

# ZAMBIA

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*This country brief reviews major investment and institutional trends in  
Zambian agricultural research since the early 1970s, incorporating a new set  
of survey data for the 1990s collected under the Agricultural Science and  
Technology Indicators (ASTI) initiative (IFPRI–ISNAR 2001–02).<sup>1</sup>*

## INSTITUTIONAL DEVELOPMENTS

The Zambian economy relies heavily on the agricultural sector, which contributed 69 percent of total employment and 22 percent of GDP in 2000 (FAO 2003; World Bank 2003). Zambia has been largely food self-sufficient though it has experienced irregular maize surpluses over the years, given poor infrastructure and marketing facilities, which have caused serious internal food distribution problems. The vast majority of the country's farmers are smallholders (about 75 percent), meaning they have no more than 2 hectares of land under cultivation. Large-scale commercial farming accounts for the production of all of the country's wheat and tobacco, most of its livestock, 50–60 percent of its soybean, and 20 percent of its maize (Elliott and Perrault 2004).

We identified 16 agencies involved in agricultural research in Zambia in 2000, employing 189 full-time equivalent (fte) researchers and spending approximately 11 billion 1999 kwachas on agricultural research and development (R&D)—equivalent to 10 million international dollars (Table 1).<sup>2,3</sup>

The Soils and Crops Research Branch (SCRB) of the Department of Research and Specialist Services (DRSS), which in turn falls under the Ministry of Agriculture, Food, and Fisheries (MAFF),<sup>4</sup> is the main agricultural research agency

**Table 1—Composition of agricultural research expenditures and total researchers, 2000**

Type of agency	Spending		Researchers <sup>a</sup> (fte's)	Share		Agencies in sample <sup>b</sup> (number)
	1999 kwachas (millions)	1993 international dollars		Spending (percent)	Researchers	
<i>Public agencies</i>						
SCRB	5,763.1	5.3	110.0	52.3	58.3	1
Other government <sup>c</sup>	1,191.1	1.1	37.9	10.8	20.1	6
Nonprofit	1,712.1	1.6	11.0	15.5	5.8	2
Higher education <sup>d</sup>	856.5	0.8	19.9	7.8	10.5	4
<b>Subtotal</b>	<b>9,522.7</b>	<b>8.7</b>	<b>178.8</b>	<b>86.5</b>	<b>94.7</b>	<b>13</b>
Business enterprises	1,488.8	1.4	10.0	13.5	5.3	3
<b>Total</b>	<b>11,011.5</b>	<b>10.1</b>	<b>188.8</b>	<b>100</b>	<b>100</b>	<b>16</b>

Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR 2001–02) and SCRBS (2001).

<sup>a</sup> Include national and expatriate staff.

<sup>b</sup> See note 2 for details of all agencies.

<sup>c</sup> Expenditures for CVRI, CFRI, LPRC/NISIR, and the higher-education sector agencies in our sample are estimates based on average expenditures per researcher for the other three government agencies combined.

<sup>d</sup> The 78 faculty staff employed in the four higher-education agencies spent between 15 and 30 percent of their time on research, resulting in 19.9 fte researchers.

## KEY TRENDS

- Agricultural research investments in Zambia, in real (inflation adjusted) prices decreased considerably over the past three decades because of declining government contributions and waning donor funding.
- Despite significant declines in resources in the 1990s, the Soils and Crops Research Branch (SCRB) remains Zambia's principal agricultural research agency, accounting for over half the country's agricultural research spending and half its research staff in 2000.
- Zambia's agricultural research sector was significantly restructured under two consecutive projects—the Zambia Agricultural Research and Extension Project (ZAREP) and the Agricultural Sector Investment Program (ASI)—which were funded World Bank loans and donor contributions.
- The government established three research trusts to stimulate private-sector participation in agricultural research; a number of seed companies also conduct their own research.

## ABOUT ASTI

The Agricultural Science and Technology Indicators (ASTI) initiative comprises a network of national, regional, and international agricultural R&D agencies and is managed by the International Service for National Agricultural Research (ISNAR) division of the International Food Policy Research Institute (IFPRI). The ASTI initiative compiles, processes, and makes available internationally comparable data on institutional developments and investments in public and private agricultural R&D worldwide, and analyses and reports on these trends in the form of occasional policy digests for research policy formulation and priority setting purposes.

Primary funding for the ASTI initiative was provided by the CGIAR Finance Committee/World Bank with additional support from the Australian Centre for International Agricultural Research (ACIAR), the European Union, and the U.S. Agency for International Development (USAID).

in Zambia. In 2000, SCRB accounted for over half the country's total agricultural R&D spending and fte researchers. Its mandate is to generate and adapt soil and crop technologies to increase the sustainability of agricultural production and serve the needs of poor farmers. SCRB consists of four technical divisions—Crop Improvement and Agronomy, Soils and Water Management, Plant Protection and Quarantine, and Farming Systems and Social Sciences—with research activities divided across 20 programs. The branch is headquartered in Chilanga and has 9 zonal agricultural research stations (ZARs) located throughout three broad agroecological zones (SCRB 2001; Elliott and Perrault 2001). Currently SCRB is in transition to become the Zambia Agriculture Research Institute (ZARI), which will be an autonomous department under the Ministry of Agriculture and Cooperatives. The operationalization of ZARI is, however, being hampered by the current freeze on recruitment to replace staff that have departed or passed away.

Six other government agencies performed agricultural research in Zambia in 2000, together accounting for 11 percent of total agricultural research spending that year and one in five fte research staff. Two of these agencies also fall under MAFF: the Central Veterinary Research Institute (CVRI), which diagnoses animal diseases and provides other laboratory services related to research on animal health, and the Central Fisheries Research Institute (CFRI), which provides information on technologies in support of sustainable fisheries resource management and increased productivity in aquaculture. The Forestry Research Branch (FRB) is administered by the Ministry of Environment and Natural Resources and was created in 1997 through a merger of the former Forestry Research and Forestry Products divisions. FRB's mandate includes the development of appropriate technologies to promote efficient use of the country's forestry resources. The remaining three government research units—the Food Technology Research Unit (FTRU), the Livestock and Pest Research Centre (LPRC), and the Water Resources Research Institute (WRRU)—fall under the National Institute for Scientific and Industrial Research (NISIR), which evolved out of the National Council for Scientific Research (NCSR) in 1997.<sup>5</sup> Together these three agencies employed 17 fte researchers in 2000. LPRC conducts research on animal

production and health, with the objective of improving human nutrition and economic development. In addition to technical and scientific training, FTRU focuses on increasing food availability and raising the population's level of nutrition. WRRU focuses on the sustainable management of water resources.

Since the late 1990s, the Government of Zambia has focused on increasing the role of the private sector in the performance of agricultural research. With this in mind, four research trusts were created: the Golden Valley Agricultural Research Trust (GART, established in 1997), the Cotton Development Trust (CDT, established in 1999), the Livestock Development Trust (LDT, established in 2002), and the Lyambai Agricultural Development Trust (LADT, established in 2002). The primary rationale for the trusts is to increase flexibility in the financing and management of both physical assets and human resources, ultimately promoting efficiency and cost-effectiveness while developing public-private partnerships (Elliott and Perrault 2004). GART and CDT have become trustees of some former SCRB stations, with a significant level of autonomy; they remain linked to SCRB, however, in the joint conduct of complementary research activities. To enhance this relationship, the director of DRSS serves on GART's board, and SCRB's deputy director is a member of CDT's board.

GART's research ranges from livestock issues for smallholders, to the adaptation and promotion of technologies relevant for farmers, such as tillage systems, water conservation, and soil fertility; other activities include varietal testing, dissemination of research results, and fostering institutional linkages among national and international institutes. CDT's research focuses on developing and disseminating technologies and for cotton farmers (MAFF 2001; Elliott and Perrault 2001). LDT is involved in training and commercial activities. The trust provides training in dairy, beef rearing and piggery. Training is also offered on animal draught power technologies, where farmers are taught to handle animals for land preparations among others. The commercial component focuses on dairy farming including an outreach facility involving trained farmers. The sale of trained animal (oxen and donkeys) for animal draught is another source of revenue. LADT was established focusing on livestock training and breeding improvement.

### A Short History of Government-Based Agricultural Research

Agricultural research in Zambia began in 1922 at the Experimental Gardens in Chilanga. At that time research focused on cash crops, such as cotton and tobacco. Many other crops were introduced over time, although cash crops remained the main area of research, and by 1940 several research stations were operating at various sites, and research themes had expanded to include pathology and pest control issues. In 1944, the Lusaka Agricultural Station was established, which focused mainly on wheat research. In 1953, the Department of Agriculture was reorganized and its research activities were separated from the department's other activities into the newly created Research Branch. In the same year, the Central Research Station in Mount Makulu and three substations were established. In 1959, livestock research, previously part of the Veterinary Department, was transferred to the Research Branch. During the early 1960s, several other regional research stations were established.

Following Zambia's independence in 1964, the focus of the Research Branch shifted slowly from commercial crops towards the problems of small-scale subsistence farmers. Until the 1970s, the Research Branch was organized by discipline and research remained heavily focused on the problems of large-scale commercial farmers. During the early 1980s, however, the Research Branch was reorganized with the aim to ensure its activities were more tailored towards the problems of smallholders.

Veterinary research began in the late 1920s with the creation of the Central Veterinary Research Station. The station was relocated and renamed the Central Veterinary Research Institute in 1979. Forestry research began in the early 1930s under the Forestry Department and fisheries research began in 1951 with the establishment of the Central Fisheries Research Institute.

Sources: Roseboom and Pardey (1995).

The trust is based at Simulambe Research Station in the Western province and its activities focuses on that province only for the time being.

Four units under the University of Zambia (UNZA) conduct agricultural research, together accounting for 11 percent of the country's agricultural research staff in 2000. The School of Agricultural Sciences (SAS) and the School of Veterinary Medicine (SVM) were responsible for most of these activities, which were undertaken by 60 faculty members in 2000 or—adjusted to reflect the amount of time spent on research—17 fte researchers. Faculty staff at SAS conducts research on a variety of crop and livestock items as well as research on natural resources and socioeconomics. Research at SVM focuses on veterinary medicine, including pets and inland fisheries. The other two units under UNZA that conduct agricultural research are the Agricultural Engineering Department (part of the School of Engineering) and the Institute of Economic and Social Research.

Unlike many African countries, private-sector research is active in Zambia, representing 14 percent of agricultural research spending in 2000. We identified three private enterprises involved in agricultural research in Zambia. ZamSeed and the Maize Research Institute (MRI) conduct mainly maize research while Dunavant focuses on cotton research. While research activities at all three agencies focus on seeds, they cover a range of other issues, such as crop improvement, pesticides, and fertilizers, as well as some postharvest activities. Dunavant and until recently ZamSeed are largely controlled by foreign capital, while MRI is a Zambian-owned enterprise.

There is a fair amount of collaboration among the various agricultural research agencies in Zambia, and with regional and international organizations. SCRIB, for example, interacts with the University of Zambia, the Zambian National Farmers Union, extension services, and other entities under MAFF, as well as with a number of non-government organizations and seed companies. At regional and international levels, SCRIB participates in a number of regional networks, such as the Maize and Wheat improvement Network, the Sorghum and Millet Improvements Programme (SMIP), the Regional Plant Genetic Resources Centre (SPGRC) of the Southern African Development Community (SADC), and the SADC Network of BioNET International (SAFRINET). Collaboration also occurs with a large number of international research centers within the Consultative Group on International Agricultural Research (CGIAR) (MAFF 2001).

## HUMAN AND FINANCIAL RESOURCES IN PUBLIC AGRICULTURAL R&D

### Overall Trends

Total public agricultural research staff numbers grew in Zambia in the 1970s and 1980s at a yearly average of close to 3 percent, but growth stagnated in the 1990s (Figure 1a).<sup>6</sup> Staff numbers at SCRIB actually fell sharply in the 1990s, largely because of cuts when the country's public service was being reformed in the early 1990s and then under the World Bank supported Agricultural Sector

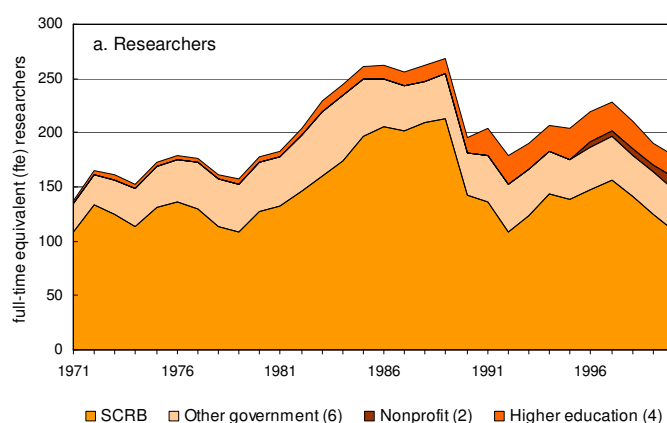
Investment Program (ASIP) in the late 1990s. As a result, SCRIB lost close to half of its fte researchers between 1989 and 1999. Reductions were intended to facilitate improved working conditions and equitable salary levels, thereby making the agency more competitive. Conditions did not change, however, and greater numbers of staff than planned left SCRIB for the private and higher-education sectors where they were offered better salary packages. Salary levels at University of Zambia in 2001, for example, were reported to be about four times higher than those offered by SCRIB (MAFF 2001). Since 2000, the total number of staff at SCRIB has remained fairly stable while there was an increase in the number of senior positions.

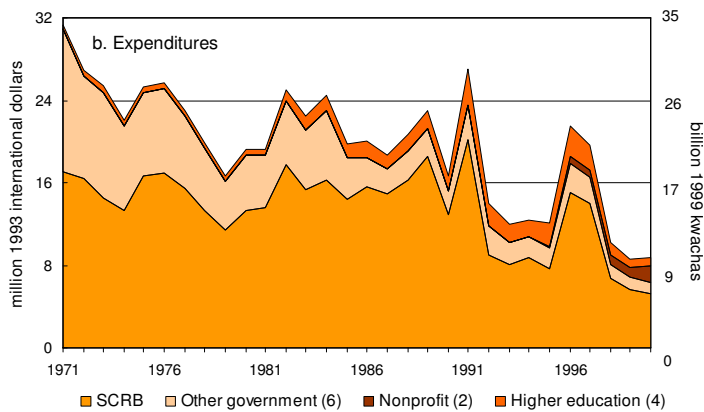
Another important factor affecting staffing levels is HIV/Aids and related diseases, which have decimated the Zambian population and, understandably, the country's overall agricultural research capacity, though the extent of this impact has not been quantified. The acceptance and even encouragement of extended leave and long-term secondments of staff to other agencies and regions further distorts apparent staff numbers within Zambia's public agricultural R&D agencies.

Many faculty staff also spend a considerable portion of their time consulting. Under informal arrangements, staff can take time off from teaching to undertake consulting contracts in exchange for a share (of about 25 percent) of the resulting fees. As of 2001, a high proportion of SCRIB's research positions were unfilled, with only 98 of the 168 professional staff positions active. Various schools under UNZA also reported vacancies, in this case resulting from staff departing for positions at the country's various donor agencies (Elliott and Perrault 2001).

Zambia began nationalizing its agricultural research system comparatively late, and slowly, in the late 1970s (Roseboom and Pardey 1995). In the early 1970s more than 80 percent of the (fte) researchers working on agricultural issues in the government and higher-education agencies were expatriates; that share declined to about 45 percent by the early 1980s, to 12 percent by 1991, and to 2 percent by 2000, indicating the completion of the nationalization process.

Figure 1—Public agricultural R&D trends, 1971-2000





Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR 2001–02); Roseboom and Pardey (1995), SCRIB (2001), and underlying data to MAFF (2001).

Notes: See Table 1. Figures in parentheses indicate the number of agencies in each category. Underlying data are available at the ASTI website ([www.asti.cgiar.org](http://www.asti.cgiar.org)).

Total agricultural R&D spending declined at an average rate of 7 percent per year over the past three decades, fluctuating considerably from year to year (Figure 1b). Declining and unstable government and donor contributions to agricultural research affected not only SCRIB but also most of the government and higher-education agencies. This unstable and declining trend apparently continued in recent years. This reduced funding, combined with increasing staff numbers, meant that spending per scientist fell dramatically from an average of approximately \$150,000 in the early 1970s to \$49,000 by 2000—about half the average 2000 level for the East and Central African region (Beintema 2003) (Figure 2).<sup>7</sup>

Figure 2—Long-term public agricultural R&D trends, 1971–2000

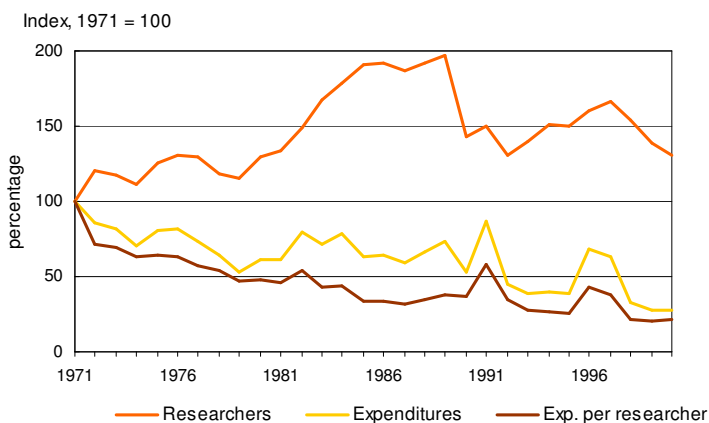
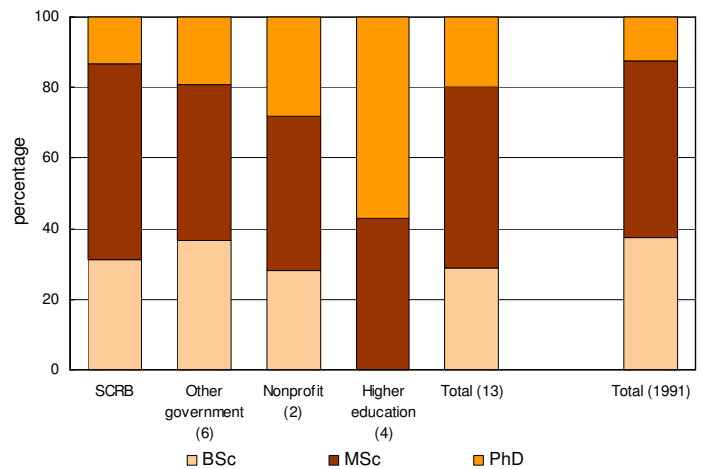


Figure 3—Educational attainment of researchers, 1991 and 2000



Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR 2001–02) and Roseboom and Pardey (1995).

Note: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff.

Source: Figure 1.

## Human Resources

In 2000, 71 percent of all research staff in Zambia held postgraduate degrees, and about 20 percent were trained to the doctorate level (Figure 3). Further, more than half the full-time researchers in the higher-education sector held PhD degrees, and all had training beyond the BSc level. This relatively high proportion of highly qualified staff in the higher-education sector is consistent with other African countries (Pardey et al.

1997; Beintema 2003). Overall, qualifications of Zambian agricultural research staff improved during the 1990s mainly because of growth in the proportion of researchers holding doctorate degrees.

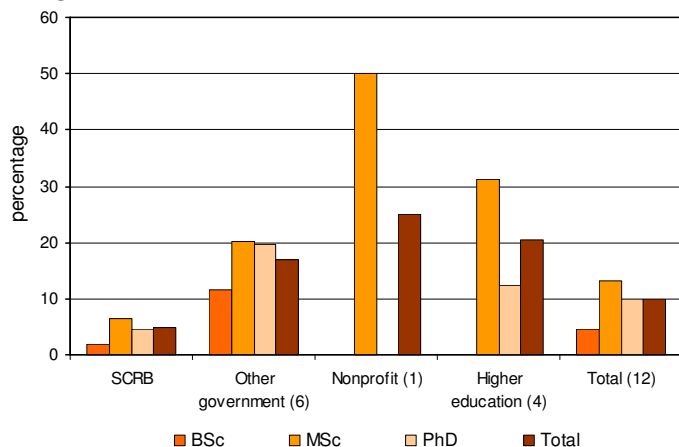
The Zambia Agricultural Research and Extension Project (ZAREP) along with ASIP, already mentioned, included significant training components for Zambian agricultural researchers in the late 1980s and 1990s. Under ZAREP, the United States Agency for International Development (USAID) provided funding for 51 researchers to undertake higher education (11 doctorate, 31 MSc, and 9 BSc training), but no information was available as to whether this training actually eventuated (IADS 1984), nor as to the number of researchers who received postgraduate training under ASIP. During the period 2000–04, however, only 3 and 9 SCRIB staff were trained to the BSc and MSc levels, respectively.

As previously mentioned, many of SCRIB's well-trained researchers departed for positions at UNZA and the private sector. In 2001, about 30 percent of the staff at SAS were reported to have come from SCRIB and other MAFF departments (MAFF 2001). As of 2001, the provision of training was ad hoc, based on the creation of opportunities by donors. Despite the relatively high share of well-qualified researchers at SCRIB as of 2001, staff departure rates combined with the lack of training opportunities indicated the threat of further future deterioration.

Shares of female researchers at Zambian agricultural research agencies are low compared with many other African countries. In 2000, 10 percent of research staff in a 12-agency sample was female, ranging from 5 percent at SCRIB to 25 percent at GART (Figure 4). A comparable 1991 share also averaged 10 percent female staff, indicating little change in overall staff composition in the 1990s based on gender (Roseboom and Pardey 1995). In terms of the qualifications, 10 percent of researchers holding PhD degrees and 13 percent of those holding MSc degrees were female, though this average share, like the overall share, did not change in the 1990s.

Looking at specific agencies, however, the share of female research staff at SCRIB decreased considerably, from 11 percent in 1991 to 5 percent in 2000, while the share of female researchers in the higher-education sector more than doubled, from 9 percent in 1991 to 20 percent in 2000.

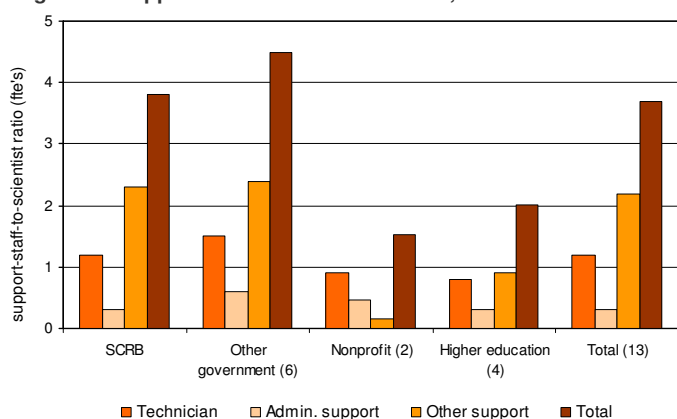
**Figure 4—Share of female researchers, 2000**



Source: Compiled by authors from ASTI survey data (IFPRI-ISNAR 2001-02). Note: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff.

In 2000, the average number of support staff per scientist was 3.7, comprising 1.2 technical staff, 0.3 administrative personnel, and 2.2 other support staff such as laborers, guards, drivers, and so on (Figure 5). The support-staff-per-scientist ratio was lower in the nongovernmental sector, averaging 1.5 for the nonprofit institutions and 2.0 for the higher-education agencies. Although support-staff numbers at SCRIB were significantly higher—starting at 5.4 support staff per full-time researcher in 1983 (Roseboom and Pardey 1995) and falling to 4.4 in 2000—the reduction represented a higher proportion at SCRIB than at other agencies (resulting from the aforementioned staff cuts).

**Figure 5—Support-staff-to-researcher ratios, 2000**

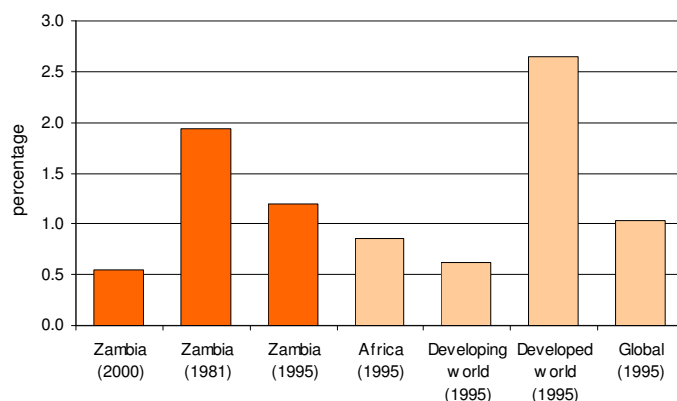


Source: Compiled by authors from ASTI survey data (IFPRI-ISNAR 2001-02). Note: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff.

## Spending

Total public spending as a ratio of agricultural output (AgGDP) is a common research investment indicator used to place a country's agricultural R&D spending in an internationally comparable context. In 2000, Zambia invested \$0.55 for every \$100 of agricultural output, representing a decline over time from a high of 1.94 percent in 1981 and 1.20 in 1995, both high compared with the averages for Africa and the developing world at the time—0.84 and 0.62 percent, respectively (Figure 6).

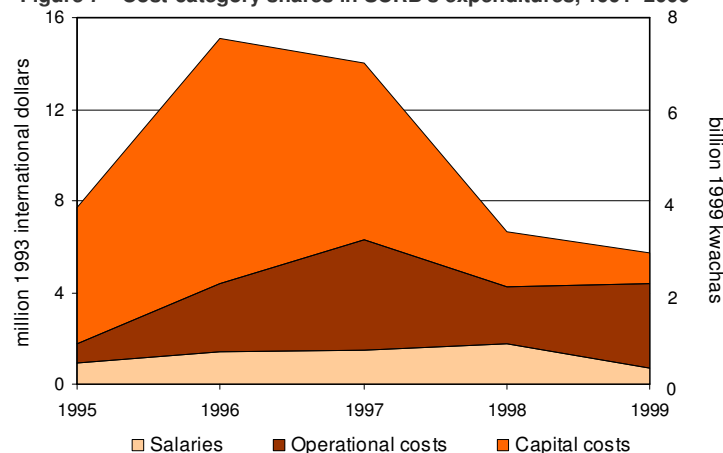
**Figure 6—Zambia's public agricultural research intensity compared regionally and globally**



Sources: Zambia compiled from Figure 1b; AgGDP from World Bank (2003); other intensity ratios from Pardey and Beintema (2001).

The shares of spending on operations and capital investments (as opposed to salary-related costs) were comparatively high at SCRIB during 1995–2000 given the influx of funding under ASIP. With the completion of ASIP and waning support from other donors—and the resultant significant drop in overall funding—operational costs represented the largest share by 1999, the last year for which detailed financial data were available. That year, total salaries accounted for only 12 percent of total spending, while operational costs accounted for close to two-thirds of the total (Figure 7).

**Figure 7—Cost-category shares in SCRIB's expenditures, 1991–2000**



Sources: Compiled by authors from underlying data to MAFF (2001) and SCRIB (2001).

Notes: Salaries only include those paid directly through government funding and estimated salaries for expatriate staff (see Methodology on page 9). Any salary payments, if existing, through donor funding are included under operational costs.

## FINANCING PUBLIC AGRICULTURAL R&D

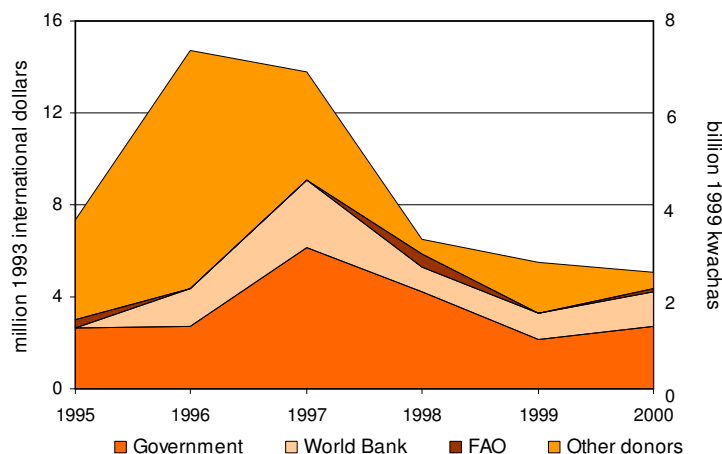
Agricultural research in Zambia has largely been funded by the government, numerous international donors, and loans from the World Bank. The first World Bank supported project was the Zambia Agricultural Research and Extension Project (ZAREP), which began in 1987 with additional counterpart funding from the Government of Zambia and contributions from the African Development Bank (AfDB) and the Norwegian Agency for Development (NORAD). With a total budget of US\$40 million, the project aimed to revitalize agricultural research and extension services by rationalizing research infrastructure and decentralizing client-oriented planning activities. The major institutional changes were outlined in a national research action plan (MASDAR n.d.; World Bank 2002).

Although ZAREP was originally intended to conclude in 1996, it was actually incorporated into the second World Bank-supported project, ASIP, which ran from 1995 until 1999. This project's objectives were to liberalize markets, privatize state-owned industries, diversify production, improve services to smallholders, improve the economic status of women, and increase the provision of financial services to smallholders. The budget totaled US\$350 million—US\$120 million from the government; US\$90 million from donors, including the European Union, Germany, the Netherlands, and Sweden; US\$60 million through a World Bank loan; US\$60 million from other donor-supported projects, such as ZAREP; and the remainder (US\$20 million) from additional beneficiaries. The project had four components—policy and institutional improvements; public investment in agricultural research, extension, training, and other areas; private-sector development; and the establishment of a fund to support small-scale capital investments in rural communities. At a base cost of US\$35 million provided by the government and nine donor agencies, the principal objective of the agricultural research component was privatization through the establishment of GART and the rehabilitation of existing research stations (World Bank 1995). Given the four-year time horizon of the project, however, it became clear that the original workplan was overly ambitious; hence it was decided at a mid-term review of the project that the remainder of the World Bank loan would be allocated to a number of core activities only, such as agricultural services, capacity building, and the rural investment fund.

SCRB's funding fluctuated considerably during the 1990s, following an overall declining trend (Figure 8). Declining donor support grew in part out of dissatisfaction about MAFF's financial management, given only a small share of financial resources were being disbursed in the field. To counter this problem, donors began diverting their funding to specific projects—many of which were undertaken by the private sector or semi-public trusts—in an attempt to minimize operating costs (Elliott and Perrault 2004). Unsurprisingly, this had significantly negative implications for SCRIB. In addition, even when donors maintained their support, they often disbursed fewer funds than were budgeted, and often with long delays. This was also the case with the government's funding. During 1994–99, for

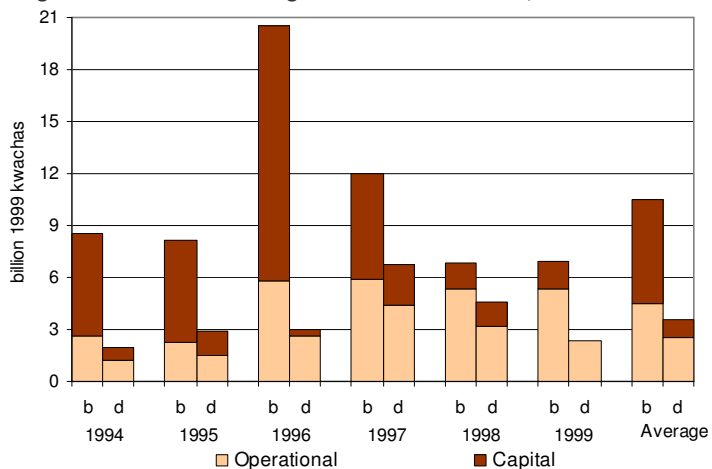
example, slightly more than half the proposed operating budget was released, on average, and only 17 percent of budgeted capital investment expenditure was disbursed (Figure 9). Unsurprisingly, these shortfalls seriously impeded SCRIB's capacity. Since 2000, government funding for agricultural research apparently continued to decline and be unstable.

Figure 8—SCRIB's funding sources, 1991–2000



Sources: Compiled by authors from underlying data to MAFF (2001) and SCRIB (2001).

Figure 9—Government budget and disbursed funds, 1994–99



Sources: Compiled by authors from underlying data to MAFF (2001) and SCRIB (2001).

Note: b indicates budgeted expenditure; d disbursed expenditure

The Swedish International Development Agency (Sida) has been a major contributor to Zambia's agricultural research. In addition to supporting the Zambia Seed Company (ZamSeed), discussed in the next section, Sida also funded SCRIB research programs in the 1980s focusing on cereals, roots, tubers, and plant breeding. Sida also contributed to two of the three government trusts, among other individual projects (Elliott and Perrault 2001).

A new project funded by the World Bank, the Agriculture Development Support Program, is under formulation. The project might support one research program under SCRIB (Plant Genetic Resources). In addition, SCRIB will compete for funds under the competitive grant system that is being proposed under the new World Bank project.

Also under development is a project proposal to be supported by ADB and which is to commence in 2005. This project will focus on the foundation of seed multiplication under SCRIB in certain targeted districts.

## PRIVATE AGRICULTURAL R&D

ZamSeed was established in 1980 as a private company largely funded by Sida, though the Government of Zambia maintained an initial 40 percent shareholding, which was later reduced to 37.5 percent. ZamSeed remained the country's primary seed company until 1991, when the seed market was liberalized and several other seed companies were established, including Dunavant, MRI, Pannar Seed, Seed Company International, and Sempro Ltd. As already discussed, only ZamSeed, MRI, and Dunavant conduct research activities, employing 3–4 fte researchers each in 2000.

Various links were established between ZamSeed and SCRIB during the 1980s given Sida's support to both agencies. ZamSeed, for example, relied on SCRIB staff to conduct breeding activities to maintain ZamSeed-owned varieties. Collaboration weakened in the late 1990s, however, prompting ZamSeed to initiate its own research activities in 1997, though activities remained very limited until 1999/2000 when a fully fledged R&D unit was created. With the establishment of the research unit at Zamseed in 1997 varietal development has taken off successfully. The main challenge has been maintenance breeding of the many crop varieties that had been handed over to the company. In addition, there is considerable effort in development of new varieties. Maize is the most important crop with some little research being done on other crops such as wheat, sorghum, sunflower, pearl millet, soybean, groundnut, Irish potato, pasture and vegetable seed among others.

In 1977, with partial funding from Sida, a Yugoslav maize breeder developed MRI from SCRIB's former maize program. Research at MRI is also small and focuses on varietal development on maize. Dunavant's R&D unit, which was established in 1995, focuses entirely on cotton, including breeding, agronomy, and entomology. With the establishment of CDT the company is doing very little research. Recently a Zimbabwean company, SeedCo, established a research station in Zambia. This is still being operationalized, but research will focus on variety development in maize, wheat, soybean and sorghum.

## RESEARCH ORIENTATION

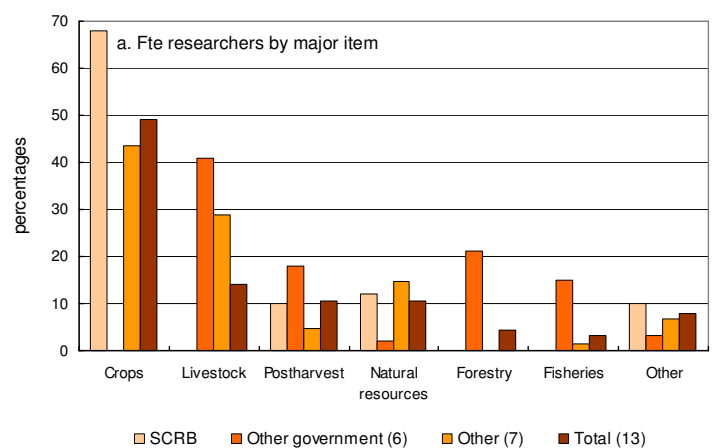
### Commodity Focus

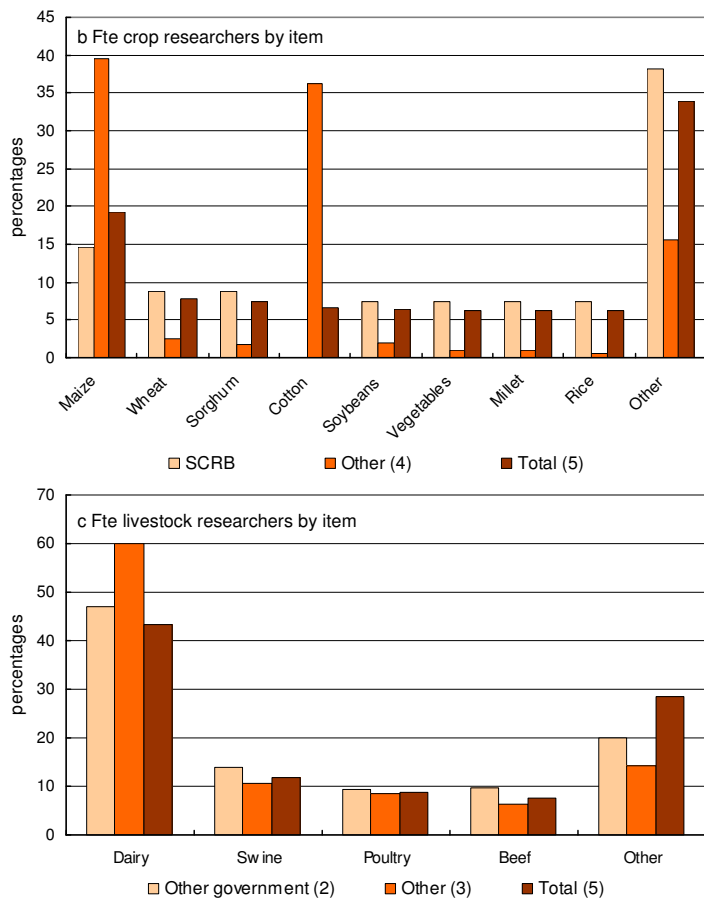
The allocation of resources across various lines of research is a significant policy decision; hence detailed information was collected on the number of fte-researchers focusing on specific commodities and themes.

In 2000, about half of the 186 fte researchers in a 13-agency sample were conducting crop research (Figure 10a). Livestock research accounted for 14 percent, while postharvest and natural resources research each accounted for 11 percent. SCRIB researchers spent relatively more time on crop research while the other government agencies focused relatively more time on livestock, forestry, and fisheries research.

The major focus of crop research was maize, which accounted for about 20 percent of the activities undertaken by the 92 fte crops researchers in our sample (Figure 10b). Other major crops being researched were wheat, sorghum, cotton, soybeans, vegetables, millet, and rice, which each accounted for 6–7 percent of activities on crops. The remaining 34 percent of crop researchers were working on other crops. Only five agencies in our sample conducted livestock research, with nearly half the associated fte researchers working on issues related to dairy (Figure 10c). Other livestock being researched were swine (12 percent), poultry (8 percent), and beef (8 percent).

Figure 10—Commodity focus, 2000





Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–ASARECA 2001–02).

Note: Figures in parentheses indicate the number of agencies in each category. Figure 10b only includes agencies involved in crop research; Figure 10c only includes agencies involved in livestock research.

## CONCLUSION

Zambia's agricultural research sector has undergone significant reform in recent years in attempts to increase effectiveness, cut costs, build capacity, attract new sources of funding—especially from the private sector—and ultimately reach out to and support small farmers, who dominate the country's agricultural sector. These changes were largely effected through two consecutive World Bank projects.

Certain undertakings did not have the desired effect, such as reducing staffing levels at SCRIB in attempts to enhance working conditions and raise salary levels per researcher to compete with other national agencies for well-qualified staff. Without the appropriate training and competitive salary packages, SCRIB's research staff was halved in the 1990s, leaving the branch with a high proportion of vacant positions. A related negative outcome was reduced donor funding to established government agencies like SCRIB in favor of smaller, often project-based support, which cut the country's overall public funding for agricultural research to unsustainable levels. On the other hand, the establishment of four research trusts in the late 1990s (GART, CDT, LDT, and LADT) has proven successful in encouraging public–private partnerships, improving the cost-effectiveness and efficiency of research, and developing opportunities for nongovernment funding.



## NOTES

1. The authors are grateful to numerous colleagues in Zambia for their time and assistance with data collection, Olympia Icochea for her assistance with data processing; and the chief executive officers of SCRB, NISIR, CVR, and other agencies that participated in the ASTI survey, for useful comments on drafts of this brief.
2. The 16-agency sample consisted of:
  - Seven government agencies: The Soils and Crops Research Branch (SCRB); the Central Veterinary Research Institute (CVRI); the Forestry Research Branch (FRB); the Central Fisheries Research Institute (CFRI); and three units under the National Institute for Scientific and Industrial Research (NISIR), the Food Technology Research Unit (FTRU), the Livestock and Pest Research Centre (LPRC), and the Water Resources Research Institute (WRRU);
  - Two nonprofit institutions: the Cotton Development Trust (CDT) and the Golden Valley Agricultural Research Trust (GART);
  - Four higher education agencies located the University of Zambia (UNZA): The School of Agricultural Sciences (SAS), the School of Veterinary Medicine (SVM), the Department of Agricultural Engineering within the School of Engineering; and the Institute of Economic and Social Research (INESOR); and
  - Three private enterprises: The Zambian Seed Company, the Maize Research Institute (MRI), and Dunavant.

This agency sample excludes one higher-education agency, the Zambia Forestry College, but no information was available as to whether this college performed agricultural research.
3. Unless otherwise stated, all data on research expenditures are reported in 1993 international dollars or in 1999 kwachas.
4. MAFF was renamed in 2003, becoming the Ministry of Agriculture and Cooperatives (MAC), however, given our survey data concludes in 2000, MAFF is used throughout the brief.
5. NISIR's mandate is to perform scientific and industrial research in support of sustainable socioeconomic development and international competitiveness in the production of high quality goods and services.
6. Annual growth rates are calculated using the least-squares regression method, which takes into account all observations in a period. This results in growth rates that reflect general trends that are not disproportionately influenced by exceptional values, especially at the end point of the period.
7. Averages for East and Central Africa in this brief include 8 of the 10 member countries of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA): Burundi, Ethiopia, Eritrea, Kenya, Madagascar, Sudan, Tanzania, and Uganda.

## METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI and ISNAR 2001-02).
- The data were compiled using internationally accepted statistical procedures and definitions developed by the OECD and UNESCO for compiling R&D statistics (OECD 1994; UNESCO 1984). We grouped estimates using three major institutional categories—government agencies, higher-education agencies, and business enterprises, the latter comprising the subcategories private enterprises and nonprofit institutions. We defined public agricultural research to include government agencies, higher-education agencies, and nonprofit institutions, thereby excluding private enterprises. Private research includes research performed by private-for-profit enterprises developing pre, on, and postfarm technologies related to agriculture.
- Agricultural research includes crops, livestock, forestry, and fisheries research plus agriculturally related natural resources research, all measured on a performer basis.
- Financial data were converted to 1993 international dollars by deflating current local currency units with a Zambian GDP deflator of base year 1993 and then converting to U.S. dollars with a 1993 purchasing power parity (ppp) index, both taken from World Bank (2003). Ppp's are synthetic exchange rates used to reflect the purchasing power of currencies, typically comparing prices among a broader range of goods and services than conventional exchange rates.
- The salaries and living expenses of many expatriate researchers working on donor-supported projects are paid directly by the donor agency and are often excluded in the financial reports of the agricultural R&D agencies. These *implicit* costs have been estimated using the average cost per researcher in 1985 to be \$160,000 1993 international dollars and backcasting this figure using the rate of change in real personnel costs per fte researcher in the US state agricultural experiment station system. This extrapolation procedure has the assumption that the personnel-cost trend for US researchers is a reasonable proxy of the trend in real costs of internationally recruited staff in the agricultural R&D agencies.

See the ASTI website (<http://www.ASTI.cgiar.org>) for more details on methodology.

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