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ZAMBIA

PRIVATE AGRICULTURAL RESEARCH AND INNOVATION

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RECENT ECONOMIC AND AGRICULTURAL GROWTH

With 67 percent of Zambia's labor force employed in agriculture, increases in agricultural production are crucial to reducing poverty. Since the late 1990s, Zambia's economy and smallholder farming sector have shown some positive trends. During 2000–08, real gross domestic product (GDP) increased by an average of 5.1 percent per year. During this period, population growth directly increased demand for food by 3 percent per year, and people with more income spent more on food.

After 2000, the country reached self-sufficiency in wheat and soybeans, largely based on cultivars introduced by private seed companies. But the biggest changes have been in high-value foods. The production and consumption of fruits, vegetables, and animal protein expanded substantially from the late 1990s to 2008. By 2002/03, small- and medium-size farmers earned almost as much from sales of vegetables (US$35 million) and livestock products (US$33 million) as they did from maize sales (US$39 million).

MEASURING PRIVATE TECHNOLOGY INTRODUCTION

Companies of all sizes innovate to reduce costs as well as to provide products that farmers and others want. A survey of 31 private organizations conducted for this study collected information on private sector introduction of agricultural technology. The survey included 21 companies and 2 non-government organizations (NGOs) selling inputs, 2 companies operating large farms, and 5 companies and a trade association marketing or processing crop and livestock products. Agribusinesses in Zambia are well linked to international markets: 17 of the companies were subsidiaries of foreign companies, and 3 local companies operated their own subsidiaries. Most companies had introduced new technologies within the previous five years, including technologies embodied in inputs (seed, pest control products, fertilizers, etc.), milling technologies, irrigation equipment, agronomic practices (conservation tillage), and others (Table 1).

The flow of new technology to Zambian farmers is much greater through private companies than through public research. During 2000–08, companies registered 105 maize cultivars

Table 1—Examples of new products or processes introduced by private organizations within the previous five years

Industry	Examples of innovations
Inputs	
Seed	New cultivars, for example of maize, cotton, and vegetables; true potato seed; seedlings
Fertilizers	Granular fertilizer, fertilizer blends for vegetables, inoculants
Pesticides	New active ingredients
Machinery	Irrigation equipment, land preparation tools (for conservation farming)
Livestock inputs	Cattle breeds, computer program to match bulls with cows, goat breeds, quail feed, heat-tolerant vaccines, smallholder dairy production guide
Large-scale crop production	Sugar and vegetable cultivars
Processors	
Crops	Vitamin A fortified sugar, biodiesel, ethanol
Livestock	Poultry meat processing (for example, freezing or smoking)

Source: Compiled by authors from survey data.

compared to 8 from public research (Table 2). For all other field crops, private companies registered 44 cultivars versus 34 from public research. Similarly, private organizations deliver most innovations in agricultural machinery, livestock, pesticides, chemicals, and processing. On the other hand, research performed by the public sector and through public–private collaborations resulted in some important technologies for small farmers, such as conservation tillage.

Companies reported various sources for their innovations (Table 3). Most reported obtaining at least some of their technologies from foreign sources, including parent companies and others. The Zambia Sugar Company, for example, imports cane varieties from its South African parent company, Illova, and then tests the varieties for adaptability in Zambia. Similarly, York Farm, a private estate farm specializing in vegetables and flowers for export, imports varieties to suit its foreign buyers.

Table 2—Number of cultivars registered for selected major crops by organization, 2000–08

	Private companies												
Cultivar	AFGRI	Buyabamba	Kamano	MRI	Monsanto	Pannar	Pioneer	Progene	SeedCo	Zamseed	Total private	Public organizations	Total
Maize	3	—	5	16	6	36	7	3	20	9	105	8	113
Sorghum	—	—	—	—	—	—	—	—	1	—	1	3	4
Millet	—	—	—	—	—	—	—	—	—	—	—	4	4
Wheat	1	—	—	—	—	2	—	—	7	3	13	4	17
Rice	—	—	—	—	—	—	—	—	—	—		2	2
Beans	—	—	—	—	—	3	—	2	1	—	6	4	10
Soybeans	—	—	—	2	—	1	—	—	8	—	11	2	13
Groundnuts	—	—	—	1	—	—	—	—	3	—	4	1	5
Sunflowers	—	—	—	1	—	3	—	—	2	—	6	—	6
Potatoes	—	1	2	—	—	—	—	—	—	—	3	—	3
Cassava	—	—	—	—	—	—	—	—	—	—	—	4	4
Sweet potatoes	—	—	—	—	—	—	—	—	—	—	—	5	5
Other	—	—	—	—	—	—	—	—	—	—	—	5	5
Total	**4**	**1**	**7**	**20**	**6**	**45**	**7**	**5**	**42**	**12**	**149**	**42**	**191**

Source: Seed Control and Certification Institute (2008).

Note: MRI indicates the Maize Research Institute. "Millet" includes pearl and finger millet; "Other" includes cotton, cowpeas, pigeon peas, castor, and guar.

Table 3—Innovations by source of technology

		Number of organization reporting each source (organizations may report >1 source)			
		Developed in Zambia through		Developed abroad and imported from	
Product	Number of organizations reporting innovations	Own R&D	Others' R&D	Parent Company	Other Source
Inputs					
Seeds	9	2	2	5	1
Fertilizers	2	—	—	2	—
Pesticides	7	—	—	4	3
Machinery	5	2	1	3	—
Livestock inputs	5	2	—	3	1
Large-scale crop production	1	—	—	1	—
Processing					
Crops	2	1	—	—	1
Livestock	1	1	—	—	—

Source: Compiled by authors from survey data.

The poultry industry imports breeds. A minority of companies reported innovations from their own in-country research. Only a few companies acquired technologies from others' in-country research; for example, Zamseed licenses cultivars developed by the public sector.

Private companies supply much of the technology farmers use to produce vegetables and livestock products. After 2000, poultry production expanded at an estimated 20 percent per year, until high grain prices and consumers' fear of avian influenza caused a temporary setback in 2007. Together with the government's Golden Valley Agricultural Research Trust, private companies introduced dairy cows with improved genetic potential, and technologies for silage and milk collection. Private maize hybrids have helped Zambia's smallholder farmers realize the highest maize yields in Sub-Saharan Africa outside South Africa, and private cultivars for maize, soybeans, and wheat have helped Zambia achieve self-sufficiency in these crops in recent years.

One innovation—in marketing—warrants special mention, because it is so important for disseminating new technologies to smallholders. Before the government's liberalizing reforms in the 1990s, private companies sold inputs to large farms and to the government, which in turn distributed seed and fertilizer to small farmers through nonmarket channels. This situation is changing. Companies selling seed and other inputs are realizing that their largest market is small farmers, who collectively account for an estimated 90 percent of planted area. To reach this market, companies are making inputs available to smallholders through Zambia's rapidly expanding network of private agri-dealers.

PRIVATE AGRICULTURAL R&D

A number of Zambian private organizations have made substantial investments in agricultural research. Notably, Zambia has a strong presence in maize breeding in Africa, with breeding in locally-owned private companies such as Zamseed and Maize Research Institute. Private organizations research jatropha and sugarcane agronomy, drip irrigation, machinery and techniques for land preparation, and other issues.

ASTI Website Interaction

More details on trends in investments, capacity, and policies in private-sector agricultural research and innovation in Zambia are available at http://www.asti.cgiar.org/pdf/Zambia-Private-Sector-Report.pdf.

More information on recent trends in public-sector agricultural research investments and capacity in Zambia is available at http://www.asti.cgiar.org/pdf/Zambia-Note.pdf.

www.asti.cgiar.org/zambia

The survey included organizations accounting for most private agricultural research, but some of the surveyed companies chose not to answer questions about staff and budgets. Seven private organizations provided data on agricultural R&D staffing (Table 4). These 7 organizations include 2 seed companies, a pesticide company, an NGO working with machinery, a company selling livestock inputs, and 2 crop-processing companies. Combined, these seven organizations reported employing a total of 25 researchers, including three women. Four researchers had PhD degrees, 8 were MSc-qualified, and 13 were qualified to the BSc level. Two companies and an NGO reported R&D expenditures. Combined, these agencies reported spending US$1.3 million on research in 2008 (Table 4). This partial account of private research spending in 2008 is equivalent to purchasing power parity (PPP) $ 1.4 million in 2005 prices; this can be compared to Zambia's PPP$ 8.3 million in public agricultural research spending in 2008 (also in 2005 prices).[1]

Table 4—Agricultural research staff and budgets, 7 private organizations, 2008

Product type	Organizations reporting researchers	Researchers by qualification level (headcount)				R&D spending (thousands current US$)
		PhD	MSc	BSc	Total	
Inputs						
Seeds	2	0	3	4	7	670
Pesticides	1	0	0	2	2	na
Machinery	1	0	1	0	1	110
Livestock inputs	1	1	1	3	5	na
Processing						
Crops	2	3	3	4	10	490
Total	**7**	**4**	**8**	**13**	**25**	**1,270**

Source: Compiled by authors from survey data.
Note: na indicates that data were not available.

RECOMMENDATIONS FOR SUPPORTING PRIVATE INNOVATION

Government and donor actions can have a big impact on private agricultural innovation and R&D. One of the most important contributions is the supply of scientifically trained graduates from public universities. Governments and donors can also support private research by collaborating with private companies to develop and introduce new technologies. For example, the Golden Valley Agricultural Research Trust, a public entity, and the Conservation Farming Unit, a local NGO, have worked with private companies to develop and introduce machinery for conservation tillage. The Profit Project, funded by the United States Agency for International Development and implemented by Land O' Lakes, works with private companies to develop and market technologies for small-scale dairy production.

Financial assistance is another way that governments can support private research. Surveyed companies with R&D programs asked for financial assistance through tax breaks and grants for research. Governments can also promote innovation by protecting intellectual property rights. In 2007, Zambia passed a law establishing plant breeders' rights, but as of 2011 regulations had not yet been issued, nor had the law been enforced. Several companies stated that the law would increase their incentives and efforts to introduce new non-hybrid cultivars. No company expressed concern about patents for agricultural chemicals or machinery; patents are more important in producing than in importing countries.

Governments can further support the introduction of technologies by private organizations with rational regulations that focus on risks but do not otherwise interfere with technology introduction. The poultry industry appreciates Zambia's current strict controls on veterinary pharmaceuticals, which ensure quality. With avian influenza and other disease threats, the poultry industry respects zoosanitary controls on the import of live birds – up to 13 weeks of quarantine for imported birds – even though these controls increase costs. On the other hand, government controls on the importation of cattle semen based not only on zoosanitary concerns but also on performance could be an obstacle to technology introduction; however, none of the survey respondents complained about not being able to import semen from specific bulls.

Some aspects of the current seed regulations arguably go beyond what is needed to protect farmers. The most important regulatory issue for technology transfer and research in seeds is whether and how the government controls the introduction of new cultivars. When a company wants to introduce a new cultivar for maize, wheat, or other field crop (with the exception of forage crops), the government requires two years of official tests and collects fees that can exceed US$2,000—and even then the request can be denied. Since the late 1990s, Zambia has taken part in discussions through the Southern Africa Development Community (SADC) to create a list of cultivars for which seed could be sold in all SADC countries. In addition to SADC's harmonization initiative, Zambia could consider unilateral steps to relax controls on the introduction of new field crop cultivars.

NOTE

[1] Puchasing power parity (PPP) dollars reflect the internal purchasing power of local currencies more effectively than do US dollars, because the PPP exchange rate considers prices for a broad range of locally traded —as opposed to only internationally traded—goods and services.

FURTHER READING

Mwala, M. and D. Gisselquist. 2012. *Private Innovation and R&D in Zambian Agriculture: Description, Impact and Policy Options*. Washington, DC and New Brunswick, NJ: International Food Policy Research Institute and Rutgers University.

Flaherty, K. and M. Mwala. 2010. *Zambia: Recent developments in public agricultural research*. Washington, DC: IFPRI.

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Rutgers, the State University of New Jersey, is a leading national public research university and the state's preeminent, comprehensive public institution of higher education. Rutgers has strong research programs with internationally recognized scholars focused on policy and management issues in three key areas: technology and innovation, food and agricultural systems, and land use.

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