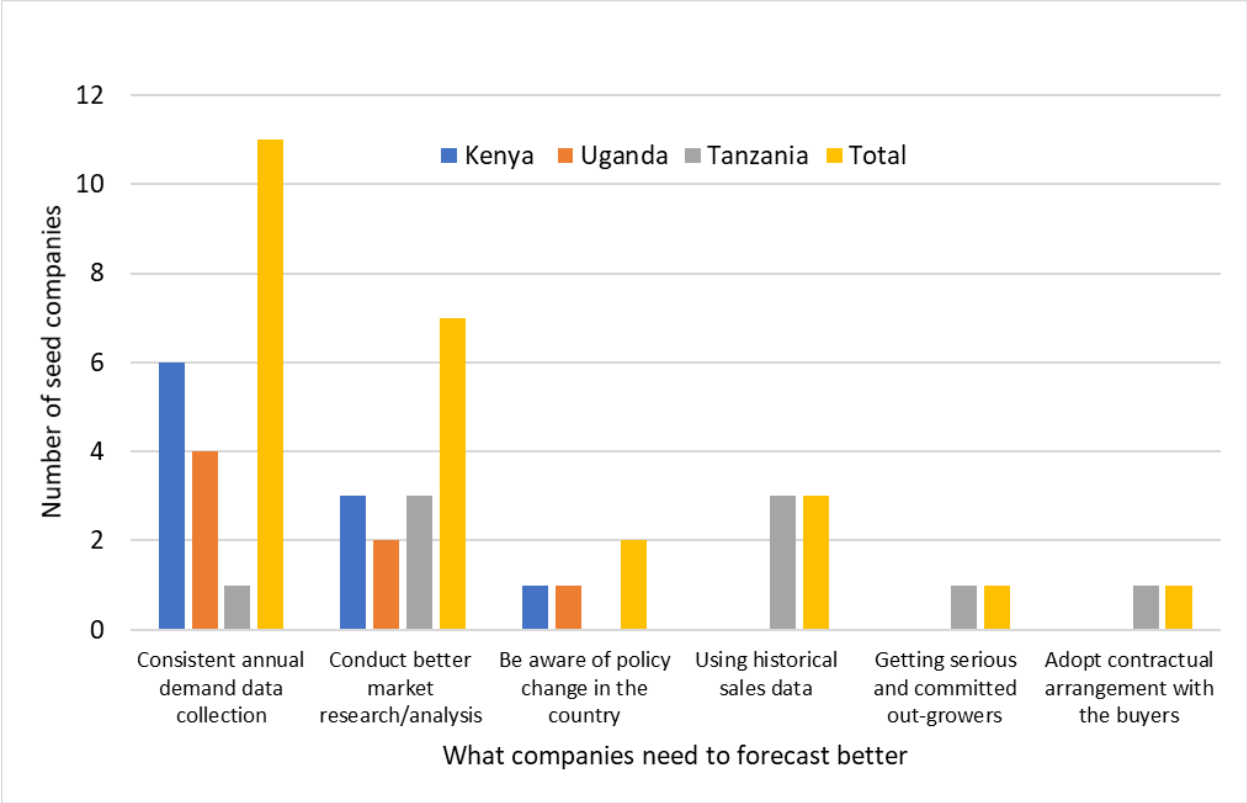


Fig 1.A. What seed companies need to conduct seed demand forecasting better.



Annex II. Survey Instrument



Interview Guide Final Version August 12.pdf

Incentives to Expand Crop Portfolio for Private Seed Companies: A Global Case Study

Section A. General information

This section requests about general information about your company, crops you produce and sell and import/export business.

1. Contact person for future correspondence:

- a. Name: -----
- b. Email: -----
- c. Phone number: -----
- d. Skype ID: -----
- e. Country-----

2. Company details:

2a Name of the company		
2.b Location of the company (HQ)		
2.c Number of branches	In the county _____	Outside the country _____
2.d Type of Company	0= International/Multinational 1= Regional 3=Local company	
2.e Number of employees	_____	
2.f Number of years in business	_____	

3. Which crops and varieties are you currently producing and selling?

No.	Crops	Variety 1	Variety 2	Variety 3	Variety 4	Variety 5
1						
2						
3						
4						
5						
6						
7						

Note: Add columns and rows as appropriate.

4. Export and import of seeds

4.a Type of international business	4.b. 1 =Yes; 0=No	4.c If YES, where do you export to/import from	4.d Which top three crop seeds do you import or export?		4.e Which top three varieties do you import or export?		
					Variety 1	Variety 2	Variety 3
1. Export			Crop 1	-----	-----	-----	-----
			Crop 2	-----	-----	-----	-----
			Crop 3	-----	-----	-----	-----
2. Import			Crop 1	-----	-----	-----	-----
			Crop 2	-----	-----	-----	-----
			Crop 3	-----	-----	-----	-----

Section B. Crop Portfolio

In this section, we request you provide information about how you decide to increase crop portfolio, factors you consider in business decision-making, challenges and how you do seed demand forecasting.

5. Has your crop-seed portfolio you introduced as new businesses changed in the last 7 years? 1=Yes 0 No; if yes please complete the Table below.

5.a Which crop seeds have you increased in the last 7 years?	5.b Which three varieties have you increased?	5.c Why did you increase or introduce these crops and varieties from your portfolio? (Use Code 5 below for this question)
Crop 1	Variety 1 _____	
	Variety 2 _____	
	Variety 3 _____	
Crop 2	Variety 1 _____	
	Variety 2 _____	

	Variety 3 _____	
Crop 3	Variety 1 _____	
	Variety 2 _____	
	Variety 3 _____	
Crop 4	Variety 1 _____	
	Variety 2 _____	
	Variety 3 _____	

Code 5: 1= High demand/sales 2=Easy to produce 3=Attract high prices 4= Low competition 5=Company is expanding its portfolio 6=Others specify _____

6. Has your crop - seed portfolio decreased in the last 7 years? 1=Yes 0 No, If Yes, please complete the Table below.

6.1 Which crops have you decreased in the last 7 years?		6.2 Which three varieties have you decreased?	6.3 Why did you decrease or remove this crops and variety from your portfolio? (Use Code 6 below for this question)
Crop 1	-----	Variety 1 _____	
		Variety 2 _____	
		Variety 3 _____	
Crop 2	-----	Variety 1 _____	
		Variety 2 _____	
		Variety 3 _____	
Crop 3	-----	Variety 1 _____	
		Variety 2 _____	
		Variety 3 _____	
Crop 4	-----	Variety 1 _____	
		Variety 2 _____	
		Variety 3 _____	

Code 6: 1= Low demand/sales 2=Expensive to produce 3=Attract low prices 4= Many competitors 5=Company is downsizing 6=Others specify _____

7. Please indicate what kinds of cost-benefit analyses did you need to do / or conduct before you entered / expanded into a new crop-seed technology/seed business?

8. What are the key challenges you are facing in broadening your crop portfolio?

8.a What are key challenges/barriers you are facing in broadening your crop portfolio? (Please choose appropriately)	8.b Explain the barrier chosen (e.g why the barrier exists)	8.c How do you circumvent/reduce bottleneck/barrier?	8.d What is the cost of producing 1kg of certified seed of your three main crops	
1=High cost of seed certification			<i>Crop</i>	<i>Cost</i>
			1	
			2	
			3	
2=Limited access to Early generation seed (EGS)				
3=Seed registration				
4= Poor policy enforcement				
5= Poor business environment				
6= Plant Variety Protection Acts not favoring seed companies				
7= Weak internal capacity				
8= High incidence of fake seeds				
9= Other, specify				



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- 9. How do you conduct seed demand forecasting for your markets and operations? What challenges do you face in seed forecasting?**

Section C. Incentive Mechanisms

This section comprises of questions related to incentives and what you would like partners to support you with to expand your business to include multiple crop variety combinations.

10. What incentives do you need to expand your crop seed-portfolio choices? What would help you to expand your business to include other non-maize, and non-hybrid crop varieties?

11. What can the sector (donor partners; government, policymakers; National seed associations (NSA) etc) do to facilitate your business expansion to include multiple crop-variety combinations?

12. What kind of partnerships would you seek that might help to improving crop-portfolio and increases access to quality seeds by famers?

Section D. Impact of COVID19 on Seed business

In this section, we would like to know how COVID-19 has affected your seed business and coping strategies you have used to mitigate the effects.

- 13. What has been the effect of Covid-19 on your business operations?
 - 1=Inability to access productive inputs
 - 2=Disruption of supply chain/logistics due to restricted movement
 - 3=Reduce access to early generation seed (EGS)
 - 4=Led to limited quality assurance of some of the products
 - 5=Low sales due to lack of customers
 - 6=Shortage of funds to expand business
 - 7= Limited cashflow
 - 8=Increase cost of production
 - 9=Others Specify_____

- 14. What are some of your COVID 19 coping mechanisms you have adopted to adapt to the crises?

- 15. What have you learnt that you will incorporate in your business operations to be better prepared for pandemics and external shocks (that are outside of your control)?

- 16. Any suggestions / recommendations for other actors – like government to help seed companies prepare for such pandemic?

- 17. What kinds of partnerships might help seed companies like yours to sustain external shocks and crises such as disease outbreaks, extreme climate change, war/conflicts etc?

