AGRICULTURAL SCIENCE AND TECHNOLOGY INDICATORS

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# BURUNDI

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*This country brief reviews the major investment and institutional trends in Burundi's 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

Burundi is a small country in Central Africa. The overwhelming majority of its population lives in rural areas, making its economy primarily agricultural. During the 1990s, the country produced about half of its income through the agricultural sector, hence agricultural research is particularly significant. Investments in agricultural research have decreased considerably, however, since the onset of civil war in 1993. In 2000, the seven agencies involved in agricultural research in Burundi collectively employed 77 full-time equivalent (fte) researchers and spent 747 million 1999 Burundi francs on agricultural research and development (R&D)—equivalent to $7 million at 1993 international prices (Table 1).[2, 3]

The Institute of Agronomic Sciences of Burundi (ISABU)[4] is the largest of Burundi's research institutes, and accounted for about 60 percent of all fte researchers and total agricultural R&D spending in 2000. ISABU was created in 1962 (see *A Short History of Government-Based Agricultural Research in Burundi* on page 2) and falls under the administrative responsibility of the Ministry of Agriculture and Livestock and has two technical departments—the Department of Production and the Department of Environmental Studies and Production Systems. ISABU is headquartered in Bujumbura and has 6 experiment stations, 13 research centers, and 4 regional research units. During the war, however, much of the infrastructure and equipment of a large number of the experiment stations and research centers was destroyed or stolen.

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

| Type of agency | Spending | | Researchers[a] | Share | | Agencies in sample[b] |
|---|---|---|---|---|---|---|
| | 1999 Burundi francs | 1993 international dollars | | Spending | Researchers | |
| | (*millions*) | | (*fte's*) | (*percent*) | | (*number*) |
| ISABU | 433.7 | 3.9 | 46.0 | 58.1 | 60.1 | 1 |
| Other government[c] | 137.5 | 1.2 | 12.0 | 18.4 | 15.7 | 2 |
| Higher education[c, d] | 175.4 | 1.6 | 18.6 | 23.5 | 24.3 | 4 |
| **Total** | **746.6** | **6.7** | **76.6** | **100** | **100** | **7** |

*Sources*: Compiled by authors from ASTI survey data (IFPRI –ISNAR–ASARECA 2001–02).
[a] Include national and expatriate staff.
[b] For a list of the seven agencies included in the sample see note 2.
[c] Expenditures for IRAZ and the four higher-education agencies are estimates based on combined expenditures per researcher for ISABU and CNTA.
[d] The 73 faculty staff employed in the 18 higher-education agencies spent between 20 and 30 percent of their time on research, resulting in the 18.6 fte researchers.

## KEY TRENDS

- Burundi is one of the smallest Sub-Saharan African countries and has only a few agencies involved in agricultural research.
- ISABU is the main agricultural research agency in Burundi and accounted for more than half the country's total spending and research staff in 2000.
- After 1993, investments in agricultural research plummeted to very low levels in response to the civil war, and all expatriates and many national researchers holding postgraduate degrees left the country since the onset of the civil war in 1993.
- Since 1997, government funding to ISABU has recovered slightly. Donor funding is apparently reappearing also, but total levels remain far below those before the outbreak of the war.
- Private-sector involvement in agricultural research in Burundi is nonexistent.

## 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).

The two other government agencies in our sample together accounted for 18 percent of Burundi's total agricultural R&D spending and 16 percent of total researchers in 2000.[5] The National Center for Food Technologies (CNTA) also falls under the administrative responsibility of the Ministry of Agriculture and Livestock. CNTA's mission is to promote research and development of food technologies and the transfer and dissemination of these technologies to small enterprises. The Institute of Agronomic and Zootechnic Research (IRAZ) is part of the Economic Community of the Countries of the Great Lakes (CEPGL), which covers Burundi, Democratic Republic of the Congo, and Rwanda. IRAZ's mandate is to provide food security through agricultural and animal science research.

In 2000, the four higher-education agencies involved in agricultural research in Burundi accounted for close to a quarter of the country's agricultural research spending and fte researchers. The Higher-Education Institute of Agriculture (ISA) and the University of Burundi's Faculty of Agronomy (FACAGRO) were responsible for most of these activities, together employing 61 faculty staff or—adjusted to reflect time spent on research—15 fte researchers.[6] During the early 1990s, FACAGRO initiated a number of research programs in food technology, food crops, and production systems. Since 1995, however, many of these programs have been closed because of financial difficulties. The University of Ngozi, established in 1999, also conducts some agricultural research. In 2000, the university's Faculty of Sciences and Technologies and its Research Center for Agricultural and Rural Studies employed 2 fte agricultural researchers each.

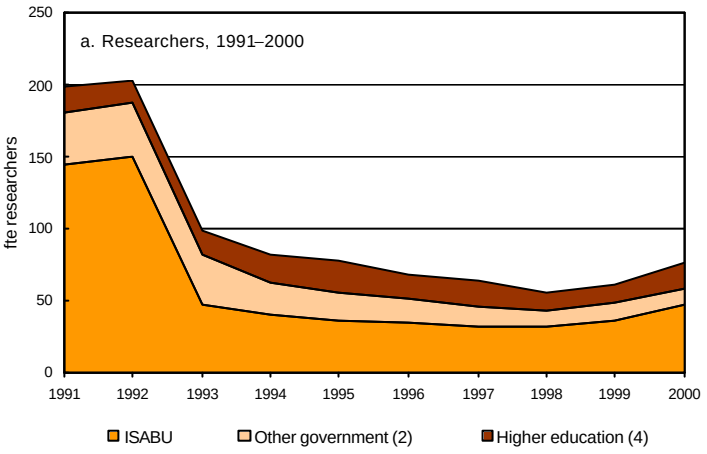
No private companies (neither for-profit nor nonprofit) were involved in agricultural research activities in Burundi during the 1990s.

## HUMAN AND FINANCIAL RESOURCES IN AGRICULTURAL R&D

### Overall Trends

The 7 agencies in our sample employed 77 fte researchers in 2000, up from a recent low of 55 in 1998 but still low compared with the 1992 figure of 202 fte researchers (Figure 1a). ISABU saw a relatively stronger decline: two-thirds of its staff left during the 1991-2000 period. In contrast, total fte researchers in the higher-education sector remained fairly constant over this period, even slightly recovering after 1998 given growth in staff at FACAGRO and the creation of the University of Ngozi. In 1991, agricultural research in Burundi relied heavily on expatriate—mostly Belgian—research staff, who accounted for close to one-third of the total researchers employed that year. Most of the expatriates, however, left when the war broke out in Burundi (one half of the 104 staff, which left agricultural research positions in Burundi in 1993, were expatriates).

**Figure 1¾ Agricultural R&D trends**

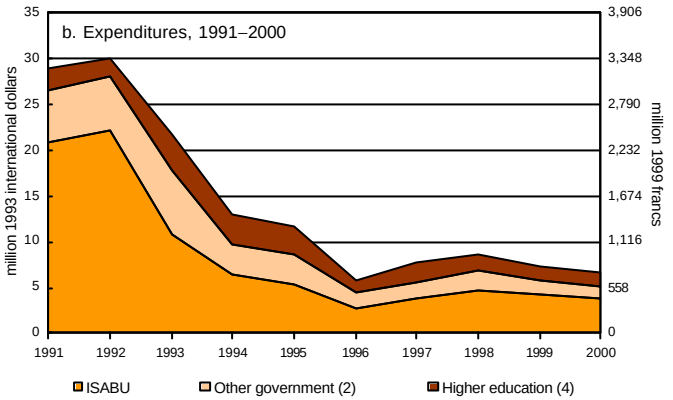



## A Short History of Government-Based Agricultural Research in Burundi

Agricultural Research in Burundi dates back to the early days of the Belgian colonization, which began soon after World War I. In the first few years of Belgium's presence, several state plantations and experiment stations were built throughout the Belgian colonies (Democratic Republic of the Congo, Rwanda, and Burundi). In 1929, these facilities were expanded with the creation of the National Institute of Agronomic Studies (INEAC). The first experiment station was established in Gisozi soon after INEAC's creation, and two other stations followed several years later. Research was undertaken on export crops such as coffee, cotton, and tea. Contrary to the prevailing pattern in other parts of Africa, considerable attention was also given to research on staple food crops such as rice, maize, cassava, and groundnuts. With an extensive network of 36 research stations spread across the three colonies, INEAC was the largest tropical agricultural research institute in Africa until 1960. In 1962, following independence from Belgium, ISABU was created to replace INEAC. Until the late 1970s, ISABU supported rural development projects by promoting the cultivation of rice and coffee in industrial units and family plots, as well as providing assistance to other export crops such as coffee, cotton, and sugarcane. During the 1980s, ISABU underwent organizational restructuring that included reorientation of its research focus.

IRAZ was created in 1979 in Democratic Republic of the Congo by the three member countries of CEPGL—Burundi, Democratic Republic of the Congo, and Rwanda. The idea of having a supranational research agency was to avoid duplication of efforts and to complement the research existing in these countries. In 1990, however, financial support by the countries disappeared, but the institute continued to operate and was able to maintain its structure, though under considerably harsher conditions. With the war in 1993, IRAZ's situation deteriorated further, and several research programs came to an end. CNTA was created in May of 1993 as a result of two research projects funded by UNDP and the FAO, under the supervision of the Ministry of Agriculture.

*Sources*: ISABU (2002) and Roseboom et al. (1998).

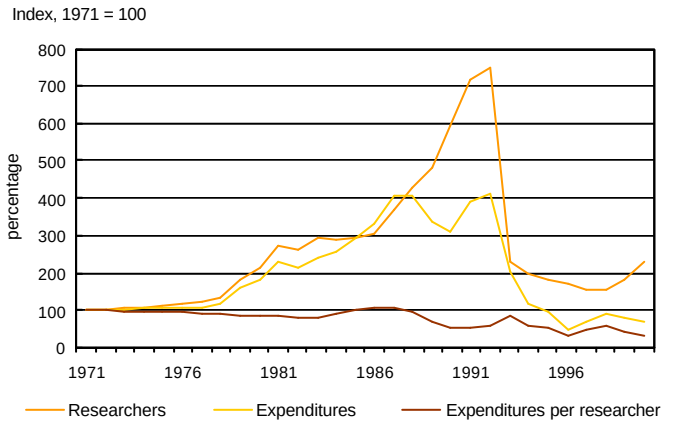



*Sources*: Compiled by authors from ASTI survey data (IFPRI –ISNAR–ASARECA 2001–02).
*Notes*: See Table 1. Figures in parentheses indicate the number of agencies in each category.

Total agricultural R&D spending declined even more acutely, but in contrast to total research staff, continued to fall in recent years (Figure 1b). In 2000, total spending was less than a quarter of the 1991 level. Consistent with the trend in researcher levels, ISABU's spending declined at a higher rate than the national average.

Available timeseries data for ISABU from 1971 onward show that most of the expansion in research staff that occurred during the 1980s was eroded with the onset of civil war in 1993 (Figure 2). The institute's total spending increased during the 1990s but at a slower rate as total research staff, and as a consequence, spending per researcher fell from the 1971 level of $267,000 to $84,000 by 2000.

**Figure 2¾ ISABU's longterm trends, 1971-2000**

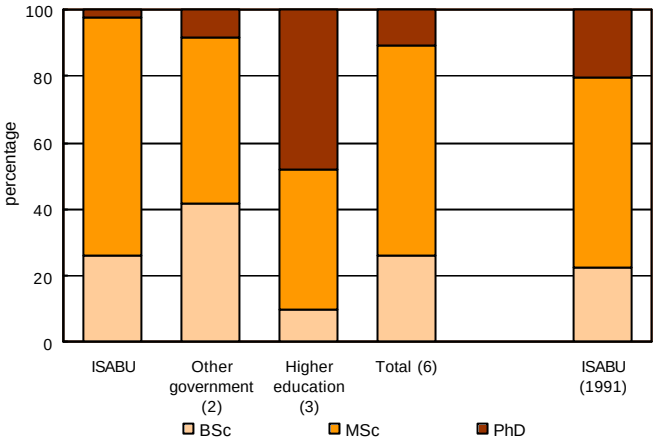



*Source*: Compiled by authors from ASTI survey data (IFPRI –ISNAR–ASARECA 2001–02) and various secondary sources.
*Notes*: Underlying data is available on the ASTI website (www.asti.cgiar.org).

## Human Resources

In 2000, 74 percent of the 69 fte researchers in a six-agency sample had postgraduate level training, with 11 percent holding doctorate degrees (Figure 3). A higher proportion of university staff held postgraduate degrees compared with staff at the government agencies, which is in line with other African countries and regions (Pardey and Beintema 2001 and Pardey et al. 1997). The sharp decline in ISABU's total number of fte researchers during the 1990s was relatively more severe for those holding doctorate degrees. In 1991, the institute employed 21 researchers with PhD degrees, accounting for 21 percent of total research staff. In 2000, only 1 researcher holding a doctorate degree remained. Noteworthy, the educational profile of the other six agencies combined was reversed. Like ISABU the share of researchers holding postgraduate degrees declined during 1991-2000, but this was because the number of researchers with MSc degrees declined while the overall share of researchers holding doctorate degrees increased.

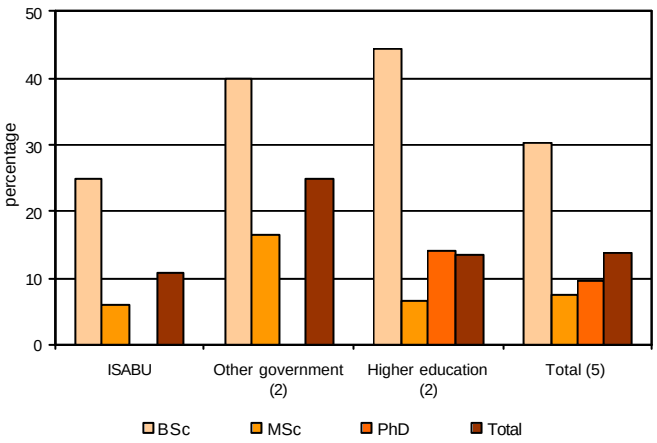
**Figure 3¾ Educational attainment of researchers, 1991 and 2000**




*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 excludes ISA as well as expatriate staff.

In 2000, 14 percent of the total researchers in a five-agency sample were female, ranging from 11 percent for ISABU to 45 percent for CNTA (Figure 4). The overall share is relatively low compared with surrounding African countries. The corresponding shares for Uganda and Tanzania, for example, were 21 and 19 percent that year (Beintema and Tizikara 2002 and Beintema et al. 2003). On average, close to one-third of the researchers trained to the BSc level were female, while the corresponding share for the fte researchers holding postgraduate degrees was 8 percent. The higher-education sector is the only sample category to employ females with PhDs.

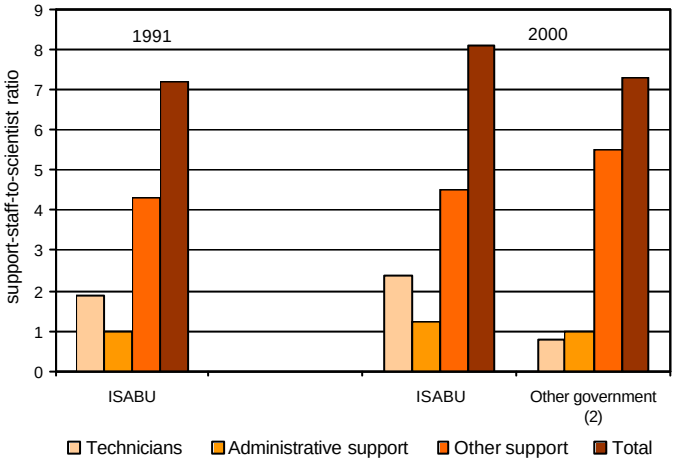
**Figure 4¾ Share of female researchers, 2000**




*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 excludes CERADER and FST as well as expatriate staff.

In 2000, 8.1 support staff were employed for each ISABU researcher, representing 2.4 technicians, 1.2 administrative personnel, and 4.5 other support staff such as laborers, guards, and drivers (Figure 5). Less support staff left ISABU relative to other agencies, explaining the slight increase in the support-staff-to-researcher ratio from 7.2 in 1991 to 8.1 in 2000. This increase was evenly distributed across the different staff categories. The corresponding support-staff-to-researcher ratio for the other two government agencies combined was 7.3. This average number of support staff per scientist for Burundi was high compared with other African countries.

**Figure 5¾ Support-staff-to-researcher ratios, 2000**

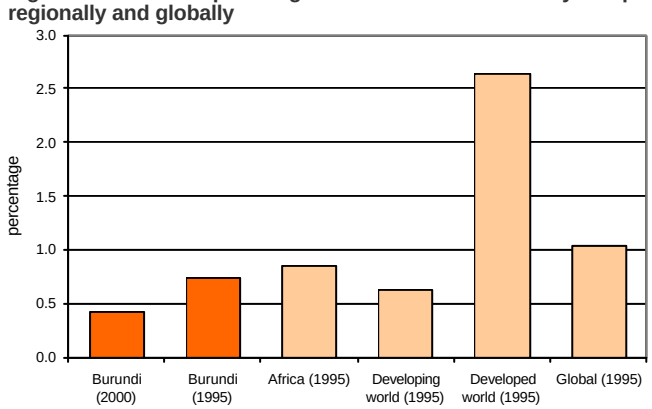



*Source*: Compiled by authors from ASTI survey data (IFPRI–ISNAR–ASARECA 2001–02).
*Note*: Figures in parentheses indicate the number of agencies in each category. Figure excludes expatriate staff.

### Spending

Total public spending as a percentage of agricultural output (AgGDP) is a useful, internationally comparable indicator of a county's research investment. In 2000, Burundi invested $0.42 for every $100 of agricultural output, comparable with the intensity ratios of Uganda and Tanzania for the same year (Beintema and Tizikara 2002 and Beintema et al. 2003). As expected, Burundi's 2000 investment ratio was much lower than the $0.74 invested five years earlier (Figure 6). The latter ratio was slightly lower than the average for Africa but higher than that for the developing world (0.9 and 0.6 percent respectively).

**Figure 6¾ Burundi's public agricultural research intensity compared regionally and globally**



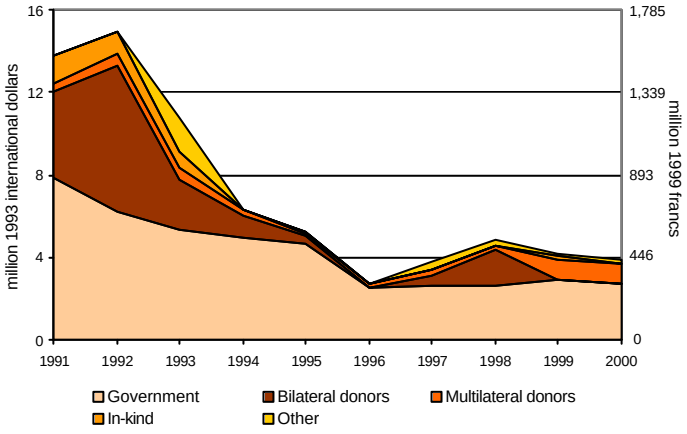

*Sources*: Burundi compiled from Figure 1; AgGDP from World Bank 2002; other intensity ratios from Pardey and Beintema 2001.

## FINANCING AGRICULTUR AL R&D

For most of its history ISABU enjoyed relatively constant financial support, mostly from the government and from Belgium through research projects. With the commencement of the civil war in 1993, however, government support to agricultural research contracted while donor support vanished. ISABU's total funding diminished significantly during the 1990s from $13 million in 1991 to $4 million in 2000 (Figure 7). During 1991-92, over one-third of ISABU's funding came from the Belgian government. Additional funding was provided by various other bilateral and multilateral donors, partly in the form of in-kind contributions like vehicles, tractors, and computers.

Since 1997, ISABU's funding situation has slightly improved. The government has increased its annual contributions, mostly for the rehabilitation of infrastructure (such as offices, vehicles, and laboratories) as well as for the improvement and maintenance of germoplasm. In 1998, the Belgian government provided a sizeable one-year contribution to ISABU for seed production. Some bilateral and multilateral funding was also reinstated during 1997-2000, mainly through joint projects with centers of the Consultative Group on International Agricultural Research (CGIAR) and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). In addition, a few local agro-industrial companies such as the Burundi Coffee Office (OCIBU), the Regional Society for the Development of Imbo (SRDI), and the Burundi Tea Office (OTB) provided funds for ISABU's coffee, rice, and tea research, respectively. Still, in 2000, the government remained the primary source of funding for ISABU and contributed nearly twice as much as external donors.

**Figure 7¾ ISABU's funding sources, 1991- 2000**




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

## RESEARCH ORIENTATION

### Commodity Focus

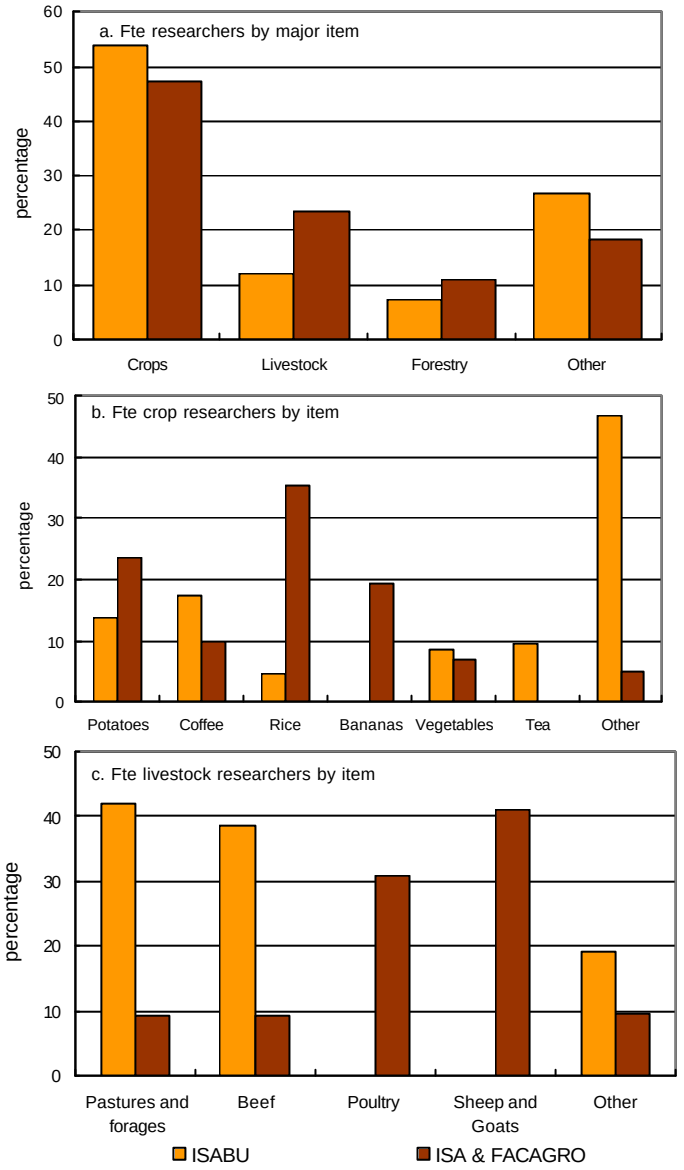
In 2000, 54 percent of ISABU's research staff conducted crop research, followed by livestock (12 percent), and forestry (7 percent) (Figure 8a). The fte researchers of two major higher-education agencies (ISA and FACAGRO of the University of Burundi) spent relatively more of their time on livestock and research than their ISABU counterparts.

The most relevant crops for ISABU in 2000 were coffee, potatoes, tea, and vegetables, which accounted for approximately one half of the total fte crops researchers (Figure 8b). Rice was the main crop researched at the two higher-education agencies, followed by potatoes, and bananas. The livestock researchers at ISABU focused their research on pastures and forages, followed by beef. ISABU conducted no research on sheep, goats, or poultry, which were the main research areas for the livestock researchers in the higher-education sector (Figure 8c).

## CONCLUSION

Unsurprisingly, investments for agricultural research in Burundi suffered enormously as a result of the civil war. Donor funding halted, government contributions to agricultural research declined, and significant numbers of qualified researchers left the country, including all the expatriates. Since 1997, funding has rebounded somewhat. The government increased its contributions to ISABU and donors contributed some funding mainly through joint projects with ASERECA and the CGIAR. Nevertheless, ISABU's current funding levels are still less than half the pre-war levels, and the institute will need to raise additional funding to rebuilt its infrastructure.

**Figure 8¾ Commodity focus, 2000**




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

## NOTES

1. The authors are grateful to numerous colleagues in Burundi for their time and assistance with data collection.
2. The seven-agency sample consisted of:
   - Three government agencies: *Institut des Sciences Agronomiques du Burundi* (ISABU), *Centre National de Technologies Alimentaires* (CNTA), and *Institut de Recherche Agronomique et Zootechnique* (IRAZ);
   - Four higher-education agencies: *Institut Supérieur d'Agriculture* (ISA), *Université du Burundi*'s *Faculté des Sciences Agronomiques* (FACAGRO), and two units at *Université de Ngozi—Centre Recherche en Agriculture et Développement Rural* (CERADER) and *Faculté des Sciences et Technologies* (FST).
3. Unless otherwise stated, all data on research expenditures are reported in 1993 international dollars and in 1999 Burundi francs.
4. English translations of institute names have been used throughout the brief except in footnote 2, where the original French is provided.
5. The National Veterinary Laboratory (*Laboratoire National Vétérinaire*, LNV) was created in 1954. Part of its mandate was to conduct applied research on animal diseases, but the laboratory's research activities were halted in 1987 because funding from the German government ceased that year.
6. About two-thirds of ISA's faculty staff were employed as local consultants, which were paid by FAO.

## METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI, ISNAR, and ASARECA 2001-02).
- The data were compiled using internationally accepted statistical procedures and definitions developed by the OECD and UNESCO for compiling R&D statistics (OECD 1994; UNESCO 1984). We grouped estimates using three major institutional categories—government agencies, higher-education agencies, and business enterprises, the latter comprising the subcategories private enterprises and nonprofit institutions. We defined public agricultural research to include government agencies, higher-education agencies, and nonprofit institutions, thereby excluding private enterprises. Private research includes research performed by private-for-profit enterprises developing pre, on, and postfarm technologies related to agriculture.
- Agricultural research includes crops, livestock, forestry, and fisheries research plus agriculturally related natural resources research, all measured on a performer basis.
- Financial data were converted to 1993 international dollars by deflating current local currency units with a Burundi 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.

## REFERENCES


Beintema, N. M., and C. Tizikara. 2002. *Uganda*. Agricultural Science and Technology Indicators Country Brief No. 1. Washington, D.C. and The Hague: IFPRI, ISNAR, and NARO.

Beintema, N. M., T. M. Ngahulira, and T. N. Kirway. 2003. *Tanzania* . Agricultural Science and Technology Indicators Country Brief No. 3. Washington, D.C. and The Hague: IFPRI, ISNAR, and DRD.

FAO (Food and Agriculture Organization of the United Nations). 2002 FAOSTAT. <http://faostat.fao.org/default.htm> (accessed August 24, 2002).

IFPRI-ISNAR-ASARECA (International Food Policy Research Institute, International Service for National Agricultural Research, and Association for Strengthening Agricultural Research in Eastern and Central Africa). 2001-02. Agricultural Science and Technology Indicators Survey for East Africa. Unpublished surveys. IFPRI and ISNAR, Washington, D.C.

ISABU (Institut des Sciences Agronomiques du Burundi). 2002. Historique. <http://www.asareca.org/NARIs/isabu/pagehistorique.htm> (accessed December 6, 2002).

OECD (Organisation for Economic Co-operation and Development). 1994. *The measurement of scientific and technical activities 1993: Standard practice for surveys of research and experimental development—Frascati Manual.* Paris.

Pardey, P. G., and N. M. Beintema. 2001. *Slow magic: Agricultural R&D a century after Mendel*. IFPRI Food Policy Report. Washington, D.C.: International Food Policy Research Institute.

Pardey, P. G., J. Roseboom, and N. M. Beintema. 1997. Investments in African agricultural research. *World Development* 25 (March): 409-423.

Roseboom, J., P. G. Pardey, and N. M. Beintema. 1998. *The changing organizational basis of African agricultural research*. EPTD Discussion Paper No. 37. Washington, D.C.: International Food Policy Research Institute.

UNESCO (United Nations Educational, Scientific and Cultural Organization), Division of Statistics on Science and Technology. 1984. Manual for statistics on scientific and technological activities. UNESCO, Paris. Mimeo.

World Bank. 2002. *World Development Indicators 2002*. Washington, D.C. CD ROM.

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