ASTI Agricultural Science & Technology Indicators
FACILITATED BY IFPRI

RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Denkleiers • Leading Minds • Dikgopolo tša Dihlalefi

SOUTH AFRICA

PRIVATE AGRICULTURAL RESEARCH AND INNOVATION

Johann Kirsten, Ruan Stander, and Choolwe Haankuku

Country Note • July 2011

PRIVATE INVESTMENT TRENDS

Private firms in South Africa have greatly expanded their involvement in agricultural research and development (R&D) in the past decade. For 19 out of 35 identified companies in five agricultural subsectors studied, private research expenditures increased from 216 million rand in 2001 to 262 million rand in 2008—or from 56 million to 68 million dollars—all based on 2005 purchasing power parity (PPP) exchange rates (Table 1).[1] Similarly, the number of privately employed agricultural researchers in these 19 companies grew from 159 full-time equivalents (FTEs) in 2001 to 201 FTEs in 2008. This growth was fueled by international participation in research, given that the majority of private agricultural firms in South Africa have formed partnerships with foreign multinational corporations and now operate as subsidiaries. Most of the research done by the private sector is performed on technologies created abroad, so domestic R&D focuses on adapting or testing these foreign technologies under local agricultural conditions and government regulations.

Private agricultural research has been encouraged by the deregulation of agricultural inputs and product markets, and the liberalization of agricultural trade. Some firms, however, contend that impediments to international participation and private R&D call for further policy attention. Many would like the government to ease phytosanitary restrictions on exports and to update policies on genetically modified organisms (GMOs) to enable domestic firms to adopt GMO technologies.

Although this recent expansion of privately performed R&D is notable, its extent has largely remained unmeasured because data have been limited and the proprietary nature of the technologies prevents them from being shared.

MOTIVATION FOR INVESTMENT

Changes in Agriculture

Agricultural production and productivity in South Africa have changed significantly over the past few decades. Output as a share of gross domestic product (GDP) declined from about 10 percent in the 1960s to 3 percent in 2007. Similarly, the country's share of agricultural exports has contracted significantly since the 1930s, when it accounted for more than 70 percent. Given international sanctions related to apartheid, the country's export share fell to a low of 7 percent in 1993 and has only regained momentum slowly, reaching an average of 8 percent since the turn of the millennium. Despite these low figures, South Africa is a net agricultural exporter, and data indicate room for growth.

South African production has shifted significantly over time, from field crops to high-value horticultural products (fruits and vegetables). The share of field crops in overall agricultural production declined from 40 percent in the 1980s to 30 percent between 2000 and 2007, while the share of horticultural crops rose from 18 to 26 percent. The production of wine, deciduous fruit, and citrus fruit has grown remarkably in the past decade, averaging more than 4 percent per year. Like field crops, livestock's share of overall production has declined over time, from an estimated 55 percent in the early 1900s to about 44 percent in 2007. The related national feed production is estimated to be roughly 8.5 million tons, with a gross value of between 12 and 15 billion rand per year.

South Africa has one of the largest cultivated forestry resources in the world, with production valued at 2 billion rand in 2008. The country's forestry plantations cover an area of approximately 1.3 million hectares and produce more than 9.5 million metric tons of pulp per year. The industry is a net exporter of wood, paper, pulp, and other products, contributing about 1 percent to the country's GDP.

Overall, the yearly rate of agricultural output growth has fluctuated from an average of 1.9 percent in the 1940s, to 3.6 percent from the 1950s through the 1970s, and 1.5 percent between 1982 and 2000. Since 2000 agricultural output has increased by about 2.1 percent per year, mainly due to growth in horticulture. Even though yearly growth has improved since 2000, it still falls far below the levels reached in the 1950s—meaning it is still well below the country's potential.

Changes in Policy

South Africa's agricultural sector has undergone a series of policy reforms since 1994. Apart from continued efforts to redress the effects of discriminatory legislation, some of the major policy shifts include deregulating the marketing of agricultural products and liberalizing agricultural trade; enacting land reform policies and programs; eradicating certain tax concessions and reducing direct subsidies; and introducing a minimum wage for farm workers. Since deregulation, the private sector has taken

over the marketing of agriculture, which has attracted foreign direct investment from multinational companies that have formed partnerships with local companies in manufacturing and distributing inputs (seed, fertilizer, agrochemicals, and machinery) and outputs. These mergers with foreign multinational companies have increased the role of South Africa's private companies in agriculture research, particularly in terms of performing trials and testing the suitability of new technologies.

The establishment of preferential trade agreements has also enhanced the private sector's involvement in agribusiness in South Africa, and increased the country's access to foreign markets for exports of products like sugar, citrus fruit, grapes, maize, and wine. The agreements have also permitted the presence of foreign products on the domestic market, mainly in the form of inputs such as agricultural machinery and equipment, fertilizer components, and agrochemicals—some of which enter the country duty free.

The reason for increased participation in agricultural research by the private sector is often cited as the declining performance of the Agricultural Research Council (ARC) resulting from reduced funding, poor management, and the departure of well-qualified researchers. Established in 1992, ARC remains the country's primary public agricultural research institution. As of 2000, ARC accounted for almost 60 percent of South Africa's (public and private) agricultural research spending and staffing. Previous studies estimated the private sector's 2000 share of agricultural R&D spending at only 3 percent of national expenditures (the balance being attributed to government agencies, commodity organizations, and universities), but data collected for the current study (which covers only a subset of private companies) indicate earlier underestimation of private participation based on a low rate of response by private firms.

METHODOLOGY

The current study identified 51 private firms or cooperatives involved in agriculture-related research in South Africa and categorized them under nine major subsectors (Table 1). Of the 51 firms or cooperatives, 35 agreed to participate in the survey, and 19 returned complete questionnaires. Thus, the proportion of firms covered is 37 percent.

ASTI Website Interaction

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

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

www.asti.cgiar.org/south-africa

THE SCOPE OF PRIVATE INVESTMENT

Under this study, total research expenditures are defined to include salaries, operating expenses, registration fees, and capital investments. As previously stated, aggregated research expenditures for the 19 companies in the five subsectors rose from 216 million rand in 2001 to 262 million rand in 2008 (both amounts in 2005 prices), and researcher numbers grew from 159 to 201 FTEs during this timeframe (Table 2). The bulk of this spending occurred in the seed and fertilizer subsector, whereas the agricultural cooperatives accounted for the smallest share of expenditures.[2]

Survey responses indicate that most innovations resulting from private research are imported or adapted, then distributed under license from international firms or parent companies.

Table 1—Number of private firms contacted, by subsector

Agricultural subsector	Number of firms contacted	Number of firms involved in R&D receiving questionnaires	Number of questionnaires returned
Seed and fertilizers	10	10	8
Agricultural chemicals	10	5	4
Feed and livestock	6	5	2
Forestry and fisheries	5	5	0
Agricultural machinery	2	0	0
Food processing and manufacturing	5	4	0
Wine and spirits	2	1	0
Private commodity-based research institutions[a]	5	4	4
Agricultural businesses (former cooperatives)	7	1	1
Total	**51**	**35**	**19**

Source: Compiled by authors from survey data.

[a] For the purposes of this study, private commodity-based research institutions are defined as privately funded institutions that perform research activities related to agriculture. The five institutions that fell into this category are the South African Sugar Research Institute, the Sugar Milling Research Institute, the Institute for Commercial Forestry Research, Citrus Research International, and the South African Society of Crop Production.

Table 2—Absolute levels of in-house agricultural R&D spending and staffing by the private sector, 2001 and 2008

	Staffing levels		Spending levels			
	Full-time equivalents		2005 rand (millions)		2005 PPP dollars (millions)	
Type of private organization	2001	2008	2001	2008	2001	2008
Seed and fertilizers	81.8	94.9	88.2	124.6	22.8	32.2
Pesticides	6.0	6.0	22.6	20.3	5.8	5.2
Feed and livestock	5.0	9.0	5.8	10.5	1.5	2.7
Private commodity-based research institutions	63.0	88.0	98.1	106.0	25.3	27.4
Agricultural cooperatives	3.0	3.0	0.8	0.8	0.2	0.2
Total	**158.8**	**200.9**	**215.5**	**262.3**	**55.7**	**67.8**

Source: Compiled by authors from survey data.

Table 3—Orientation of private firms in the seed and fertilizer subsector

Institution	Orientation	Research activities
Pannar	Multinational seed producer	• Releasing new cultivars and exchanging germplasm and technology with various international partners • Developing new techniques in biotechnology, such as gene mapping and the incorporation of trait-specific genes into plants to enhance conventional breeding efforts
Agricol	Seed company specializing in agronomy crops such as cereals, canola, hybrid sunflowers, and alternative crops (for example, forage seed)	• Developing seed technology and disseminating knowledge and information
Monsanto	Seed technology company specializing in a wide range of herbicides and biotechnology traits	• Developing seed cultivars, innovative biotechnology products, and chemical products that offer crop protection
Hygrotech	Vegetable seed company specializing (a) in numerous vegetable crops in South and Southern Africa, as well as internationally and (b) in water-soluble fertilizers for crops, foliar- nutrient products, and seedling production	• Developing vegetable cultivars
Sakata seed Southern Africa	Company specializing in seed production; packet seed; vegetable, forage, turf, and flower seed; vegetable breeding programs; and specialized products for the home garden industry	• Breeding plants and testing seed in the laboratory
Starke Ayres	Company supplying innovative, premium seed and associated products to the professional grower and home gardener throughout South Africa and internationally	• Developing vegetable cultivars
Syngenta	Agribusiness company focusing on seed and crop protection and investing in research and field development, manufacturing and supply, and sales and marketing	• Developing new biological products, label expansions, crop programs, and crop solutions • Ensuring sound registrations to minimize risk to end users and the environment
OMNIA	Diversified, specialist chemical services company that produces dry, liquid, and specialty fertilizers and has production plants throughout South Africa	• Conducting laboratory research on chemicals and greenhouse fertilizers, and supporting clients with related expertise
SASOL	An integrated energy and chemical company that manufactures fertilizers, wax, solvents, and other chemicals	• Using new technology to produce plastics and other products and conducting research into the production of cleaner fuels

Sources: Personal interviews and information available at the organizations' websites, 2009.

While this means that most of the technologies are not locally generated, the presence of multinational companies has enabled the development of collaborative synergies. For example, Monsanto and BASF have announced a South African project that will integrate Monsanto's DEKALB maize seed into BASF's stress-resistant AgCelence in order to increase effective yields and more effectively utilize available production capacity.

Seed and fertilizer has been and remains the largest of the subsectors, with local seed industry currently comprising multinational seed companies such as Pannar, Sakata, and Monsanto (Table 3). Pannar has international partners in the United States and Argentina, and Monsanto has a parent company located in the United States and Europe—as do Sakata, Syngenta, Agricol, and Omnia. The South African seed and fertilizer companies also have a significant presence in the regional market, with joint ventures in countries such as Angola, Kenya, Malawi, Mozambique, Zimbabwe, and Zambia. Other seed companies include Hygrotech and Starke Ayres (a subsidiary of Pannar), both of which specialize in the production of vegetable and flower seed. These companies are headquartered in South Africa, and operate subsidiaries in other African countries.

Finally, the role of commodity organizations in private agricultural R&D should not be overlooked. Funds are extracted from the food supply chain through statutory levies paid by producers on each unit of a commodity delivered. The National Agricultural Marketing Council (NAMC) conducts an annual review of all statutory levies implemented under the Marketing of Agricultural Products Act, No 47, of 1996. In its 2006 survey, NAMC reviewed 10 industries that collect statutory levies (citrus, cotton, dairy, deciduous fruit, dried fruit, potatoes, red meat, sorghum, wine, and winter cereals), reporting that they collected a total of 149.1 million rand that year and spent 60.4 million rand on research. Preliminary figures suggest that up to 70 million rand was spent on research by these industries in 2008, and that funds were allocated to private and public institutions to conduct research on themes chosen by the industry and producer organizations. In contrast, the government allocates 380 million rand per year to ARC (all amounts in current prices).

POLICY RECOMMENDATIONS

Most of the firms that participated in the survey suggested the need for the government to ease stringent phytosanitary restrictions on the export of maize seed to foreign destinations in order to facilitate the transfer of local seed to laboratories where advanced genetic studies could be performed. Most firms also wanted the government to update policies regarding GMOs to enable their adoption and allow local firms to compete on an equal footing with their foreign counterparts. Firms also expressed support for tax incentives to promote investment in research, the easing of bureaucratic impediments to registering new products, and the tightening of measures to protect local researchers and breeders from generic competitors. The easing of restrictions and opening of markets have played important roles in the growth of investment in private agricultural R&D in South Africa, and many organizations would like to see these trends continue.

NOTES

[1] PPPs reflect the purchasing power of currencies more effectively than do standard exchange rates because they compare the prices of a broader range of local—as opposed to internationally traded—goods and services.

[2] It was difficult to compare data across subsectors given variations in the number of firms and questionnaires returned.

FURTHER READING

Kirsten, J., R. Stander, and C. Haankuku. 2010. *Measuring Private Research and Innovation in South Asia and Sub-Saharan Africa: A South Africa Country Report*. Washington, DC and New Brunswick, NJ: International Food Policy Research Institute and Rutgers University.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
2033 K Street, NW • Washington, DC 20006-1002 USA
Tel: +1-202-862-5600 • Skype: ifprihomeoffice
Fax: +1-202-467-4439 • Email: ifpri@cgiar.org
www.ifpri.org

Rutgers, the State University of New Jersey
Department of Agriculture, Food, and Resource Economics
School of Environmental and Biological Sciences
55 Dudley Road • New Brunswick, NJ 08901-8520 USA
Tel: +1-732-932-3000
http://dafre.rutgers.edu/

The International Food Policy Research Institute (IFPRI) is one of 15 agricultural research centers that receive their principal funding from governments, private foundations, and international and regional organizations, most of which are members of the Consultative Group on International Agricultural Research (www.cgiar.org). The Agricultural Science and Technology Indicators (ASTI) initiative compiles, analyzes, and publishes data on institutional developments, investments, and human resources in agricultural R&D in low- and middle-income countries. The ASTI initiative is facilitated by IFPRI and involves collaborative alliances with many national and regional R&D agencies, as well as international institutions. The initiative, which is funded by the Bill & Melinda Gates Foundation with additional support from IFPRI, is widely recognized as the most authoritative source of information on the support for and structure of agricultural R&D worldwide. To learn more about the ASTI initiative visit www.asti.cgiar.org.

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.

The authors thank the 19 South African companies that participated in the survey; without their commitment this country note would not have been possible. The authors also thank Nienke Beintema, David Gisselquist, Carl Pray, David Spielman, and Gert-Jan Stads who provided comments on an early draft of this note. IFPRI and Rutgers greatly acknowledge the generous support from the Bill & Melinda Gates Foundation.