

# KENYA

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

## INSTITUTIONAL DEVELOPMENTS

We identified 28 agencies engaged in agricultural research in Kenya in the late-1990s, 26 of which are included in our sample.<sup>2</sup> These 26 agencies employed a total of 833 full-time equivalent (fte) researchers and spent a combined 3 billion 1999 Kenyan shillings on agricultural research and development (R&D)—equivalent to \$135 million in 1993 international prices (Table 1).<sup>3</sup> The Kenyan Agricultural Research Institute (KARI) accounted for more than half of both total agricultural research spending and staff. KARI falls under the administrative responsibility of the Ministry of Agriculture and Livestock Development (MoALD).<sup>4</sup> Its mandate covers a broad spectrum of agricultural research but excludes forestry and fisheries. KARI's research activities are organized into programs by commodities and factors (meaning issues that cut across commodities) and its infrastructure consists of a headquarters in Nairobi, 15 national research centers, 6 regional centers, and 7 subcenters covering all agroecological zones in the country. The national research centers conduct research

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

Type of agency	Spending		Researchers <sup>a</sup>	Share		Agencies in sample <sup>b</sup>
	1999 Kenyan shillings (millions)	1993 international dollars		Spending (percent)	Researchers	
<i>Public agencies</i>						
KARI <sup>c</sup>	1,838.7	75.1	469.0	55.5	56.3	1
Other government <sup>d</sup>	565.1	23.1	178.2	17.1	21.4	3
Nonprofit agencies	288.7	11.8	37.0	8.7	4.4	2
Higher education <sup>e</sup>	512.8	20.9	138.1	15.5	16.6	18
<b>Subtotal</b>	<b>3,205.3</b>	<b>130.9</b>	<b>822.3</b>	<b>96.8</b>	<b>98.7</b>	<b>24</b>
Business enterprises <sup>f</sup>	106.7	4.4	11.0	3.2	1.3	2
<b>Total</b>	<b>3,312.0</b>	<b>135.3</b>	<b>833.3</b>	<b>100</b>	<b>100</b>	<b>26</b>

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

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

<sup>b</sup> For a list of the 26 agencies included in the sample see note 2.

<sup>c</sup> KARI's financial data are from budget year 1999/2000.

<sup>d</sup> No data could be obtained for the Kenya Trypanosomiasis Research Institute (KETRI).

<sup>e</sup> Expenditures for the higher-education sector are estimates based on average expenditures per researcher for the government sector. The 680 faculty staff employed in the 18 higher-education agencies spent between 10 and 30 percent of their time on research, resulting in the 138.1 fte researchers.

<sup>f</sup> Data was available for Delmonte and the Oserian Development Company but not for the Kenya Seed Company, which also had a research program in 2000.

## KEY TRENDS

- Kenyan agricultural research is relatively well funded compared with other countries in Africa, but it is still somewhat inadequate given the country's large research portfolio.
- The share of total agricultural GDP that Kenya invests in agricultural research (known as its investment intensity ratio) was 2.6 percent in 2000—considerably higher than the Sub-Saharan African regional average and close to the corresponding rate for the developed world.
- The Kenyan Agricultural Research Institute (KARI) is the main agricultural research agency in Kenya and accounted for more than half the country's total spending and research staff in 2000.
- KARI is highly dependent on donor funding. During 1993–2000, close to half the total revenue came from two consecutive World Bank loans and contributions from other donors.
- In recent years KARI was reorganized with a view to increasing its efficiency. This process included the privatization of seed production activities and sugar research. At the same time, KARI expanded its portfolio of contract research.

## 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 Centre for International Agricultural Research (ACIAR), the European Union, and the U.S. Agency for International Development (USAID).

of both national and regional relevance, while the regional centers focus exclusively on adaptive research of regional importance. Research at the subcenters supports selected regional and national centers (ASARECA 1995). During the 1990s, KARI made considerable efforts to improve its organizational and management systems, including research priority setting. In addition, the linkages between KARI's strategic and adaptive programs were strengthened to ensure that newly developed technologies reach farmers (Kiome 2003). As a response to declining operational resources and continuing donor dependency, KARI has sought other funding sources such as contract research, royalties, and payment for some of its services. For this purpose a special unit was established, the Agricultural Research Investments Services (ARIS), as a semi-autonomous company under KARI. In addition, KARI transferred its seed protection and quality control activities to a separate parastatal institution, the Kenya Plant Health Inspectorate Services (KEPHIS), and its sugar research facilities to the Kenya Sugar Research Foundation (KESREF).<sup>5</sup>

In addition to KARI, four other government agencies conduct agricultural research in Kenya, accounting for 17 and 21 percent of the total financial and human resources in 2000, respectively. The larger of these are the Kenya Forestry Research Institute (KEFRI) and the Kenya Marine and Fisheries Research Institute (KEMFRI), employing 92 and 81 fte researchers in 2000, respectively. KEMFRI falls under the administrative responsibility of MoALD, while KEFRI reports to the Ministry of Environment and Natural Resources. KEFRI is headquartered in Muguga in the Central Province and has a network of 17 research centers spread across the country's agroecological zones. KEFRI conducts research on farm forestry, natural forests, dryland forestry, and forestry plantations. KEMFRI is comprised of a headquarters in Mombasa, a research center in Kisumu on Lake Victoria, and 5 research stations. Its mandate covers marine and freshwater fisheries. In 2000, the Kenya Industrial Research and Development Institute (KIRDI) employed 6 fte scientists involved in agricultural research. We were unable to obtain data on the Kenya Trypanosomiasis Research Institute (KETRI); hence it is excluded from our sample.

Kenya's two nonprofit research institutions, the Coffee Research Foundation (CRF) and the Tea Research Foundation

(TRF), accounted for 9 percent of total agricultural R&D spending in 2000.

Kenya has a comparatively large number of higher-education agencies involved in agricultural research. In 2000, the 18 higher-education agencies in our sample accounted for about 17 percent of total financial and human resources in agricultural research. The University of Nairobi's Faculty of Agriculture and Faculty of Veterinary Medicine were responsible for half of these activities, employing 275 faculty staff or—adjusted to reflect time spent on research—69 fte research staff. Both faculties have numerous research projects conducted by individual researchers, specifically postgraduate students. Egerton University's Faculty of Agriculture and the Jomo Kenyatta University of Agriculture and Technology (JKUAT) employed 26 and 12 fte researchers in 2000, respectively. The remaining 14 higher-education agencies in our sample played only a limited research role in 2000, employing between 1 and 5 fte agricultural researchers each.

We identified two national companies—the Oserian Development Company and the Kenya Seed Company—involved in agricultural research. In addition, one multinational company, Del Monte, has a local research program in Kenya. Unfortunately, the Kenya Seed Company, which is known to conduct a substantial amount of research, did not respond to our survey. Hence the share of private for-profit companies in Kenyan agricultural R&D spending would be slightly higher, in reality, than the 3 percent indicated by our present sample.

There is a fair amount of collaboration among the various Kenyan agricultural research agencies, as well as collaboration with regional and international agencies. KARI, for example, conducts some projects jointly with a number of Kenyan universities and has numerous collaborative projects with the private sector, donor organizations, and the international agricultural research centers.<sup>6</sup>

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

### Overall Trends

During 1971–91, the total number of public agricultural researchers increased by 6 percent per year, though an average negative growth rate of 2 percent has persisted since then

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

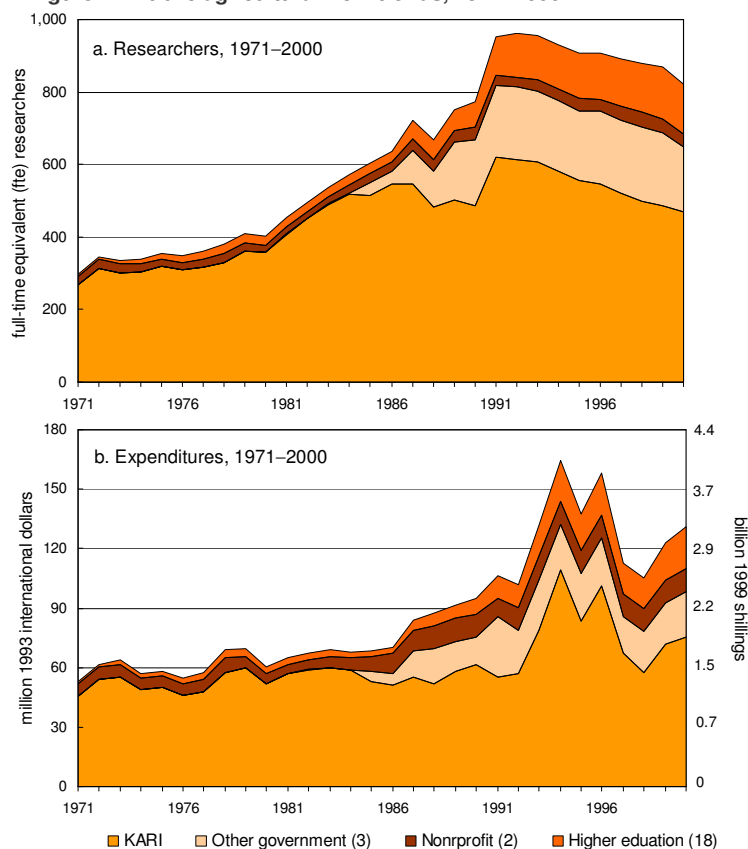
Formal agricultural research in Kenya was initiated in 1903 with the establishment of the Department of Agriculture under the British colonial government, which set up an experiment station at a government farm in Kabete. For the next two decades, research capacity slowly developed. Veterinary research laboratories were also set up at Kabete in 1908. In 1924, the research staff was transferred to a new laboratory facility, and over subsequent years a number of other agricultural research stations were established throughout the country. 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. Three of these, the East African Agriculture and Forestry Research Organization (EAAFRO), the East African Veterinary Research Organization (EAVRO), and the Tea Research Institute of East Africa (TRIEA), were located in Kenya.

With independence in 1963, all national agricultural research agencies were transferred, with few disruptions, to the newly independent government. In the first two decades, there were a few changes in the organization of agricultural research. The regional research organizations continued to exist until the collapse of the East African Community in 1977. Kenya inherited EAAFRO, EAVRO, and TRIEA. This resulted in an assessment of the performance and structure of agricultural research. The then recently established National Council for Science and Technology (NCST) advised the government to reorganize all agricultural R&D into a number of semi-autonomous parastatal institutes, and this led to the creation of KARI as well as KEFRI, KEMFRI, KETRI and KIRDI. These reforms were financially supported by a World Bank loan and various contributions by other donors as part of the National Agricultural Research Project (NARP). In the past two decades, KARI has been undergoing continuous transformations to enhance its efficiency and improve its research results and outreach capabilities.

Sources: Roseboom and Pardey (1993) and Kiome (2003).

(Figure 1a).<sup>7</sup> This decline was the result of a contraction in total fte researcher numbers at KARI, KEFRI, and KEMFRI. During 1991–2000, KARI’s total number of researchers diminished by 150 fte researchers as a result of KARI’s policy to improve the effectiveness of its facilities (such as the transfer of activities into KEPHIS and KESREF) and reduce its overall staff numbers.<sup>8</sup> This program was established during the early 1990s with the decline of government contributions to research given the country’s economic crisis and a renewed focus on improving the efficiency of KARI’s limited resources (Akroyd et al. 2001).

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



*Sources:* Compiled by authors from ASTI survey data (IFPRI–ISNAR–ASARECA 2001–02); ACU (various years); and Roseboom and Pardey (1993). *Notes:* 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)). 1971–86 data for KARI include the institute’s predecessors. Expenditures for the higher-education sector are estimates based on average expenditures per researcher for the government sector. 1980–90 researcher and spending data for KIRDI were estimated based on averages for the other government agencies combined.

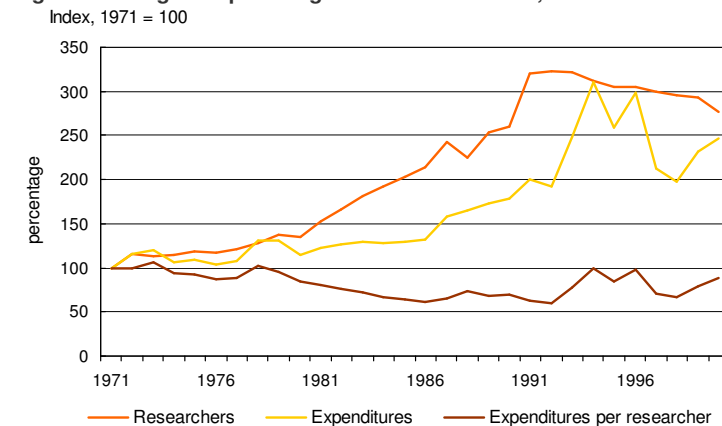
Total fte researcher numbers in the higher-education sector increased considerably over the past three decades, though this growth seems to have tapered off in recent years. During the 1990s, total fte researcher numbers at the 18 higher-education agencies in our sample increased by 3 percent per year, considerably lower than the 15 percent annual growth rate recorded during 1971–81. The expatriate share of total research staff consistently declined, from about 50 percent in the early 1970s, to 8 percent by 1991, and most recently to 2 percent in 2000, reflecting the transition to full national control of Kenyan agricultural research facilities.

During 1971–2000, public agricultural R&D spending grew

annually by 4 percent, though most of this growth occurred during the 1980s (Figure 1b). The pattern of KARI’s total spending was erratic year-to-year in the 1990s.

During most of the 1971–2000 period, spending-per-scientist levels failed to meet the 1971 level of \$179,000 (Figure 2); however declining researcher numbers in recent years have resulted in a relative improvement. In 2000, spending per scientist was on average \$159,000—which was lower the \$179,000 in 1971.

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

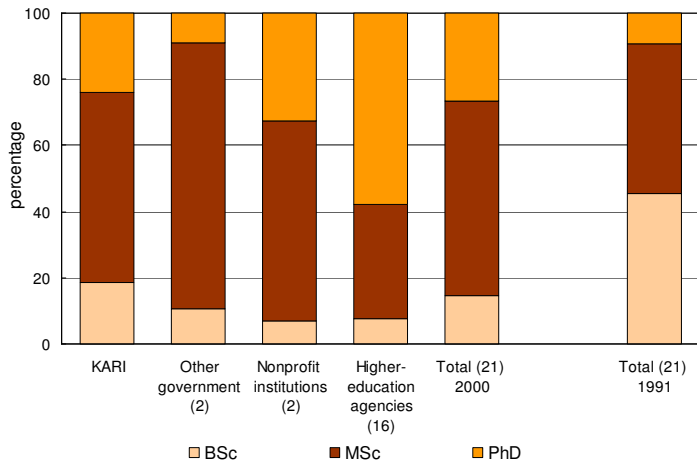


*Source:* Figure 1.

## Human Resources

In 2000, 85 percent of the 797 fte researchers in a 21-agency sample had postgraduate-level training, with over a quarter holding doctorate degrees (Figure 3). A higher proportion of university staff held postgraduate degrees compared with staff at other agencies, in line with other African countries and regions (Pardey et al. 1997; Beintema and Pardey 2001). In contrast, a relatively low proportion of researchers at the other two government agencies held PhD degrees, although the quality of staff at the government agencies—measured as the share of researchers with PhD and MSc degrees—increased from 54 percent in 1991 to 85 percent in 2000, almost solely because of an increase in the number of government research staff holding MSc degrees. Development of research staff to the PhD level was slow in the 1980s, reflected in a low 9 percent share in 1991. By 2000, this share had tripled to 27 percent of total research staff as a result of KARI’s efforts to upgrade staff qualifications. KARI’s first training plan ran from 1985 to 1995 and was funded through various donors under the first phase of the National Agricultural Research Project (NARP).<sup>9</sup> During 1987–95, 109 researchers received PhD training; 191 received MSc training; and 20 received a postgraduate diploma. In addition, 316 technical and 24 administrative staff received BSc, diploma, or certificate training. A second training plan was instigated for the period 1997/98 to 2001/02 in response to changing staffing demands stemming from KARI’s late-1990s reorganization (KARI 1998).

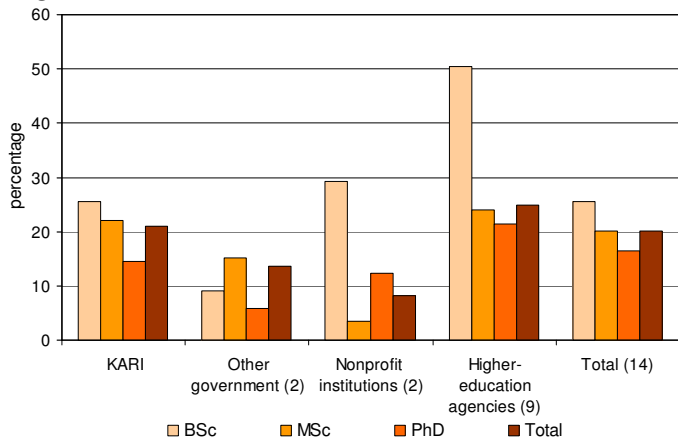
In 2000, 20 percent of the total fte researchers in a 14-agency sample were female, including 17 percent of all researchers holding doctorate degrees and 26 percent of all researchers trained to the BSc level (Figure 4). Although these female shares are slightly higher than those in neighboring countries, they have not changed since 1985–91 (Roseboom and

**Figure 3—Educational attainment of researchers, 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. Data exclude expatriate staff and business enterprises.

Pardey 1993). The higher-education agencies employed relatively more female researchers, specifically among those holding BSc degrees, where 51 percent of the total fte researchers were female. In contrast, only 4 female researchers were employed at the 2 nonprofit institutions (8 percent of the total). A quarter of the researchers at the other government agencies were female, but most of them held lower degrees than the country average.

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

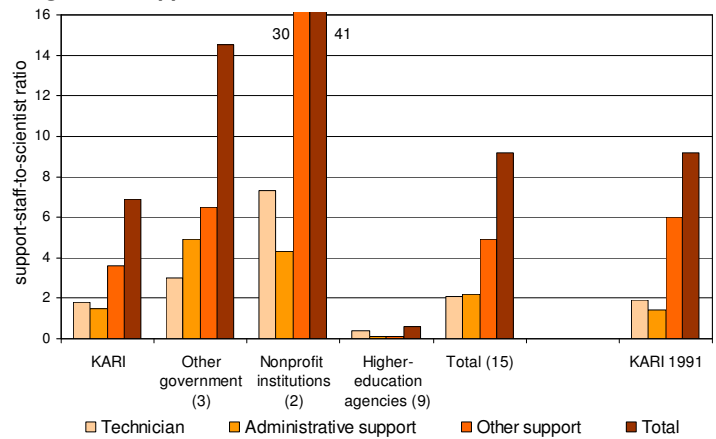
Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–ASARECA 2001–02).

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

For a 15-agency sample, the average number of support staff per scientist was 9.2—comprising 2.1 technicians, 2.2 administrative personnel, and 4.9 other support staff such as laborers, guards, and drivers (Figure 5). The overall ratio is very high compared with surrounding African countries. The corresponding ratios for Uganda and Tanzania, for example, were 2.4 and 2.5 that year (Beintema and Tizikara 2002 and Beintema et al. 2003). The relatively high ratio can be explained in part by the high number of other support staff employed in (coffee and tea) production at the nonprofit institutions.

In 2000, KARI's support-staff-per-scientist ratio was about one-third lower than the corresponding ratio in 1991. This was a

consequence of the previously mentioned staff cuts of the 1990s. Many of the nontechnical support staff were retrenched, and KARI began to outsource services such as vehicle repair, maintenance, and security (Akroyd et al. 2001).

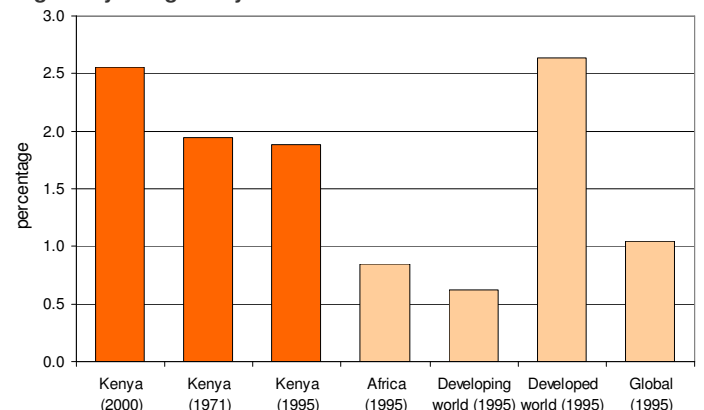
**Figure 5—Support-staff-to-researcher ratios, 2000**

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. Data exclude expatriate staff and business enterprises.

## Spending

Total public spending as a percent of agricultural output (AgGDP) is a common research investment indicator that helps to place a country's agricultural R&D spending in an internationally comparable context. In 2000, Kenya invested \$2.55 for every \$100 of agricultural output, which was close to the 1995 ratio for the developed world (Figure 6). This was also considerably higher than the country's ratio five years earlier (1.89 percent) but was actually the result of declining real AgGDP, not increased investment. The 1995 intensity ratio was also high relative to the average ratio for Africa or the developing world (0.85 and 0.62 percent respectively).

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

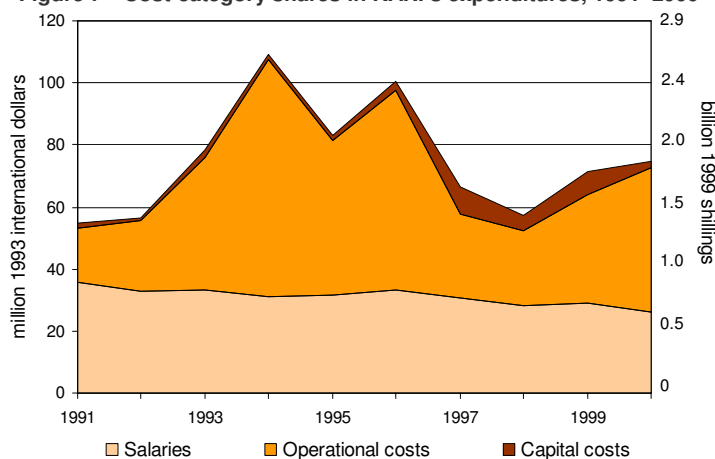
Sources: Kenya compiled from Figure 1b; AgGDP from World Bank 2002; other intensity ratios from Pardey and Beintema 2001.

With the influx of funding under the first and second phases of NARP, as well as through other projects funded by the European Union, KARI invested significantly in infrastructure, equipment, and staff training, all reflected in the increase in operational and capital costs during the 1990s. During this



period, total salaries averaged only 41 percent, while operational costs accounted for more than half of all spending (Figure 7). This is in contrast to the late-1980s when the situation was reversed (Roseboom and Pardey 1993).

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



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

Notes: Data reflect financial rather than calendar years (1996 data are for financial year 1995/96, and so on. Data include estimated salaries for expatriate staff (see *Methodology* on page 8).

## FINANCING PUBLIC AGRICULTURAL R&D

Agricultural research in Kenya is largely funded by the government, World Bank loans, and donor contributions from USAID, the United Kingdom's Department for International Development (DFID), and other donors through NARP I and II. NARP I (1987–95) was funded by a World Bank loan and contributions by USAID, the European Union, and the governments of Japan, the Netherlands, Sweden, and the United Kingdom. The main objectives of the project were to reorganize agricultural research around one institution, KARI, and to improve the institute's human resources, infrastructure, and equipment; other goals were to encourage producer participation, collaboration among research agencies, and linkages between research and extension (World Bank 1996). NARP I was followed by a second phase, which initially ran until 2001 but was extended by 18 months to mid-2003. The total budget of NARP II amounts to US\$180 million, of which US\$40 million is being provided by a second World Bank loan, US\$12–15 million from bilateral donors, US\$70 million from the government, and the remainder from private-sector contributions. NARP II's main objective is to further strengthen KARI's organization and management, to invest in new equipment, and to provide training for staff specifically focused on KARI's national and regional research centers (World Bank 1996).

Producers have also contributed to agricultural research over the years. While such contributions have historically been limited to coffee and tea, it has recently expanded to sugar with the restructuring of KARI. The universities also rely heavily on donors to fund the operational costs of their research activities. JKUAT receives funding for its training and research activities from various donors, the primary one being the Japan International Cooperation Agency (JICA), which has provided financial and technical assistance to the university since its creation. The Faculty of Agriculture of the University of Nairobi

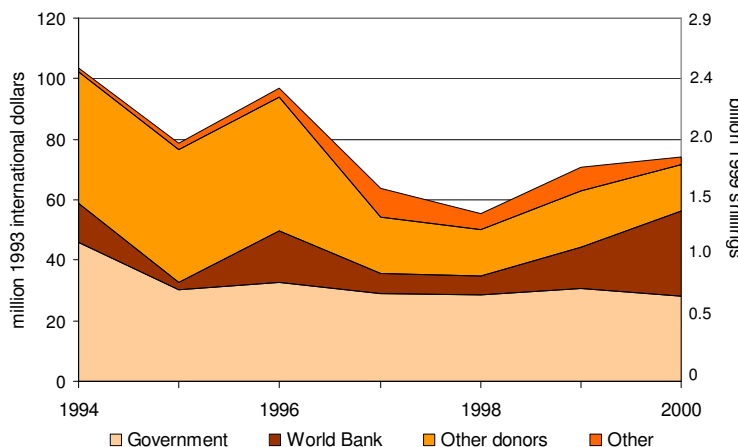
receives funding for its research activities and staff training from the Rockefeller Foundation, the Belgian Government, and other donors. The faculty is also engaged in a large number of collaborative projects with the international agricultural research centers.

## Kenyan Agricultural Research Institute

During the 1990s, government contributions accounted for about half of KARI's total funding, while the combined World Bank loan and donor contributions accounted, on average, for slightly less than half during the 1990s (Figure 8). The proportion of donor support, however, fluctuated year-to-year, peaking in 1994 at 64 percent. Most of these contributions came under the first and second phase of NARP.

Given the high dependence on donor funding, KARI has sought alternative funding means since the late-1980s. For example, beginning in 1989 KARI undertook contract-based, (flower) tissue-culture research on behalf of and funded by the Oserian Development Company; KARI also helped the agency with staff training and in establishing a tissue culture laboratory.

**Figure 8—KARI's funding sources, 1994–2000**



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

Note: Data reflect financial rather than calendar years (1994 data are from financial year 1993/94, and so on).

KARI signed a Memorandum of Understanding (MOU) with the Kenya Seed Company, which agreed to contribute 5 percent of its gross revenues to KARI for research on maize breeding, and with KSA to fund all the development and operational costs of sugar research. This latter agreement began in 1994 but was halted in 2000 when KARI's sugarcane research activities were privatized and formally taken over by KESREF. KARI signed another MOU with the Kenya Veterinary Vaccines Production Institute, and additional MOUs are currently being negotiated with the Horticulture Crops Development Authority and the Pyrethrum Board.

Additional KARI facilities, such as the soil-testing laboratory that used to provide free services to farmers, have more recently begun to charge fees, though while this has generated some revenues, the number of farmers requesting services has actually decreased (Akroyd et al. 2001). KARI is also selling crop and livestock produce but usually on a cost-recovery basis. The KARI Seed Unit (KSU) was established during NARP II to produce various crop planting materials

on a cost-recovery basis (such as dryland crop seeds and fruit tree seedlings) that were not otherwise produced for commercial sale to farmers. KSU was subsequently registered as a seed trader and therefore allowed to package and sell such materials. During the late-1990s, these internally generated funds accounted for over 10 percent of total funding, but by 2000 its share had dropped to only 2 percent.

### Commodity-Based Funding for Agricultural Research

Historically, coffee and tea research have been funded and performed by the producers themselves. In 1964, the Coffee Board of Kenya established CRF to carry out research related to coffee production. TRF was created in 1980, taking over the tea research activities previously undertaken by the Tea Research Institute of East Africa. Both foundations fund their research activities from revenues collected through a cess, administered by the respective marketing agencies, as well as the sales of production from their own lands. During the 1990s, CRF relied mostly on the levies to fund its research activities; sales revenues accounted for only a quarter of the foundation's total funding. While a large portion of TRF's budget is provided by the tea industry through the Kenya Tea Board, like CRF, an increasing portion of its funding is generated from production sales. In 1999–2000, the share of total sales revenue in TRF's funding accounted for close to 60 percent.

### Agricultural Research Fund

As part of NARP I and under KARI's management, the Agricultural Research Fund (ARF) was established in 1990 and became operational in July 1991. ARF is a competitive funding mechanism for highly adaptive and on-farm research in areas outside KARI's traditional focus. It aims to enhance collaboration across the various agricultural research agencies. Under NARP I and II, funds were allocated from the World Bank loan and USAID and DFID contributions. Small contributions were also provided by a number of bilateral donors (Chema 1999). The funds reside in a multi-donor account, but donors can earmark their contributions toward specific research areas. The Kenyan government has not made direct cash contributions to the fund but has provided staff, office space, electricity, and other operational expenses. ARF is managed by the Research Fund Management Committee located at KARI but also has representatives from universities, the government, and the private sector. Two calls for proposals are made annually, and research grants normally do not exceed \$37,000. From July 1991 to July 1998, 349 project proposals were received, 61 of which were accepted to a total budget value of 75 million Kenyan shilling. More than half of the accepted proposals (and associated funding allocation) were from the universities, while KARI accounted for less than a quarter of the total. Additional recipients were other public agencies, international centers, private companies, and nongovernment organizations (Akroyd et al. 2001).

### PRIVATE AGRICULTURAL R&D

Agricultural R&D performed by the private sector in Kenya is small. We identified three private companies, two of which could be included in our sample based on data availability—ODC and Del Monte. ODC conducts research on tissue culture of flowering plants, while Del Monte conducts research on fruit,

mainly pineapples.<sup>10</sup> Many of the larger private companies do not employ their own research staff but instead contract research out to KARI, universities, or other agencies. For instance, KARI conducts research on barley on behalf of the East African Breweries and conducts on-farm trials and other assessments of new products on behalf of various agrochemical companies. It has also developed the aforementioned MOUs with various commercial seed companies.

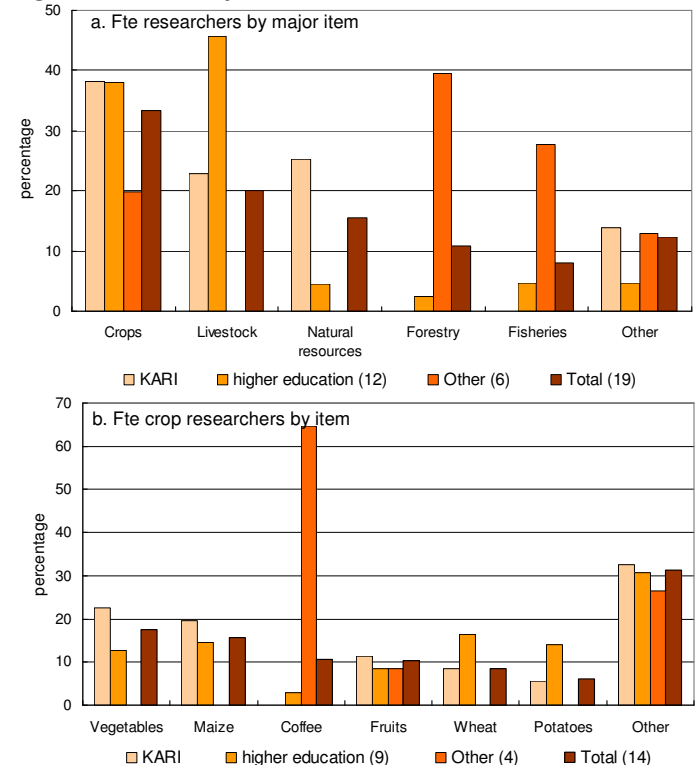
## RESEARCH ORIENTATION

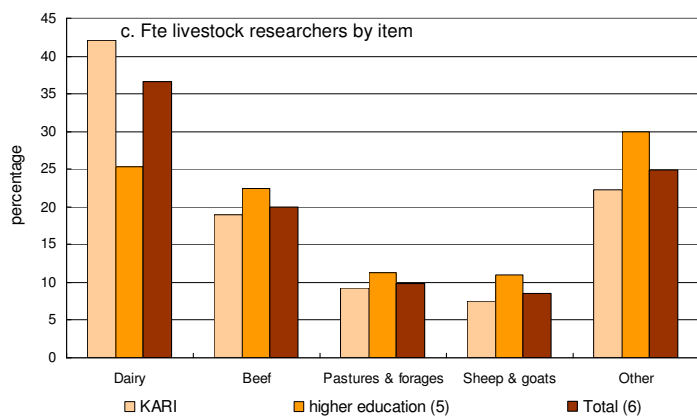
### Commodity Focus

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, one-third of the close to 800 fte researchers in our 19-agency sample conducted crop research (Figure 9a). Livestock, natural resources, and forestry accounted for 20, 16 and 11 percent, respectively, while 8 percent of fte researchers focused on fisheries research. KARI researchers spent relatively more time on natural resources (25 percent), while the researchers at the 12 higher-education agencies, combined, spent more time on livestock research than the sample average (46 percent). The major crops are vegetables, maize, coffee, and fruits, each of which accounted for over 10 percent of the total fte crop researchers in our sample (Figure 9b). Researchers working on wheat and potatoes accounted for 9 and 6 percent, respectively. 31 percent of researchers were working on a wide variety of other crop items, including tea, ornamentals, and barley. Only KARI and 5 higher-education agencies in our 18-agency sample conducted livestock research; more than one-third of those were working on dairy, while one-fifth were working on beef (Figure 9c). Other important livestock items were pastures and forages (10 percent) and sheep and goats (9 percent).

Figure 9—Commodity focus, 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. Figure 9b only includes agencies involved in crop research, and Figure 9c only includes agencies involved in livestock research.

Table 2—Thematic focus, 2000

	Numbers of researchers		Shares	
	KARI	Other (16)	KARI	Other (16)
	(in fte's)		(percent)	
Crop genetic improvement	52.2	12.8	11.1	24.1
Crop pest and disease control	24.9	12.3	5.3	23.3
Other crop	49.4	10.8	10.5	20.5
Livestock genetic improvement	17.9	—	3.8	—
Livestock pest and disease control	24.9	—	5.3	—
Other livestock	44.2	—	9.4	—
Soil	47.9	1.4	10.2	2.6
Water	24.9	1.4	5.3	2.6
Other natural resources	9.9	—	2.1	—
Postharvest	9.9	4.8	2.1	9.0
Other	164.0	9.5	34.9	17.9
<b>Total</b>	<b>470.0</b>	<b>52.9</b>	<b>100</b>	<b>100</b>

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

## NOTES

- The authors are grateful to Joan Chesoro, Leonard Otieno Oruko, and numerous other colleagues in Kenya for their time and assistance with data collection; Olympia Icochea and Tatiana Prada Owen for their assistance with data processing; and thank Romano Kiome, Cyrus Ndiritu, John Omiti, Han Roseboom, and Michael Waitthaka for useful comments on drafts of this brief.
- The 26-agency sample consisted of:
  - Four government agencies/units: the Kenya Agricultural Research Institute (KARI), the Kenya Forestry Research Institute (KEFRI), the Kenya Marine and Fisheries Research Institute (KEMFRI), and the Kenya Industrial Research and Development Institute (KIRDI);
  - Two nonprofit institutions: the Coffee Research Foundation (CRF) and the Tea Research Foundation (TRF);
  - 18 higher-education agencies: the Jomo Kenyatta University of Agriculture and Technology (JKUAT); the University of Nairobi's Faculty of Agriculture, Faculty of Veterinary Medicine, and Departments of Botany and Zoology; Egerton University's Faculty of Agriculture and Departments of Botany and Zoology; Kenyatta University's Departments of Environmental Planning and Management, Botany, and Zoology; Moi University's Faculty of Agriculture, Faculty of Forestry Resources and Wildlife Management, Departments of Botany and Zoology, and School of Environmental Sciences; the Department of Agriculture of Maseno University; and the Department of Agriculture of the University of Eastern Africa, Baraton;
  - Two business enterprises—the Del Monte Kenya and the Oserian Development Company.

## Thematic Focus

In 2000, 11 percent of the total researchers at KARI in our sample were working on crop genetic improvement, while 5 percent focused on pest and disease control (Table 2). The corresponding shares for the other agencies were considerably higher (24 and 23 percent, respectively). The remainder of KARI researchers focused on a wide variety of themes including other crops, livestock, soil, water, and postharvest research.

## CONCLUSION

Kenyan agricultural research is relatively well funded compared with many other African countries. Its intensity of research is well above that of other African countries and close to the average for the developed world. KARI continues to have the highest concentration of agricultural research activities in Kenya although the higher-education agencies, nonprofit institutions, and other agencies also make significant contributions to agricultural research. Agricultural research by the private sector remains small and limited to specific high-value commercial enterprises.

Agricultural research, however, continues to rely heavily on external donor funding. More local funding, either public or private, should be mobilized in order to reduce donor dependency. The establishment of partnerships with the private sector, for example, needs to be further encouraged and developed.

Not included in the sample are one government agency, the Kenya Trypanosomiasis Research Institute (KETRI), and one business enterprise, the Kenyan Seed Company, involved in agricultural research.

- Unless otherwise stated, all data on research expenditures are reported in 1993 international dollars or in 1999 Kenyan shillings.
- At the time the ASTI survey, the ministry was called the Ministry of Agriculture and Rural Development (MARD), but after late-2002 elections it became MoALD.
- Four research subcenters, including over 280 staff and all infrastructure and equipment, were transferred to KEPHIS, while one research center and two subcenters—again, including all staff, infrastructure, and equipment—were transferred to KESREF. The latter was established in 2000 by the Kenya Sugar Authority (KSA).
- Two of the 16 centers under the umbrella of the Consultative Group on International Agricultural Research (CGIAR) are headquartered in Nairobi: The International Livestock Research Institute (ILRI) and the World Agroforestry Centre (ICRAF).
- Data are calculated as least squares growth rates.
- Some KARI scientists moved to the University of Nairobi or locally based international organizations and often collaborate with KARI on research projects.
- A detailed overview of NARP is provided in the financing section of this brief.
- R&D investments are measured on a performer basis. The private shares would actually be somewhat higher because many private firms outsource research to KARI, other agencies, and individuals.

## 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 Kenyan 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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