

An analysis of the challenges of the maize seed industry in eastern and southern Africa

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Contributed Paper prepared for presentation at the International Association of Agricultural Economists Conference, Beijing, China, August 16-22, 2009

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Abstract

The liberalization and restructuring of the seed sector in eastern and southern Africa (ESA) during the past two decades have witnessed a proliferation of private seed companies in the maize seed industry (Hassan *et al.*, 2001; Lemonius, 2005). Although the total number of registered maize seed companies increased from 8 and 11, respectively, in 1997 to 40 each, the quantities of seed marketed barely doubled, increasing from 23,000 and 27,000 tons to 53,000 and 51,000 tons, respectively; an indication that the reforms are insufficient in ensuring efficient functioning of the sector in the two regions. A study involving 117 seed providers, representing 92 percent of all registered maize seed companies in ESA in 2007 identified bottlenecks that have differential impacts on the establishment and operation of a seed company, seed production and processing, seed marketing and demand, and seed policy in the two regions. To promote growth and development of the maize seed industry, it is imperative for a coordinated intervention effort by both public and private sector players to address the various bottlenecks. The collection, processing, dissemination and management of information on varietal release and adaptation remain vital in ensuring success of the coordinated effort.

Keywords: Maize seed industry, seed policies, eastern and southern Africa

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1. Introduction

The demise of the African seed industry has been of a major concern to policy makers over the years. Tripp and Rohrbach (2001) blame it on the seed sector regulatory framework that favors parastatal enterprises in the past decades as well as government and donor projects that provide seed to farmers for free or at subsidized prices. Recent attempts by African governments to deregulate the seed sector have resulted in the proliferation of private seed companies. Today, there are 80 seed companies compared to only 19 a decade ago (Hassan *et al.*, 2001; Langyintuo *et al.*, 2008). Despite a four-fold increase in the number of seed companies, the 103,600 tons of seed marketed in 2006/07 compared with 49,000 tons in 1996/97 seems to suggest that the reforms are insufficient in ensuring efficient functioning of the seed sector.

The rapid deployment of a new variety can only be guaranteed if the seed industry is functioning efficiently. Except in a few countries in Africa (e.g. South Africa), the functioning of the seed sector leaves much to be desired. In the past two decades, the seed sector was strictly regulated, allowing only public sector research, foundation seed production and certification of seeds while inhibiting the participation of the private sector (Rusike and Eicher, 1997; Rusike and Smale, 1998; Tripp, 1998; Tripp and Rohrbach, 2001). In the 1980s and 1990s, many countries made significant progress in liberalizing and restructuring their maize sectors (Hassan *et al.*, 2001). Nevertheless, the seed sector is inefficient, clearly demonstrated by the fact that, whereas the total number of seed entrepreneurs have increased by almost four times between 1997 and 2007, seed produced and marketed merely doubled and the additional maize area under improved seed increased by less than 10 percent (Hassan *et al.*, 2001; Langyintuo *et al.*, 2008).

To provide a better understanding of the factors currently affecting the maize seed industry in eastern and southern Africa, this study was undertaken in 2007 involving nearly all seed companies and all national Agricultural Research Organizations (NARO), Community-Based Organizations (CBOs), and Non-Governmental Organizations (NGOs) promoting seed production in eastern and southern Africa (ESA). Specific objectives of the study were to characterize maize seed production organizations, and identify the bottlenecks hampering the efficient production and deployment of maize seeds to farmers in ESA. The rest of the paper is organized as follows: Section 2 describes the sources of data used in the analysis. The results and discussions are presented in Section 3. Section 4 draws some policy implications of the results while Section 5 presents some concluding remarks.

2. Data sources

Data for the analysis were collected from a total of 117 seed providers made up of 82 maize seed companies (representing 92 percent of all registered maize seed companies), 10 NAROs and 25 CBOs/NGOs in Angola, Ethiopia, Kenya, Malawi, Mozambique, Tanzania, Uganda, Zambia and Zimbabwe (Table 1). Of the seed companies interviewed, 57 percent were private national seed companies, 17 percent regional seed companies, 21 percent multinational seed companies, and 4 percent public seed companies. Interviews were conducted between January and July 2007 by CIMMYT and NARO scientists using structured questionnaires. Response rate was 100 percent.

[Table 1 about here]

3. Results

3.1 Estimated seed supply by seed providers in eastern and southern Africa

Seed provision in Africa can be categorized into the formal and informal (local or traditional) seed systems (Tripp, 2001; Sperling and Cooper, 2003). Whereas the formal seed system is dominated by seed companies and generally governed by seed laws, the informal system of seed provision is carried out mainly by farmers, CBOs and NGOs with limited access to institutionalized mechanisms for quality control or seed delivery.

During the 2006/07 crop season, an estimated 103,600 tons of improved maize seeds were marketed in Angola, Ethiopia, Kenya, Malawi, Mozambique, Uganda, Tanzania, Zambia and Zimbabwe enough to cover 35 percent of the maize area of 12 million ha at a seeding rate of 25 kg ha⁻¹ (SeedCo, 2003) (Table 1). Seed companies accounted for 96 percent while the NAROs and CBOs/NGOs accounted for the remaining 4 percent and the average annual production per company estimated 1,390 tons. This indirectly implies that everything being equal, an additional 140 companies to meet the regional demand for maize seeds. The major reasons for the low productivity levels per company are discussed below.

3.2 Bottlenecks affecting the maize seed value chain in eastern and southern Africa

A number of institutional bottlenecks affect the entire maize seed value chain viz: (a) seed policy environment; (b) establishing and managing a seed company; (c) seed production and processing; (d) marketing and distribution; and (e) farm level demand. More than a third of the respondents consider production bottlenecks as the dominant constraint followed by policy constraints (Figure 1). More than a third of the respondents consider production bottlenecks as the dominant constraint followed by policy constraints. Seed company establishment and marketing bottlenecks ranked third and demand fourth. Each of these bottlenecks is discussed in detail below.

[Figure 1 about here]

3.2.1 Seed policy environment

Notwithstanding reforms in the seed sector in the past two decades to stimulate the development of private sector activities (SSSN, 2006), the maize seed production and deployment environment still faces policy related challenges such as: (i) unfavorable seed policies, (ii) lengthy variety release procedures, and (iii) controlled seed markets such as price fixing (Figure 2). More than a third of the respondents consider production bottlenecks as the dominant constraint followed by policy constraints. Seed company establishment and marketing bottlenecks ranked third and demand fourth. Each of these bottlenecks is discussed in detail below.

[Figure 2 about here]

Few countries have comprehensive and functioning legislation to support the seed sector. In Angola and Malawi, the Seed Act is either not fully implemented or outdated (Goncalves, 2001; Langyintuo, 2004; Lemonius, 2005). The lack of plant variety protection legislation in Angola, Malawi and Uganda and International Seed Testing Association and the OECD Scheme

for the movement of seed in international trade accreditations in Angola, Ethiopia, Mozambique, Tanzania, and Uganda are major obstacles just as taxation and import restrictions in Zimbabwe.

Varietal registration ensures establishing the genetic identity of a variety, and testing its performance. The process has the potential of enhancing public welfare by discouraging the release of germplasm that are inappropriate, unproductive, or unsafe but the design and implementation of the registration scheme is often problematic (Tripp, 1998). In theory, a new variety undergoes an official National Performance Trial (NPT) test in several locations in the country for two to three years and a Distinctness, Uniformity and Stability (DUS) test is conducted in parallel or subsequently. In practice, however, the process often takes longer due to problems such as lack of sufficient breeder seed, limited resources, poor performance of trials due to drought, and failure of the breeders to raise money to pay for the testing. The fee that the variety owner must pay for both tests varies from country to country but in the range of USD1000 to USD1500 per entry. In general, it takes 2.5 years on average and up to seven years to have a variety released and a further two to four years before farmers get the new variety in their fields (Table 2).

[Table 2 about here]

3.2.2 Establishing a seed company

At the regional level, the bottlenecks affecting the setting up and running a seed company are (i) high initial investment costs (44 percent), (ii) lack of qualified manpower (33 percent), and (iii) lack of access to operational credit (23 percent) (Table 3). High investment cost is a particularly important bottleneck in all the selected countries except Angola, Tanzania and Uganda. In Tanzania, Uganda and Zambia seed companies complain about lack of access to qualified manpower (breeders and agronomists) due mainly to staff attrition and death through HIV/AIDS to meet the increased demand. In Mozambique and Zimbabwe, lack of access to credit for operations is equally important as investment costs.

[Table 3 about here]

3.3.3 Seed production and processing

As detailed in Table 3, seed production bottlenecks are (i) lack of access to suitable germplasm (35 percent), (ii) technical constraints (40 percent), and (iii) lack of production credit to pay for the husbandry practices and processing the seed (18 percent). In the choice of germplasm for seed production, care has to be taken in selecting a reliable one that fits the defined agro-ecology the company wants to serve in order to survive in the increasingly competitive seed market (Pandey, 1998; Agrawal *et al.*, 1998).

The lack of access to germplasm claim by some of the seed companies in these countries relate to NARO germplasm. Over 80 percent of them complain that it is either difficult or very difficult to have access to NARO germplasm. Even if seed companies are licensed to market NARO germplasm, they are restrained by the lack of breeder and foundation seed as they cannot get the parental lines to produce the seed themselves. None of the seed companies, CBOs/NGOs NARO thought that it was difficult to access CIMMYT and IITA centers germplasms.

Figure 3 shows that lack of production infrastructure, unfavorable land policies, poor climatic conditions, and field pests and diseases are the main technical constraints to seed

production. Seed companies often contract farmers to grow seed mostly under rain-fed conditions thereby exposing the crop to variable rainfall conditions and lower seed yields (Agrawal *et al.*, 1998; Langyintuo, 2004). Additionally, seed companies face contractual problems such as the difficulty in achieving isolation distances of 200 – 400m to ensure genetic purity and seed quality, side selling of seed to competitors by farmers, and outlays in training, developing agreements, inspecting and transporting seed. Indeed maintaining a strong contract-grower base is among the most significant challenges for most seed companies in all the countries and ultimately results in lower seed availability and higher seed production costs.

[Figure 3 about here]

3.2.4 Seed marketing and demand

In general, maize seed is environment-specific in the sense that the same seed often performs differently from one location to another, from one season to the next and under different management levels (Krull *et al.*, 1998). Seed retailing faces problems such as poor road networks (45 percent), limited access to transportation facilities (33 percent), and poorly established storage infrastructure in the rural areas (22 percent). Typically, seed markets are characterized by large number of small buyers, none of whom accounts for a significant proportion of a seed company's overall sales volume (Krull *et al.*, 1998). Poor road networks, limited transportation facilities and the fact that every negotiated exchange involves considerable transaction costs, seed companies retail a bulk of their seeds through agro-dealers, NGOs, retail chain stores and government agents notwithstanding problems such as (i) lack of knowledge on varietal characteristics, (ii) lack of credibility on the part of some agents, (iii) adulteration of seed, and (iv) poor storage facilities (Table 4). There may be various layers of distributors and as the chain gets longer, the information about the variety or management practices get diluted or lost completely by the time it gets to the farmer.

When seeds are delivered on consignment¹ basis, some retailers are reluctant to remit proceeds from the seed sales to the companies. Related to the delivering of seeds on consignment basis, some retailers are known to willfully adulterate the seed by opening the seed packs, taking out portions and mixing the rest with common grain, which consequently compromises on future sales but the survival of the company depends the sale of good quality seed (Krull *et al.*, 1998).

Agro-dealers often have poor storage facilities. In fact most of them store seed, fertilizer and other consumer goods side by side in the sun or humid conditions for extended periods thereby compromising on the quality of the seeds.

[Table 4 about here]

3.2.5 Farm level seed demand

The major problems seed companies identified as being the main limiting factors to their farm level seed sales are (i) low adoption rates (32 percent), (ii) poor extension coverage (25 percent), and (iii) difficulty in estimating seed demand (22 percent). Lack of insurance against drought risk is known to be an important demand side constraint. Seed companies consider (i) lack of awareness of the availability and value of existing varieties, (ii) high relative price of

¹ Seed companies deliver the seeds to agro-dealers to be sold on commission basis.

seed because of poor and uncompetitive grain prices, (iii) farmers' reluctance to change from their old practices, (iv) limited ecological adaptation of the seeds sold, and (v) lack of credit to buy the improved seed and/or complimentary inputs such as fertilizer, in that rank order as the main reasons why farmers buy limited quantities of improved seed.

4. Policy implications of the results

To recap, deregulating the seed sector in Africa has witnessed some positive improvement in private sector participation in the seed business. Over the past decade, there has been a four-fold increase in the number of seed companies engaged in the production and marketing of maize seeds but the average productivity levels for most of them leaves much to be desired. Notwithstanding the strides made in reforming the seed sector in ESA, more still needs to be done. Some of the tax policies are unfavorable and import/export restrictions exists in some countries. Variety release procedures are lengthy and breeder and foundation seed production often overregulated. They prove to be contra-productive to their purpose of fostering productivity increasing in farmers' fields as they unduly delay the deployment of new and more productive varieties to farmers.

The establishment of new seed companies is hampered by high investment cost, lack of manpower (especially breeders and agronomists), and lack of operational credit, while seed production is constrained by lack of access to suitable germplasm, production credit, and technical constraints such as poor climatic conditions, pests and disease, and unfriendly land policies. Major seed marketing problems include delivery constraints, and poor infrastructure. On the demand side, poor grain markets, poor extension services, and low adoption rates are challenges to increased seed sales.

4.1 Reforming seed policies and regulations

In order to provide a conducive seed production and deployment policy environment, the following recommendations are made:

- (1) Strengthening internal seed laws and regulations:** To police fake seeds and protect genuine seed producers and farmers, internal regulations to monitor seed purity should be strengthened. Several countries lack the legislative framework to deal with culprits. Where such frameworks exist, they seem outdated and penalties imposed (if at all) do not seem to be punitive enough to deter others and should therefore be revised.
- (2) Avoiding undue delays in the release of new varieties:** Governments urgently need to work towards reducing the time to actually release a new variety to no more than two years. This could be achieved by adopting the following: (i) carrying out the DUS tests alongside the NPT, (ii) using data generated by the breeders in the observational and advanced yield trials to support the NPT, (iii) updating the release criteria to take into account varieties with special traits (stress tolerance, nutritional value, improved seed production characteristics for lower seed costs, etc), (iv) making mandatory the availability of certain quantity of breeder seed a prerequisite before the release of the variety, and (v) between public and private sector actors, devising and enforcing an agreed roadmap that enables rapid variety release.
- (3) Facilitating access to public germplasm:** To promote branding and increased investment in advertising, it is important to grant exclusivity for public germplasm to seed companies through transparent tender processes. Seed companies should be empowered to manage or contract their own breeder and foundation seed production of public varieties.

- (4) **Regional harmonization of seed laws and regulations:** For rapid spillovers of varieties released in one country to similar agro-ecologies in different countries, the implementation of regional seed laws and regulations should be expedited. Regional seed laws and markets can lead to a drastic reduction in the time lag between the release of a variety in one country and its access by farmers in similar agro-ecology in other countries, more rapid seed availability of new varieties, and lower seed costs due to more competitive markets.
- (5) **Promoting seed production at the community levels:** Policies that prohibit the production and sale of seed by CBOs should be reviewed so that such seeds could be produced under minimal control and sold as “quality declared” or “truthful labeling”. CBOs should be linked to seed companies to overcome constraints associated with isolation distances, quality assurance, distribution, and marketing of seed.

4.2 Facilitating the establishment and operation of seed companies

To improve competition in the seed sector and hence better serve farmers, it is imperative to support the establishment of new companies, especially in countries where few companies exist. However, establishing and running a seed company can be limited by (a) high investment costs, (b) lack of qualified manpower, and (c) lack of access to operational credit. It is recommended that governments and development partners should be encouraged to provide entrepreneurs with long-term investment capital to start new companies and/or run existing ones.

Public sector engagement in providing applied long- and short-term training of seed companies’ staff in all aspects of a seed business is needed to address the lack of qualified manpower.

4.3 Maintaining efficient seed production and processing programs

Increasing average productivity levels of seed companies to at least 2,000 tons a year will decrease the number of additional seed companies required in the region by about 70 percent. This can be achieved through a combination of any of the following:

- (1) **Access to appropriate and adapted stress tolerant maize germplasm:** NARO and CG centers should be encouraged to make their germplasm distribution policies better known and more transparent to seed companies while seed companies, on their part, should also be open to cross-licensing of germplasm especially to CBOs. Governments should implement faster tender processes for public germplasm. Foundation seed production should be decentralized.
- (2) **Production of seed in areas with reliable rainfall or investment in irrigation facilities to minimize drought risk:** There is need for seed companies to invest in selected geographic areas that are suitable for seed production. If necessary, governments should be brought in to intervene in facilitating access to such lands. In addition, financing of the acquisition of irrigation facilities, processing and drying equipment can boost the more reliable and higher production of good quality seed.
- (3) **Education and training of contract growers in improved crop management:** Seed production is a specialized activity and poor seed crop management can lead to huge losses when rejected by the certification authorities. Building up a country’s number and qualification of contract growers through public and private partnerships for regular in-service training in good seed crop management practices, growers associations and accreditation schemes can greatly support increased quality seed production.
- (4) **Increased access to production inputs at affordable prices:** Access to inputs at affordable prices can enable the production of good quality seed at low cost and subsequently sold to

farmers at affordable prices. Registered seed growers may also be considered for smart subsidies to enable them produce seed efficiently.

- (5) **Access to production credit:** While making the effort to increase the awareness of traditional lending institutions of the need to support seed companies through demonstration of the economic viability of such operations, it is imperative to identify non-traditional financiers, e.g., donors interested in supporting rural development initiatives to provide soft loans to companies for seed production.

4.4 Improving seed marketing and distribution

Providing credit and training on the characteristics of varieties and good seed handling practices to agro-dealers that market a bulk of the seed but lack credit for efficient operations will boost seed sales and encourage more entrants into the seed retailing business.

4.5 Enhancing farmers' demand for improved maize seed

The adoption rate of improved maize varieties among smallholder farmers will improve through (i) enhanced extension message delivery to inform farmers of the nature and types of varieties as well as the economic benefits, (ii) targeted subsidy on inputs, (iii) improved access to credit, (iv) improved grain markets, and (v) improved retail networks.

5. Concluding remarks

The survey results suggest that a number of institutional bottlenecks hamper the smooth functioning of the maize seed sector in ESA. To address these bottlenecks and improve the efficiency of seed production and deployment to farmers will require a coordinated effort from policy makers, seed companies, seed trade associations, national research and extension organizations, NGOs, farmer organizations, credit institutions, sub-regional organizations and donors. The collection, processing, dissemination and management of information on varietal release and adaptation remain vital in ensuring success of the coordinated effort.

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Table 1: Estimated maize seed supply in 2006/07 in southern Africa by seed providers interviewed

Country	Number of seed providers interviewed			Estimated maize seed supply and demand, 2006/07				
	Private national seed companies	Regional/multinational seed companies	NARO and NGOs/CBOs ²	Maize area (1990-2007 average in Million ha)	Estimated seed demand (1000 tons) ³	Quantity of improved seed marketed in 2006/07 (1000 tons)		Adoption rate 2006/07 (as percent of maize area) ⁴
						OPV	Hybrid	
Eastern Africa	25	12	12	6.6	161.8	11.1	42.0	36
Ethiopia	7	-	6	1.7	42.4	2.0	6.2	19
Kenya	6	5	2	1.6	38.9	1.7	26.3	72
Tanzania	10	3	2	2.6	64.0	3.9	7.3	18
Uganda	2	4	2	0.7	16.5	3.5	2.2	35
Southern Africa	23	10	20	4.6	114.1	11.2	38.3	38
Angola	3	0	2	0.8	19.3	0.8	0.2	5
Malawi	2	2	6	1.4	35.3	5.4	2.5	22
Mozambique	12	2	2	1.2	30.3	3.1	0.2	11
Zambia	3	3	5	0.6	14.1	0.5	9.7	73
Zimbabwe	6	3	7	1.4	34.4	2.2	25.9	80
Whole region	48	22	32	11.2	275.9	22.3	80.3	37

Notes: ¹In parentheses represent number of companies observed in 1997 by Hassan *et al.* (2001).

²NGOs interviewed are those involved in seed production.

³Estimate based on area and planting rate of 25 kg/ha⁻¹.

⁴In parentheses were the adoption figures observed in 1997 by Hassan *et al.* (2001).

Table 2: Bottlenecks affecting the establishment of seed companies and seed production southern Africa (percent)

	Eastern Africa (n = 49)	Southern Africa (n = 58)	Whole region (n = 107)
Time to release a variety	2.6	2.1	2.4
Time for a released variety to reach farmers	2.1	2.4	2.3
<i>Seed company establishment bottlenecks</i>			
High investment cost	37	51	44
Lack of qualified manpower	37	28	33
Lack of access to credit	25	21	23
<i>Seed production bottlenecks</i>			
Lack of access to suitable germplasm	40	31	35
Technical constraints	38	42	40
Lack of access to production credit	12	23	18
Other	11	4	7

Table 3: Challenges seed companies face when selling seed through retail agents

Challenge	Retail agents (percent)			
	Wholesalers	Retailers	Government	NGOs
Lack of knowledge on varietal information	18	18	20	-
Poor storage facilities	9	28	20	5
Seed adulteration	10	9	-	5
Lack of credibility	31	22	27	64
Other	32	23	33	26

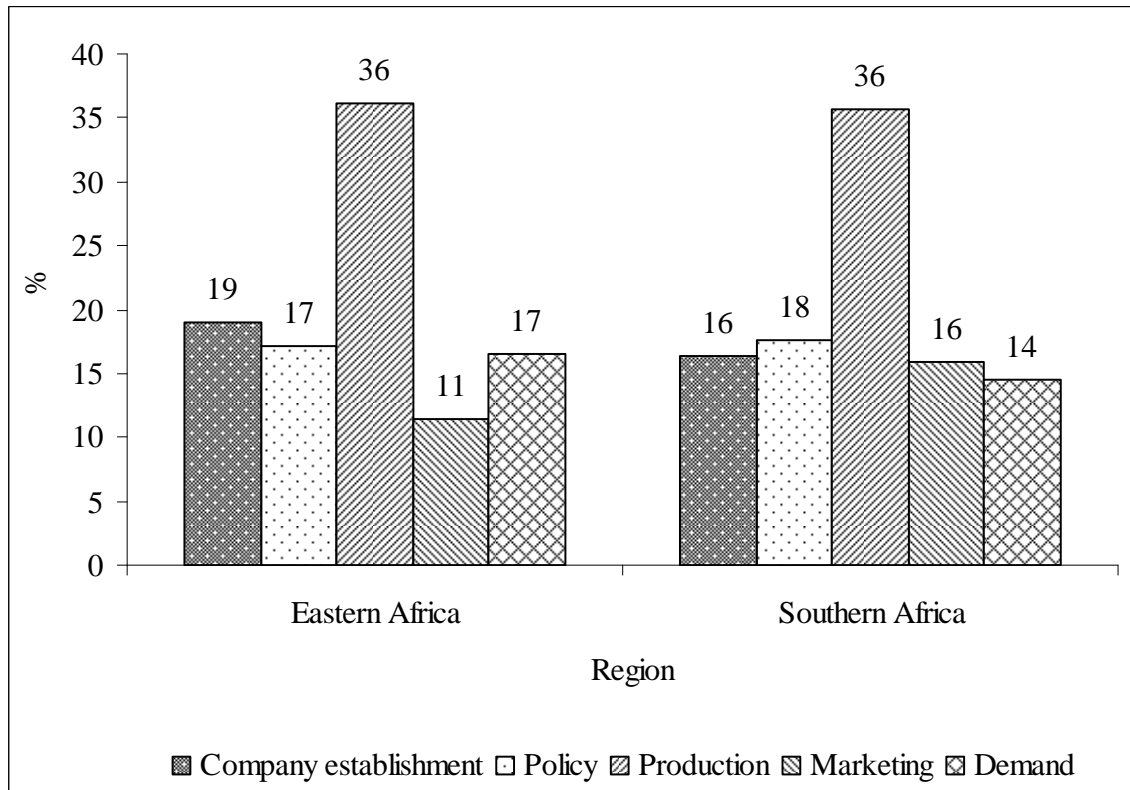


Figure 1: Bottlenecks to seed deployment in project countries in eastern Africa

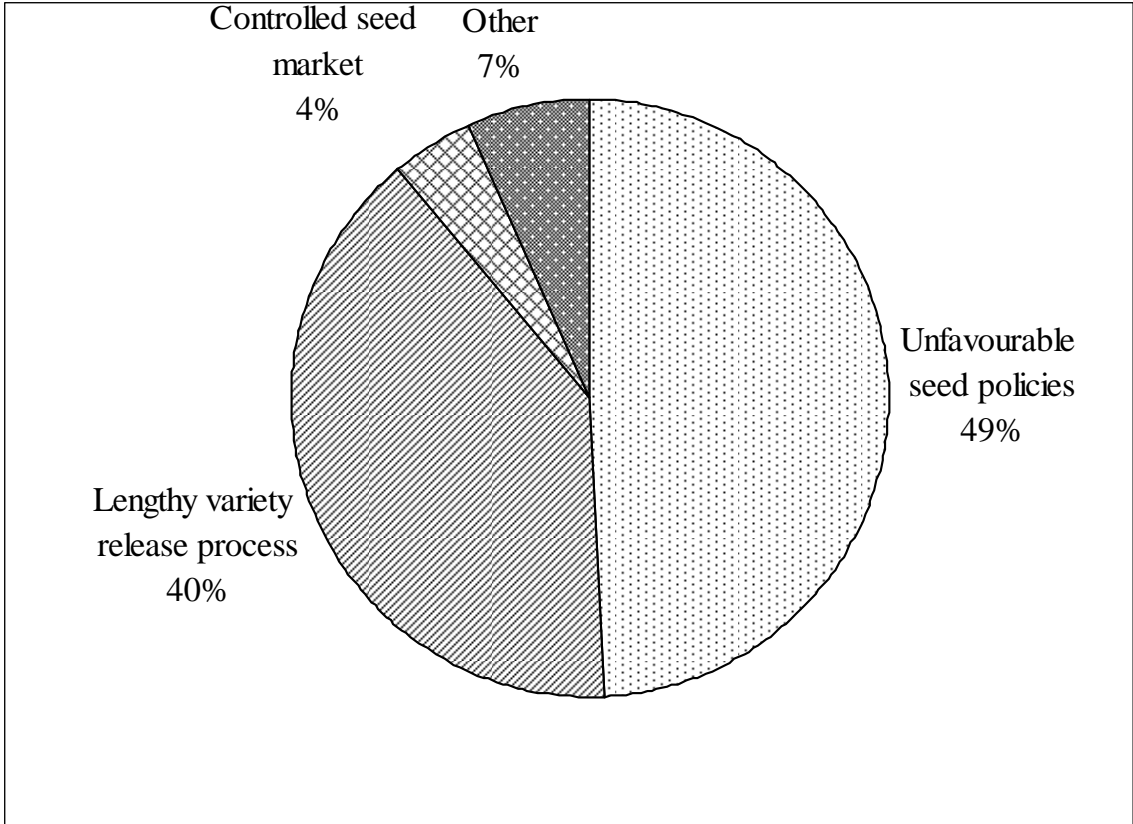


Figure 2: Major seed policy related bottlenecks hindering the production and distribution of seed in Africa

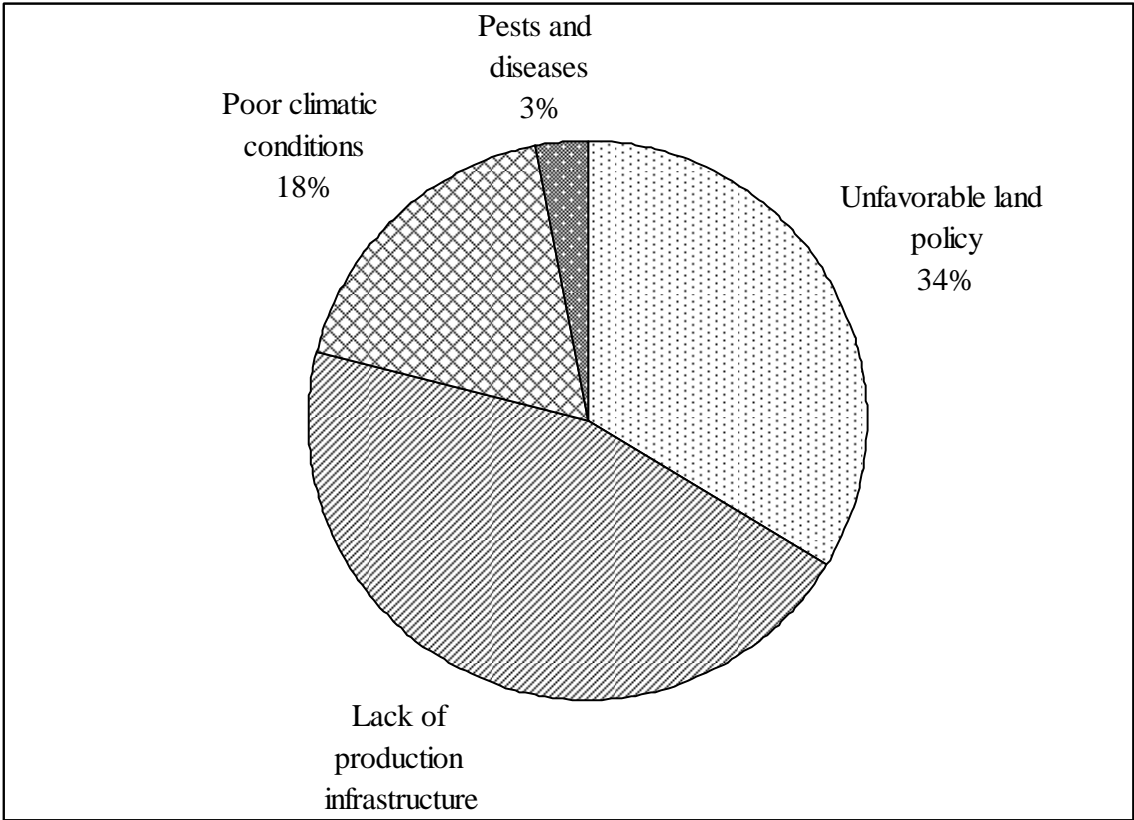


Figure 3: Production technical constraints to seed production in Africa