AGRICULTURAL SCIENCE
AND TECHNOLOGY INDICATORS

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BURKINA FASO

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This country brief reviews the major investment and institutional trends in public agricultural research in Burkina Faso since the early 1970s, including a new set of survey data collected under the Agricultural Science and Technology Indicators (ASTI) initiative (IFPRI-ISNAR-CORAF/WECARD 2002-03).[1]

INSTITUTIONAL DEVELOPMENTS

Despite a decade of consistent economic growth, Burkina Faso still occupies one of the last places in the United Nations Human Development Index (UNDP 2003). The soils of this landlocked West African country have very low fertility levels, and its vulnerable farming sector is strongly affected by variations in rainfall. Nevertheless, the agricultural sector plays an important role in the country's economy, employing more than 90 percent of the active population and accounting for 38 percent of total gross domestic product (GDP), as well as close to half of the country's exports (World Bank 2003; FAO 2004). Agricultural research and development (R&D) are therefore given a high priority by the national government. In 2001, 11 agencies were involved in agricultural research in Burkina Faso (eight government agencies and three higher education agencies), all of which are included in our sample.[2] These 11 agencies employed a total of 261 full-time equivalent (fte) researchers, and spent over 3 billion 1999 CFA francs, the equivalent of 22 million 1993 international dollars (Table 1).[3]

Burkina Faso's principal agricultural research agency is the Environment and Agricultural Research Institute (INERA),[4] accounting for roughly 60 percent of the country's agricultural researchers and expenditures in 2001. In its present form, INERA was established in 1996, when several of the research programs of the Study Institute of Agricultural Research (a former incarnation of INERA) and the forestry

Table 1—Composition of agricultural research expenditures and total researchers, 2001

Type of agency	Spending: 1999 CFA francs	Spending: 1993 international dollars	Total Researchers[a]	Share: Spending	Share: Researchers	Agencies in sample[b]
	(*millions*)		(*fte's*)	(*percent*)		(*number*)
INERA	1,956.2	13.5	154.0	62.6	59.1	1
Other government[c]	971.0	6.7	90.2	31.1	34.6	7
Higher education[d]	195.4	1.4	16.3	6.3	6.3	3
Total	**3,122.6**	**21.6**	**260.5**	**100**	**100**	**11**

Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).
[a] Includes national and expatriate research staff.
[b] See note 2 for a list of the 11 agencies in our sample.
[c] The expenditures for IRSS are estimates based on the institute's expenditures in 2000. The staff at the seven other government agencies spent between 10 and 100 percent of their time on research, resulting in 90.2 fte researchers.
[d] The expenditures for the higher education agencies are estimates based on the average expenditures per researcher for the government sector. The staff at the three higher education agencies spent between 15 and 25 percent of their time on research, resulting in 16.3 fte researchers.

KEY TRENDS

- The total number of agricultural researchers in Burkina Faso has doubled since the early 1990s, but agricultural R&D expenditure has been erratic.
- Burkina Faso's main agricultural R&D agency is the Environment and Agricultural Research Institute (INERA), accounting for roughly 60 percent of the country's agricultural researchers and 60 percent of its agricultural R&D expenditure in 2001.
- In addition to the important financial support of bilateral donors, since 1989 INERA has depended heavily upon two consecutive projects that were largely funded by World Bank loans.
- The education levels of Burkinabe researchers have improved greatly since the early 1990s. As a result, half of the country's agricultural researchers held PhD degrees in 2001—one of the highest levels in Africa.

ABOUT ASTI

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

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

program of the Tropical Biology and Ecology Research Institute (IRBET) were merged (see *A Short History of Government-Based Agricultural Research* below).

INERA is charged with formulating, implementing, and coordinating the country's environmental and agricultural research, and is placed under the National Center of Scientific and Technological Research (CNRST), which in turn falls under the jurisdiction of the Ministry of Secondary and Higher Education and Scientific Research (MESSRS). Headquartered in Ouagadougou, INERA consists of an environmental and agricultural research and training center (CREAF) in Kamboinsé and five regional environmental and agricultural research centers (CRREAs)—one in each of the country's five agro-ecological zones. Each CRREA consists of stations, substations, research laboratories, and production units (INERA 2003). In 2003, INERA's scientific portfolio covered 16 research programs, and was divided into four general themes: animal production, crop production, forestry, and natural resource management.

During the 1990s, INERA depended largely on the funding provided by two consecutive World Bank projects: the First Agricultural Research Project (PRA-I) and the Second National Agricultural Services Development Project (NASDP-II). Both have contributed greatly to the cohesion, quality, and relevance of the research INERA conducts, by encouraging institutional reforms, researcher training programs, and the rehabilitation of the institute's research infrastructure.

In 2001, the seven other government agricultural research agencies considered in our sample employed roughly one-third of the country's fte researchers and accounted for about one-third of its agricultural R&D expenditures (Table 1). The first of these, the Applied Sciences and Technology Research Institute (IRSAT) operates under CNRST and was created in 1995. In 2001, IRSAT employed 39 fte researchers, conducting applied research in the fields of natural resources, agricultural technologies, and energy.

Limited agricultural research was also undertaken in 2001 by two other CNRST institutes: the Society Sciences Institute (INSS) and the Health Sciences Research Institute (IRSS). These conduct socio-economic and bio-medical research, and employed 3.2 and 6.8 fte researchers in 2001, respectively. In the same year, 18 fte researchers carried out forestry research at the National Forestry Seed Center (CNSF), which falls under the administrative responsibility of the Ministry of the Environment and Livelihood (MECV), while 11 fte researchers at the Fisheries Directorate (DDP), which falls under the Ministry of Agriculture, Hydraulics and Water Resources (MAHRH), focused their research efforts on river and lake fisheries. During the same period, 4.4 fte researchers from the National Livestock Laboratory (LNE), which operates under the Ministry of Animal Resources (MRA), concentrated on the issue of livestock. The National Soil Bureau (BUNASOL), under MAHRH, undertook soil research, employing 7.8 fte researchers in 2001.

We identified three higher education agencies involved in agricultural research in Burkina Faso. In 2001, these agencies accounted for only 6 percent of the total number of agricultural researchers and total agricultural R&D expenditures in the country. The first of these was the Rural Development Institute (IDR), which was originally part of the University of Ouagadougou (UO), until it was transferred to the Polytechnic University of Bobo-Dioulasso (UPB) in 1995. By 2001, 6.3 fte researchers at IDR were involved in research into natural resources, fisheries, animal nutrition, livestock parasitology, and soil science. The other two higher education agencies involved

A Short History of Government-Based Agricultural Research

The first institutions to conduct agricultural research in Burkina Faso (called Upper Volta until 1984) were established during French colonial rule. At that time, the majority of research activities were linked to the French federal agricultural research stations in Bambey (Senegal) or Kankan (Guinea). When Burkina Faso gained independence in 1960, the country inherited four research stations (Farako-Bâ, Niangoloko, Saria, and Kamboinsé), but no institutional research structure.

Like many West African countries colonized by the French, Burkina Faso signed bilateral agreements with France immediately after its independence, in order to secure continuous support for agricultural research from France. These agreements ensured that France remained the main executor of agricultural research in the country. Virtually all researchers active in Burkina Faso in the 1970s were French. It was not until 1978 that the General Directorate for Scientific and Technological Research (DGRST) of Burkina Faso became responsible for the development of the government's science and technology policy. Most of the research activities previously undertaken by the French were then transferred to the DGRST. However, the share of French researchers in the Burkinabe agricultural research system remained important until the mid-1980s.

In 1981, the Ministry of Higher Education and Scientific Research (MESRS) was reorganized and the National Center of Scientific and Technological Research (CNRST) established, to supervise five new research institutes: the Voltaic Agricultural and Zootechnic Research Institute (IVRAZ), the Tropical Biology and Ecology Research Institute (IRBET), the Social and Human Sciences Research Institute (IRSSH), the Voltaic Energy Institute (IVE), and the Natural Substances Research Institute (IRSN). Ten years later, the Biochemistry and Food Technology Laboratory (LBTA) was created as the sixth CNRST agency. Besides the CNRST agencies, numerous other agencies (all established during the 1970s and 1980s) carried out agricultural research. These included the National Livestock Laboratory (LNE), the Fisheries Directorate (DDP), the National Forestry Seed Center (CNSF), the National Soil Bureau (BUNASOL), and the Crop Protection and Conditioning Directorate (DPVC).

With the adoption of the National Agricultural Research Program (PNRA) in 1985, the Burkinabe agricultural research system entered a decisive stage. IVRAZ was reorganized during the period 1986-1987, to better integrate the various entities placed under its supervision. The institute was renamed the Study Institute of Agricultural Research (INERA). However, many of Burkina Faso's agricultural research agencies were reshuffled once again during the 1990s as part of two consecutive World Bank projects. This led to the creation of the Environment and Agricultural Research Institute (INERA) and the Applied Sciences and Technology Research Institute (IRSAT), the latter being the result of a merger of the Biochemistry and Food Technology Laboratory (LBTA), the Burkinabe Energy Institute (IBE), and the mechanization research program of the institute formerly known as INERA.

Sources: Mazzucato (1994) and World Bank (1997b).

in agricultural research in 2001 were training and research units (UFR) attached to UO: the UFR of Life and Earth Sciences (UFR-SVT) and the UFR of Economic and Management Sciences (UFR-SEG). In the case of the former, 5.6 fte researchers carried out limited research on natural resources, crop biodiversity, and animal production in 2001; in the latter case, 4.5 fte researchers focused their research efforts mainly on socio-economic issues.

No private sector agencies were identified as being involved in agricultural research in Burkina Faso. However, both INERA and IRSAT work closely with various producer organizations and private enterprises, particularly the Burkinabe Textile Fiber Company (SOFITEX), a cotton company for which the two CNRST agencies conduct contract-based research. INERA also carries out limited cowpea research for Nestlé as well as experiments for private companies producing fertilizers.

With regard to its collaborative activities, INERA maintains close ties with many of the national research and extension agencies under MAHRH and MECV. INERA also collaborates intensively with counterpart institutes from other West African countries, such as the Rural Economy Institute (IER) of Mali, the National Agricultural Research Center (CNRA) of Côte d'Ivoire, and the National Agricultural Research Institute of Niger (INRAN). In addition, INERA works closely with a number of international agencies, such as the West Africa Rice Development Association (WARDA), the International Institute of Tropical Agriculture (IITA), the French Institute of Research for Development (IRD), the Sahel Institute (INSAH), and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). IRSAT also cooperates closely with other institutions. Notable levels of collaboration exist between IRSAT and the Technical Center of Food Product Transformation (CETRAPA) and FASOCOSAM, a milk factory. Internationally, IRSAT works with the Agricultural Research Institute of Guinea (IRAG), IITA, and Morocco's Agricultural and Veterinary Institute of Hassan II (IAV), while maintaining links with numerous research organizations in Belgium, Denmark, and Sweden. In the case of the higher education agencies, UO and UPB undertake research in partnership with various Belgian, Danish, Dutch, French, and Italian universities (Watteyne and Parigi 2002).

HUMAN AND FINANCIAL RESOURCES IN AGRICULTURAL R&D

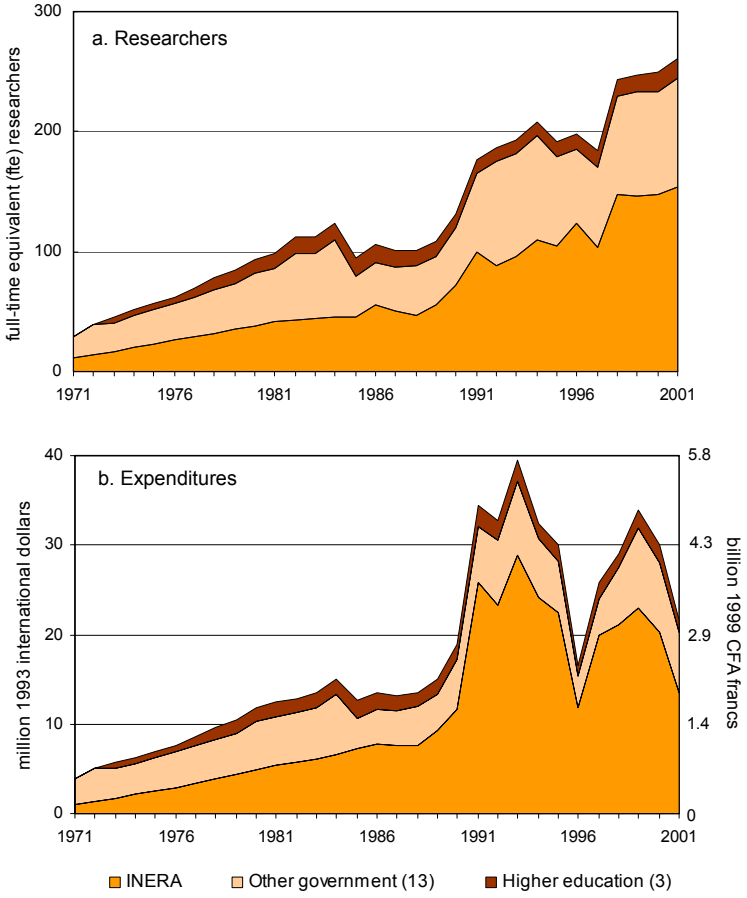
Overall Trends

The total number of Burkina Faso's agricultural researchers increased by an average of 6.4 percent per year during the period 1971-2001 (Figure 1a).[5] This annual growth rate was higher for INERA (8.3 percent) than it was for either the other government agencies (4.7 percent) or the higher education agencies (2.8 percent).[6] Between 1990 and 2001, the total number of Burkina Faso's fte agricultural researchers doubled from 131 to 261. Financial support provided through PRA-I and NASDP-II during the 1990s enabled the CNRST agencies to greatly accelerate their levels of recruitment.

Until 1985, French researchers working for French agencies operating in the country dominated the agricultural research carried out in Burkina Faso. However, during the 1970s and 1980s, increased financial support from foreign donors meant that more Burkinabe researchers received formal training. As a result, the role they played within the country's agricultural research sector rapidly increased in importance after the mid-1980s (Mazzucato 1994). In 1991, 33 fte expatriate researchers were active in Burkina Faso, compared with eight a decade later. Of these, two-thirds worked at IRSAT and CNSF; INERA only employed one expatriate in 2001.

Though erratic, total agricultural research spending showed a general upward trend, rising by 6.2 percent per year on average during the period 1971-2001 (Figure 1b). Between 1971 and 1989, expenditures increased steadily, by 7.0 percent per year. The 1990s were characterized by a surge in total spending, as a result of the financial support provided by PRA-I and NASDP-II, both projects being funded mainly through World Bank loans. The sharp drops that occurred in total spending in 1996 and 2001 resulted from the conclusion of PRA-I in 1996 and the temporary suspension of NASDP-II at the end of 2000, respectively. Total agricultural research expenditure in Burkina Faso in 2001 ($22 million) was roughly half the corresponding level for 1993 ($40 million). When NASDP-II funding resumed in January 2002, total expenditures bounced back.

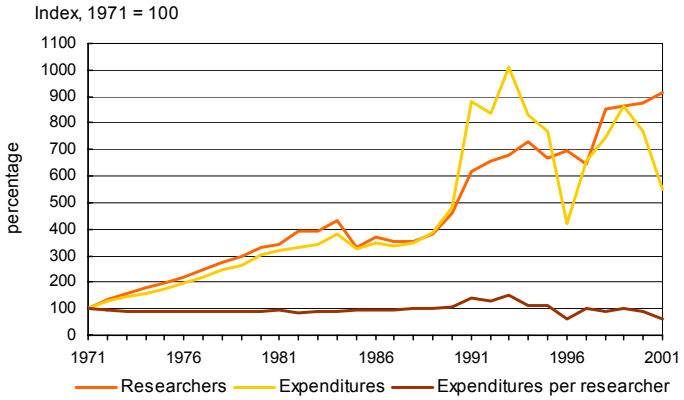
Figure 1—Public agricultural R&D trends, 1971-2001



Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03) and Mazzucato (1994).
Notes: Figures in parentheses indicate the number of agencies in each category. INERA data include CVRS, IRA and IVRAZ, all of which are institutes that the "former" INERA inherited (see box, page 2). Post-1996 data refer to the "new" INERA. "Other government" refers to government agencies other than INERA. Expenditures for the higher education agencies are estimates based on combined average expenditures per researcher for the government agencies. Underlying data are available on the ASTI website (http://www.asti.cgiar.org).

The total number of researchers rose steadily throughout the 1990s. This, combined with a steep decline in total agricultural research spending in 2001, led to a decrease in the average amount of expenditure per researcher (Figure 2). As a result, the 2001 figure of $83,000 was much lower than the 1991 equivalent of $195,000, or even the 2000 figure of $120,000. However, despite this substantial drop, average spending per researcher in Burkina Faso in 2001 was comparable with the average for West Africa.

Figure 2—Trends in public expenditures, researchers, and expenditures per researcher, 1971-2001

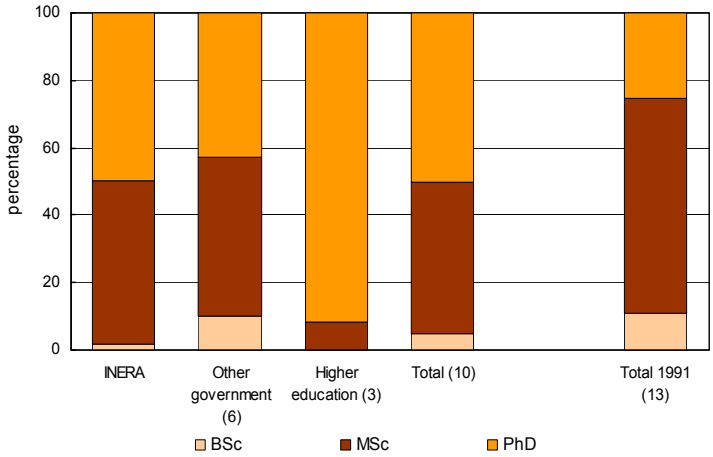


Source: Figure 1.

Human Resources

In 2001, Burkina Faso possessed one of the most highly qualified research staff on the entire African continent, with 95 percent of the 253 researchers in a 10-agency sample being trained to postgraduate level, and 50 percent holding PhD degrees (Figure 3). The research staff at INERA and the other government agencies were less highly qualified than those at the higher education agencies; this corresponds with the findings from most other African countries (Beintema 2003). Ten years earlier, 89 percent of the researchers from a 13-agency sample had postgraduate-level training, a level only slightly lower than that observed in 2001. However, the share of researchers with doctorates in 1991 (25 percent) was only half the 2001 equivalent. In fact, over the past decade, PRA-I and NASDP-II have helped to greatly increase the levels to which Burkinabe researchers are trained. Between 1989 and 1994, 57 researchers received training—19 to PhD level. Funding for this was provided mainly by PRA-I, with complementary funds being made available by the French government and the United States Agency for International Development (USAID). The training itself was largely conducted at the University of Abidjan-Cocody in Côte d'Ivoire, as well as several French and American universities. PRA-I also financed additional workshops on scientific writing, as well as statistical software training and English language courses (World Bank 1997a). Extensive training continued under NASDP-II, when a vast four-year training program for INERA's entire staff was launched. As part of this program, 23 researchers were scheduled for doctorate-level training and an additional 48 technical, administrative, and other support staff were scheduled for supplementary training in their respective fields. When NASDP-II was suspended in October 2000, virtually all the training planned had already taken place.

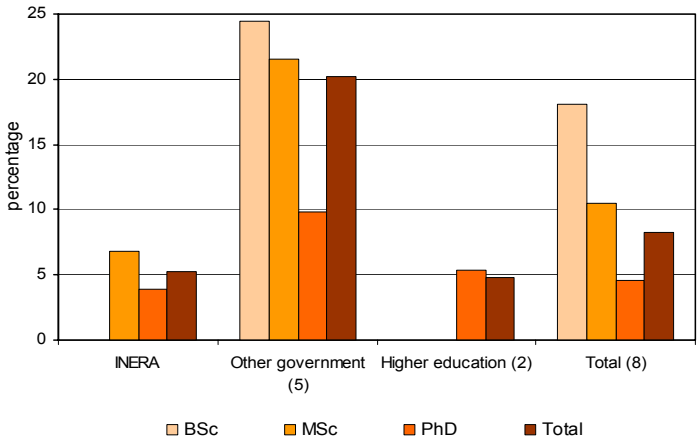
Figure 3—Educational attainment of researchers, 1991 and 2001



Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03) and Mazzucato (1994).
Notes: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff. 1991 data include CVRS, IRA and IVRAZ, all of which are institutes that the "former" INERA inherited (see box, page 2).

In 2001, based on a sample of eight agencies, 8 percent of Burkina Faso's researchers were female (Figure 4). This is four percentage points less than the 12 percent recorded in 1991, and low in comparison to the figures for most other West African countries (Beintema 2003; Mazzucato 1994). The seven other government agencies we considered employed a much higher percentage of female researchers than either INERA or the higher education agencies. With 45 percent of its researchers being women, LNE had the highest share of female researchers in 2001, followed by DDP (30 percent) and INSS (16 percent). INERA employed eight female researchers in 2001—only 5 percent of the institute's total number of researchers. In 2001, five percent of Burkinabe researchers with PhDs were women. Women accounted for 10 percent of Burkinabe researchers with MSc degrees and 18 percent of researchers with BSc degrees.

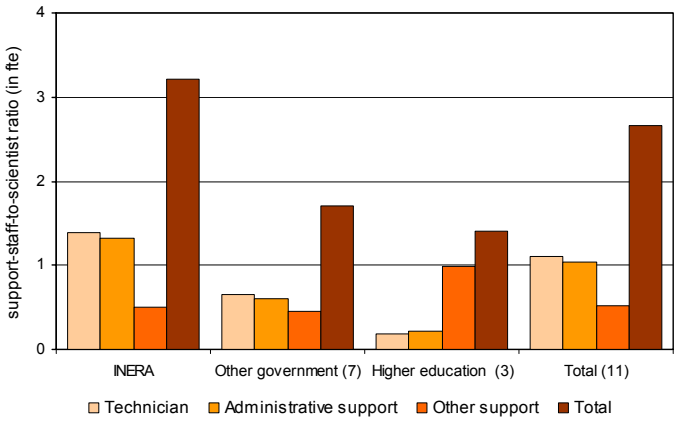
Figure 4—Share of female researchers, 2001



Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).
Notes: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff. Figure excludes IRSAT and IRSS.

In 2001, the average number of support staff per scientist in an 11-agency sample was 2.7, comprising 1.1 technicians, 1.0 administrative personnel, and 0.5 other support staff such as laborers, guards, drivers and so on (Figure 5). This support-staff-to-scientist ratio is small in comparison with those of many other West African countries. INERA's ratio of support staff to scientists of 3.2 was slightly higher than the corresponding ratios of the other government agencies and the higher education agencies. NASDP-II provided substantial support for the recruitment of technicians and administrative personnel in the late 1990s. However, the quality of some of the support staff leaves something to be desired. Most CNRST agencies lack support staff with the specialist skills needed to maintain and repair the modern laboratory equipment acquired under PRA-I and NSDAP-II (Khelfaoui 2001).

Figure 5—Support-staff-to-researcher ratios, 2001

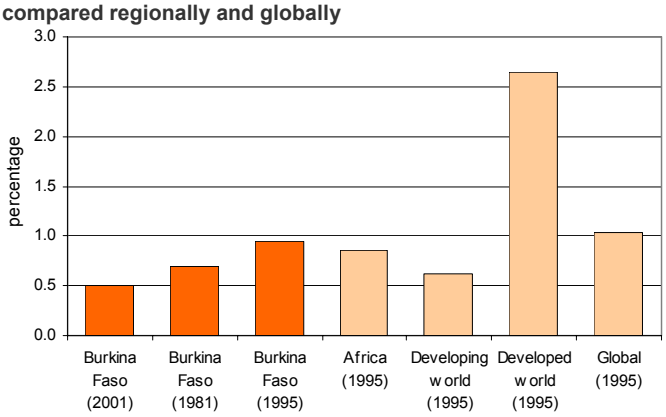


Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03) and Mazzucato (1994).
Notes: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff.

Spending

Total public spending as a percentage 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 2001, Burkina Faso invested $0.50 for every $100 of agricultural output, much less than in 1981 ($0.70) and 1995 ($0.95) (Figure 6). Burkina Faso's 1995 research intensity ratio was higher than the corresponding ratios for Africa (0.85 percent) and the developing world (0.62 percent).

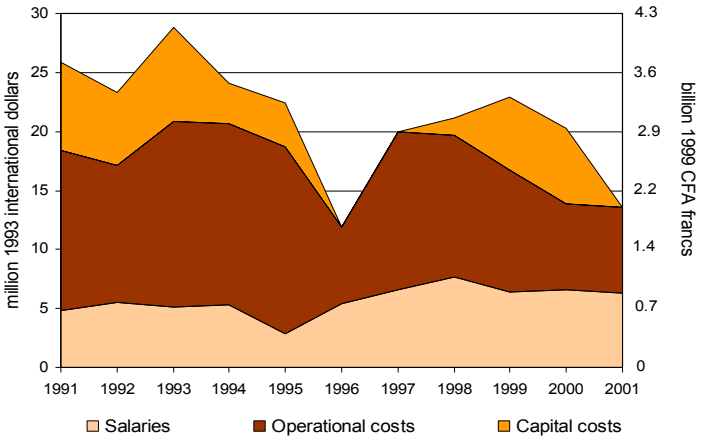
Figure 6—Burkina Faso's public agricultural research intensity compared regionally and globally



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

With the influx of funding under PRA-I and NASDP-II, INERA invested heavily in infrastructure, equipment, and staff training. This led to relatively high operational and capital costs during the 1990s, when total salaries averaged only 27 percent of total costs, while operational and capital costs were 55 percent and 18 percent, respectively (Figure 7). Important fluctuations occurred throughout this period, coinciding largely with the conclusion of PRA-I in 1996 and the suspension, at the end of 2000, of NASDP-II funding. Both PRA-I and NASDP-II financed a large part of INERA's operating and capital costs. So, the institute's capital expenditures came to a halt during the years that INERA did not receive any World Bank funding. PRA-I had provided financial support for investments in the infrastructure of new research stations and for the construction of INERA's headquarters in Ouagadougou (World Bank 1997a). Under NASDP-II, the funding for the construction and renovation of buildings that began during PRA-I was continued. In addition, several administrative support staff recruited to implement a new financial and accountancy system were paid using NASDP-II funds, although the proportion of their salaries paid by NASDP-II declined over time (World Bank 1997b). A large number of these support staff were eventually absorbed by CNRST and their salaries paid out of the national budget.

Figure 7—Cost-category shares in INERA's expenditures, 1991–2001



Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).
Note: Data include estimated salaries for expatriate staff (see *Methodology* on page 9).

FINANCING PUBLIC AGRICULTURAL R&D

During the 1990s, agricultural research in Burkina Faso was largely financed by the Burkinabe government, the World Bank, and foreign donors, and to a lesser extent by producer organizations, private enterprises, and the research agencies' own resources. Since 2000, CNSF has depended largely on internally generated resources, whereas the main source of financial support for the majority of the other government agencies has been the national government. Besides contributions from the State budget, IRSAT received funding from the World Bank and the governments of Belgium, Denmark, and Canada. Some DDP funding was provided by the German Technical Cooperation (GTZ) and the European Development Fund (EDF). CNSF was partly funded by Danish International Development Assistance (DANIDA), and BUNASOL by the University of Wageningen in the Netherlands. Government contributions to UO and UPB have decreased gradually in recent years. Researchers at these higher education agencies have therefore had to turn to foreign partners (mostly European universities) for financial support (Khelfaoui 2001).

As mentioned above, the World Bank has played an important role in the financing of agricultural research in Burkina Faso over the past 15 years. PRA-I was implemented between 1989 and 1996, primarily to strengthen the country's agricultural research capacity while responding to farmers' needs. The enhancement of linkages between agricultural research and extension, as well as an upgrade of INERA's and IRBET's physical research infrastructure were priorities under PRA-I. The project's total budget (US$18.8 million) consisted of a World Bank loan (US$17.9 million) and a modest contribution from the Burkinabe government (US$0.9 million). Although the project took off rather slowly, PRA-I's total cost exceeded its budget. By the end of the project (December 31, 1996), US$20.0 million had been spent, with complementary funds being provided by USAID, the governments of the Netherlands and Canada, and the European Union (World Bank 1988 and 1997a). Overall, the principal objectives of PRA-I had largely been attained. Substantial progress was made in building the capacity of local agricultural researchers, in planning and implementing research programs, and in achieving a better balance between programs. However, little progress was made in linking agricultural research with extension (World Bank 1997a).

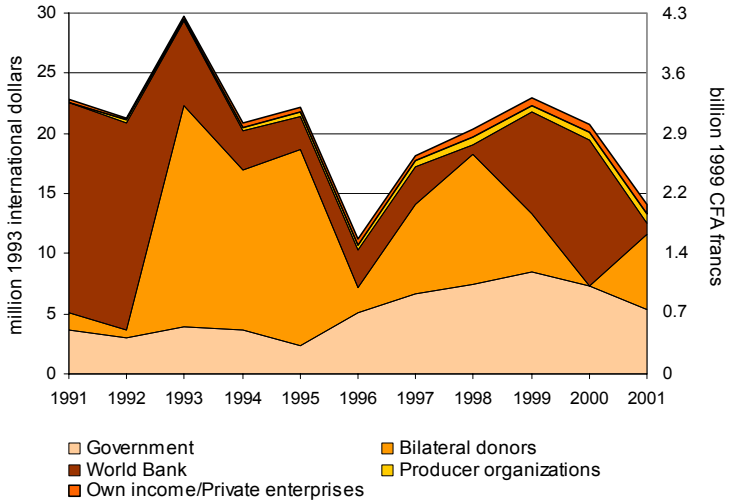
The NASDP-II project (1998-2004) built upon the achievements of PRA-I. NASDP-II's total cost was US$47.3 million. Of this, US$41.3 million were provided by a World Bank loan and US$6 million by the Burkinabe government. The agricultural research component of NASDP-II totaled US$18.8 million, providing funds for the restructuring of CNRST, and the establishment of IRSAT and the new INERA.[7] NASDP-II aimed to strengthen the technical capacity and management of CNRST, INERA and IRSAT, through civil engineering works, the acquisition of research equipment, the recruitment of research and technical support staff, and the supply of technical advisory services and long- and short-term training (World Bank 1997b). Numerous research stations and laboratories were renovated or rehabilitated as part of this project, as were experimental fields at Kamboinsé, Saria, Farako-Bâ, Dori-Katchari, Di-Tougan, Fada-Kouaré, and Niangoloko. Having successfully launched IRSAT and the new INERA, the project significantly strengthened both institutes through improved research management and coordination, researcher training, regionalization of research, civil engineering works, and the provision of modern laboratory equipment. CNRST's technical, operational, and management capacities were also strengthened. However, despite these positive achievements, the World Bank loan was suspended in November 2000 following financial management irregularities at INERA. Funding resumed in January 2002, following the intervention of an external auditing firm, and is expected to continue until December 2004.

Environment and Agricultural Research Institute

Between 1991 and 2001, INERA relied heavily on foreign donor funding. On average, 34 percent of the institute's total funds were provided by the World Bank, 36 percent by other donors, 25 percent by the national government, and the remainder by producer organizations, private enterprises, and the institute itself, using its own resources (Figure 8). INERA's major bilateral donors during the period 1991-2001 were the Netherlands and France.[8] Other donors included the European Union, USAID, Canada's International Development Research Center (IDRC), INSAH, and the International Foundation for Science from Sweden. INERA's own resources and funds from private enterprises accounted for 2 percent, on average, of INERA's total funding during 1991-2001. However, the share of internally generated resources and funds provided by private enterprises has gained in importance since the early 1990s, rising from 1 percent of the institute's total funding in 1991 to 6 percent in 2001. SOFITEX, with which INERA has a research agreement, has consistently donated to INERA's cotton program. It provided 111 million current CFA francs annually to the institute between 1993 and 1997, and 306 million current CFA francs per year between 2000 and 2002. In addition, a growing proportion of INERA's funds are generated through the sale of commodities grown on the institute's trial fields (Khelfaoui 2001).

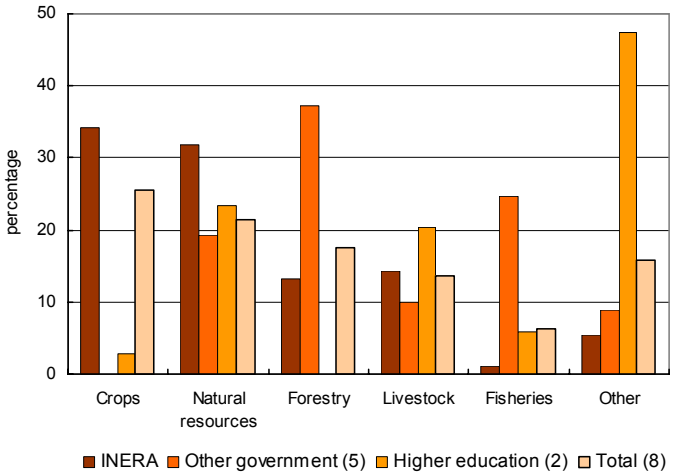
The future of INERA's funding remains highly uncertain. The national government is currently negotiating with the World Bank with the aim of securing a loan for a third phase of the national agricultural research project. This phase would build upon the achievements of PRA-I and NASDP-II, contributing to a productive and competitive agricultural research sector responsive to farmers' needs while improving their livelihoods. Until a decision is made regarding the potential third phase, Burkinabe agricultural research agencies will remain highly dependent on financial support from the national government and especially (foreign) donors.

Figure 8—INERA's funding sources, 1991–2001



Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).

Figure 9—Commodity focus by major item, 2001



Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).
Note: Figures in parentheses indicate the number of agencies in each category. Figure excludes IRSAT and IRSS.

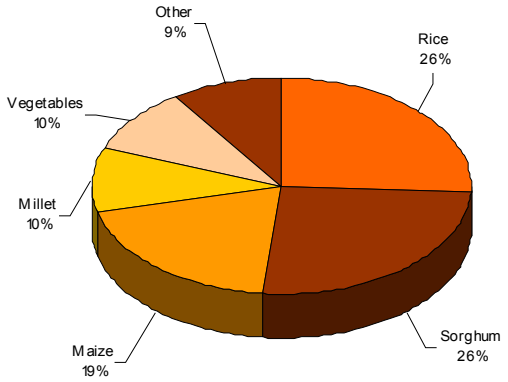
RESEARCH ORIENTATION

Commodity Focus

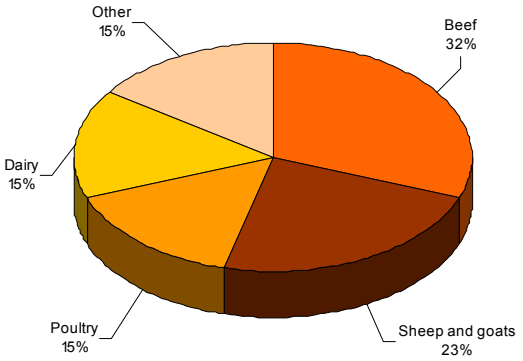
Because the allocation of resources to different lines of research is an important aspect of policy, detailed information was collected on the number of fte researchers working in specific commodity and thematic areas. In 2001, one quarter of the 209 fte researchers in an eight-agency sample were conducting crop research, 22 percent considered natural resources, 18 percent forestry, and 13 percent livestock (Figure 9). Researchers at INERA spent relatively more time on crop research than their counterparts in the other government and higher education agencies in our sample. INERA's crop research focused largely on rice and sorghum, each accounting for 26 percent of the institute's 54 fte crop researchers (Figure 10a). The other important crops worked upon at INERA were maize (19 percent), millet, and vegetables (10 percent each). The main focuses of livestock research at INERA were beef production (accounting for 31 percent of the institute's 22 livestock researchers), sheep and goats (23 percent), and poultry and dairy products (17 percent each) (Figure 10b).

Figure 10—INERA's commodity research focus

a. Fte crop researchers by item



b. Fte livestock researchers by item



Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).
Notes: Figures in parentheses indicate the number of agencies in each category. Figure 9b only includes agencies involved in crop research. Figure 9c only includes agencies not involved in livestock research.

Thematic Focus

In 2001, 15 percent of INERA's researchers concentrated on soils, 10 percent on crop genetic improvement, and 10 percent on water (Table 2). The remaining researchers concentrated mainly on other crop and livestock themes. Research into natural resources, soils, and livestock pest and disease control were the most important research themes of the six other agencies in our sample. Nearly 40 percent of the fte researchers employed by these six other agencies could not be allocated to specific research themes.

Table 2—Thematic focus, 2001

	Numbers of researchers		Shares	
	IER	Other (4)	IER	Other (4)
	(*in fte's*)		(*percent*)	
Crop genetic improvement	15.4	2.2	10.0	4.3
Crop pest and disease control	9.2	0.9	6.0	1.7
Other crop	15.4	0.7	10.0	1.4
Livestock genetic improvement	6.2	1.5	4.0	3.0
Livestock pest and disease control	0	3.7	0	7.3
Other livestock	18.5	2.3	12.0	4.6
Soil	23.1	7.7	15.0	15.1
Water	15.4	0.4	10.0	0.8
Other natural resources	7.7	12.4	5.0	24.4
Postharvest	4.6	0	3.0	0
Other	38.5	19.0	25.0	37.6
Total	**154.0**	**50.7**	**100**	**100**

Source: Compiled by authors from ASTI survey data (IFPRI-ISNAR-CORAF/WECARD 2002-03).
Notes: Figures in parentheses indicate the number of agencies in each category.

CONCLUSION

Since the beginning of the 1990s, the total number of agricultural researchers in Burkina Faso has doubled. Agricultural R&D expenditure, however, has been erratic, with increases in spending coinciding largely with the implementation of two consecutive World Bank projects (PRA-I and NASDP-II), on which the country's agricultural research sector has relied heavily since 1989. These projects have contributed greatly to the recruitment of national researchers, the upgrading of the buildings and laboratory equipment belonging to many CNRST agencies, and the improvement of research management and coordination. In addition, numerous researchers have profited from extensive training as part of these projects. Consequently, Burkina Faso's agricultural researchers are among the most highly qualified in Africa. Nevertheless, future funding remains uncertain. The national government is currently attempting to secure funding from the World Bank for a third phase of the agricultural research project. Until final approval is granted, agricultural research in Burkina Faso will remain highly dependent on government and donor funding.

When compared with that of its neighbors, Burkina Faso's performance in many key agricultural science and technology indicator areas is average. However, the country's research intensity ratio and its average expenditure per researcher in 2001 compared well with those of many other countries in the region.

NOTES

1. The authors are grateful to numerous colleagues in Burkina Faso for their time and assistance with the data collection, and thank Nienke Beintema, Hamidou Boly, Léopold Somé , and Jean Sibiri Zoundi for their useful comments on previous drafts of this brief.
2. The 11-agency sample consisted of
   - eight government agencies/units—*Institut de l'Environnement et de Recherches Agricoles* (INERA), *Institut de Recherche en Sciences Appliquées et de Technologie* (IRSAT), *Institut de Recherche en Sciences de la Santé* (IRSS), *Institut des Sciences des Sociétés* (INSS), *Centre National de Semences Forestières* (CNSF), *Direction des Pêches* (DDP), *Laboratoire National d'Élevage* (LNE), and *Bureau National des Sols* (BUNASOL); and
   - three higher education agencies—*Institut du Développement Rural* (IDR) under *Université Polytechnique de Bobo-Dioulasso* (UPB), *Unité de Formation et de Recherche* (UFR) *en Sciences de la Vie et de la Terre* (SVT) and *UFR en Sciences Économiques et de Gestion* (SEG), both under *Université de Ouagadougou* (UO).
3. Unless otherwise stated, all data on research expenditures are reported in 1993 international dollars or in 1999 CFA francs.
4. English translations of agency names have been used throughout the brief except in note 2, where the original French is provided.
5. Data are calculated as least squares growth rates.
6. Agricultural research in the higher education sector began in 1973; hence, the growth rate given for this sector covers the period 1973-2001.
7. Besides the agricultural research component, NASDP-II consisted of four additional components: agricultural livestock and extension (US$20.3 million), animal health and pastoralist promotion (US$2.5 million), pilot programs (US$4.3 million), and restructuring of agricultural services (US$1.4 million).
8. The Directorate-General for International Cooperation (DGIS) of the Netherlands funded a Livestock Optimization program. The Centre for Development Cooperation Services (CDCS) of the Free University of Amsterdam financed the Water and Soil Conservation (CES) project and the Nutrient Networking and Stakeholder Perceptions (NUTNET) project. France assisted INERA by providing funds for the Western Pioneer Front project, the combating desertification project, and the agro-biodiversity project.

METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI, ISNAR, and CORAF/WECARD 2002-03).
- 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 Burkinabe GDP deflator of base year 1993 and then converting to U.S. dollars with a 1993 purchasing power parity (PPP) index, both taken from World Bank (2003). PPP's are synthetic exchange rates used to reflect the purchasing power of currencies, typically comparing prices among a broader range of goods and services than conventional exchange rates.
- The salaries and living expenses of many expatriate researchers working on donor-supported projects are paid directly by the donor agency and are often excluded in the financial reports of the agricultural R&D agencies. These *implicit* costs have been estimated using the average cost per researcher in 1985 to be $160,000 1993 international dollars and backcasting this figure using the rate of change in real personnel costs per fte researcher in the US state agricultural experiment station system. This extrapolation procedure has the assumption that the personnel-cost trend for US researchers is a reasonable proxy of the trend in real costs of internationally recruited staff in the agricultural R&D agencies.

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

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