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PROMOTING A STRONG SEED SECTOR IN SUB-SAHARAN AFRICA

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Given that Sub-Saharan Africa has the highest incidence of poverty and malnutrition in the world, the stagnation in per capita grain production there is worrisome. Since 1970, per capita grain production in Sub-Saharan Africa has declined more than 10 percent. Increasing the productivity of staple foodcrops will help poor farmers and consumers, and one of the most sustainable ways to expand food production in Sub-Saharan Africa is to generate new technologies—including staple seed varieties—that are adapted to the constraints of the continent's small-scale farmers. The region thus requires a cost-effective system of seed production and distribution to ensure that appropriate seeds are delivered to farmers.

Both the private and public sectors have a role to play in developing the seed sector in Sub-Saharan Africa. Although the private sector can effectively carry out many seed production and distribution activities, for reasons discussed in this brief, private companies acting on their own will not develop and produce optimal amounts of appropriate seeds for Sub-Saharan Africa. Thus the public sector also has a role to play.

The Public-Sector Role in Developing Seed Systems

The seed industry has several economic characteristics that justify selective government involvement. First, developing new seed varieties involves large fixed costs in terms of fields, equipment, and scientific expertise, and the development process can take up to 20 years. The payoff for these investments is uncertain, especially given that many types of seed are easy for farmers to reproduce. Only a large private company or a subsidized public entity can afford to invest in an activity with such uncertain, long-term payoffs, and the private sector will supply less than the socially optimal amount. The difficulty of capturing the benefits of improved seed varieties provides a public-good rationale for government support for plant breeding, particularly for crops that are easy to recycle and for crops that are important to small farmers. This does not imply that the public sector must be involved in all stages of seed production or in plant breeding for all crops. Nor does it imply that breeding must be carried out by scientists at government-funded research institutes. Rather, it implies that there is some social value in subsidizing plant breeding and other agronomic work that generates new and improved varieties of important crops, particularly those produced and consumed by the poor.

Second, seed quality varies widely, depending on the genetically determined performance potential, varietal purity, physical cleanliness, and viability. Yet quality is difficult for farmers to observe until after the seed has been purchased and planted. Public intervention is thus needed to provide farmers with information about seed quality. A range of policies and regulations has been adopted to protect farmers from low-quality seed, including minimum standards, voluntary or mandatory seed certification, import restrictions, licensing and registration of seed companies, and legal protocols for testing

seed quality. Overly strict quality controls, however, will impede international flows of seed technology and slow the diffusion of new technologies from the research station to the farmers.

Third, most seed consumers in Sub-Saharan Africa are poor and risk averse. Cash constraints often limit their ability to make investments—even profitable ones. The fact that small-scale agriculture is the main source of income for the majority of the poor in most African countries suggests that there is a strong equity argument for public investments to strengthen the system of developing new crop varieties and delivering them to farmers.

Yet many of the individual functions within the seed supply system, such as seed multiplication, processing, and distribution, do not have significant externalities or public-good characteristics. Thus, an efficient seed system is likely to involve a complex combination of public-sector support and private-sector commercial activities. The public sector must play a bigger role in plant breeding and some aspects of quality control, whereas the private sector has better incentives in the area of seed multiplication, processing, and distribution. Moreover, the private sector has adequate incentives to play a major role in producing and distributing seed of hybrids (particularly maize) and other crops (such as vegetables) for which farmers tend to rely on external supply. On the other hand, the public sector generally needs to play a bigger role in seed systems for open-pollinated varieties of staple foodcrops, as well as the seeds of minor crops for which the scale of production is relatively small. These crops include sorghum, millet, cassava, and cowpeas. In addition, the state may need to play a larger role in poor countries where the private sector is not sufficiently developed to assume the risks associated with seed production and distribution.

Developing New Varieties

Farmers have been creating new and improved varieties of crops for thousands of years, but in the 20th century, advances in knowledge about genetics led to more scientific approaches to plant breeding. Studies show that plant breeding has generated high rates of return to public investments, thanks to improvements in yield, disease resistance, and other characteristics. In spite of this fact, public funding for plant breeding and crop improvement in developing countries has been variable and on a downward trend in recent years. Given that agricultural research is a cumulative, long-term endeavor, adequate and stable funding is crucial.

When the research institutes of the Consultative Group on International Agricultural Research (CGIAR) were established in the 1970s, breeding for global adaptation was a commonly accepted paradigm, but the resulting traits did not always improve performance in the variety of agroecological conditions in which the crops were actually grown. More recently, CGIAR centers and national agricultural research systems (NARSs) working on crop improvement have made efforts to define cross-national regions with common agroclimatic features. Neither regional (cross-national)

nor local (national and subnational) breeding strategies alone are likely to be as successful as a judicious blend of regional and local breeding strategies. In general, however, it is better to start with a decentralized approach, to promote communication and interaction within a region, and to build a regional strategy from the ground up than to use a top-down approach.

Although the allocation of resources between conventional breeding and biotechnology is a contentious issue, well-targeted objectives and effective field testing and selection are essential for success under either approach. The first priority should therefore be to provide training, infrastructure, and operational funds to support core breeding activities.

In addition, new varieties will be adopted only if they possess agronomic and postharvest characteristics that are acceptable to farmers and consumers in the target production environments. Farmer participation in selecting the best experimental varieties for commercial production is thus highly desirable.

Finally, in many countries, the procedures for releasing new crop varieties need to be clarified, simplified, and accelerated. Excessive regulations slow the diffusion of new technology to farmers without providing offsetting benefits in terms of protecting farmers from underperforming varieties.

Producing Seeds

Since the mid-1980s, seed programs have turned away from supporting state seed enterprises and toward the development of a more diverse and competitive seed sector, including private seed companies, nongovernmental organizations (NGOs), and farmer organizations. The number of private firms involved in seed production has increased, although not as much as hoped for, and private firms are reluctant to provide seed for minor crops. In some cases, it may simply not be profitable to produce seed for minor crops or crops that are easily recycled. It is likely, however, that the private sector could play a larger role in seed production given a more favorable policy environment, including the following conditions: (1) a clear regulatory framework; (2) fair competition, including assurance that private seed companies will not be forced to compete with a heavily subsidized state-owned seed enterprise; (3) access to germplasm from national or international research centers; and (4) limits on the distribution of free emergency seed.

Whereas early programs ignored the informal seed sector, there is now greater interest in understanding and learning from it, including attempts to combine the strengths of the formal and informal seed sectors. Community seed production projects have become quite common in Sub-Saharan African countries to provide emergency seed relief, to develop the seed sector, or simply to generate income, but they often require external support.

Marketing Seeds

The government has a role in supporting agricultural research and extension activities related to seed development, as well as in setting standards, testing, and requiring labels to inform buyers. But the economic justification for direct government involvement in

seed marketing per se is not strong; rather, the government should facilitate the development of private marketing channels.

For example, governments can facilitate international trade in seed by promoting regional harmonization of seed regulations and reciprocal recognition of new varieties. By expanding the potential size of the market, this policy creates stronger incentives for investments by private seed companies, both local and international.

In addition, governments can work with networks of agricultural input dealers, providing them with credit, helping them understand seed demand, and training them to provide technical information regarding seed and other inputs. Governments can also help ensure that seeds distributed by NGOs for free after emergencies do not have an adverse effect on private-sector seed companies. Private seed companies tend to focus on hybrid maize, vegetables, and industrial crops, so there is a role for government in marketing seeds of minor crops and to farmers in remote areas.

Building Effective and Sustainable Seed Systems

To help build effective and sustainable seed systems, governments need to focus on educating and training participants in the public and private sectors to increase their understanding of the technical aspects of varietal development, seed production, and seed marketing, as well as of policies and regulations related to seed development.

Governments should also work to strengthen output markets so that as agricultural research generates productivity-increasing technology to farmers, countries can avoid a situation of oversupply that depresses prices and causes farmers to reject the technology. Such steps will include more coordinated and predictable government behavior and increased investment in infrastructure and regulatory frameworks to support the development of food markets. Reducing barriers to grain trade would expand markets and make them less vulnerable to local supply disturbances.

In summary, promoting the development of a strong seed sector in Sub-Saharan Africa requires a coordinated effort between the public and private sectors, where the roles may differ across activities (seed development, production, and marketing), across crops, and across countries. The public sector needs to invest more in plant breeding and the development of new varieties, particularly for open-pollinated varieties of staple foodcrops. Seed production and marketing are often more efficiently carried out by private seed companies, but they must be supported with an enabling policy environment. Such an environment would include a clear legal framework for private seed companies, access to public-sector germplasm, the absence of subsidized state seed companies, streamlined varietal release policies, regional harmonization of seed regulations, and limits on the distribution of free seed by NGOs in nonemergency situations. Seed policy should also help promote efficient informal seed systems, while controlling misleading sales practices. Effective and sustainable seed systems can help improve the livelihoods of Sub-Saharan Africa's small farmers and benefit consumers as well, serving as an important element in strategies for agricultural development and poverty reduction.

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