An analysis of the maize seed sector in southern Africa

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Abstract

Seed is an essential, strategic, and relatively inexpensive input to agriculture with a high rate of return on investment that often sets the upper limit for crop production. In southern Africa, a number of seed companies, farmers' associations and community based seed production systems are involved in the production and distribution of improved maize seed to complement farmer's own seed stocks. Notwithstanding the concerted efforts of these various seed providers, improved maize seed is still chronically unavailable at the farm level due mainly to production and distribution challenges broadly categorized as (1) farmers' circumstances, (2) institutional environment, (3) national and regional policy environments, and (4) climatic conditions. Using industry level survey data, this paper critically examines how these challenges impact upon seed provision and specifically highlights the fact that the dual role of seed as an input and a technology often overlooked by researchers complicates the determination of seed demand required for effective production planning. Drawing on the findings, the paper makes relevant policy recommendations necessary to enhance the provision of improved maize seed at the farm level.

1. Introduction

Maize is an important food crop in Southern Africa, accounting for 56% of the total harvested area of annual food crops (Figure 1) and 30-70% of total caloric consumption (FAOSTAT, 2004). Over the past two and half decades, (1980-2003), annual production averaged 17 million MT with very high seasonal variability on an estimated 11 million hectares. The trend in production was largely influenced by South Africa and Zimbabwe which together accounted for over 62% of the total maize output. Therefore, recent economic instability in Zimbabwe had significant impact on the regional maize production. Although total production appears to be increasing over time, per capita production has been decreasing at the rate of 0.1% per annum (Figure 2) partly due to unavailability of improved, high yielding maize varieties at the farm level. In their assessment of the utilization of improved varieties in the SADC region, Phiri et al (2003) observed that the adoption rates for maize varieties were generally low, ranging from 4% in Tanzania, 30% in Malawi, 45% in Zambia to 82% in Zimbabwe. Combining low yielding traditional varieties and improved high yielding varieties at various stages of recycling has contributed to the high fluctuations of mean regional yields about the long term (1980-2003) average of 1.6 mt/ha (Figure 3).

It is common knowledge that there are a number of complementary efforts by private and public institutions, and private individuals to provide seed to farmers yet we observe low levels of seed uptake at the farm level. Why the paradox? A cursory examination of the problem indicates that on one hand, most of the commercial maize varieties supplied mainly by the private seed companies are hybrids which are relatively expensive (compared with open pollinated varieties (OPV)) and suitable for optimal maize growing conditions – good water regimes and high soil fertility. This means that only resource endowed farmers and those with access to external finances can plant hybrids. On the other hand, the bulk of maize farmers in Southern Africa is resource poor with limited access to external financial resources and operates in marginal areas that are characterized by frequent drought stress and low soil fertility. Such farmers lack the financial resources to purchase inorganic fertilizers which have become very expensive and

beyond their reach. This suggests that the varieties on the market are not necessarily suitable for the majority of the farmers.

Recognizing this problem, CIMMYT breeders and their national agricultural research services (NARS) collaborators through the Southern African Drought and Low Soil Fertility (SADLF) Project (which is jointly funded by the Swiss Agency for Development and Cooperation and the Rockefeller Foundation) developed hybrid and open pollinated varieties of maize that are stable, high yielding, and drought resistant, and therefore suitable for both favorable and marginal areas. Table 1 shows that some of the drought tolerant OPVs also have high tolerance for low soil fertility and acid soils as well as resistance to the common gray leaf spot, leaf blight, rust and ear rot. Results from on-farm trials conducted under farmers' management suggest that the best OPVs and hybrids generated through the SADLF breeding program outperform the best commercial hybrids currently available on the market (Banzinger, et al, 1999; Pixley and Bansiger, 2002). The fact that improved varieties are still unavailable at the farm level suggests the presence of other factors than just variety mix. The objective of the study is to identify major challenges to seed production and distribution at the industry level.

The rest of the report is structured as follows: The next section discusses briefly data sources followed by the types of seed production systems involved in the production and distribution of maize seed in southern Africa. This is followed by an examination of the major challenges faced by seed providers in supplying seed. The fourth section discusses the roles of various seed sector support agencies and the challenges they face in their service provision. The final section summarizes the main findings and draws policy recommendations of the main findings.

2 Data collection

This report synthesizes the major challenges of the maize seed sector in Malawi, Mozambique, Zambia and Zimbabwe identified by a total of 32 representatives of public and private seed companies, non-governmental organizations (NGOs) involved in seed production, research institutes, and seed certification and regulatory services interviewed in the four countries using structured questionnaires in 2003/04. The data were complemented by outcomes from maize sector stakeholders consultative meetings organized in Malawi, Mozambique, and Zambia in 2004 in which between 40 and 50 participants each were drawn from the National Agricultural Research and Extension Services, private and public seed companies, NGOs, input dealers, and framers' organizations in each country. As far as possible data collected from 1200 farm households interviewed in the four countries as part of region-wide survey conducted by CIMMYT were used to illustrate important points.

3. Seed systems in southern Africa

Seed is an essential, strategic, and relatively inexpensive input to agriculture with a high rate of return on investment that often sets the upper limit for crop production and the access to seed by farmers is a basic human right simply because seed is life. Consequently, most governments promulgate seed policies to promote (1) NGO programmes in the seed sector, (2) encourage private seed industry development, (3) decentralize seed certification schemes, and (4) strengthen seed quality control programmes. In southern Africa, a number of seed companies,

farmers' associations and community based seed production systems are involved in the production and distribution of seed to meet farmers' residual demand arising from the inadequate supply from their own seed stock (the primary source of seed). Using the adoption rates estimated by Hassan et al, 2001 (assuming they have not changed over the years), Table 2 shows that there is a significant capacity for private and public sector seed providers to expand their operations to meet the demand for improved maize varieties in southern Africa. Except in Lesotho, South Africa, Swaziland and Zimbabwe where over 70% of the area is under improved seed, all other selected countries cultivate far less than 50% of their maize area to improved, high yielding varieties. Below is a brief discussion of formal and informal seed production systems operating in southern Africa.

3.1 Farmer seed system

In the acquisition of seed, small scale resource poor farmers rely first on "farmers' seed system" which relates to the process whereby the entire seed production and distribution continuum is performed by individual farmers within an integrated farming system. Individual farmers attempt to meet their seed needs by first selecting from the previous harvest. In the case of maize, cobs that meet desirable traits (or characteristics) are selected as seed and reserved for use the following season. This system represents a dynamic evolutionary system due to repeated crop production and selection under local conditions and allowing for mutation, hybridization and selection pressure (exerted by both natural factors and humans). Most small scale, resource poor farmers prefer the farmer seed systems to the market source of seed supply as it ensures local seed security, both a function of availability and access although quality may be poor. Seed availability generally refers to the amount of seed harvested, timeliness of the harvest and the sustainability of the supply. Seed access on the other hand relates to the quality (desired variety with the right genetic and sanitary criteria for producing a crop), equity in distribution (to all farmers) and the ability to have from external sources (through financial means). Yields may, however, decline with successive recycling. The rate of yield depression relates to the type of seed (i.e., hybrid or OPV). As has been noted by Pixley and Banziger (2002), yield reduction of recycled OPV is about 5% while that for recycled hybrids can be as high as 32%. A farmer's choice of either an OPV or hybrid is influenced by unavailability of the type of seed, cost of the seed itself (e.g., hybrids are 20% more expensive than OPVs), the necessity to buy complementary inputs to ensure optimal yields (e.g., for hybrids), and the possibility to recycle the seed (as in the case of OPV).

Although farmers generally prefer farmers seed systems, conditions as outlined by Tripp; (2000) such as (1) emergency situations when environmental calamities or civil conflict results in insufficient harvest to provide seed stock, (2) poverty situation when shortage of labor or illness, etc result in poor harvest compelling farmers to consume their seed stock, and (3) demand for seed quality arising from the farmer's desire to replace old seed stock due to poor performance or when a new variety or germplasm is introduced into the community compel farmers to source seed from elsewhere. In general, external sources of seed are meant to satisfy farmers' residual seed demand, especially when the reason for sourcing is not related to a desire to adopt an improved variety.

3.2 Community based seed systems

At the community level, individual farmers or groups of farmers produce and market seed. There are no formal structures in the case of farmer groups except the local ethics of group behavioral attitudes. In recent times, schools have been involved in community-based seed production systems as a way of generating income for the school, providing seed for the communities as well as equipping pupils with skills to produce and market seed effectively. Details of how the involvement of schools in community-based seed production is operationalized can be obtained from Monyo and Mgonja (2004). Due to the limited resource base of such systems, community-based seed production systems almost invariably concentrate on the production and marketing of OPVs which are less resource demanding compared to hybrids.

Based on the type of seed produced, three models of community-based seed production systems can be identified (Table 3). In Model 1, an individual farmer, group of farmers, or a school may acquire foundation seed from a seed company or public research institute with equity capital or financial support from an NGO (such as World Vision International, Catholic Relief Services, Programme Against Malnutrition (Zambia), etc.) to produce certified seed under the supervision of a government certified seed services unit. Model 2 is similar to Model 1 except that instead of using foundation seed, certified seed is used. In this case, the seed eventually produced and marketed is termed "quality declared" seed. In Model 3, certified seed is also used instead of foundation seed as in Model 2 but the production process is not supervised by a seed certification unit. Consequently, the seed produced is of unknown quality and type.

These community efforts are a direct response to the lack of timely provision of seed of desired characteristics at the community levels. In a community, therefore, depending on the types of models available (i.e., Model 1, Model 2 or Model 3) there may be a mixture of types of seed (certified, quality declared or unknown) sold. Although the systems attempt to respond to the community needs for types of seed, their lack of breeding and foundation seed production capabilities compel them to depend on seed available from seed houses or public research systems, which invariably dictates the type of seed to produce. Being individual efforts, community-based seed systems lack any political influence or power to influence the functioning of seed systems except seed supply at the community level.

3.3 Farmers' associations

Farmers' Associations grow out of farmer groups discussed under community-based seed production systems. Various farmer groups are organized into formal associations to ensure visibility and recognition. One such association is the Association of Smallholders Seed Multiplication Action Group (ASSMAG) of Malawi. In general, seed production of any kind of grain is by individual farmers with emphasizes on Model 1 (described under the community-based seed production systems) although Models 2 and 3 are also acceptable.

It is the responsibility of the association to assist members to source initial foundation or certified seed and find markets for the seed produced. Whenever a market is identified for a given type of seed, quotas are given to the various producers so that at least each producer can

sell some seed. The association imposes a levy on members, which is deducted at sales, which contributes to the financing of the operations of the association. To limit quantities of seed produced, it is customary to impose quotas on members for certain crops (e.g., maize). Farmers' associations usually lack research capacity as well as seed processing equipment and have to rely on established seed companies for processing.

3.4 Seed companies

A number of seed companies exist in the region as either national, regional or multinational companies (Table 4). These companies have institutional structures to facilitate their operations. Most of them have elaborate research and seed processing facilities except new, and small ones such as Agpy. Such companies source their foundation seed from other companies and public research centers.

Because seed companies lack adequate land and related resources to produce enough seed to meet set targets they contract between 15 and 50 farmers annually to produce and deliver seed to them. The choice of farmer to produce either OPV or hybrid maize takes the farmer's production resources into consideration since the two types of seed require different levels of resources. For instance, production of hybrid maize seeds requires (a) cash to hire additional labor for de-tussling, (b) irrigation facilities for a good crop, and (c) relatively better managerial skills. Consequently, large scale commercial farmers are contracted to produce hybrid seeds while their small scale counterparts produce OPVs. In some cases, however, large scale commercial farmers contracted also sub-contract tenant farmers and provide them with adequate resources to produce and deliver the hybrid seeds to them.

The contraction process works like this: When a farmer expresses interest in becoming a contract farmer of a given company, a company staff member visits the farmer to make sure that:

a) The land identified and ploughed for seed production is accessible (to facilitate supervision), of suitable isolation distance from other maize fields and within 100 km radius to the company's processing plant, and
b) The farmer has adequate financial resources to pay for the production inputs.

If the conditions are met, a contract is signed between the farmer and the seed company and a producer price for seed maize set. The contract farmer is then supplied with foundation seed (of the company's choice) and given training in seed maize crop management where necessary. Field supervision starts at planting and increases in frequency at tussling stage (for hybrids). Close supervision affords the company the opportunity to identify any production problems and possibly intervene to prevent seed crop failure and thus increases seed recovery rates.

Seeds delivered to the companies by farmers are processed and stored in 50 kg bags and later re-packaged into 2, 5, 10 and 25 kg for sale between November and December mainly. The 10 kg packs are the preferred packages by farmers, which accounts for 70% of sales followed by 5 kg packs (20%) and 25 kg pack the remaining percentage. The 2 kg packs are mainly for backyard farming and re-filling only. In general, hybrids are sold on the shelves through the company's retail outlets while OPVs sold through NGOs. The main reason why companies prefer to distribute OPVs through NGO is that NGOs float tenders and are prepared to pay relatively

higher prices than offered on the open market. Seed companies argue that they produce OPVs at relatively higher cost following their strict production procedures compared to any non-specialized agent but have to sell at similar prices on the open market. However, seed companies acknowledge the difficulty in dealing with NGOs. Because NGOs reply on donor funding which is mostly driven by need, they tend to be inconsistent in their demand for seed thus making planning difficult for seed companies.

4. Challenges to seed provision and distribution at the various systems levels

Notwithstanding the concerted efforts of various seed systems operating in southern Africa to meet farmers demand for seed, unavailability of improved seed at the farm level is a chronic problem. As noted earlier, only about 30% of seed planted is improved seed. A number of factors constrain seed provision and may be broadly categorize into (1) farmer level, (2) institutional environment level, (3) regional and national policy, (4) Climatic conditions including catastrophes. Figure 4 shows the various layers of these challenges with differential impacts on the different actors in the seed provision sector. Most of these challenges affect either company's profitability, seed supply or general operations of the companies. Following is a discussion of the different challenges as they relate to the different participants in the seed industry.

4.1 Farmers' level challenges

The first challenge that seed producers face is related to the farmers' circumstances. Farmers are either clientele or contract seed producers. Under either category they pose significant challenges to the production and distribution of seed in the region. As clientele, farmers' preferences, and their unfamiliarity with the numerous varieties on the market constrain seed companies' ability to estimate seed demand for planning especially under conditions of poor market information (Table 5). Also complicating the decisions of seed producers are the relatively poor maize grain prices, negative mindset of farmers and restricted seed marketing window. As contract growers on the other hand, farmers' security, inexperience and operating small scattered plots are challenges seed producers face in contracting them. Additionally, some contract growers are thought to be unreliable. Each of these challenges is further examined below.

4.1.1 Determination of farmers' preferences and estimation of level of maize seed demand

Determining farmers' preferences and estimating seed demand at the farm level is a daunting problem for most seed providers. This problem is compounded by the presence of many maize varieties on the market with difficult names for farmers. Farmers face an enormous challenge to decipher information related to the different varieties partly because of their illiteracy. Even granted that preferences are known, it is still a challenge to estimate the demand for improved maize varieties because of the dual role of improved seed to the farmer.

A new maize variety developed by the breeder goes through breeder and foundation seed production processes before being produced as certified seed, quality declared seed or unknown type of seed for sale on the market. Figure 5 suggests that at the variety uptake stage, the farmer views an improved variety both as an input and a technology. Consequently, his/her decision to buy the new seed is influenced by both input distribution and technology adoption problems.

As a derived input to the production of maize grain, seed uptake or purchase choices are influenced by government input pricing policies, infrastructure, prices of substitutes as well as farmers' anticipation for free seed issues from the government or NGOs. A good price for maize grains would justify investment in the seed (as an input). This suggests that factors that influence the functioning of maize grain markets also indirectly influence the seed market. Note that farmers' reactions to seed marketing problems are fed to seed providers (left hand side of Figure 5) and not necessarily to the breeder who forms part of the seed provision continuum.

As a technology, on the other hand, farmer's own perceptions about the attributes of the variety as well as his or her socioeconomic circumstances are important factors in the adoption decision process. Additionally, government policies (e.g., effectiveness of extension education) are also significant determinants of farmers' decision to adopt a technology. Specific constraints limiting maize technology uptake often identified in the region include:

a) Un-affordability of the technology, e.g., high cost of improved maize seed and related inputs such as fertilizer,
b) Long distances to input and output markets,
c) Limited input credit in the rural settings,
d) Poor infrastructure for technology dissemination,
e) Natural hazards such as drought which makes technologies unprofitable,
f) Inappropriateness of technologies, e.g., hybrids which farmers want to recycle,
g) Reduced contact between farmer and extension worker. For instance in Malawi and other countries, the extension worker: farmer ratio is 1: 2900. That notwithstanding, extension staff lack the needed mobility to carry out their duties,
h) Lack of knowledge of the technology and its attributes partly due to the high illiteracy rate of smallholder farmers, and
i) Weak linkages among stakeholders to ensure effective technology dissemination.

Farmer's reactions to technology attributes are fed back to the breeder directly or via change agents such as extension service, NGOs, etc (right hand side of Figure 5) for modification of the said variety if possible.

This suggests that a farmer will take up a new maize variety if both the input and technology problems are appropriately addressed. If only the marketing problems are solved but the fundamental technology adoption constraints not adequately identified and resolved, seed uptake at the farm level will remain low. Similarly, if the technology adoption problems are addressed but the marketing constraints inadequately tackled, seed uptake will remain low. Considering how the feedback loops are described above, it is conceivable that little interactions exists between input and technology conduits of seed. Consequently, estimating seed demand is complicated. Seed providers do not have sufficient knowledge about the demand levels they face. Different categories of farmers have different levels of demand for seed influenced by the adoption rates. In estimating seed demand, therefore, it is essential to factor in adoption rates which are often neglected leading grossly inaccurate estimates. Not accurately estimating demand directly affects the quantity of seed produced and marketed. An over supply leads to depressed seed prices and carry over stock with its attended storage financing costs which are known to be very high in southern Africa as well as negatively influencing supply volumes the following season and vice versa.

4.1.2 Too many varieties with unfamiliar names on the market

There seems to be too many brands of seed on the market (Table 6). With the numerous varieties released onto the market without adequate farmer education, unfamiliar variety information and poor labeling create confusion for farmers eventually affecting brand loyalty. It has been observed that some unscrupulous traders engage in unethical advertising practices or simply paint grains in a color similar to existing seed color adopted by some companies and undercut prices. The danger here is not only that under such circumstances it becomes very difficult to sell the "actual" certified seed at competitive prices, but also it creates problems of brand loyalty. When the performance of the supposed "seed" fails to meet the expectations of the farmers, their loyalty to the given company's seed may be affected. That is, affected farmers loose confidence in the brand they probably knew and trusted.

Farmers' confidence in a given variety may also be compromised when NGOs organizing seed production adopt the principle of repayment in kind and revolve the repayment (Figure 6). Usually the first generation of farmers is given actual foundation seed to produce certified seed and is expected to pay back in the output, in this case seed. This is then given to the next generation of farmers as if it was foundation seed and are also expected to produce seed. But in fact what they produce is grain. They also in turn pay back in the output to be revolved and the process continues. By so doing the communities end up with a mixture of actual seed and grains of various levels of recycling being sold as seed.

3.1.3 Relatively poor maize grain prices

In the late 1980s and early 1990s, many countries in Africa made significant progress in liberalizing trade and maize being a major sector in agriculture in Southern Africa was greatly affected. In output market reforms, policy makers attempt to improve the welfare of consumers by imposing price ceilings on maize grain significantly reducing the profitability of maize production. Although seed companies feel seed prices are poor, such prices are still beyond the means of the majority of farmers due primarily to relatively poor grain prices. For instance, in Malawi the 1998 average maize grain price of 7.5 MK/kg was about 42% of the improved seed price but the margin begun widening and by 2003, the price margin was 68% (Figure 7). Poor market infrastructure further depresses grain prices but increases input (such as fertilizer and seed) prices. Consequently farmers are reluctant to invest in seed.

4.1.4 Negative mindset of farmers

In some parts of the region, farmers have a negative mindset that seeds should be distributed free of charge through some program as a result of frequent seed handouts. Hence they do not see the need to purchase seed which obviously affects the profitability of seed companies who are forced to reduce prices in order to market their products. As shown in Figure 8, once government issues free seed under a given program (e.g., Target Input Program in Malawi) market level demand for seed reduces. This means that such policies are counter developmental to the seed industry.

3.1.5 Compressed seed sales

One of the challenges faced by seed companies is that most of the seed sales are done between 3 – 4 months (between September and December) only in the year. This means seed companies lock-up working capital for extended periods of the year. As shown in Figure 9, between June and September when seed supply is highest demand is relatively low. In southern Africa as in any other parts of Africa, storage financing costs are usually very high due mainly to very high interest rates on borrowed capital. Therefore, storing seed for extended periods and having to sell them at reduced prices to maintain a market share is a source of financial loss to seed companies.

4.1.6 Weak market information systems

In general, seed providers do not have clear information on the demand for various types of seed. Decisions to produce are based on company's judgment as well as those obtained from NGOs through tendering. That is, information flow among buyers and sellers is limited.

4.1.7 Security concerns of growers

Recent land reform in Zimbabwe in 2001/02 has created a feeling of insecurity among some seed producers in the entire region. In particular, many large scale commercial farmers are reluctant to produce especially hybrid seed. As a result the quantity of seed produced and delivered onto the market is reduced.

4.1.8 Small scattered seed plots

In recent years, seed companies have observed an increase in the recruitment of small scale farmers (most of whom have limited production resources) as large scale commercial farmers continue to pull out of seed production due to various reasons. Many of these small scale farmers lack the necessary financial resources to purchase needed production inputs and hence production is inefficient. Moreover, such farmers are unable to exploit economies of scale in their operations due to small holdings. As a result of the small holdings, companies are compelled to contract many farmers scattered over wide areas which increases supervision costs. In some cases, grain fields have to be cut down to create the necessary isolation distances and the farm owners compensated adding extra cost to the operations.

4.1.9 Unreliable contract growers

In some cases, contracted smallholder farmers divert some seed (especially OPV) to alternative uses that offer them relatively higher returns. This thus affects the volume of seed produced and marketed as well as profitability of the companies.

4.1.10 Concluding remarks on farmers level challenges

Related to the different types of seed provision, estimating seed demand has the biggest impact on seed companies who supply seed to a wider farming community. Among the seed companies, however, the challenge is less for national companies compared with regional and multinational

ones who sometimes service across regional borders. The second category is the farmers associations whose output extends beyond the communities in which the seed is produced in a similar manner to national seed companies. Regional disparity in preferences is of less concern to farmers associations as they are to seed companies. The least affected are the community-based seed production systems which attempt to satisfy the demand of the local community. All things being equal, local preferences are better known and hence demand adequately approximated. However, their inability to generate their own source seed complicates their operations just as farmers associations and those seed companies without research capacity. Farmers own seed system attempts to answer the immediate seed need of the farmer therefore preference determination and hence estimation of demand is of no consequence to the operations of the system.

4.2 Institutional level challenges

Seed producers face challenges related to their institutional structure or policy. As indicated in Table 7, the producer's capacity to deliver services may also be a source of challenge. If the institution is incapable of delivering efficient market information, that can serve as a severe constraint to seed provision. An institutional policy to produce only hybrid maize seed for, example, can be a constraint to the provision of OPVs to resource poor farmers. Companies without research facilities are compelled to rely on third parties for their foundation seed supply which can be a challenge to the effective implementation of their programs. Some rely on CIMMYT for materials but do not have variety protection to brand such materials which is detrimental to creating brand loyalty among farmers although such loyalty is sometimes abused by unscrupulous seed agents. Under conditions of escalating input prices, some companies feel it cheaper to import their own inputs but are constrained by the apparent lack of foreign exchange.

For logistical reasons, most seed companies use NGOs to distribute seed, especially OPV. The problem with engaging NGOs in seed distribution is the difficulty of using their input in decision making. It is generally believed that NGOs are unable to take any firm decisions on the type and quantities of seed they require partly because they (NGOs) rely on donors for financial support for given activities. Therefore, until they get or are assured of funds, they are unable to make any firm commitments on seed demand types and quantities. Accordingly, there are times NGOs make their decisions at inappropriate times for planning. Nevertheless some companies continue to rely on NGOs for the distribution of especially OPVs for the simple reason that they are assured of adequate returns on their seed. Seed companies know that OPVs can be produced by non-specialised agents who may not follow very strict production procedure as they do. This implies that seed companies following strict production procedures incur relatively higher cost of production compared with those non-specialized agents not following such guidelines. Unfortunately OPVs seed from the seed companies can't be sold at a premium on the open market. Therefore producing and marketing through tenders (where prices are agreed upon before production) is a better option than using the open market.

4.3 Seed policy environment

Seed production and distribution is heavily influenced by national and regional policies (Table 8). The extent of influence of a policy on producers depends on the type of policy and the

producer concerned. Below is an examination of the different types of policy challenges on the different seed producers in the region.

4.3.1 Destabilizing seed policies

Interventions in input markets by policy makers are often aimed at improving the welfare of producers. Though intended for the betterment of farmers, input policies sometimes work against them. Improved maize seed is a key component of maize production technology and hence seed policies directly influence farmers' production decisions and income. As noted by Tripp (1998), the maize seed industry often receives special attention from policy makers given the importance of seed as a key technology component. A significant policy shift has been the relaxation of restrictions on participants in the seed industry. There is an active private-sector participation in the seed industry which was legally proscribed in most countries until recently (Hassan et al, 2001). To ensure that national seed industries perform well, southern African governments institute varietal registration and seed certification laws ostensibly to control the genetic and physical purity of commercial seed sold on the market. Where such laws are effective, they have tendered to cause paralyzing effects on the industry. For example, varietal registration procedures are very lengthy (at least three years of testing) and cumbersome seed certification requirements mandatory.

In countries where seed regulatory laws are ineffective, it is not possible to protect genuine seed producers. This has resulted in substandard seeds on the market depressing seed prices and profitability of genuine seed producers. For example, seed legislation in Malawi is unduly delayed. The Seed Act was formulated in 1988 and revised in 1996. Till to date, the regulations are still in a draft form. Consequently, Seed Services is not fully empowered to deal with culprits in seed trade. One other important factor influencing profitability of the seed sector in the region is the relaxed seed laws in some countries, for example in South Africa, compared with others within the region. This gives seed companies in such countries unfair competitive advantage over those with stiffer seed laws but trading in the same markets (since they can easily undercut prices).

Instability in government policies is however a concern for most producers. For instance, in their study of the seed sector, Hassan et al (2001) observed the complete lifting of restrictions on the importation of commercial maize seed. Recently, companies have faced restrictions in the importation and exportation of maize seed in some countries in the region. Zimbabwe recently banned the exportation of maize seed when the country faced significant shortage of maize. This created some problems for seed companies that had accepted to produce seed on contract for clients outside of Zimbabwe. Additionally, companies were compelled to sell their seed at a ridiculously low price set by the government.

4.3.2 Unsatisfactory seed pricing policies

It is the consensus of seed producers that input dealers peg inputs prices to the US dollar leading to high and variable prices. Meanwhile producer prices for seed are de-linked from the dollar and ridiculously low. This makes it very difficult for companies and other seed producers to make any reasonable margins on seed sales because seeds are priced less than marginal cost to be

affordable to small scale resource poor farmers. Avoiding the input providers and importing inputs does not necessarily solve the problem because of a very high premium placed on foreign exchange because of its scarcity. Interest rates on borrowed capital are also very high making seed production un-profitable. Notwithstanding the relatively high input prices, producer prices of seed are poor. Companies do not have reasonable margins on sales as a result of the relatively low prices.

4.3.3 Regional seed trade barriers

The region has not benefited from similarity in climatic conditions through the exchange of seed. On the contrary, all sorts of barriers are limiting the free flow of seed trade. There are indeed many more challenges than those listed above. Overcoming these challenges will rain in tremendous benefits. The effectiveness of the private sector as a prime source of an essential input will not be fully realized until change takes place.

4.3.4 Poor seed market infrastructure

One biggest bottleneck to seed delivery, especially at the farm level is the poor road infrastructure in most parts of the region. Some farming communities are unreachable during the rainy season when roads become un-motorable. Farmers located in the rural areas frequently face transportation problems when they want to cart their produce to the market. In some cases, roads are impassable, especially during the rainy season. Information flow between farmers and other market players is poor making it difficult to link suppliers with demanders.

4.4 Climatic factors

Though fairly homogeneous, there are unpredictable weather patterns which call for a wide base of germplasm. Droughts and excessive rains are challenges to breeders and agronomists. There is total dependence on rain fed production which is unsuitable for seed production because the rains are erratic in nature. About 80% of maize planted in lowland tropic environment is reported to suffer periodic yield reduction ranging from 10-50% because of drought stress (Edmeades et al, 1989). On the other hand, irrigation facilities are limited.

Farming is a costly and long-term investment venture. Economic ills have not provided the required support to the seed industry. The market operates inefficiently and consequently the volume of seed traded and used has remained low and static. Input prices are very high and governments attempt to fix prices regardless of the cost of production to the detriment of all seed producers. In recent times, some seed companies in Zimbabwe for example, had to release their seed stock for various government programs and payments made to them without due regard to the companies' production costs.

5. Major challenges of seed support services

Various organizations act to mitigate the challenges facing the provision of improved seed in the region. Below is a brief description of the support services they provide to seed producers and the challenges they face in delivering those services.

5.1 Challenges of research and development

All the governments in the region endeavor to increase maize production in order to maintain food self sufficiency in the rural areas and provide enough food for the growing urban population. Governments also aim to accumulate sufficient grain (especially maize) reserves to sustain the country's needs in the event of adverse climatic conditions. In the case of maize, the national agricultural research systems (NARS) are mandated to develop different types of varieties for different categories of farmers but target specific agro-ecologies in the countries some of which are listed in Table 6. Some NARS play a key role in the production of foundation seed for distribution to seed producers.

In the implementation of their activities, NARS face various challenges including insufficient funding, staff attrition, inappropriate government policies and low staff morale.

5.2 Challenges of the seed services units

The Seed Control and Certification Units are mandated by the various governments to certify seed and coordinate activities in the seed industry by performing the following activities:

1) Variety testing and registration: The units carry out post control analysis of varieties to be released by conducting the Distinctiveness, Uniformity and Stability (DUS) test. A variety can only be certified after two years of testing but could be released earlier if sufficient reason is given for an early release. The varietal testing process is designed to examine the variety for Value for Cultivation and Use (VCU). Although the company may identify a given nitch for which the variety was developed either than yield, a maize variety still undergoes yield test just as soybean and groundnuts undergo oil content test irrespective of what aspect has been improved upon. It costs around US$20 to register a variety and US$125 to test the variety before release.
2) Seed inspection: The seed inspection unit is responsible for rural seed coordination in the country to ensure that seeds produced are of good quality.
3) Seed testing: The seed testing unit undertakes testing of seed lots in the laboratory before a certificate is issued permitting the seeds to be sold.
4) Capacity building: The capacity building unit conducts training courses for stakeholders in the seed industry on seed production and in some cases seed inspection.

The seed industry in the region is growing significantly overstretching certification services as manpower is constrained thereby leading to low quality service delivery. Without proper seed legislation, however, lots of substandard seed flood the markets negatively affecting the industry. As noted earlier, seed production has substantially increased on small scattered fields thereby increasing inspection cost. Most seed services units lack reliable transportation for timely operations such as, seed crop field inspections, seed sampling and testing. Just as any NARS, the seed certification units face serious staff attrition and limited funding.

6. Concluding remarks

The problems militating against the effective provision of improved seed is multifaceted requiring the intervention of different stakeholders. As demonstrated in Figure 10 the relevant partners needed to address the identified problems ought to work more closely together at various levels of the seed production and distribution continuum. It is not just sufficient to identify who matters but also when they matter. Given the invaluable role of policy in dealing with the various issues it is important to stress the need to employ tactical policy advocacy to achieve the relevant interventions and synergies needed.

A key element often overlooked is the link between seed delivery and output markets. There is a strong need to appropriately link seed and grain markets to ensure good markets for the grains to stimulate seed demand. To ensure that all relevant partners actively participate in the implementation of strategies to solve seed unavailability problems, it might be important to form an "Improved Seed Delivery Consortium" made up of representatives from all relevant and willing stakeholders identified in a participatory manner. Such a consortium would be responsible for alerting the relevant bodies of needed interventions and general backstopping of activities.

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Table 1: Selected drought tolerant open pollinated maize varieties available for adoption by farmers in Southern Africa

Variety	Origin	Maturity Group	Grain yield range (t/ha)	Tolerant to		Resistant to				
				Low soil fertility	Acid soils	Maize streak virus	Gray leaf spot	Leaf blight	Rust	Ear rot
Very good tolerance to drought										
ZM305	CIMMYT	Extra early	2	2	2	1	3	4	3	2
ZM423	CIMMYT	Extra early	1	1	1	1	2	2	1	1
ZM521	CIMMYT	Early	1	1	2	2	1	2	2	2
ZM611	CIMMYT	Intermediate	1	2	1	1	3	1	1	3
ZM623	CIMMYT	Late	1	1	1	1	2	3	2	3
Good tolerance to drought										
GRACE	Ecolink RSA	Early	3	5		1	4	3	5	4
ZM421	CIMMYT	Early	2	2	2	1	2	2	2	2
ZM523	CIMMYT	Early	1	1	1	2	1	1	1	2
MASIKA	Malawi	Intermediate	2	3	5	2	4	3	2	3
ZM621	CIMMYT	Intermediate	1	2	4	3	2	3	2	2
Average tolerance to drought										
KATUMANI ST	Tanzania	Extra early	3	5	3	2	4	3	2	2
ZM301	Botswana	Extra early	3	3	2	1	5	5	4	3
ZM303	CIMMYT	Extra early	2	2	5	2	2	4	2	3
KAFULA	Malawi	Early	3	3	2	4	4	4	3	5
TMV-1 SR	Tanzania	Intermediate	4	4		1	5	3	5	2
KAKHOMERA	Malawi	Late	4	4		4	2	2	1	4
KILIMA SR	Tanzania	Late	3	3		2	3	4	2	1

Legend

Very good for this trait	1
Good for this trait	2
Average for this trait	3
Poor for this trait	4
Very poor for this trait	5

Source: Adapted from CIMMYT, Choosing the right variety open pollinated variety

Table 2: Estimated seed supply in southern Africa, 1994-2003 average

Country	Maize area (1994-2003 average)	Adoption rates*	Estimated seed requirement**	Source of seed supply	
				Formal seed sector***	Farmers' seed system
Angola	674,760	11.80	26,990	1,991	14,878
Lesotho	147,944	70.76	5,918	2,617	1,081
Malawi	1,341,638	13.80	53,666	4,629	28,912
Mozambique	1,154,155	9.14	46,166	2,637	26,217
South Africa	3,683,491	95.90	147,340	88,312	3,776
Swaziland	58,780	78.37	2,351	1,152	318
Tanzania	1,691,517	4.25	67,661	1,797	40,491
Zambia	581,052	22.89	23,242	3,325	11,201
Zimbabwe	1,399,014	81.63	55,961	28,550	6,425
Total	10,732,351	-	429,295	135,010	133,299

Note: *Source: Hassan et al, 2001

**Estimate derived from seeding rate of 25 kg/ha and total cropped area from FAO statistics (1994-2003 average)

***Estimates obtained using adoption rates reported by Hassan et al, 2001.

Table 3: Models of community based seed production systems

	Model 1	Model 2	Model 3
Type of initial seed	Foundation seed	Certified seed	Certified seed
Source of seed	Seed company or public sector breeding program	Seed company or public sector breeding program	Seed company
Quality control	Seed Certified Services	Seed Certified Services	None
Type of seed produced	Certified seed	Quality declared seed	Unknown

Source: Extracted from Banziger et al. (2004)

Table 4: Seed companies in selected countries in Southern Africa handling maize seed

	Company	Zimbabwe	Mozambique	Zambia	Malawi
1	SeedCo/SEMOC	■	■	■	■
2	Pannar	■	■	■	■
3	Monsanto[1]*	■			■
4	Pioneer	■			
5	National Tested Seeds	■			
6	Agricultural Seeds and Services	■			
7	Prime seeds	■			
8	Nhimbe Seeds	■			
9	Agpy	■			
10	Zambia Seeds			■	
11	Maize Research Institute1			■	
12	V&M		■		
13	Agro Alfa		■		
14	AgriFocus		■		
15	Agrotech		■		

Note: Shaded cells indicate the presence of the company in the given country and crop handled

*Has just pulled out of Zimababwe

1Does not produce and market maize OPV

Table 5: Farmer level challenges and their sources impacts on seed production and marketing

	Farmer level challenge	Source of impact	
		Company profit	Seed supply
Farmer as a clientele			
1	Determination of farmers' preferences and estimating seed demand		x
2	Too many varieties with unfamiliar names on the market		x
3	Relatively poor maize grain prices	x	x
4	Negative mindset of farmers	x	x
5	Compressed seed sales	x	
6	Weak market information systems	x	x
Farmer as a seed contract grower			
7	Security concerns of growers		x
8	Small scattered seed plots	x	x
9	Inexperienced contract seed growers	x	x
10	Unreliability of some growers	x	x

Table 6: Some of the varieties on the seed market in selected countries in southern Africa

	Malawi	Mozambique	Zambia	Zimbabwe
Hybrids				
1	DK 8031	MM 502	MRI 634	AC31
2	DK 8051	MM 603	MRI 614	AC71
3	DK 8071	MM 604	MRI 624	CG4141
4	SC 409	MM 612	MRI 712	DK8031
5	SC 627	MM 752	MRI 455	PRG3051
6	SC 709	MR 1614	MRI 513	PAN413
7	SC 713	MR 1634	MRI 534	PAN61
8	SC 715	MR 1734	MRI 734	PAN6363
9	PAN 67	Pan 6363	Pannar 67	PAN6479
10	PAN 6479	Pan 6243	Pannar 6363	PHB30G97
11	PAN 6193	Pan 6543	Pannar 6243	PHB30R73
12	MH 18	CG 4141	SeedCo 513	SC401
13	MH 12	Pool 16	SeedCo 601	SC403
14	MH 17	MMV 400	SeedCo 401	SC407
15	CZR 3		SeedCo 407	SC501
16	CZR 5		SeedCo 701	SC513
17	CZR 8		SeedCo 501	SC517
18	MH 16		SeedCo 403	SC627
19	MH 18		GV 412	ZS257
20	MH 19		GV 408	SC413
21	MH 20		GV 470	PAN31
22	MH 21		GV 512	PAN473
23	MH 22		GV 607	SC505
24			GV 702	SC519
25			GV 703	SC521
26			GV 704	PAN67
27			GV 722	PAN3
28			MM 441	SC402
29			MM 501	SC423
30			MM 502	
31			MM 504	

Table 7: (cont.)

	Malawi	Mozambique	Zambia	Zimbabwe
Hybrids				
32			MM 601	
33			MM 603	
34			MM 604	
35			MM 612	
36			MM 752	
OPVs				
37	Masika	Hickory King	MMV 600	Kickory King
38	Sundwe	Siluntuba	MMV 400	Kalahari Early Pearl
39	Kafumba	Kafwamba	Pool 16	La Posta
40	Matindiri	Moffat	Pop 10	NTS9406
41	Chitibu	Tunjelenjele	Pop 25	NTS9407
42	Kadzuwa	Matuba	ZM 621	NTS8905
43	ZM 623	Susuma	ZM 521	ZM421
44	ZM 611		ZM 421	ZM423
45	ZM 621			ZM521
46	ZM 521			ZM523
47	ZM 421			ZM621

Table 8: Institutional level challenges to seed provision in southern Africa

	Challenge	Nature of challenge		
		Structure	Policy	Capacity
1	Weak market information systems	x		
2	Abuse of brand loyalty	x		
3	Production mandate		x	
4	Lack of foreign exchange			x
5	Limited research capacity			x
6	Lack of security for CIMMYT germplasm		x	
7	Choice of third party in service delivery		x	

Table 9: Seed policy level challenges facing producers

	Challenge	Level of policy	
		National	Regional
1	Destabilizing seed policies	x	x
2	Unsatisfactory seed pricing policies	x	
3	Regional seed trade barriers		x
4	Poor seed market infrastructure	x	x

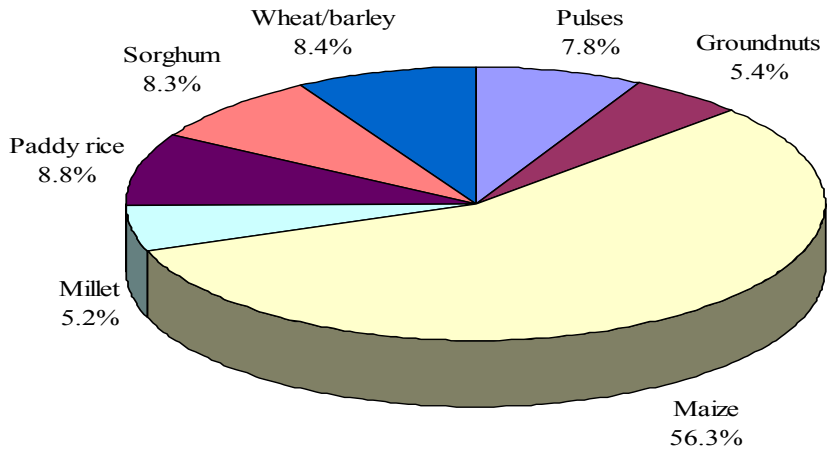


Figure 1: Distribution of cultivated area of major crops in Southern Africa (1994-2003
Source: FAOSTAT (2004)

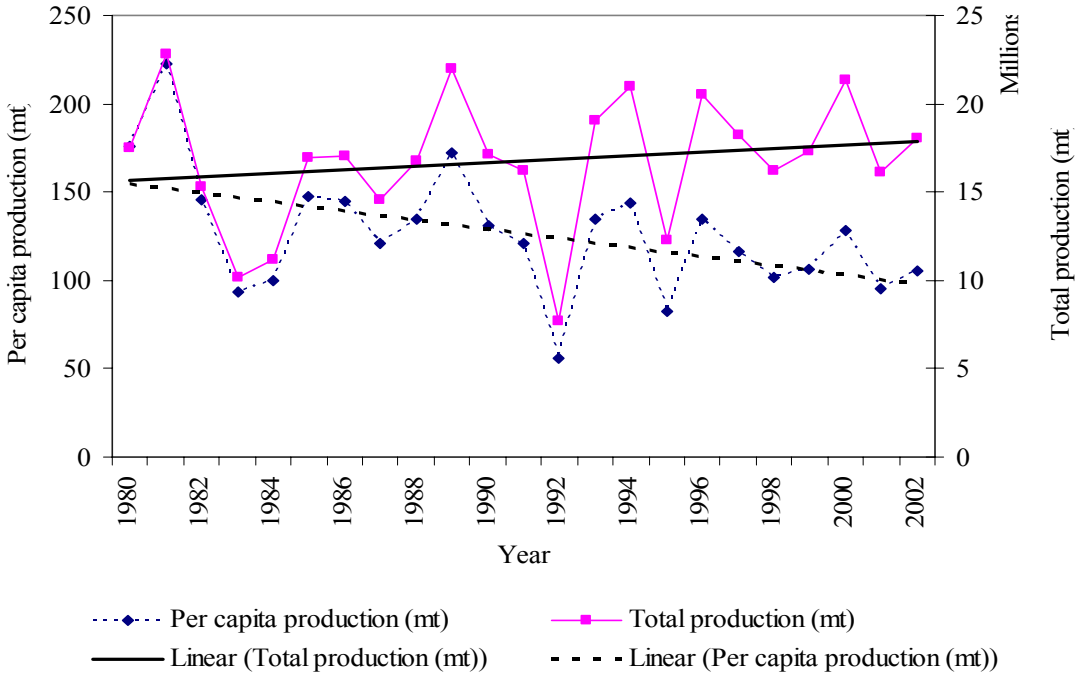


Figure 2: Trends in maize production in the SADC region
Source: FAOSTAT (2004)

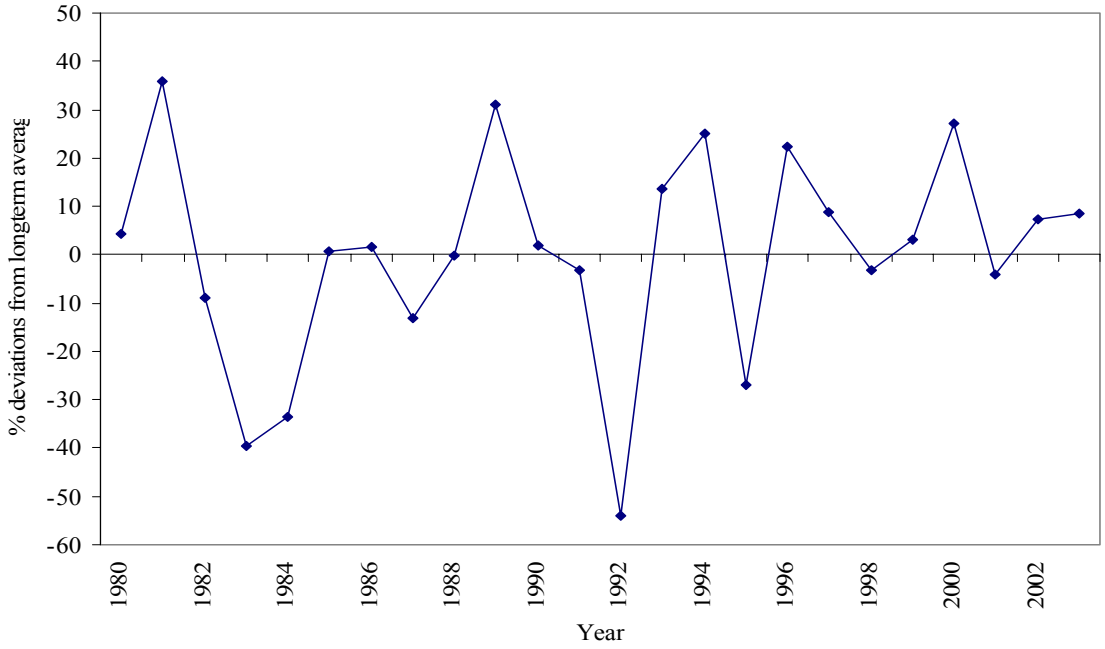


Figure 3: Deviations of average maize yield from the 1980-2003 average
Source: FAOSTAT (2004)

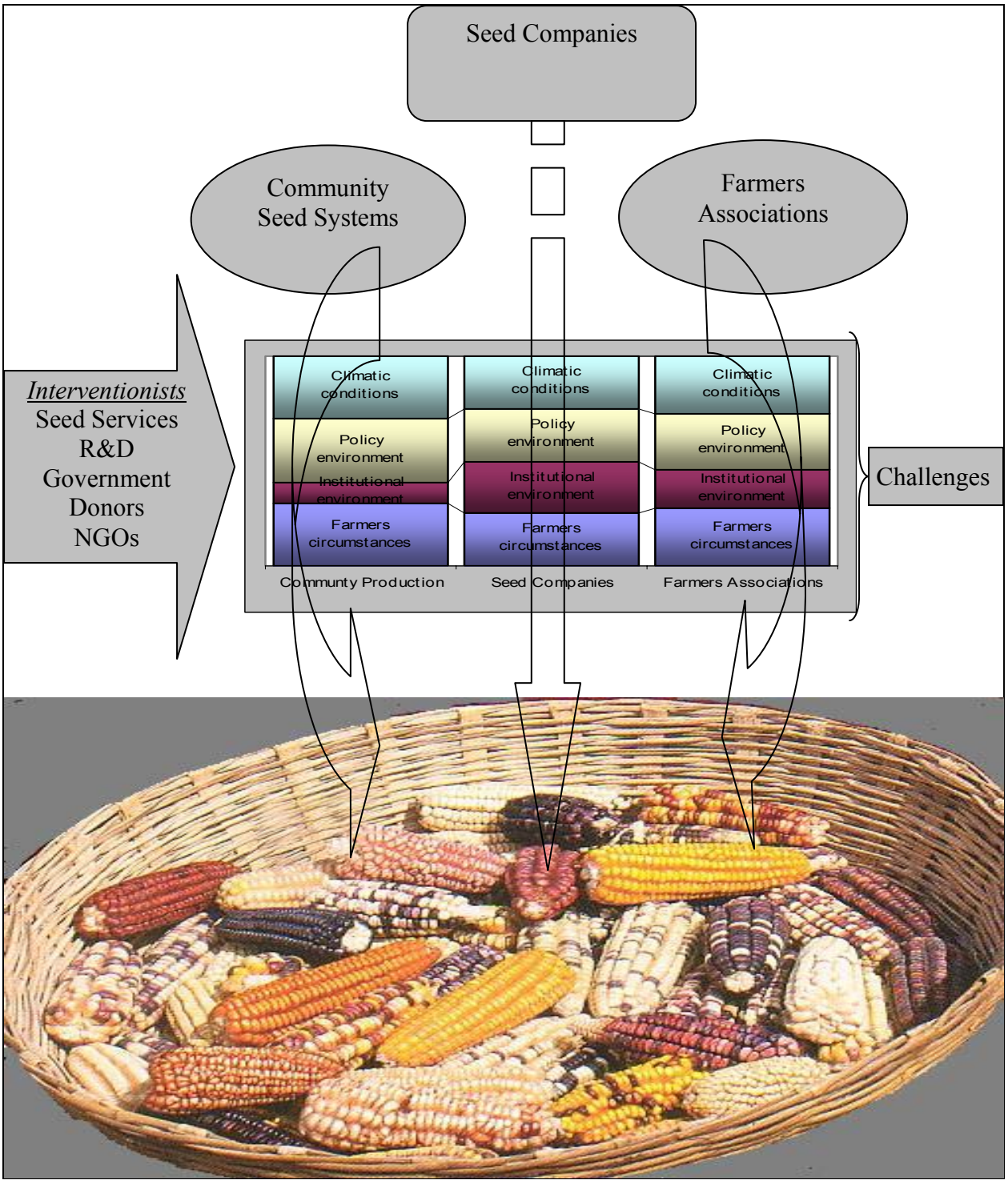
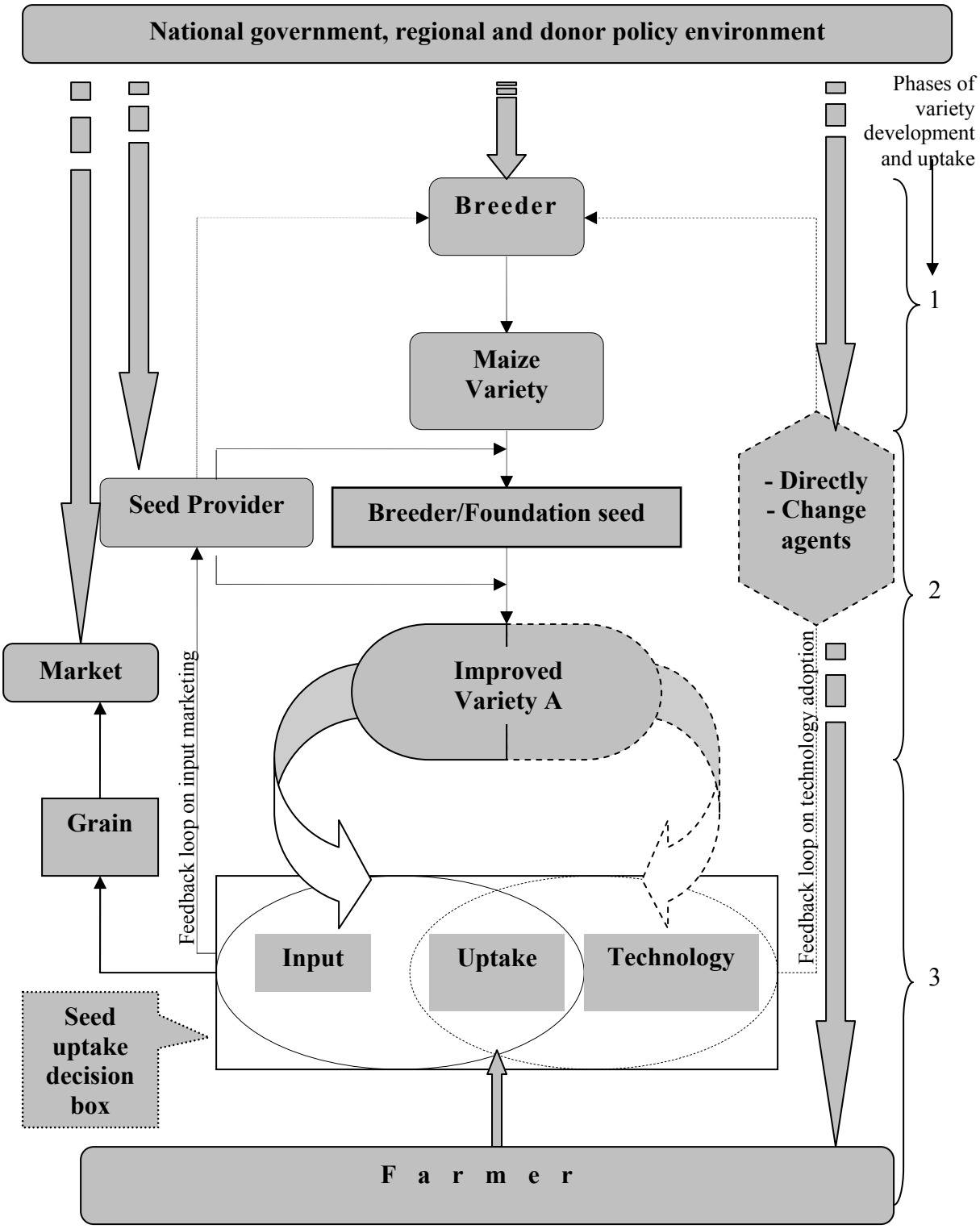


Figure 4: Diagrammatic representation of seed provision challenges



Phases of variety development and uptake:

1) *Variety development*
2) *Seed multiplication*
3) *Dissemination*

Figure 5: Diagrammatic representation of seed uptake both as a technology and an input

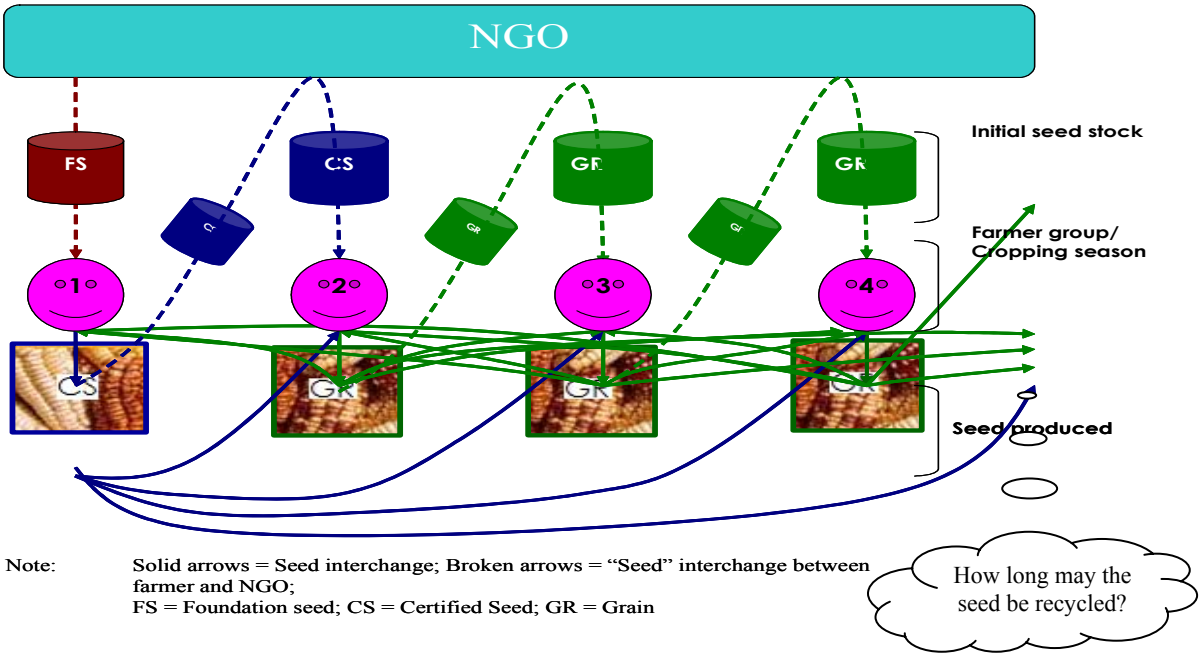


Figure 6: Seed production and repayment strategy adopted by some NGOs

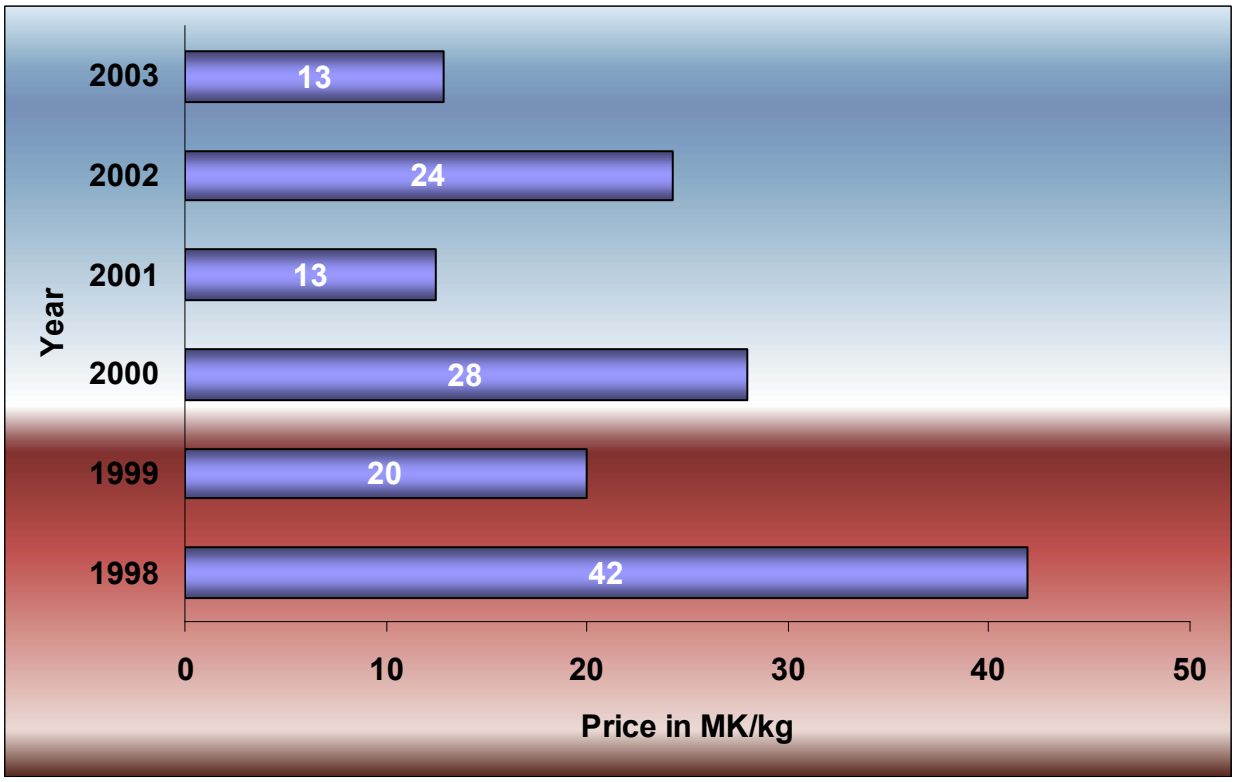


Figure 7: Maize grain price as a percentage of seed price in Malawi, 1998-2003

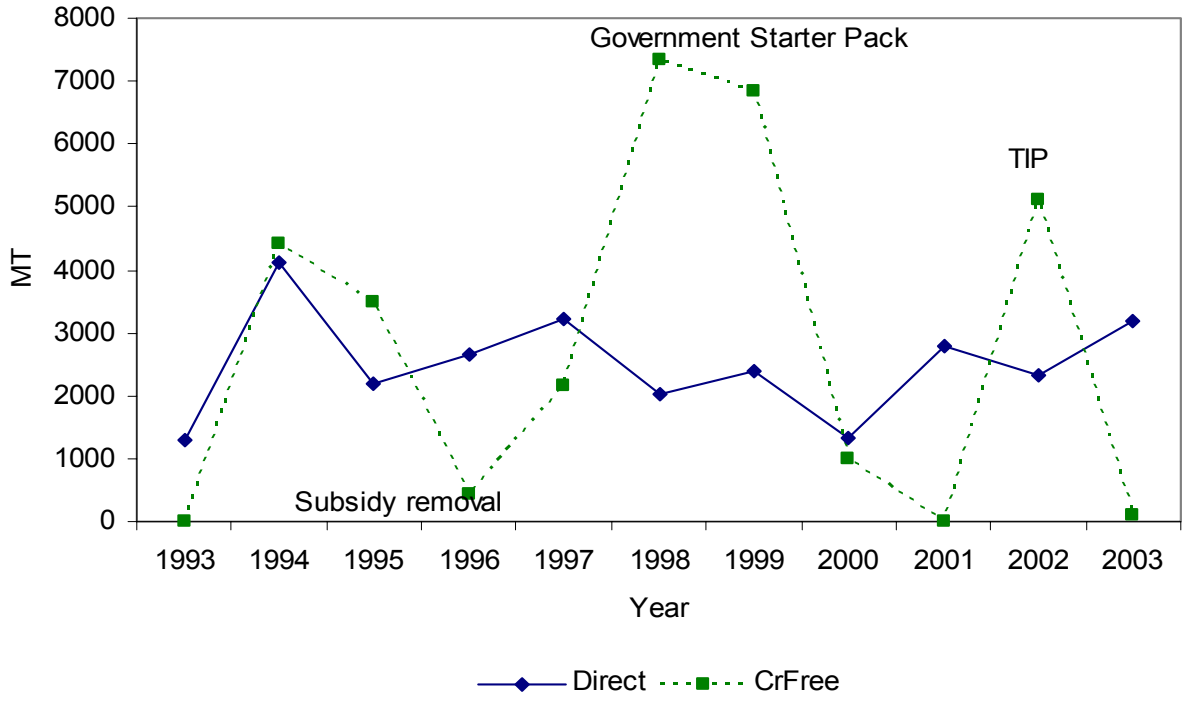


Figure 7: Impact of government policy on seed sales

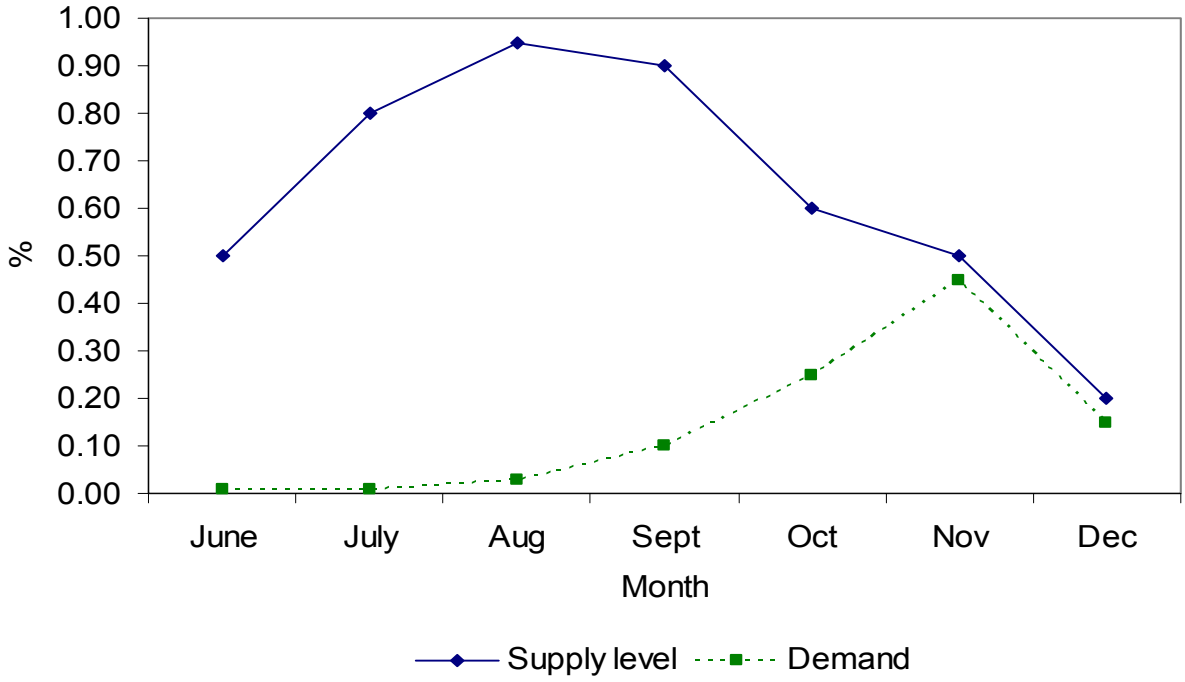


Figure 8: Annual trend in seed supply and demand

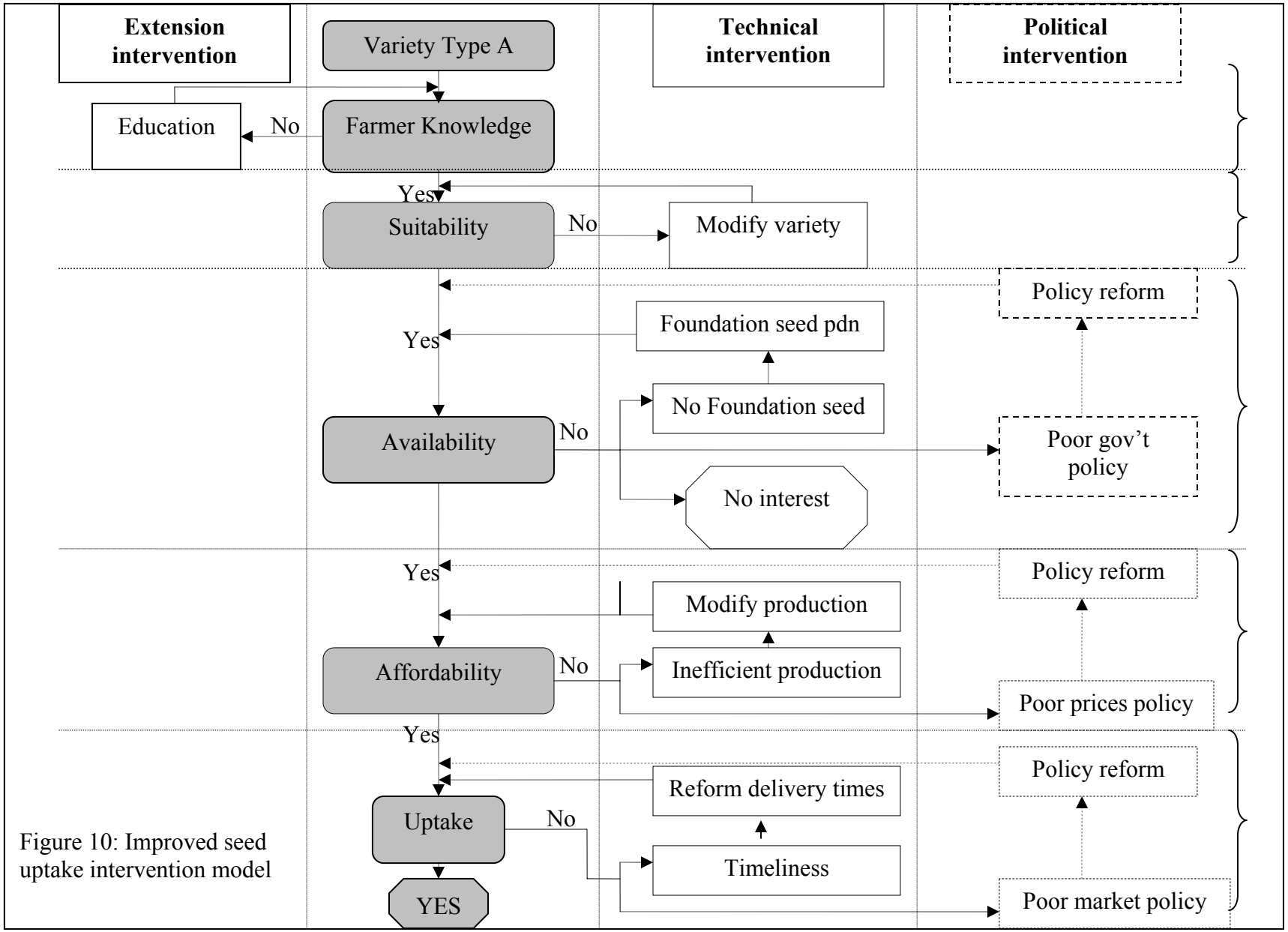


Figure 10: Improved seed uptake intervention model