



TANZANIA

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This country brief reviews the major investment and institutional trends in Tanzanian public agricultural research since the early 1990s using new survey data collected under the Agricultural Science and Technology Indicators (ASTI) initiative (IFPRI–ISNAR–ASARECA 2001–02).¹

INSTITUTIONAL DEVELOPMENTS

Thirteen agencies were engaged in agricultural research in Tanzania in the 1990s, 12 of which are included in our sample.² These 12 agencies employed a total of 542 full-time equivalent (fte) researchers and spent a combined 10 billion 1999 Tanzanian shillings on agricultural research and development (R&D)—equivalent to \$26 million at 1993 international prices (Table 1).³ The Department of Research and Development (DRD) under the Ministry of Agriculture and Food Security (MAFS) is the principal agricultural research agency accounting for close to two-thirds of total research spending and fte researchers. DRD is headquartered in Dar es Salaam. It has 22 agricultural research institutes and livestock centers led by a central institute in each of the seven agroecological zones (the zonal center in Uyole leads the Southern Highlands zone, for example).

In February 2001, the government of Tanzania was restructured. At that time, DRD's livestock research institutes were relocated under the newly established Ministry of Water and Livestock Development. Despite this, to-date, livestock research at the field level remains under DRD responsibility largely because it is part of the Tanzania Agricultural Research Project (TARP-II), which is funded through a World Bank loan.

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

Type of agency	Spending		Researchers ^a (fte's)	Share		Agencies in sample ^b (number)
	1999 Tanzanian shillings (millions)	1993 international dollars		Spending (percent)	Researchers	
DRD ^c	6,198.7	15.5	346.6	60.0	63.8	1
Other government ^d	1,815.1	4.5	94.0	17.6	17.3	4
Nonprofit agencies	680.0	1.7	12.0	6.6	2.2	2
Higher education ^{d,e}	1,644.6	4.1	90.3	15.9	16.7	5
Total	10,338.4	25.9	542.3	100	100	12

Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR–ASARECA 2001–02) and ACU (various years).

^a Includes national and expatriate staff.

^b See note 2 for details of all agencies. TAWIRI was excluded in this table and further data analysis in this brief because of data unavailability.

^c DRD's financial data are from budget year 1999/2000.

^d Expenditures for TAFIRI, TTRI, and the higher-education sector are estimates based on average expenditures per researcher for the government sector.

^e The 327 faculty staff employed in the five higher-education agencies spent between 10 and 30 percent of their time on research, resulting in 90.3 fte researchers.

KEY TRENDS

- Two consecutive projects, funded by World Bank loans and bilateral funding, have been a major influence on the development of research infrastructure in Tanzania in the 1990s and beyond.
- DRD is the main agricultural research agency in Tanzania and accounted for close to two-thirds of the country's total spending and research staff in 2000.
- During the 1990s, DRD was reorganized with a view to reducing operational costs and increasing efficiency. This process included the privatization of coffee, tea, and tobacco research, which resulted in three newly established nonprofit institutions.
- Like many African (and other) countries, DRD has become increasingly dependent on donor funding. More than half of total 2000 revenue came from the World Bank and other donors.
- Some private companies and NGOs conduct limited adaptive research, but they apparently do not have appropriate research facilities and hence rely on DRD facilities and researchers. However, several of the commodity boards fund research at DRD on the nonprofit institutions.

ABOUT ASTI

The Agricultural Science and Technology Indicators (ASTI) Initiative consists of a network of national, regional, and international agricultural R&D agencies managed by IFPRI and ISNAR. The 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 Center for International Agricultural Research (ACIAR), the European Union, and the U.S. Agency for International Development (USAID).

For the past 10 years the Tanzanian national agricultural research system has been guided by the National Agricultural and Livestock Research Masterplan (NALRM), which was formulated in 1990/91. NALRM established the framework for “rightsizing” the DRD research network, whereby research resources were to be streamlined to increase efficiency and effectiveness. Given the national drive for decentralization and the need to be more responsive to the demands of the farming community, a zonal prioritization exercise was conducted in 1993/94. While some decisionmaking responsibilities shifted to the zonal level as a result, envisaged zonal autonomy has not been fully realized. Human resource management is centralized under the Civil Service Department (CSD) of the president’s office and funds are still disbursed through DRD headquarters, which also handles the procurement of goods and services.

During the 1990s significant changes in the global and national economic environment affected agricultural research. In response, DRD management recognized the need to conduct research in a more holistic and integrated way by involving the farming community and other stakeholders in participatory technology development and transfer. In October 2001, MAFS completed its Agricultural Sector Development Strategy (ASDS)—the conclusion of a participatory process involving a wide range of stakeholders. ASDS became the basis for public- and private-sector action in support of agricultural growth and rural poverty reduction in Tanzania, and as of early 2003 the Agricultural Sector Development Programme (ASDP) was in preparation to put ASDS into effect at subsector levels, including research.

In addition to DRD, five other government institutes are involved in agricultural research in Tanzania. MAFS has administrative responsibility for the Tropical Pesticides Research Institute (TPRI) and the Tse-Tse and Trypanosomiasis

Research Institute (TTRI),⁴ while the Tanzania Fisheries Research Institute (TAFIRI), the Tanzania Forestry Research Institute (TAFORI), and the Tanzania Wildlife Research Institute (TAWIRI) fall under the Ministry of Natural Resources and Tourism. Except for TTRI, the institutes have semi-autonomous status, allowing them to set their own research programs and seek nongovernment funding, at the same time maintaining secure government funding for staffing and basic facilities.⁵ We were unable to obtain data on TAWIRI so it is excluded from our 12-agency sample; the remaining four government agencies accounted for 17 percent of the sample’s total agricultural R&D spending in 2000.

Tanzania’s two nonprofit research institutions, the Tanzania Coffee Research Institute (TACRI) and the Tea Research Institute of Tanzania (TRIT), accounted for 7 percent of total agricultural R&D spending in 2000. Both were only recently established—TRIT in 1997 and TACRI in 2000—through privatization of research activities that had been the responsibility of DRD (and are included in DRD data in the pre-privatization years). Both TACRI and TRIT are funded by a cess on tea and coffee production as well as government and donor contributions. Tobacco research at DRD’s Tumbi Research Institute was terminated in 1995. A third nonprofit institution—the Tobacco Research Institute of Tanzania (TORITA)—was established in 2000, but as of December 2002, the institute has yet to initiate its own research activities, and uses DRD staff, who submit project proposals to TORITA’s board for their approval and funding.

The five higher-education agencies involved in agricultural research in Tanzania accounted for about 16 percent total expenditures in agricultural research in 2000. The Sokoine University of Agriculture (SUA) was responsible for most of these activities, employing 243 faculty staff or—adjusted to

A Short History of Government-Based Agricultural Research

Agricultural research in Tanzania (then Tanganyika) was initiated as early as the late nineteenth century. German colonial powers at that time established laboratory facilities within the botanical garden and trial farms across the region to study crop plants and husbandry. In the 1920s, under British rule, agricultural R&D was virtually abandoned, but in the next few decades research stations were established as part of the Departments of Agriculture and Veterinary Sciences. Agricultural research was largely the domain of the local colonial government until World War II, during which time the British government sought a more active role in the promotion of science and technology in its colonies. This led to the creation of several regional agricultural research organizations in East Africa that complemented or partially replaced existing facilities. Two of these, the East African Marine Fisheries Research Organization (EAMFRO) and the Tropical Pesticides Research Institute of East Africa (TPRI), were located in Tanzania.

With independence in 1961, the Tanzanian Ministry of Agriculture inherited relatively well-developed research infrastructure, but activities depended heavily on British researchers and favored export commodities—like cotton, coffee, and sisal—over food crops. In the two decades following independence, investment in agricultural R&D rapidly developed resulting in the establishment of several research stations and an expansion of the research focus to include food crops and natural resources. The regional research organizations continued to exist until the collapse of the East African Community in 1977. The Ministry of Agriculture inherited TPRI while EAMFRO was transferred to the University of Dar es Salaam and renamed the Institute of Marine Sciences (IMS). In 1980, the Ministry of Agriculture was divided into the Ministry of Agriculture and the Ministry of Livestock Development. At the same time, agricultural research was reorganized into four parastatal organizations: the Tanzania Agricultural Research Organization (TARO), Tanzania Agricultural Livestock Research Organization (TALIRO), TPRI, and the Uyoale Agricultural Centre (established in 1976). Also in 1980, the forestry and fisheries research activities of the Ministry of Land, Natural Resources, and Tourism were reorganized into two parastatals: the Tanzania Forestry Research Institute (TAFORI) and the Tanzania Fisheries Research Institute (TAFIRI). In 1984 the Agriculture and Livestock ministries were reconsolidated into the Ministry of Agriculture and Livestock Development (MALD) and a new Directorate of Research and Training (DRT) was created. TARO, TALIRO, UAC, and TPRI remained semi-autonomous. In 1989, MALD was restructured and renamed the Ministry of Agriculture and Cooperatives (MAC), and TARO and TALIRO were merged with DRT. The World Bank and other donors recommended that the department needed greater efficiency and client focus, resulting in decentralization and the reduction of the number of facilities from over 50 institutes, stations, centers, and substations to just 22. In 1997, DRT was renamed the Department of Research and Development (DRD) and its training component was transferred to the newly created Department of Training Institutes. In October 2000, MAC was renamed the Ministry of Agriculture and Food Security (MAFS).

Sources: Ndunguru (1984), Gavian et al. (2001), and Haki (2002).

reflect time spent on research—73 fte research staff. Research is undertaken at each of the university's 4 faculties and 2 institutes, and falls predominantly into the category of applied research; basic research only accounts for 2 percent of all SUA research activities (SUA 2002). The four institutes and departments of the University of Dar es Salaam (UDSM), by comparison, played only a small research role in 2000, employing a combined total of 17 fte agricultural researchers.

Gavian et al. (2002) report that some private bodies and nongovernmental organizations (NGOs) conduct adaptive research, but mainly in collaboration with DRD using the government's research facilities.

As part of the restructuring of national agricultural research, the National Agricultural Research Council (NARC) was established in 1990 to oversee the coordination of agricultural research at both public and private agencies and to ensure that the research agenda meets national agricultural development objectives. NARC could not perform its duties as it lacked statutory powers and had no budget provisions for its operations and in reality the coordination of agricultural research is carried out by the Research and Development Committee on Agriculture and Natural Resources under the Commission for Science and Technology (COSTECH).

Notable levels of collaboration occur among the various Tanzanian agricultural research agencies, as well as with regional and international agencies. Nationally, DRD collaborates closely with a large number of government and nonprofit agencies such as TAFORI, COSTECH, TPRI, SUA, TACRI, and TRIT. International linkages include collaboration with ASARECA and other regional networks, as well as many of the international centers. Collaboration is basically via bilateral agreements. Donor agencies like the World Bank and African Development Bank (ADB) have also provided substantial support to national agricultural R&D in Tanzania.

HUMAN AND FINANCIAL RESOURCES IN PUBLIC AGRICULTURAL R&D

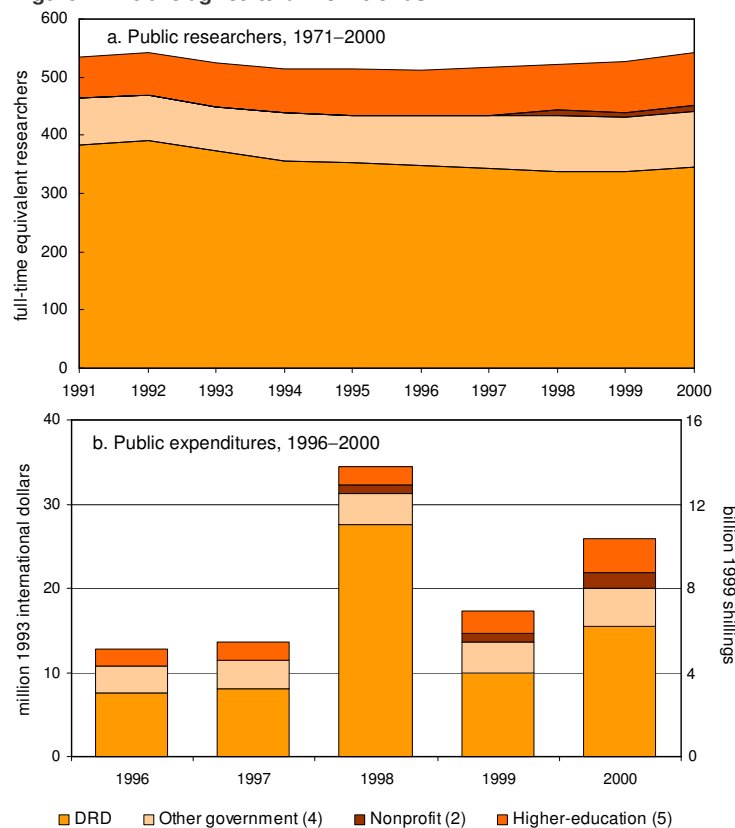
Overall Trends

The total number of fte agricultural researchers remained fairly constant during the 1990s (Figure 1a). DRD's total research staff numbers declined slightly (in absolute and relative terms), but this was primarily the result of privatization of coffee and tea research. Total fte researchers at the other government agencies and at the higher-education agencies increased during 1991–2000. The share of expatriate research staff further declined to negligible levels.

Public R&D spending data were only available for the period 1996–2000, during which time expenditure doubled to 26 million 1993 international dollars or 10 billion 1999 Tanzanian shillings (Figure 1b). This growth was the result of World Bank loans to DRD and SUA through the National Agricultural and Livestock Research Project (NARP I) and the TARP-II project along with increased research activities at the other government and higher-education agencies. DRD's increased 1998 spending resulted from termination payments to retrenched staff of the previous two to three years.

Spending per scientist almost doubled from \$25,000 in 1995 to \$48,000 in 2000 but was still very low level compared with spending in surrounding countries.

Figure 1—Public agricultural R&D trends



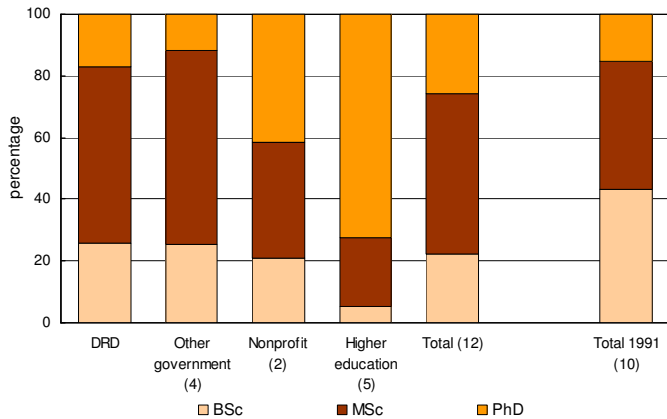
Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR–ASARECA 2001–02) and ACU (various years).

Notes: Figures in parentheses indicate the number of agencies in each category. Underlying data are available on the ASTI website (www.asti.cgiar.org). TAWIRI is excluded from our 12-agency sample (and hence the category “other government”) because data were unavailable. Expenditures for TAFIRI, TTRI, and the higher-education sector are estimates based on average expenditures per researcher for the government sector.

Human Resources

Although the total number of researchers remained fairly constant in the 1990s, staff qualifications—in terms of the share of researchers with PhD and MSc degrees—increased considerably. Excluding expatriate staff, 78 percent of the 538 fte researchers in our 12-agency sample had postgraduate level training in 2000 compared with a corresponding share of 57 percent in 1991 (Figure 2). A higher proportion of the university staff held postgraduate degrees compared with staff at other agencies, which is consistent with other African countries and regions (Pardey et al. 1997 and Beintema and Pardey 2001). Of note, however, is the high share of university staff with doctorate degrees at 72 percent—much higher than in many other African countries.

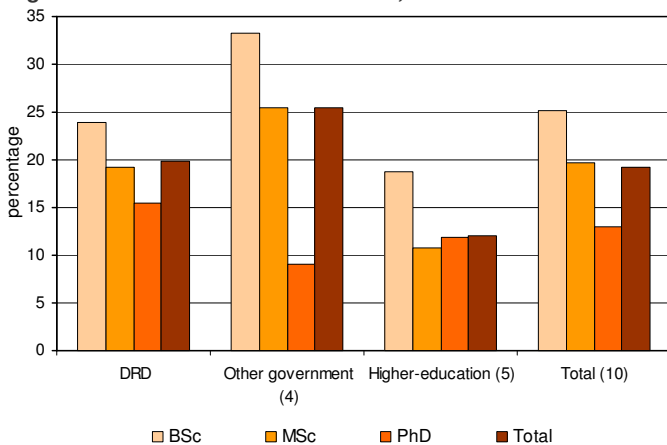
Most of the training of DRD researchers was funded under the projects NARLP-I and TARP-II. As of December 2002, 56 DRD researchers had completed MSc degrees, with 5 still studying, and 12 researchers had completed PhD degrees, with 21 still studying. Under NALRP-I, all researchers were sent abroad for postgraduate training, and under the SUA component of TARP-II, as of December 2002, 31 of the 50 researchers, which that had completed or were in the process of completing degrees, were enrolled at SUA.

Figure 2—Educational attainment of researchers, 2000

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

Notes: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff. 1991 data for coffee and tea research (prior to its privatization) are included under DRD (and hence the lower agency sample).

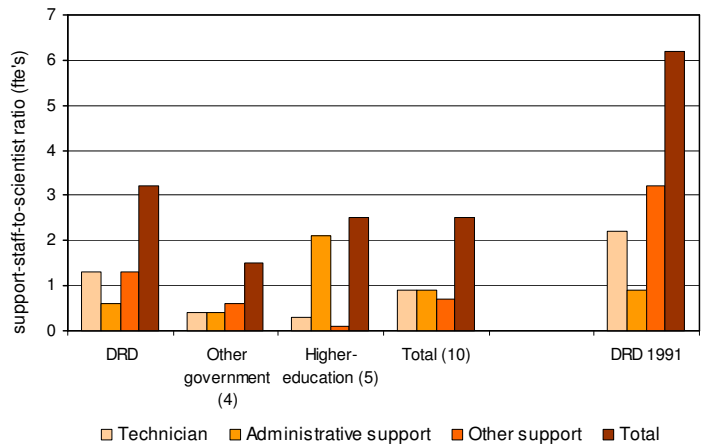
For the 10-agency sample for which data were available, 19 percent of the total fte researchers were female, ranging from 13 percent of those holding doctorate degrees to 25 percent of all researchers trained to the BSc level. The higher-education agencies employed relatively fewer female researchers. One-quarter of the researchers at the other government agencies were female, but most held lower degree qualifications than the Tanzanian average.

Figure 3—Share of female researchers, 2000

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

Notes: Figures in parentheses indicate the number of agencies in each category. Data excludes expatriate staff and the two nonprofit institutions because of data unavailability.

In 2000, the average number of support staff per scientist in the 10-agency sample for which data were available was 2.5, made up of 0.9 technicians, 0.9 administrative personnel, and 0.7 other support staff such as laborers, guards, and drivers (Figure 4). DRD had the highest ratio of support staff per scientist in 2000 (3.2), although this was still only about half the corresponding 1991 number, reflecting the retrenchment of (mainly) nontechnical and administrative support staff during 1995–98.

Figure 4—Support-staff-to-researcher ratios, 2000

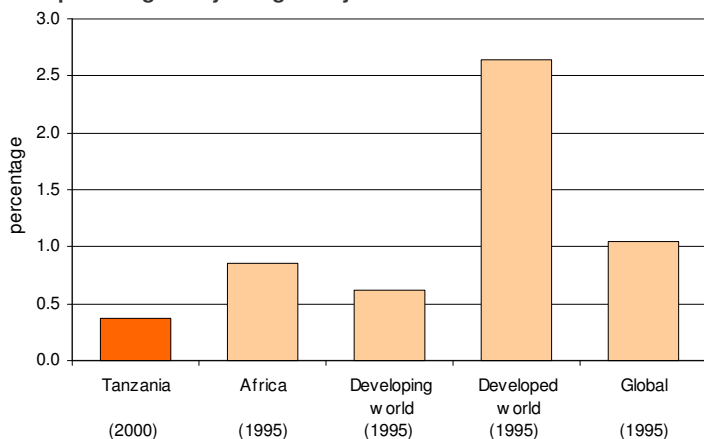
Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–ASARECA 2001–02).

Notes: Figures in parentheses indicate the number of agencies in each category. Data excludes expatriate staff. DRD ratios are based on support staff data for 18 research centers, representing over two-thirds of total DRD researchers in 2000.

Spending

Total public spending as a percentage of agricultural output (AgGDP) is a commonly used research investment indicator that enables a nation's agricultural R&D spending to be viewed in an international context. In 2000, Tanzania invested \$0.38 for every \$100 of agricultural output—less than half the average of \$0.85 for Africa as a whole in 1995 (Figure 5).

Despite the two consecutive World Bank loans, the salary share of total DRD spending remained fairly high during 1996–98, but in recent years DRD spending has shifted somewhat toward physical infrastructure, equipment, and staff training. In 2000, total salaries and operational costs each accounted for about a quarter of DRD's total spending (Figure 6). The high level of salaries in total spending in 1998 stems from the retrenchment of support staff mentioned above, along with a raise in the minimum wage for government employees.

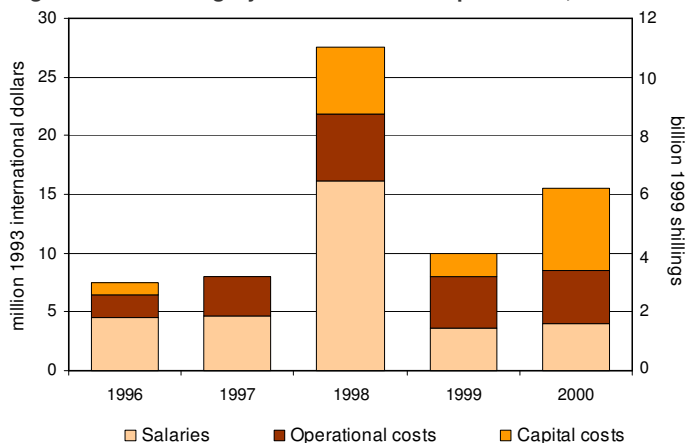
Figure 5—Tanzania's public agricultural research intensity compared regionally and globally

Sources: Tanzania data are from Table 1; AgGDP data are from World Bank (2002); other intensity ratio data are from Pardey and Beintema (2001).

As in many countries in the surrounding region, one of the most serious problems is low public salary levels for researchers compared with salaries at similar nongovernment agencies. The

salary of a junior research assistant at SUA or TPRI, for example, is about three times the salary of a DRD counterpart and includes superior incentive packages with housing allowances, teaching/hardship allowances, training opportunities, and provisions for consultancy work. Further, higher-degree training and refresher courses are mandatory. Understandably, DRD has been unsuccessful in competing for and holding on to qualified staff.

Figure 6—Cost-category shares in DRD's expenditures, 1996–2000



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

Notes: Annual data are taken the respective budget year (1996 data from budget year 1995/96 and so on). Data include estimated salaries for expatriate staff.

FINANCING PUBLIC AGRICULTURAL R&D

Agricultural research in Tanzania is largely funded by the Tanzanian government, loans from the World Bank, and contributions from other donors. More recently, a number of producer organizations have begun to fund commodity-specific research activities. The World Bank contributions to Tanzanian agricultural research were part of the two consecutive projects, NARLP-I from 1989 to 1997 and TARP-II, from 1998 until June 30, 2003 (a further one-year extension is under negotiation). Of TARP-II's total US\$25 million funding, about 20 percent came from the World Bank, African Development Bank, and various bilateral donors such as the governments of the Netherlands, Germany, and the United Kingdom. In addition, the national government's contribution to the project was US\$5 million. These sources were allocated to develop a new organizational structure for agricultural research (including the preparation of the masterplan), establishment of an agricultural research fund, rehabilitation of research institutes, and support for long- and short-term researcher training (World Bank 1999). TARP-II provided additional support to DRD's institutional development as well as research programs focusing on decentralization of research management and funding resources to the zonal level. In addition, funds were earmarked to support training of SUA's staff, and to upgrade the university's facilities and equipment (World Bank 1999 and NORAD 1999). This sub-project under TARP-II was completed in December 2002.

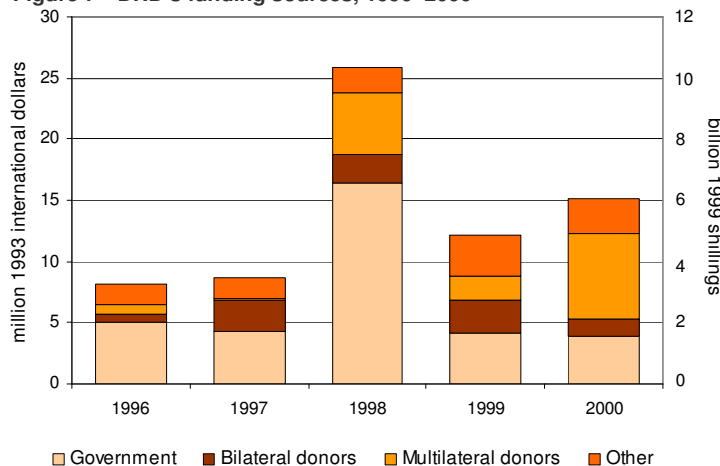
Information on funding sources was only available for one other government agency. Most of TAFORI's funding was provided by the government with donor funding contributing

about 10 percent over this time, although this share has apparently increased during this period. Agricultural research at SUA is almost completely funded by external donors and half of those projects are funded by the Norwegian Agency for Development Cooperation (NORAD). Only 2 percent of the University's total agricultural research projects are funded by in-country sources (SUA 2002).

Department of Research and Development

Government and donor funding to DRD between 1996 and 2000 can best be described as erratic (Figure 7). Government contributions are determined by the parliament and, to a small degree, by the local districts. One of DRD's problems has been inconsistencies between the budget allocations and actual disbursements (allocations have even exceeded approved budgets in some years). About two-thirds of total government funding underwrites the recurrent budget, 90 percent of which is earmarked for salaries and benefits. This seems high, but as previously mentioned, researcher salaries are low compared with other African countries. The development budget represents about one-third of the total allocation, drawn almost completely from World Bank contributions, which are given in the form of loans and are therefore treated as part of the total government allocation (Gavian et al 2001). The government is obligated to disburse 10 percent of its development budget as local counterpart funding, though this does not necessarily happen in practice.

Figure 7—DRD's funding sources, 1996–2000



Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–ASARECA 2001–02); producer organization contributions under "other" are from Gavian et al. (2001).

Notes: Annual data are taken the respective budget year (1996 data from budget year 1995/96 and so on).

The government allows its agencies to retain internally generated revenues. Hence DRD research institutes have incentive to generate these so-called self-help funds, and do so via sales of produce, secretarial services, printing units, and institutional fees from contract research. These sources accounted for 4 percent of total DRD funding in 1996–2000. Most of these funds are used to maintain equipment and infrastructure and for purchasing inputs. In addition, DRD receives also funding from commodity levies. In 1996–2000, these sources accounted for 12 percent of total funding; more than half this amount was generated from cashews.

Funding through Commodity Levies

Research funding through commodity levies is relatively high in Tanzania compared with other African countries.⁶ The government set up various commodity levies, but the share of revenues that are allocated to research as well as the collection mechanisms differ:

- One-third of the 3 percent levy on the total export value of raw or processed cashews is earmarked to research.⁷ Most of these funds are channeled to DRD's agricultural research institute in Naliendele. Since the mid 1990s commodity-based funding accounted for more than two-thirds of Naliendele's total budget. This funding is used for cashew as well as other crops research in the region.
- The Cotton Development Fund was established in 1999, and collects a levy of 3 percent on the production value of cotton lint. Half of this levy officially funds cotton research activities, mainly at DRD's agricultural research institutes at Ukiriguru and Ilonga, but in practice the allocation apparently is much less.
- Tea research is mainly funded through a levy on all tea producers, but also receives funding from contributions from the European Union, and the Department of International Development (DFID).
- Coffee research is in part funded by a point-of-sale tax at wholesale. The amount allocated to research is 0.25 percent, but negotiations with Tanzania Coffee Board are in place to raise the research share to 0.85 percent.
- Sugarcane producers pay a tax of 2 Tanzanian shillings per kilogram of sugar. Half of this officially funds sugarcane research. The Sugar Cane Research Institute, under DRD, submits annual budgets to the Sugar Development Corporation (SUDECO), which in turn controls the fund. It is unclear whether these resources are actually allocated to research.
- TORITA generates revenue via a levy of 2 Tanzanian shillings per kilogram of green leaf of tobacco sold to companies. This revenue covers operational and administrative research costs while salaries are paid by the government. As of December 2002, the institute has yet to initiate its own research activities.

A few other producer organizations fund agricultural research such as the Tanzania Pyrethrum Council, but their contributions have been ad hoc.

National and Zonal Agricultural Research Funds

The first competitive fund for agricultural research was established in 1991 and became operational in 1994. The fund, called the National Agricultural Research Fund (NARF), was devised to support research activities under the National Masterplans separate from those of NARLP-I. The fund was also intended to improve linkages among agricultural research agencies in Tanzania, between the public and private sectors, and with agencies outside of Tanzania. As of June 30, 2002, over US\$750,000 had been allocated to NARF, but only about half this amount had actually been disbursed.

NARF has succeeded in exposing scientists to collaborative research, thus improving overall linkages, especially with SUA. Some setbacks have arisen, however, resulting from unexpected delays in approval of proposals from lengthy review procedures

and the failure of anticipated funding agreements. Nevertheless, NARF remains a promising funding source for cross-cutting zonal research issues.

In 1997, the Zonal Agricultural Research Fund (ZARF) was established to address what were perceived as inherent problems with NARF, specifically that it operated in isolation of farm-level clients. ZARF is more decentralized, empowers local stakeholders and zonal institutes, and is seemingly more financially sustainable with contributions from district councils, nongovernmental organizations, the governments of Sweden and the Netherlands, and other donors. These contributions are matched equally by the World Bank through TARP-II. As of June 30, 2002, stakeholder contributions to ZARF totaled over US\$280,000, with World Bank matching funds totaling US\$216,000. ZARF only funds operational costs.

ZARF is operational in the lake, central, northern, and southern zones and is being implemented in the remaining three zones. Overall, funding levels are far below demand though the initiative holds significant potential for sustainable research.

RESEARCH ORIENTATION

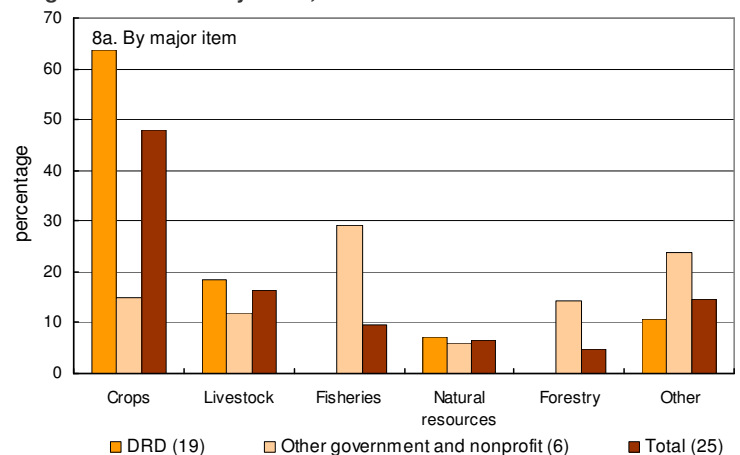
Commodity Focus

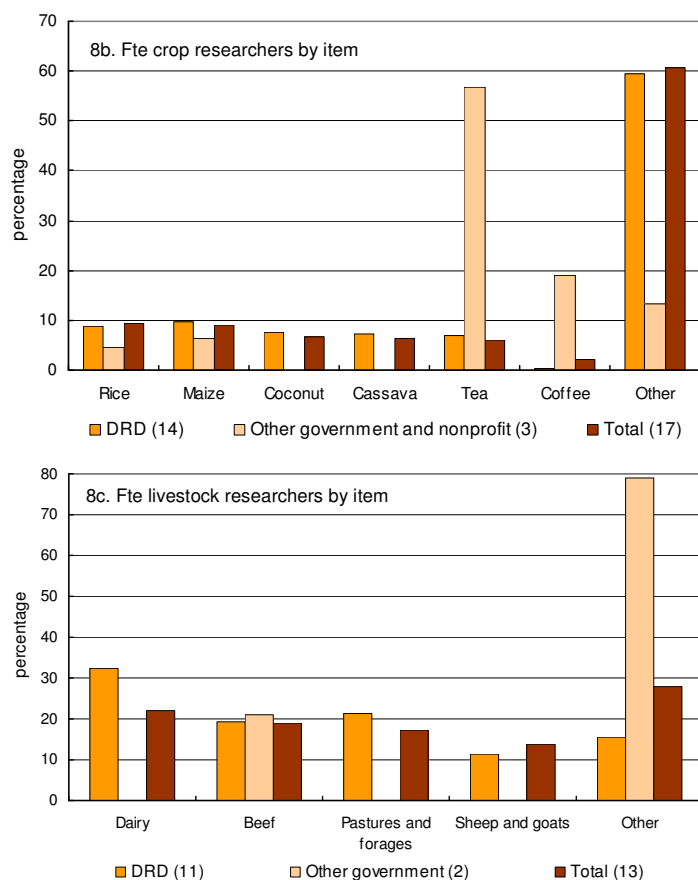
The allocation of resources across various lines of research is a significant policy decision; hence detailed survey information was collected on the number of fte-researchers working in specific commodity and thematic areas.

In 2000, close to half the 379 fte researchers in the 25-unit sample (for which we were able to obtain data) conducted crop research. Livestock accounted for 17 percent of the total, while fisheries research for 9 percent, natural resources for 7 percent, and forestry for 6 percent (Figure 8a). This allocation would differ slightly were the higher-education sector included: SUA's website indicates that close to a quarter of the university's research projects focused on livestock, 19 percent on forestry and natural resources, and while only 11 percent on crop production and horticulture (SUA 2002).

Two thirds of the DRD researchers in our sample were involved in crop research. Rice, maize, coconut, cassava, tea, and coffee accounted for 6–9 percent each, while the remaining crops researchers (60 percent) focused on a wide variety of other crops (Figure 8b). Most livestock researchers were conducting research on dairy, beef, or pastures (Figure 8c).

Figure 8—Commodity focus, 2000





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

Notes: Figures in parentheses indicate the number of agencies in each category. Data exclude the higher-education sector. For Figure 8b, data include DRD facilities involved in crop research only; for Figure 8c, data include DRD units involved in livestock research only.

Thematic Focus

In 2000, 19 percent of DRD's researchers were working on crop genetic improvement, 13 percent on crop pest and disease control, and 10 percent on livestock pest and disease control (Table 2). The remainder of DRD's researchers focused on other

crop and livestock research with only a small portion working on natural resources or other thematic areas. A large share of the researchers at the other five agencies conduct research on other thematic areas such as postharvest, food safety, and socioeconomics.

Table 2—Thematic focus, 2000

	Numbers of researchers		Shares	
	DRD (20)	Other (5)	DRD (20)	Other (5)
	<i>(in fte's)</i>		<i>(percent)</i>	
Crop genetic improvement	47.3	8.7	19.3	8.4
Crop pest and disease control	30.7	12.2	12.5	11.8
Other crop	50.4	10.5	20.5	10.2
Livestock genetic improvement	4.7	12.0	1.9	11.6
Livestock pest and disease control	24.0	9.5	9.8	9.2
Other livestock	33.5	—	13.7	—
Soil	11.1	—	4.5	—
Water	6.8	1.0	2.8	1.0
Other natural resources	3.3	4.5	1.4	4.4
Postharvest	3.6	2.4	1.5	2.3
Other	30.1	42.3	12.2	41.0
Total	245.5	103.1	100	100

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.
^a This category includes the four other government agencies and TRIT.

CONCLUSION

Agricultural research in Tanzania follows the regional pattern of high dependency on donor funding. Yet even with the high donor support, agricultural research investments per researcher and as a share of AgGDP remain very low, in part because government employees earn very low salaries relative to their colleagues at nongovernmental organizations or in other countries.

Recent institutional developments focused on increasing DRD's efficiency, which (among other measures) included downsizing, privatizing tea and coffee research, and instituting new funding sources and allocation mechanisms such as the ZARFS.

NOTES

- The authors are grateful to Olympia Icochea for her assistance with the data processing; numerous colleagues in Tanzania for their time and assistance with data collection; and Jeremiah Haki, Barnabas Kapange, Mary Lutkamu, Gaudence Mitawa, and Han Roseboom for useful comments on drafts of this brief.
- The 12-agency sample consisted of:
 - Five government agencies: the Department of Research and Development (DRD), the Tanzania Fisheries Research Institute (TAFIRI), the Tanzania Forestry Research Institute (TAFORI), the Tropical Pesticides Research Institute (TPRI) and the Tse-Tse & Trypanosomiasis Research Institute (TTRI);
 - Two nonprofit institutions: the Tanzania Coffee Research Institute (TACRI) and the Tea Research Institute of Tanzania (TRIT);
 - Five higher-education agencies: the Sokoine University of Agriculture (SUA) and four institutes/departments of the University of Dar es Salaam (UDSM)—the Institute of Marine Sciences (IMS), the Institute of Resource Assessment (IRA), and the Faculty of Science's Departments of Botany, and Zoology and Marine Biology.

- The one government agency excluded from our sample is the Tanzania Wildlife Research Institute (TAWIRI), for which we were unable to obtain data.
- Unless otherwise stated, all data on research expenditures are reported in 1999 Tanzanian shillings or in 1993 international dollars.
- TTRI is funded separately from DRD and hence is not officially classified as a DRD unit; however, operationally the DRD's Animal Disease Research Institute (ADRI) coordinates TTRI's research activities and the two entities work in close collaboration.
- In accordance with the Frascati Manual (see *Methodology* box on page 8), these parastatals are classified as government agencies because they are largely administered by the government and receive more than half of their annual funding from government sources.
- This section draws largely on Gavian et al (2001), who elaborate on the various producer levies.
- The research share of the cashew levy was recently doubled from 0.5 to 1 percent.
- At that time, 92 research proposals had been processed—19 for approval, 29 for revision, and 36 for peer review. The remaining 8 were rejected.

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METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI, ISNAR, and ASARECA 2001-02) and ACU (various years).
- 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 Tanzanian 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 (2002). 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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