

KENYA

RECENT DEVELOPMENTS IN PUBLIC AGRICULTURAL RESEARCH

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LONG-TERM INVESTMENT AND CAPACITY PATTERNS IN PUBLIC AGRICULTURAL R&D

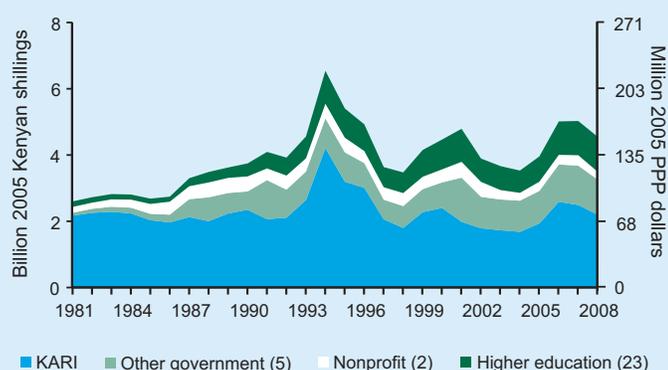
Since the early 1990s, public agricultural research and development (R&D) spending in Kenya has varied considerably from year to year, while agricultural research capacity showed a more stable trend.¹ In 2008, Kenya spent 4.5 billion Kenyan shillings or 154 million PPP dollars (both in 2005 constant prices) on agricultural R&D (Figure 1; Table 1). Unless otherwise stated, all investment data in this note are expressed in purchasing power parity (PPP) prices.² PPPs reflect the purchasing power of currencies more effectively than do standard exchange rates because they compare the prices of a broader range of local—as opposed to internationally traded—goods and services. Agricultural R&D spending increased modestly during the 1980s, when several government and higher education agencies involved in agricultural research were established. The variation in spending since the early 1990s, however, was mostly the effect of fluctuations in donor funding and, to a lesser extent, government contributions to KARI.

Total public agricultural R&D research capacity has shown a gradual increase since 2000 to a total of 1,011 full-time equivalent (FTE) research staff in 2008 (Figure 2). However, this

Key Trends Since 2000

- Public agricultural research and development (R&D) expenditures in Kenya have varied from year to year largely because spending at the country's main agricultural research agency, the Kenya Agricultural Research Institute (KARI), has been affected by fluctuations in government and donor funding.
- Following a period of decline during the late 1990s, the number of agricultural researchers in Kenya has increased in recent years. This was the combined result of a merger of two institutes with KARI and the loosening of a general recruitment freeze that had been in place under the conditions of the structural adjustment programs.
- The overall institutional structure of agricultural R&D in Kenya changed to some extent, including the establishment of a few new government and higher education agencies.
- Government contributions remain the main funding source for KARI; donor funding averaged one-third of total funding during 2001-08; a smaller share than in the 1990s.

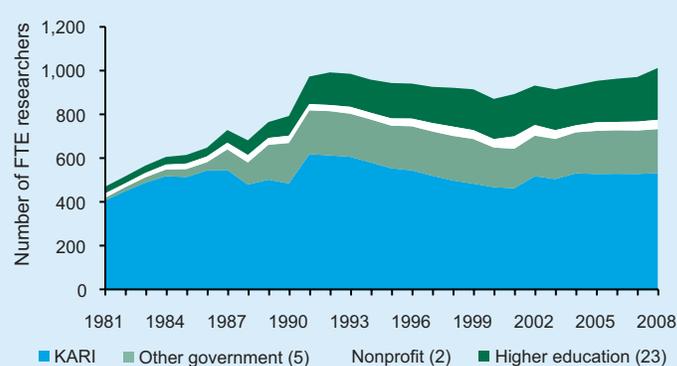
Figure 1—Public agricultural R&D spending adjusted for inflation, 1981–2008



Sources: Calculated by authors from ASTI-KARI 2009 and Beintema, Murithi, and Mwangi 2003.

Notes: Figures in parentheses indicate the number of agencies in each category. 1981-86 data for KARI include the institute's predecessors. For more information on coverage and estimation procedures, see the Kenya country page on ASTI's website at asti.cgiar.org/kenya.

Figure 2—Public agricultural research staff in full-time equivalents, 1981–2008



Sources: Calculated by authors from ASTI-KARI 2009; Beintema, Murithi, and Mwangi 2003; Mutunga and de Nooijer 2006; and Kenyatta University 2009.

Notes: Figures in parentheses indicate the number of agencies in each category. 1981-86 data for KARI include the institute's predecessors

Table 1—Overview of public agricultural R&D spending and research staff levels, 2008

Type of agency	Total spending			Total staffing	
	Kenyan shillings	PPP dollars	Shares	Number	Shares
	(million 2005 prices)		(%)	(FTEs)	(%)
KARI	2,204.7	74.7	49	533.0	53
Other government (5)	1,054.6	35.7	23	200.3	20
Nonprofit (2)	234.8	8.0	5	42.2	4
Higher education (23)	1,048.3	35.5	23	235.9	23
Total (31)	4,542.3	153.9	100	1,011.5	100

Source: Compiled by authors from ASTI-KARI 2009.
 Note: Figures in parentheses indicate the number of agencies in each category.

number represents only a slight increase from previously high levels seen in the early 1990s.

KARI accounted for roughly half of the researchers and spending on agricultural R&D in the country. The number of FTE researchers at KARI has increased since 2001, from 464 to 533 in 2008. However, there were still fewer researchers in 2008 than in the early 1990s, when there were over 600 FTE research staff. The previous, higher numbers are attributable in part to expatriate staff, whereas no expatriate researchers were employed at KARI after 2000. There were also deliberate efforts to reduce the number of KARI staff and improve the efficiency of the agency (Beintema, Murithi, and Mwangi 2003). A number of staff members were transferred to the Kenya Plant Health Inspectorate Services and to the new sugar research facility, the Kenya Sugar Research Foundation (KESREF), in 2001. In addition, after 1988 there was no direct recruitment of new graduates from the universities to KARI, as had been the practice previously. These factors contributed to a general decline in the number of staff throughout the mid- and late 1990s, leading to a low point in 2001 of 464 FTE researchers. The increases after this point were due partly to the merger of the Kenya Trypanosomosis Research Institute (KETRI) and the Kenya Veterinary Vaccines Production Institute (KEVEVAPI) with KARI in 2003. In addition, a general hiring freeze that had been in place under the conditions of the structural adjustment programs had loosened after the change in government in 2003. Agencies could recruit new staff on a case-by-case basis as the need arose.

Other government agencies, including the Kenya Forestry Research Institute (KEFRI), the Kenya Marine and Fisheries Research Institute (KMFRI), the Kenya Industrial Research and Development Institute (KIRDI), the Kenya Institute for Public Policy Research and Analysis (KIPPRA), and KESREF together accounted for roughly one-quarter of the total public agricultural R&D expenditures and capacity in the country in 2008.

Accounting for roughly 5 percent of total expenditures and capacity in 2008, the role of the nonprofit sector in Kenya's public agricultural R&D is rather small. Research capacity at the Tea Research Foundation (TRF) remained fairly consistent and totaled

ASTI Website Interaction

-  More details on institutional developments in agricultural research on Kenya are available in the 2003 country brief at asti.cgiar.org/pdf/kenya_cb8.pdf.
-  Underlying datasets can be downloaded using ASTI's data tool at www.asti.cgiar.org/data.
-  This brief presents aggregated data; additional graphs with more detailed data are available at asti.cgiar.org/kenya/datatrends.

www.asti.cgiar.org/kenya

between 12 and 14 FTE researchers from 2001 to 2008. The total number of FTE research staff at the Coffee Research Foundation's (CRF) has shown a more irregular pattern since 2000. In 2008, CRF employed 30 FTE researchers. CRF receives most of its income from commodity levies and sales of goods and services. The gradual decline in Kenya's coffee production has prompted a fall in CRF's R&D expenditures since the turn of the millennium.

The role of Kenya's higher education sector has grown greatly since the 1980s and by 2008, the sector accounted for close to a quarter of the country's public agricultural R&D capacity. The increase in research capacity from 192 FTEs in 2001 to 236 FTEs in 2008 was the result of the establishment of several new agricultural colleges and departments that opened in the past decade. Two of the largest and longest-established faculties, the Faculty of Agriculture and the Faculty of Veterinary Medicine at the University of Nairobi (UON), remained relatively unchanged in terms of total research staff over the 2001–08 period, with 45 and 34 FTE staff, respectively, in 2008. The Faculty of Agriculture at Egerton University employed a total of 42 FTE research staff in 2008, while the next largest, the Faculty of Agriculture at the Jomo Kenyatta University of Agriculture and Technology (JKUAT), had 17 FTE research staff.

On average, female researchers made up 27 percent of Kenya's total agricultural research staff in 2008, and the share of female staff has been steadily rising (ASTI-KARI 2009; Beintema, Murithi, and Mwangi 2003). In particular, the percentage of female researchers at KARI increased from 21 percent in 2000 to 30 percent in 2008.

In 2008 there were 1.4 technicians, 1.8 administrative staff, and 2.1 other support staff per researcher at KARI (ASTI-KARI 2009). The total number of support staff at KARI has declined since the early 1990s (see also Beintema, Murithi, and Mwangi 2003). This trend, combined with an increasing number of research staff during 2001–08, led to a decrease in KARI's ratio of support staff per researcher from 6.8 in 2001 to 5.3 in 2008. KEFRI, KMFRI, KIRDI, and KIPPRA also experienced declining ratios of support staff to researchers. The total support-staff-per researcher ratio for the higher education agencies averaged 0.8, which is

common given that research is not their primary mandate.

To compare agricultural R&D spending across countries, one indicator often used is that of total public spending as a percentage of agricultural output (AgGDP), known as the research intensity ratio. In 2008, Kenya invested \$1.43 in agricultural R&D for every \$100 in agricultural output (Figure 3). The intensity ratio fluctuated from year to year during the 2001–08 period, following varied trends in agricultural R&D spending combined with a relatively static AgGDP (Figure 3). However, levels were much higher in the early 1990s. Similarly, the number of FTE agricultural researchers did not keep up with the increasing number of farmers. In 2008, for every 1 million farmers there were 79 FTE researchers, compared with 119 in 1991.

INSTITUTIONAL STRUCTURE AND POLICY ENVIRONMENT

The overall institutional structure of agricultural R&D in Kenya changed to some extent since 2000. KARI serves as the main agricultural research agency, with KEFRI and KMFRI supporting the forestry and fisheries subsectors, respectively. As mentioned earlier, KEVEVAPI and KETRI merged with KARI in 2003. However, in 2009 KEVEVAPI was removed from KARI and returned to the Ministry of Livestock Development as a semiautonomous government agency but with the same mandate of commercial production of vaccines, which were developed mainly by KARI. Two new government agencies were established, KIPPRA in 1999 and KESREF in 2001. KIPPRA is an autonomous public institute, and its mandate is overall public policy research, in which agricultural policy research is just one thematic area. KESREF took over all of the staff and centers of KARI that dealt with sugar research.

In the higher education sector, the new faculties and departments established in recent years include the School of Agriculture and Enterprise Development at Pwani University College of Kenyatta University, the Institute of Sugar and Agro-Research Management and Technology at Masinde Muliro University of Science and Technology, the Department of Agriculture and Natural Resources at Kenya Methodist University, and Egerton's Faculty of Environment and Resources Development. However, the number of staff focused on agricultural research at these higher education agencies is

Figure 3—Intensity of public agricultural research spending and capacity, 1981–2008



Sources: Calculated by authors from ASTI-KARI 2009; Beintema, Murithi, and Mwangi 2003; World Bank 2009a; and FAO 2009.

ASTI Website Interaction

-  A list of the 6 government agencies, 2 nonprofit institutions, and 23 higher education agencies included in this note is available at asti.cgiar.org/kenya/agencies.
-  Detailed definitions of PPPs, FTEs, and other methodologies employed by ASTI are available at asti.cgiar.org/methodology.
-  The data in this brief are predominantly derived from surveys. Some data are from secondary sources or were estimated. More information on data coverage is available at asti.cgiar.org/kenya/datacoverage.
-  More relevant resources on agricultural R&D in Kenya are available at asti.cgiar.org/kenya.

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relatively small.

No major policy changes have taken place since 2000 that affect agricultural R&D. However, it is important to note that after the elections of 2002 and reconstitution of the government, a Ministry of Science and Technology was established. The ministry has the mandate to coordinate policy matters affecting science, technology, and innovation in the country. In particular, the ministry spearheaded the development of a national policy to cover research and innovation matters for all sectors of the economy. The National Council of Science and Technology (NCST) has the statutory responsibility to coordinate the science, technology, and innovation issues that fall under the ministry's purview. After the 2007 elections, the Ministry of Higher Education, Science and Technology (MoHEST) was formed to coordinate policy issues for higher education, including universities, and science and technology (S&T) matters. Whereas matters of S&T policy rest with MoHEST, the operational and managerial issues of public research agencies rest with line ministries such as the Ministry of Agriculture in the case of KARI, KESREF, CRF, and TRF; the Ministry of Fisheries for KMFRI; and the Ministry of Natural Resources for KEFRI. Some of the public research agencies such as KARI, KEFRI, and KMFRI were established under the Science and Technology Act of Parliament, while others dealing with specific commodities such as CRF and TRF were established under the Companies Act. The various public universities were established under individual acts of Parliament that regulate their operations. Private universities are established under the Higher Education Act. There are currently efforts to put in place a single act of Parliament to deal with all matters of science, technology, and innovation.

In 2008, the government of Kenya launched the Vision 2030 Strategy document as the blueprint to guide development activities in the country. Vision 2030 identifies three development pillars—economic, social, and political—upon which development in the country will be based. These pillars are to be supported by cross-cutting foundations, among them, science, technology, and innovation. Within the agricultural sector, there have been efforts to develop an overall national agricultural research system policy. The policy is expected to come up with a framework for conducting and coordinating agricultural research across the different institutions in the country.

Collaboration with regional and international agencies continues to be a significant aspect of research at Kenya agricultural research agencies. Some research projects specifically require collaboration between international and national partners. Major collaborative projects are implemented jointly with the Consultative Group on International Agricultural Research (CGIAR) centers and cover research on different commodities and thematic issues. Collaboration among national agencies is common as well, as government agencies often engage in various types of collaborative projects with universities and private sector firms.

RESEARCH STAFF QUALIFICATIONS AND TRAINING

An increasing majority of the agricultural research staff in Kenya has been trained at the postgraduate level, with 34 percent holding PhD and 49 percent holding MSc degrees in 2008 (Figure 4). A trend toward an increasing number of research staff with PhDs was evident at KARI and other government agencies. In 2001, 24 percent of KARI staff held PhDs, compared to 28 percent in 2008. This increase was due largely to an influx of female scientists with a PhD degree. The number of female researchers with PhDs at KARI tripled from 16 to 49 FTEs during 2000-08 (ASTI-KARI 2009; Beintema, Murithi, and Mwangi 2003). The share of researchers with PhDs at the five other government

agencies increased from 9 percent in 2001 to 23 percent in 2008. Higher education agencies generally have a higher share of staff with PhDs than do other institutions. This is true in Kenya as well, where 59 percent of higher education FTE researchers held PhDs in 2008. This represents an absolute increase from 84 FTE research staff with PhDs in 2001 to 138 in 2008.

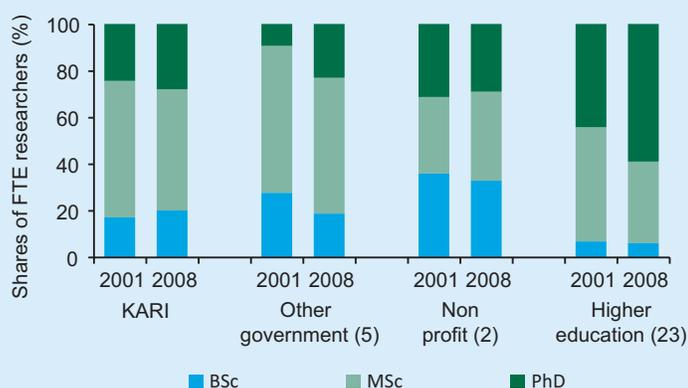
Major training opportunities for KARI scientists have come through funding from multilateral and bilateral donor-supported projects such as by the World Bank and the European Union (EU). Several hundred scientists were trained under the World Bank-financed National Agricultural Research Programme (NARP) Phases I (1987–95) and II (1997–2003) (Beintema, Murithi, and Mwangi 2003). Under the Kenya Agricultural Productivity Project (KAPP) I that followed NARP II from 2004 to 2008, 18 staff were offered scholarships for MSc-level training and 7 for PhD-level training. The EU is currently supporting the Kenya Arid and Semi-Arid Lands (KASAL) research program under European Development Fund 9, and this program is expected to run from 2006 to 2010. Under this support, seven staff are being trained for MSc and eight for PhD degrees. Under KAPP and KASAL, KARI adopted a policy that the scholarships for MScs/MAs and PhDs would be tenable in the local universities so that a higher number of staff could benefit due to the lower costs compared with going abroad.

Other training opportunities come through funding agencies such as the Rockefeller Foundation, the Alliance for a Green Revolution in Africa (AGRA), and CGIAR centers where staff apply for competitive scholarships or are partners in collaborative projects that offer training opportunities as part of project implementation. Staff who are able to obtain training scholarships through these avenues can register in any university in the world, provided the donor is in agreement. All staff on training are given leave for the duration of the studies and continue to receive their salaries.

Even with the increased training opportunities provided for staff, including the opportunity to earn higher degrees, the research agencies face the challenge of staff retention. Once staff members earn higher degrees, they become more attractive to other institutions that can offer better remuneration packages than public agencies, where salaries are funded mainly by the government. Retention strategies that institutes such as KARI are putting in place include regular staff performance evaluations—for KARI, after every three years—which form the basis for promotions. The institutes are also working on other incentives, such as better medical benefits. KARI bonds staff that are offered study leave; the staff members agree to work for the agency for a given period before leaving.

Since 1988, the government stopped recruiting new graduates from universities for direct employment to public entities such as KARI. This restriction led to an aging staff situation. Recruitment, for instance in KARI, takes place on a case-by-case basis. In 2007, 36 percent of KARI's researchers were 51 years or older (ASTI-AWARD 2008). Around 2004, KARI and other research institutes managed to convince the government to increase the retirement age of scientists from 55 to 65 years in order to address the serious staff shortages. Given the long time it normally takes to train a researcher to PhD-level and considering that scientists are eligible for higher degree training

Figure 4—Qualifications of researchers by institutional category, 2001 and 2008



Sources: Calculated by authors from ASTI-KARI 2009; Beintema, Murithi, and Mwangi 2003; Mutunga and de Nooijer 2006; and Kenyatta University 2009.

Notes: Figures in parentheses indicate the number of agencies in each category. Data are for researchers only and therefore exclude 17 and 30 FTE technicians holding MSc degrees and BSc degrees, respectively.

only after they have worked long enough to secure a study leave, the research institutes argued that they were not getting the optimal value from highly trained scientists when they had to retire at 55 years. The increase in retirement age also became an incentive for the nongraduate staff (for example, technicians with diplomas) to go for degree training—sometimes through self-sponsorship—to ensure they could stay longer on the job after acquiring the degree and being designated as research scientists. In 2009, the government also raised the retirement age for all public sector workers from 55 to 60 years.

The other research institutes use similar approaches like KARI to train their staff to higher degrees. Those institutes that currently do not give study leave are trying to change their policies so that they can provide leave as an incentive to encourage researchers to return to the institutes after training.

Universities train staff under their own staff development programs. For promotion in the universities to positions of senior lecturer or professor, having a PhD is a minimum requirement. Therefore, staff in the universities strive to attain higher degrees through funding from either the universities or donors.

INVESTMENT TRENDS

Expenditures

The allocation of research budgets across salaries, operating costs, and capital investments affects the efficiency of agricultural R&D, and therefore detailed data on cost categories of government agencies were collected as part of this study. Salaries accounted for 52 percent of total expenditures at KARI in 2008, compared with 43 for operating costs and 5 percent for capital investments (Figure 5). Capital investments jumped in 2006 due to construction and repair of various research facilities and equipment purchases that were financed by the World Bank under KAPP I. The average allocation of expenditures among cost categories at other government research agencies was weighted more toward salaries than at KARI. Capital costs were high in 2001 due to the establishment of KESREF.

Staff salaries at the government agencies and public universities are generally funded by the government. The

operating and capital costs of research are mostly paid by donors through funded projects.³ Some donor-funded projects require that the government provide counterpart funding or matching funds. The government then might direct some funds to meet research operating expenses, in addition to the recurrent funds.

Funding Sources

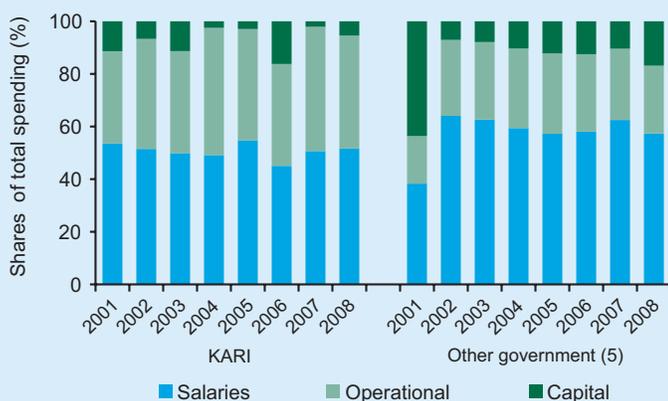
Funding sources for agricultural R&D in Kenya included the national government, multilateral and bilateral donors, development bank loans, proceeds from the sale of goods and services, and commodity levies. KARI's main source of funding from 2001 to 2008 was the government, accounting for 55 percent of total funding in 2008 (Figure 6). Donors and development banks provided 36 percent of funding, while the sale of goods and services provided a 9 percent share.

Overall, government and donor funding and income from the sales of goods and services for KARI increased from 2001 to 2008. However, year-to-year amounts varied quite a bit, particularly with donor funding. The overall trend for 2001–08 for KARI appears to be an increasing reliance on government support rather than donor funding. This shift is in contrast with the 1994–2000 period, when donor funding exceeded government funding in some years (Beintema, Murithi, and Mwangi 2003). The sale of goods and services also made up a greater share of income than in the 1990s, averaging 0.2 billion shillings (in 2005 prices) over the 2001–08 period.

Among the other government agencies, KEFRI, KMFRI, and KIRDI were mainly government funded during the 2001–08 period, while KIPPR generally received more funding from donors and the sale of goods and services. KESREF is considered a state corporation under the Ministry of Agriculture and relies primarily on funding from sugar levies. The nonprofit agencies, CRF and TRF, received most of their funding from commodity levies, while the sale of goods and services in 2008 accounted for 23 percent at CRF and 31 percent at TRF.

For public budgetary and resource allocation under the Medium-Term Expenditure Framework (MTEF) process coordinated by the Ministry of Finance (MOF), MoHEST (including

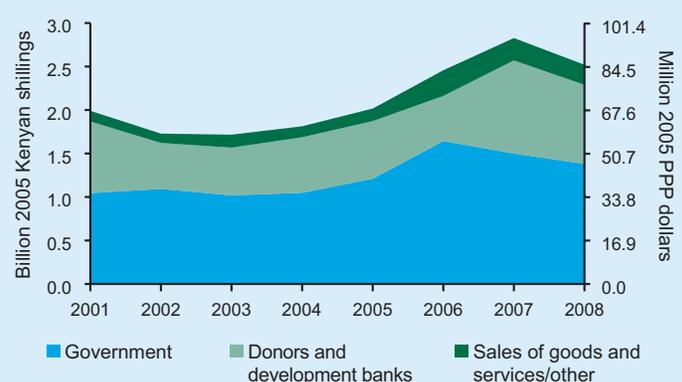
Figure 5—Cost category shares of KARI and other government agencies, 2001–08



Source: Calculated by authors from ASTI-KARI 2009.

Note: Figures in parentheses indicate the number of agencies in each category.

Figure 6—Funding sources of KARI, 2001–08



Source: Calculated by authors from ASTI-KARI 2009.

the public universities) and the different research institutes are placed under one sector, the research, innovations and technology sector. Under the MTEF process, MOF provides budgetary allocations to the different sectors. The various ministries and institutions that constitute a sector meet to deliberate and agree on criteria on which to set the amounts of funds to be allocated to a ministry or institution for a particular year. Yearly funding can vary depending on the government allocation to the sector and agency. Donor funding also fluctuates from year to year. Some projects might come to an end in the middle of a particular year while new ones might not start until the following year, leaving a gap in funding. The same variability applies to internally generated revenue through the sales of products and services or funds obtained through competitive grants.

The World Bank has been the main source of finance for agricultural research in Kenya. From 1987 until 2003, NARP I and II funded agricultural research training and infrastructure and focused primarily on strengthening KARI (World Bank 2009b). Under KAPP I, which ran from 2004 to 2008, Kenya received US\$40 million for agricultural research and extension. Phase II, known as the Kenya Agricultural Productivity and Agribusiness Project (KAPAP), with proposed funding of US\$82 million, will run from 2009 to 2014 and take a sector-wide approach in line with Kenya's Agricultural Sector Development Strategy (ASDS) (World Bank 2009c). One of the components of the project will include support to KARI and to the national agricultural research system in general.

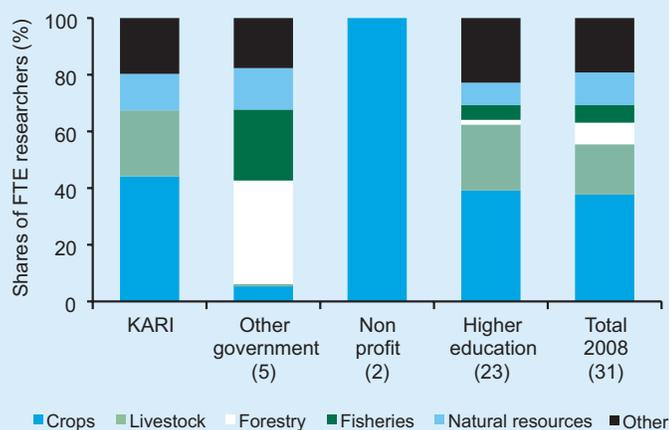
Apart from the World Bank, other major project donors include the EU, which funds the KASAL project (2006–10) focusing on the development and adoption of technologies in the arid and semi-arid areas of eastern and northern Kenya. The EU is also involved in human and physical capacity building in the KARI centers of Marsabit, Katumani, and Kiboko, where the projects' field activities are based. The other major donor is the United States Agency for International Development (USAID), which funds research activities in maize, dairy, soil fertility, biotechnology, and horticulture under its food security program.

Other sources of bilateral and multilateral funding to agricultural R&D include the Japan International Cooperation Agency (JICA), Danish International Development Agency (DANIDA), African Development Bank (AfDB), Food and Agriculture Organization of the United Nations (FAO), Rockefeller Foundation, Ford Foundation, International Potato Center (CIP), International Livestock Research Institute (ILRI), International Center for Tropical Agriculture (CIAT), International Maize and Wheat Improvement Center (CIMMYT), Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), International Development Research Centre (IDRC), Bill and Melinda Gates Foundation (BMGF), and AGRA.

As mentioned, the government of Kenya funds all the personnel-related recurrent expenditures such as salaries and allowances. The government has also established a national research fund under the NCST to which scientists from research institutes, universities, and other agencies may submit proposals for funding. Similarly, the universities fund their research through allocations from the government, donor-funded projects, competitive grants, and collaborative projects. Overall, different research agencies and universities have their traditional major donors who continually support their research activities. For example, JICA has provided long-term support to JKUAT and KEFRI, while the World Bank, EU, and USAID have supported KARI for many years.

Some of the financial support in the 1990s and early 2000s was awarded through a competitive funding mechanism, the Agricultural Research Fund (ARF). ARF was supported mainly by the World Bank under NARP I and II. Under KAPP I (2004–08), a competitive grants scheme was established in which partners could develop joint proposals for funding. One critical condition was that the proposals were to be developed by researchers and partners from more than one institution. Successful project applicants could receive a maximum of US\$100,000 for three years. The KASAL project supported by the EU also has a component whereby partner institutions can obtain grants to implement joint projects. ASARECA and AGRA also use the competitive grants scheme, and several KARI scientists and their partners have been able to prepare proposals for funding. Scientists also write proposals to other funding agencies when such agencies advertise calls for proposals. Other funding opportunities come through collaborative projects whereby KARI staff are called upon to partner in implementing the project with another institution, especially CGIAR centers.

Figure 7—Research focus by major commodity area, 2008



Source: Calculated by authors from ASTI-KARI 2009.

Note: Figures in parentheses indicate the number of agencies in each category.

ALLOCATION OF RESEARCH ACROSS COMMODITIES

Given that the allocation of resources across various lines of research is a significant policy decision, detailed information was collected on the number of researchers working in specific commodity and thematic areas (in FTEs).

In 2008, crop research involved 38 percent of the 1,011 FTE agricultural researchers in Kenya (Figure 7). Livestock was the next most significant area of research, accounting for 18 percent of researchers, followed by natural resources with 12 percent, forestry with 8 percent, and fisheries with 6 percent. The remaining researchers focus on socioeconomic, agricultural engineering, post-harvest, and other areas of research.

Commodity Focus

Maize and fruits are Kenya's predominant commodity crops, with 12 and 9 percent shares, respectively, of total crop and livestock research combined (Table 2). Other significant crops include coffee, wheat, potatoes, and vegetables, accounting for shares of 5-6 percent each. In the livestock sub-sector, the primary research focus was on dairy and beef, with shares of 14 and 6 percent, respectively, of total commodity research.

CONCLUSION

Public agricultural R&D in Kenya continues to be relatively well-funded and staffed compared with many other African countries. In 2008, the country employed over 1,000 FTE agricultural researchers and spent 4.5 billion Kenyan shillings or 154 million dollars on agricultural R&D (both in 2005 constant prices). Following a period of decline during the late 1990s, the number of agricultural R&D staff in Kenya has increased again in recent years. This was the combined result of a merger of two institutes with KARI and the loosening of a general recruitment freeze that had been in place under the conditions of a number of structural adjustment programs. In 2008, total capacity levels were at levels that were slightly higher than those recorded in the early 1990s. KARI remains Kenya's largest agricultural research agency, although the role of the country's higher education sector has been on the increase in recent years.

Total agricultural R&D investments in Kenya varied from one year to the next, reflecting fluctuations in donor funding and, to a lesser extent, contributions from the national government to

KARI. KARI remains fairly dependent on funding from the World Bank and various other donor agencies, although less so than during the 1990s. The other government agencies are still heavily donor dependent too. In contrast, Kenya's commodity-based research agencies (KESREF, CRF, and TRF) are almost entirely funded through commodity levies and the sale of goods and services. Although income from the sale of goods and services has increased at KARI and many of the other government agencies since 2001, the share of internally generated resources in total funding in 2008 remained small.

Overall, Kenya outperformed many of its African counterparts in numerous key indicator areas. The country has among the highest research intensity ratios in the region; it continues to attract large sums of donor funding; it has made major improvements when it comes to hiring and training female research staff; and average qualification levels of the country's agricultural scientists have shown a steady increase in recent years. Despite these positive developments, KARI and the other government agencies face some important challenges on the staffing front. Rapidly increasing numbers of agricultural scientists are approaching retirement age, and staff retention has become a major concern for KARI and the other government agencies as researchers favor better-paid positions at the country's universities and private sector companies.

NOTES

¹ For more detailed information on private sector agricultural R&D in Kenya, see: Odame, H. and E. Kangai, *Measuring private agricultural research and innovation in Kenya* (2010, forthcoming).

² Financial data are also available in current local currencies or constant 2005 US dollars in the ASTI data tool (www.asti.cgiar.org/data).

³ Operating and capital expenditures include costs related to the purchase of farm inputs for research activities; transport costs, including the purchase of vehicles, vehicle operation, and maintenance; staff costs such as daily subsistence allowances related to research activities; the purchase of research equipment such as computers and accessories, lab equipment, and chemicals; costs for the construction/rehabilitation of offices and laboratories, and equipping and maintaining them; and costs for utilities, such as electricity and water, related to research activities.

Table 2—Crop and livestock research focus by major item, 2008

	KARI	KESREF	Nonprofit (2)	Higher education (19)	Total (23)
Crop items	Shares of FTE researchers (%)				
Maize	14.8	2.4	—	8.9	11.8
Fruits	9.5	—	—	11.9	9.3
Coffee	—	—	71.6	3.3	6.2
Potatoes	5.9	—	—	7.6	5.9
Vegetables	5.2	—	—	8.9	5.8
Wheat	5.9	—	—	5.8	5.3
Tea	—	—	28.4	0.7	2.3
Sugarcane	—	92.0	—	1.1	2.3
Other crop	24.0	0.5	—	14.6	19.1
Livestock items					
Dairy	14.8	—	—	16.6	14.0
Beef	8.9	—	—	2.7	6.3
Sheep and goats	6.2	—	—	4.7	5.2
Other livestock	4.6	5.1	—	13.2	6.8
Total crop and livestock	100	100	100	100	100

Source: Calculated by authors from ASTI-KARI 2009.

Notes: Figures in parentheses indicate the number of agencies in each category. Four other government and four higher education agencies in the total agency-sample of 31 did not conduct crops or livestock research.

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