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SEED SECTOR EVOLUTION IN ZAMBIA AND ZIMBABWE: HAS FARMER ACCESS IMPROVED FOLLOWING ECONOMIC REFORMS?

By

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BACKGROUND: Improving smallholder access to new crop varieties has long been recognized as a critical step for increasing agricultural productivity in sub-Saharan Africa. Adoption of improved varieties that resist pests and drought can often raise yields even when farmers are unable to adopt more costly inputs such as chemical fertilizer.

Over the past 30 years, substantial resources have been invested in crop breeding programs at international and national research centers serving Africa, and hundreds of new varieties have been released. However, except for a few commodities such as hybrid maize in southern Africa, sustained adoption of improved varieties has been very limited.

One explanation given for the lack of adoption is the inefficiency of seed supply systems put in place by governments in the 1970s and 1980s. These usually consisted of single distribution channels dominated by public agricultural departments, parastatals, or large private seed companies. Beginning in the late 1980s, many countries introduced economic reforms that included liberalization of the seed industry. Little is known about how these reforms have affected seed sector structure and performance, in particular how smallholder access to improved seed has changed.

OBJECTIVES: Focusing on Zimbabwe and Zambia, this study examines how the seed systems for three different commodities (maize, sorghum, groundnut) have changed following structural reform of the seed sector. These commodities were chosen for their differing commercial and agronomic characteristics, key factors affecting the economics of seed production and dissemination. The objectives of the analysis are to (1) summarize existing data on availability and uptake of improved varieties; (2) examine the response of actors at various functional levels to recent changes in the economic and policy environment; (3) identify constraints and opportunities for improved seed sector performance; and (4) outline policy and institutional changes necessary for improved seed sector performance.

METHODS: The study is based on informal interviews carried out during 1996 with managers of seed companies, government researchers and policymakers, representatives of farmer organizations, and field officers of nongovernmental organizations (NGOs). Secondary data were collected from reports of agricultural ministries, research stations, central statistical offices, donor agencies and NGOs.

KEY FINDINGS

Improved varieties are available, but sustained adoption by smallholders is linked to subsidized or free distribution of seed. Since 1950, Zimbabwe's national agricultural research system (NARS) has released 35 maize hybrids, 8 sorghum and 11 groundnut varieties. Zambia's NARS has produced 18 maize hybrids, 8 sorghum, and 8 groundnut varieties since 1965.

Adoption of hybrid maize by smallholders is high in both countries: an estimated 98% of maize area in Zimbabwe and 60% of area in Zambia was planted to hybrids by the early 1990s. The adoption of hybrid maize with fertilizer increased smallholder yields by an estimated 46-64%. The high adoption rate was facilitated by stable, state-subsidized, and geographically dispersed input and output markets for maize in both countries. The programs proved to be financially unsustainable because of credit defaults and the expense of maintaining an extensive network of market depots, and programs were sharply reduced in the early 1990s. The effect of their elimination was felt most severely in Zambia, which liberalized more rapidly yet has a weaker private sector than Zimbabwe: in 1994/95 hybrid seed sales fell to less than 3,400 tons from an annual average of 8,000 tons between 1981 and 1993.

The proportion of sorghum area planted to improved varieties in both countries increased from 8-12% to 30-36% after 1993 due to government and donor programs that distributed improved open pollinated varieties (OPVs) for free through drought relief programs. One of the improved Zimbabwean varieties, SV2, offered estimated yield gains of up to 50% over traditional varieties. Commercial demand for sorghum seed remains low because (unlike hybrid maize) farmers can replant OPVs for several seasons with little deterioration of varietal characteristics.

Adoption of improved groundnut varieties has been extremely limited in Zambia and Zimbabwe despite the availability of releases that yield up to 80% more than local varieties under on-station conditions. Nearly all of the groundnut crop in Zambia is produced from farmer-retained seed.

Private sector activity (for-profit and NGO) has greatly expanded since the reforms. Seed subsectors are undergoing rapid change and development in the wake of market liberalization and deep government budget cuts. Government organizations, through design and default,

are transferring responsibilities for plant breeding, extension, multiplication, marketing, and regulation to private organizations.

Before reforms, the government breeding program was the single source for new varieties, which were multiplied and distributed by a single parastatal or semi-private seed company. As a result of liberalization there are now multiple sources of new varieties (including private firms and NGOs), but commercial farmers, not smallholders, have been the major beneficiaries so far. Several research-based international seed companies[1] dominate the supply of hybrid maize seed, while international research centers, NGOs, informal farmer groups and commodity traders control the supply of open pollinated seed for maize, sorghum and groundnuts. The government and NGOs continue to dominate the supply of seed to farmers in marginal areas through drought relief programs. Government organizations are also beginning to transfer regulatory functions to the private sector.

Biological and technical factors affect commercial interest in the production of different seed types. Biological and technical production features of a crop (e.g., reproductive characteristic, sowing rate, multiplication factor, rate of varietal deterioration) affect seed profitability and the level of commercial interest in seed research, production, multiplication, processing, and distribution.

Improved seed can take two forms, open-pollinated varieties (OPVs) and hybrids. OPVs are more stable (i.e., they degenerate less quickly) than hybrids, which must be replaced annually. In most cases hybrids outyield OPVs and tend to be more responsive to fertilizer, but seed production is more technically demanding and costly. Large seed companies promote the use of hybrid seed because it must be purchased annually, but it may be too expensive for small farmers to use for less commercialized crops.

Multiplication and seeding rates are other important factors affecting seed profitability. Crops with high multiplication factors (such as maize, sorghum and millet) are less costly to manage: fewer multiplications are required and there are smaller quantities to process, store, transport and distribute at each stage. Low sowing rates mean that the volume of seed sold to individual farmers is also low. Companies can normally compensate for the low volume by charging higher seed prices, since the seed cost to farmers is a relatively small proportion of total production costs per hectare.

On the other hand, grain legumes are characterized by low multiplication factors and high seeding rates, and these are consequently the least attractive crops for large centralized seed companies to handle. The extreme example is groundnut, which has a multiplication factor of less than 10 and a sowing rate of 125 kg per hectare. These bulky seed crops are more amenable to production by localized seed companies that can minimize transport costs at each stage.

A tri-level seed system is emerging in Zimbabwe and Zambia. In the first tier, seed sectors with high profit margins and high and regular annual seed sales such as hybrid maize, sunflower and (to a lesser extent) hybrid sorghum are now dominated by several large companies with financial and technical resources to carry out private research and extension programs. These companies cross inbred lines from their international breeding programs and select adapted hybrids based on their performance in strip trials and demonstrations carried out in collaboration with government and private researchers, extensionists and NGOs. The trials are concentrated in high potential agricultural areas along major transportation routes. Hybrid seed is multiplied by an elite group of large-scale mechanized farmers.

At the second tier, financial returns to private (for-profit) research on groundnuts and OPVs of maize and sorghum are too low to attract large seed firms, but emerging domestic companies and commercially-oriented NGOs have shown interest. Sales volumes from open pollinated maize and sorghum are low and erratic; farmers save their own seed and have become accustomed to receiving free seed through drought relief programs. Groundnut seed sales are also irregular, but volumes are substantial because of the high seeding rate. In both Zimbabwe and Zambia, small domestic firms and NGOs are beginning to test varieties, train local seed producers, and develop niche markets for these seed commodities.

In the third tier are NGOs and farmer organizations that undertake village level varietal screening, seed production and germplasm conservation on subsistence crops with little commercial intent. For example, COMMUTECH in Zimbabwe provides technical support to smallholders on seed selection, disease control, field crop isolation, and seed storage tailored for specific commodities, and promotes *in situ* conservation and biodiversity maintenance.

MAJOR CONSTRAINTS

Limited demand by smallholders. Smallholder adoption of improved seed (especially sorghum and groundnut) is constrained by limited commercial demand for these commodities, lack of information about the benefits of using new technology and inadequate access to new seed. Pre-reform programs provided powerful incentives for smallholder adoption of hybrid maize and fertilizer, although they became financially unsustainable. The programs educated smallholders about the yield advantages of hybrid maize and fertilizer and directly linked smallholders with input and output markets. Improved inputs were provided on (subsidized) credit through local cooperative depots, with payment deducted at the end of the season when the farmer marketed

Following the reforms that eliminated these marketing programs and other subsidies to seed parastatals, commercial seed seems expensive, difficult to obtain, and its use risky given poorly developed output markets. With the decline of extension services in both countries following budget cutbacks, smallholders today lack a reliable source of information about the benefits of improved varieties.

High startup costs for seed production. Hybrid maize and sorghum companies can take advantage of an established network of large-scale commercial seed producers, but companies and NGOs interested in OPVs must first train smallholder seed producers. Training and supervision costs are much higher for dispersed smallholder seed growers than for large-scale enterprises with hectares of seed under one farmer's management.

Setting up marketing channels in rural areas is expensive. Seed companies at all levels find it expensive to reach customers beyond the main agricultural areas served by good roads. Four problems are evident: (1) transport costs are high (especially in Zambia) because of the poor rural road network; (2) rural shopkeepers lack technical training that would allow them to advise farmers on appropriate varieties, seeding rates, planting dates, and proper storage of seeds; (3) shopkeepers lack bookkeeping and credit management

[1] These include Pannar, the Seed Company of Zimbabwe, Cargill-Carnia, Pioneer Hi-Bred International, and Africa Pacific Seeds-National Tested Seeds (NTS).

skills; and (4) credit defaults by both shopkeepers and farmers are a problem because repayment contracts are not enforced by the state legal system.

Poorly targeted seed relief programs. The development of commercial channels for seed has also been hampered by the continued distribution of free or subsidized seed through government and donor-financed drought relief programs. These programs are not always well targeted to commodities and areas where there is little existing or potential commercial activity. They then compete with commercial channels and each other and send mixed signals to farmers. For example, in Zambia three programs operated in the same areas during 1995-96: Zambia Seed Company tried to sell maize seed for cash through district-level distributors, the Program Against Malnutrition distributed maize seed to be paid back in kind at the end of the season, and other NGOS and the Ministry of Agriculture, Food and Fisheries gave seed away.

Inconsistent, poorly enforced government regulations. The implementation of reforms has facilitated the diversification of the seed sector, encouraging the growth of many different types of for-profit and cooperative seed enterprises. Many government regulations are still geared toward first tier large seed companies, and with reduced budgets public seed agencies are unable to effectively carry out these regulatory functions for an expanded set of seed companies. There are three problems. First, a number of unofficial and sometimes conflicting changes have been made to the statutory instruments affecting the seed sector by different agencies in recent years (e.g., a letter sent from Zimbabwe's Ministry of Industry and Commerce in 1989 advised companies that they could no longer sell open-pollinated maize seed), but they have not been formally codified and are creating confusion and impeding development of the sector.

Second, seed certification is compulsory for all crops in Zimbabwe (but not Zambia). Compulsory certification constrains the multiplication and distribution of seed of OPVs because their low seed yields and profit margins cannot absorb the costs of stringent and frequent inspections needed to comply with certification standards.

Third, deep budget cuts have made it difficult for public seed agencies to carry out regulatory functions in a timely way, but public agencies have been slow to reorganize so that more functions are delegated to the private sector with oversight from the public agency. Lengthy delays in issuing seed analysis certifications have moved several Zimbabwean seed companies to begin (illegally) self-certifying their seeds.

STRATEGIES FOR IMPROVING SEED SECTOR PERFORMANCE

Reduce the learning costs for new seed enterprises. Several NGOs in Zimbabwe and Zambia (e.g., CARE, ENDA, COMMUTECH), in partnership with the public extension service, are helping first-, second- and third-tier seed organizations reduce the transactions costs of dealing with smallholder seed producers, rural shopkeepers, and rural clients by (1) providing links to NARS and international research centers to get information and seed of appropriate varieties; (2) training and supervising farmers in seed production, selection, storage and marketing; (3) providing basic training on seeds and bookkeeping to rural shopkeepers; and (4) screening rural shopkeepers for creditworthiness, providing working capital for input stocks and aggregating orders to be filled by large input supply companies. The government and donor community should support these activities but also ensure that the seed organizations do not grow dependent on subsidized aid. The CARE AGENT program in Zimbabwe, for example, identifies and trains rural traders and initially guarantees credit for input stocks, but "graduates" traders to supplier credit as quickly as possible.

Encourage the development of seed markets. A first step in encouraging the development of seed markets would be to discontinue the direct distribution of relief seed for commodities that are available commercially and instead provide farmers with vouchers to purchase seed locally.

Second, finance could be made available to enable commodity traders to set up seed outgrower schemes under which the traders would supply improved seed, other inputs, extension advice and supervision to farmer associations. Farmers could repay the inputs with a specified amount of seed grain at harvest time and retain the option of selling the crop to the trader or on the open market. More experienced associations could eventually apply for finance as a group, contract for extension assistance and certification inspections as necessary, and offer the seed product for sale through the national commodity exchange.

Third, seed companies can reduce their costs and risk by actively marketing the byproducts of seed processing. For example, since the shelling percentage for groundnut seed is so low, Zimbabwe's Seed Company formed a subsidiary to shell and process all groundnuts for seed marketed by the Seed Company and to process all byproducts to be sold to oil and confectionary groundnut p

Expand markets for smallholder commodities. Increasing the demand for improved varieties by smallholders ultimately depends on expanding the post-harvest market for commodities traditionally produced by smallholders such as sorghum, groundnuts and pearl millet. The stockfeed and beer industries are already using sorghum produced by large-scale farmers. Some small-scale millers are experimenting with the production of ready-processed sorghum and millet weaning foods. Preferential financing could be made available to entrepreneurs willing to access grains from the smallholder sector and develop domestic and international markets for new products.

Strengthen public and private research and extension for smallholder commodities. The drastic reduction in government budgets following structural adjustment has dramatically reduced government capacity in seed research, extension and regulation. While large international seed companies have the resources to mount their own research and extension programs, smallholder seed producers do not. NGOs are currently acting as technical liaisons between smallholder seed producers and extension services, NARS, and international research centers, but the sustainability of these activities is questionable. It is vital that core research and extension services (provided directly by the public sector or contracted by the government to the private sector) be maintained for commodities and marginal areas that are unlikely to be serviced by the for-profit private sector in the near future, including open pollinated maize, sorghum and groundnuts. A key to improving research and extension in these areas will be increasing the accountability of research and extension services to client farmers.

Rationalize public sector seed regulations and functions. We recommend that compulsory certification for all crops be abandoned and that a two-tier seed multiplication and distribution system be put in place instead. At the first level, foundation seed would be multiplied to certified seed under the stringent and highly controlled conditions currently required by seed authorities and made available for direct sale. In the second stage, seed from the first level would be bulked by individual farmers and farmer groups in local villages under

inspection by extension workers, and marketed as standard seed. Removing compulsory seed certification and restrictive trade licensing requirements will permit formal production of quality open pollinated maize, sorghum and groundnut seed by smallholders and sale among neighboring farmers. In addition, seed companies will be able to involve smallholders in contract seed production more easily.

In both countries, encouraging the development of private seed testing laboratories and focusing public sector efforts on monitoring these facilities rather than carrying out tests itself would improve regulatory function. A comprehensive review of seed sector regulations should also be carried out to resolve conflicts and remove regulations that impose an unnecessary financial burden on seed companies, e.g., Zimbabwe's requirement that exported seeds carry an Orange Certificate, whether or not one is required by the buying company or importing authority. A document should be printed that incorporates all official amendments to existing seed legislation.

Contract enforcement. One of the unfortunate legacies of maize support programs during the 1980s is a lax attitude toward the repayment of credit and honoring of contracts among farmers and businesses in Zimbabwe and Zambia. In order for market-driven input and output markets to develop, strengthening the judicial system and lowering the cost of contract enforcement are urgent priorities.

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