



BANGLADESH

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This country brief reviews the major investment and institutional trends in public agricultural research in Bangladesh since the early 1980s using new data collected under the Agricultural Science and Technology Indicators (ASTI) initiative (IFPRI–BARC 2003–04).¹

INSTITUTIONAL DEVELOPMENTS

Bangladesh's agricultural sector has undergone rapid changes over the past few decades. The country's production of rice—its most important food staple—more than doubled between 1975 and 2005, nearing, but not reaching, the point of self-sufficiency. The production of other food crops has also grown substantially over the past three decades. At the same time, the agricultural sector has diversified into areas such as livestock and of high-value agricultural exports (West 2002; FAO 2005). Still, Bangladesh remains one of the poorest countries in Asia, with less than half its population, particularly its rural population, living below the poverty line. Although the country's economic dependence on agriculture has lessened over time, the population continues to rely heavily on the sector for employment: as of 2003, 75 percent of the rural population and over half the total labor force worked in agriculture (World Bank 2005; FAO 2005).

Advances in technology have been the major driver of agricultural productivity growth and will remain important in the country's efforts to address poverty. Agricultural research has been an important contributor to substantial growth in the production of rice, wheat (only recently introduced), potatoes, vegetables, and fish. We identified 41 agencies involved in agricultural R&D in Bangladesh, including

Table 1—Composition of agricultural research expenditures and total researchers, 2002

Type of agency	Spending		Researchers (fte's)	Share		Agencies in sample ^a (number)
	2000 takas	2000 international dollars		Spending	Researchers	
	(millions)			(percent)		
<i>Public agencies</i>						
BARI	547.6	46.9	511.0	26.4	28.4	1
BARC-affiliated	1,105.6	94.7	806.0	53.4	44.9	10
Other government ^b	182.6	15.6	273.0	8.8	15.2	10
Higher education ^c	227.9	19.5	197.4	11.0	11.0	17
Subtotal	2,063.7	176.8	1,787.4	99.4	99.5	38
<i>Private enterprises</i>						
Private enterprises	11.7	1.0	9.0	0.6	0.5	2
Total	2,075.4	177.8	1,796.4	100	100	40

Sources: Compiled by authors from ASTI survey data (IFPRI–BARC 2003-04).

^a See note 2 for a list of the 40 agencies included in this sample.

^b Expenditures for IFST are estimates based on average expenditures per researcher for the other 20 government agencies.

^c Expenditures for the higher-education sector in our sample are estimates based on average expenditures per researcher at the government agencies. The 719 faculty staff employed at the 17 higher-education agencies spent between 10 and 35 percent of their time on research, resulting in 197 fte researchers.

KEY TRENDS

- From 1981 until 2002, agricultural research spending and staffing numbers in Bangladesh grew, though spending growth was erratic.
- Government-based agricultural research in Bangladesh is coordinated by the Bangladesh Agricultural Research Council (BARC). BARC, however, has no control over the allocation of the financial resources.
- In 2002, BARC and its 10 affiliated research institutes accounted for about three-quarters of the country's agricultural research expenditure.
- Agricultural research has depended on donor financing, particularly in terms of World Bank loans, which facilitated considerable investments in infrastructure and equipment.
- Bangladesh's agricultural research capacity has deteriorated in terms of researcher numbers as a result of the brain drain of the qualified and experienced researchers.
- The private sector has minimal input into agricultural R&D in Bangladesh, though greater involvement is anticipated in the future

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.

Funding for the ASTI initiative was provided by the CGIAR Finance Committee/World Bank, IFPRI unrestricted funding, and the U.S. Agency for International Development (USAID).

agricultural research institutes, university units, and various smaller organizations.² In 2002, the 40 agencies for which data were available combined employed close to 1,800 full-time equivalent (fte) researchers and spent approximately 2 billion 2000 takas—the equivalent of 179 million 2000 international dollars—on agricultural R&D (Table 1).^{3,4}

The Bangladesh Agricultural Research Council (BARC) was established in 1973 to coordinate agricultural research activities by government agencies (see *A Short History on Government-Based Agricultural Research* below). The council's mandate was later broadened to encompass the planning, coordination, and implementation of agricultural research strategies (Ahmed and Karim 2005). In that capacity BARC prepares national agricultural research plans, sets priorities, evaluates research programs, and assesses the researcher capacity of the various institutes it oversees. BARC has three main components. First, a Governing Board—comprising representatives from ministries, agricultural universities, nongovernmental organizations (NGOs), the private sector, and farmer groups—is responsible for policy formation and research planning and coordination. Secondly, an executive council—comprising BARC's executive chairman, 7 divisional directors (named member directors), and heads of 10 affiliated research institutes—assists the governing board in various policy-related activities, such as approving research programs and formulating human resource policy. Finally, a secretariat is responsible for implementing the policies and guidelines of the Governing Board. Each of the 7 divisions is responsible for identifying problem areas, setting priorities, examining research proposals, reviewing research outputs, monitoring and evaluating activities, and human resources development at the institutes (BARC 2001).

Currently, 10 research institutes are affiliated with BARC, which together with the headquarters accounted for over three-quarters of the country's total agricultural R&D spending in 2002 (These 10 institutes are commonly referred to as NARS institutes within Bangladesh, but in this report labeled as BARC-affiliated institutes for the sake of uniformity with other ASTI country and regional reports). The management of the

institutes is somewhat complex. In addition to BARC's overarching role, the research institutes fall under the jurisdiction of four different ministries, two forming ministerial departments. In addition, the Bangladesh Tea Research Institute (BTRI) is managed by the Bangladesh Tea Board. The remaining seven institutes are autonomous, each with their own legally enacted board. This has made BARC's coordination role somewhat challenging. For example, research programs and budgets of the various institutes are reviewed by BARC's executive council. But financial resources are disbursed to the institutes centrally from the Ministry of Finance without any input from BARC.⁵ This has made BARC less effective in research coordination. Recognizing the problem, the Bangladesh government with assistance of the World Bank has taken up the agenda to reform BARC and the affiliated institutes in the recently proposed National Agricultural Technology Project. A possible solution could be to abolish the individual acts of the institutes and develop one act that will govern all institutes to improve coordination.

Six institutes fall under the Ministry of Agriculture. The Bangladesh Agricultural Research Institute (BARI), which employed over 500 fte researchers and spent \$47 million in 2002, is by far the largest agricultural R&D agency in Bangladesh. The institute conducts research on a wide variety of crops, including cereals, tubers, pulses, oilseeds, vegetables, fruits, spices, and flowers. BARI is headquartered at Gazipur, Joydebpur, about 35 kilometers from Dhaka, and comprises three branches: research, support services, and training and communication. The research branch is further subdivided into 15 departments. BARI has 6 crop research centers,⁶ 6 regional research stations, 24 additional research stations and substations, 9 farm-system research sites, and 72 testing sites across the country's agricultural zones (BARI 2001). Since its establishment, BARI has developed over 200 crop varieties; conducted socioeconomic research; and influenced improvements in management technologies, pest control methods, postharvest technologies, farm machinery, and tools (Karim 1999).

A Short History of Government-Based Agricultural Research

Formal agricultural research in Bangladesh traces back to 1880 when, under British rule, a Department of Agriculture was established. At that time, research mainly focused on jute and, to a lesser extent, tea. In 1905, a separate Bengal Department of Agriculture was created. In 1908, an agricultural research laboratory was set up in Tejgaon to serve the provinces of Bengal and Assam, and a 403-acre experimental station, the Dhaka farm, was formed. In 1929, the Royal Commission on Agriculture recommended that the Imperial Council of Agricultural Research be established to oversee research undertaken by India's various institutes and centers.

From the mid-1930s to the end of the World War II, agricultural R&D was constrained by a lack of funding. Importantly, in 1947 Indian territory was redrawn and Bangladesh became East Pakistan. As a result, however, Bangladesh lost several research entities focusing on jute, tea, sugarcane, and veterinary education to India. At this time, the Department of Agriculture's veterinary and livestock units were merged to form the Directorate of Animal Husbandry (renamed the Directorate of Livestock Services in 1961). In the mid-1950s, a number of new research agencies were established to replace those lost to India: the Jute Research Institute (1951), the Sugarcane Research Station (1951), the Forest Research Institute (1955), and the Tea Research Institute (1958).

This growth continued into the 1960s. The Bangladesh University of Agriculture was established in 1961, at first comprised of faculties of agriculture and veterinary science, but later to include faculties of animal husbandry, agricultural economics, agricultural engineering, and fisheries, all established between 1962 and 1966. Bangladesh became independent from Pakistan in 1971. The Bangladesh Agricultural Research Council (BARC) was established in 1973 to oversee and promote agricultural research. BARI, the Sugarcane Research Station, and the Tea Research Station were given autonomous status as research institutes in 1976, and in 1984 the Directorate of Fisheries became the Fisheries Research Institute, while the Directorate of Livestock Research became the Bangladesh Livestock Research Institute.

Source: Jabbar and Zainul Abedin (1989).

The Bangladesh Rice Research Institute (BRRI) is the country's second largest agricultural R&D agency and focuses on all aspects of rice development including varietal improvement, production technologies, and technology transfer. So far BRRI has developed 45 high yielding rice varieties and number of production technologies. BRRI comprises a headquarters in Joydebpur and 9 regional stations across the country (BARC 2001). In 2002, it employed 190 fte researchers. The four remaining institutes under the Ministry of Agriculture are smaller than either BARI or BRRI. The Bangladesh Institute of Nuclear Agriculture (BINA), the Bangladesh Sugarcane Research Institute (BSRI), the Soil Resource Development Institute (SRDI), and the Bangladesh Jute Research Institute (BJRI) each employed between 71 and 141 fte agricultural researchers in 2002.

Two BARC-affiliated institutes fall under the Ministry of Fisheries and Livestock. The Bangladesh Livestock Research Institute (BLRI) is responsible for livestock and poultry research. In 2002, it employed 34 fte researchers and comprised a headquarters at Savar, near Dhaka, and two substations. The Bangladesh Fisheries Research Institute (FRI) develops improved fishery production technologies, as well as formulating policy related to the cultivation and capture of fish. In 2002, FRI employed 80 fte researchers at four research stations—two focusing on freshwater, one on brackishwater, and one on marine fisheries. The last two BARC-affiliated research agencies are the Bangladesh Forest Research Institute (BFRI) under the Ministry of Environment and Forest (MoEF) and the Bangladesh Tea Research Institute (BTRI) under the Ministry of Commerce. BTRI, which is also administered by the Bangladesh Tea Board focuses on the development of high-yielding tea varieties and improved production technologies.

The Bangladesh Council of Scientific and Industrial Research (BCSIR) under the Ministry of Science, Information, and Communication Technology (MSICT) was established at the same time as BARC (1973). BCSIR's main objective is to initiate, guide, and promote research related to developing and promoting industry. In 2000, the council employed about 300 scientists and had an annual budget of approximately 110 million taka. BCSIR comprises three research laboratories and five research institutes encompassing fundamental and industrial research primarily related to food and nutrition, paper and pulp, fiber and polymers, glass and ceramics, renewable and conventional energy aspects, medicines and drugs, biotechnology and tissue culture, leather technology, aromatic and edible oils, and physical instrumentation (BCSIR 2002). BCSIR's agricultural research focuses on adding value and processing agricultural products for industrial use. BCSIR operates the Institute of Food Science and Technology (IFST) and three laboratories in Dhaka, Chittagong, and Rajshahi focusing on areas such as aromatic crops and vegetables processing for industrial use, bamboo, and medicinal plants. The organizational character of BARC and BCSIR are different. Unlike BARC, BCSIR has direct responsibility for the administrative and financial management of the units it oversees.

Six other government agencies conduct agricultural research under various other ministries. These are the Bangladesh Sericulture Research and Training Institute (BSRTI), the Atomic Energy Commission's Institute of Food and

Radiation Biology (IFRB), the Bangladesh Academy of Rural Development in Comilla (BARD), the Rural Development Academy (RDA) in Bogra, the Bangladesh Institute of Development Studies (BIDS), and the Cotton Development Board (CDB), each of which employed between 11 and 50 fte agricultural researchers in 2002.

The main higher-education agency involved in agricultural research is the Bangladesh Agricultural University (BAU). It is located just outside Mymensingh and houses two BARC-affiliated institutes (BINA and BFRI) as well as a number of experiment farms and gardens. BAU has faculties of agriculture, veterinary science, animal husbandry, agricultural economics and rural sociology, agricultural engineering and technology, and fisheries. The university's agricultural research activities are categorized as academic research, which is supervised by the teachers and includes postgraduate training, and project research, which is generally funded by the university or external donors and falls under BAU's Research System (BAURES) (BAU 1999). BAURES manages funding, evaluates projects, and plans research activities. Between 1984 and 2001 about 400 projects had been completed, and as of November 2002, more than 150 research projects were in progress. Project research includes activities related to the development of new crop varieties, including rice, soybeans, sweet potatoes, and mustard seeds; poultry vaccines and varieties; and fish and shrimp cultures for paddy fields. It also investigates production technologies, pest and disease management, and postharvest activities (BAU 1999). In 2002, the university's six faculties and research projects together employed 133 fte researchers (50 of which were staff from the Faculty of Agriculture).

Compared to BAU, Bangladesh's two other agricultural universities are smaller in terms of fte researchers and research activities. In 2002 the Shere-e-Bangla Agricultural University (SAU) employed 14 fte researchers, while the Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) employed 9. Research at both universities focuses mostly on crops. We identified eight other higher-education agencies involved in agricultural R&D in 2002, employing a total of 42 fte researchers. These agencies include four units at Dhaka University and two at Bangladesh University of Engineering and Technology.

Bangladesh has a large number of nongovernmental organizations (NGOs) involved in agriculture, but research activities, if any, are very limited and often ad hoc. The well-know Bangladesh Rural Advancement Committee (BRAC) has recently expanded its agricultural R&D program in the area of crops (such as rice, vegetables, flowers) and fisheries. Agricultural research performed by the private sector is minimal. One study (Ahmed and Karim 2005) reports that, while the intensity of private-sector involvement in agricultural research appears to have increased, actual research activities mostly focus on the introduction of foreign technologies. A few producers conduct research to adapt these technologies to local conditions. We identified only two private companies involved in agricultural research, both of which were affiliated with multinational companies. East-West Seed Group (EWS) produces, develops, and sells tropical hybrid seeds for Southeast and South Asian vegetable seed markets (East West Seed 2005). Research activities are largely based in the Philippines and Indonesia, but EWS has a 20-acre research farm in Joydebpur. In 2002, EWS employed 8 fte researchers and 20 technicians.

The Bangladesh office (formerly Bangladesh Tobacco Company) of the British–American Tobacco Company, conducts some adaptive research trials, and in 2002 employed 1 fte researcher and 20 technicians.

The agricultural research institutes affiliated with BARC are engaged in a wide range of collaborative activities within the system, as well as with other research and extension agencies and universities in Bangladesh and abroad. Most of the activities, however, are focused on the transfer of technologies to farmers' fields, including exchanging scientific information and expertise, and plant materials. BARC, for example, undertook a four-year project with financial support from the United States Agency for International Development (USAID) with the aim of transferring technologies developed by research agencies affiliated with BARC.

BARC is a member of the Consultative Group on International Agricultural Research (CGIAR). BARC and its affiliated institutes have been collaborating with a wide range of international agencies such as the International Rice Research Institute (IRRI), the International Maize and Wheat Improvement Center (CIMMYT), the International Potato Center (CIP), the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), the Asian Vegetable Research and Development Center (AVRDC), the Food and Agriculture Organization of the United Nations (FAO), the Center for Agriculture and Biosciences International (CABI), the International Livestock Research Institute (ILRI), the International Centre for Underutilised Crops (ICUC) through the Underutilised Tropical Fruits in Asia Network (UTFANET), and the Asia-Pacific Center for Agricultural Engineering and Machinery (APCAEM). BARC-affiliated agencies also collaborate with national research agencies in India, Nepal, Pakistan and the Philippines, among other countries, directly or through the Asia Pacific Association of Agricultural Research Institutes (APAARI).

HUMAN AND FINANCIAL RESOURCES IN AGRICULTURAL R&D

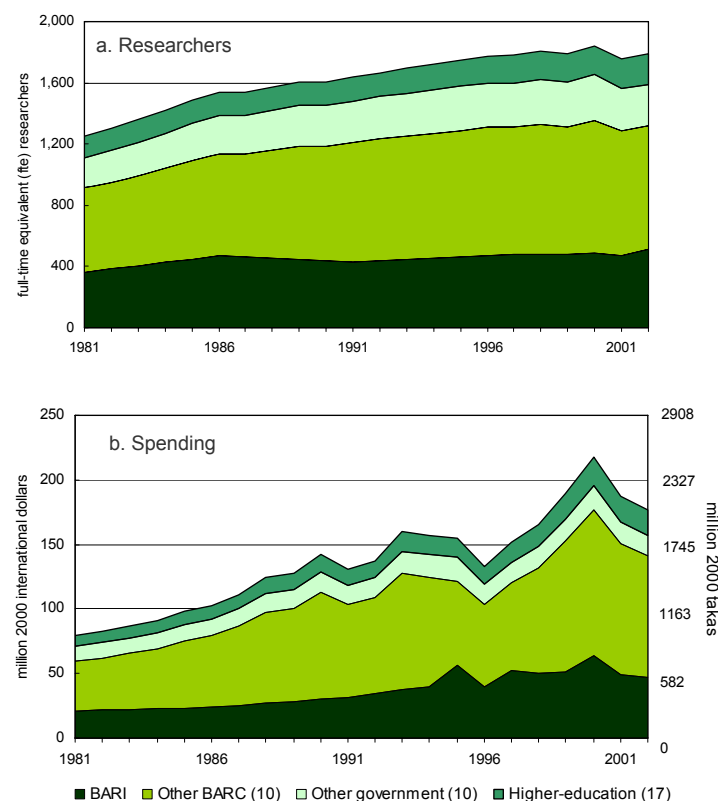
Overall Trends

During 1981–2002, the total number of public agricultural researchers increased by 1.6 percent per year, though most of this growth occurred during the 1980s (Figure 1a). Since 2000, the overall number of researchers has declined due to staff reductions in many government agencies. Total research staff at BARC headquarters, BJRI, and BRRI, for example, fell by 18 fte's or more between 2000 and 2002, mainly as a result of the loss of (often highly qualified) scientists to agencies abroad. Ahmed and Karim (2005) reported that institutes such as BARI, BRRI, BARC, and FRI lost between 25 and 50 percent of their researchers during the 1994–2000 period as a result of a recruitment freeze across all staff categories in research agencies under the Ministry of Agriculture and other ministries combined with limited promotion opportunities or other incentives. This has led to a decline not only in the number of staff but also in their qualifications. Since 2002, total researcher levels continued to decline at BRRI and FRI; the latter saw a decline of almost one half during 2002–05. In contrast, BARC headquarters and BARI saw a slight increase in total research staff during the same period.

Although total fte researcher numbers in the higher-education sector increased over the past two decades—from 14 fte researchers in 1981 to close 200 in 2002—the sector's fte researcher share remained fairly constant at 9–10 percent.

During 1981–2002, total public agricultural R&D spending increased in inflation-adjusted terms by an average of 4.3 percent per year—substantially more than the growth in the total researcher numbers over the same period (Figure 1b). This funding growth was caused by increased government contributions and project-related funds derived from World Bank loans. The overall trend, however, was quite erratic, especially for BARI and the other BARC-affiliated institutes. Total spending at most government agencies increased substantially from 1996 to 2000 but decreased somewhat thereafter due to the completion of the most recent World Bank project. Hence by 2002, total spending had declined below its 2000 level. But since 2002 the total has rebounded somewhat.

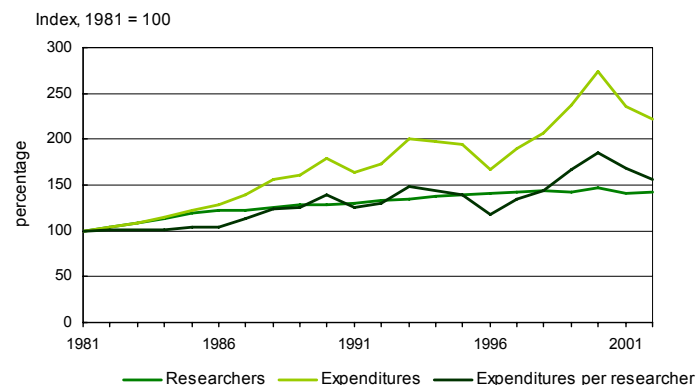
Figure 1—Public agricultural R&D trends, 1981–2002



Sources: Compiled by authors from ASTI survey data (IFPRI–BARC 2003–04), ACU (various years), ISNAR (1990), and various institute-specific publications. Notes: See Table 1. Figures in parentheses indicate the number of agencies in each category. Total researcher numbers and expenditures for some of the government agencies and in general for the years 1982–85, 1987–90, 1992–95 have been interpolated or extrapolated using average spending per researcher data of government agencies for which data were available. Underlying data are available at the ASTI website (www.asti.cgiar.org).

Given the comparatively higher growth in research spending, spending per scientist almost doubled during 1981–2000; it decreased thereafter with more than 15 percent (Figure 2).

Figure 2—Trends in public expenditures, researchers, and expenditures per researcher, 1981-2002

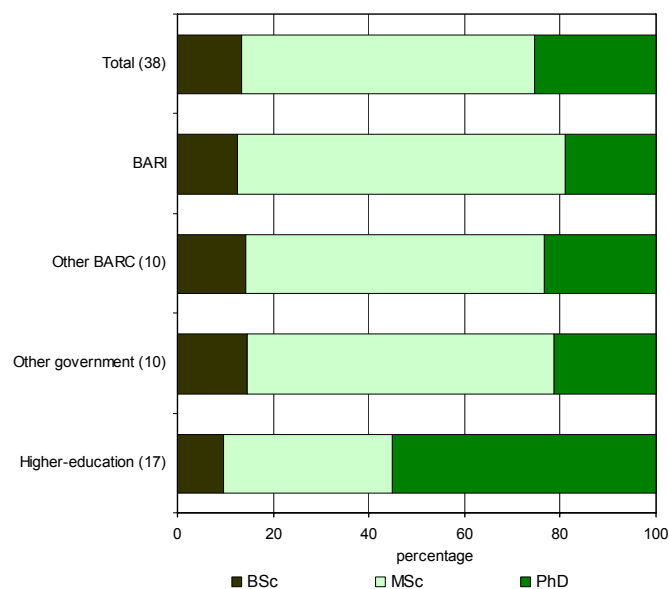


Sources: Figure 1.
Notes: See Figure 1.

Human Resources

In 2002, 87 percent of close to 1,800 researchers in the 38 public agencies in our sample had undertaken postgraduate-level training and about 25 percent held doctorate degrees (Figure 3). This was considerably higher than the corresponding shares in other Asian countries, such as Malaysia and Sri Lanka, where about two-thirds of the researchers were trained to the postgraduate level during the same year (Stads et al. 2005a; Stads et al. 2005b). While the share of PhD-qualified researchers was roughly the same in all three countries, Bangladesh has a higher share of MSc-qualified research staff. There were no major differences in the shares of MSc- or PhD-qualified staff across the various institutional categories, but the higher-education sector had many more PhD-qualified staff—55 percent, or more than twice the average level for the government agencies. These averages, however, mask considerable differences in shares across the various agencies in our sample, particularly in the government sector. Over 40–47 percent of 17 researchers at BINA, BSRTI, and BLRI, for example, were trained to the doctorate level in 2002, while the corresponding share for BARC headquarters was a very high 70 percent. In contrast, the corresponding shares at SRDI and BARD—the mandate of which extends beyond research—were below 10 percent.

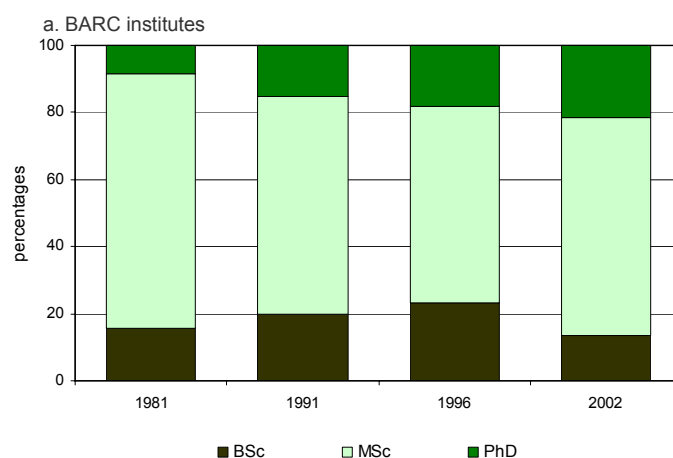
Figure 3—Educational attainment of researchers, 2002

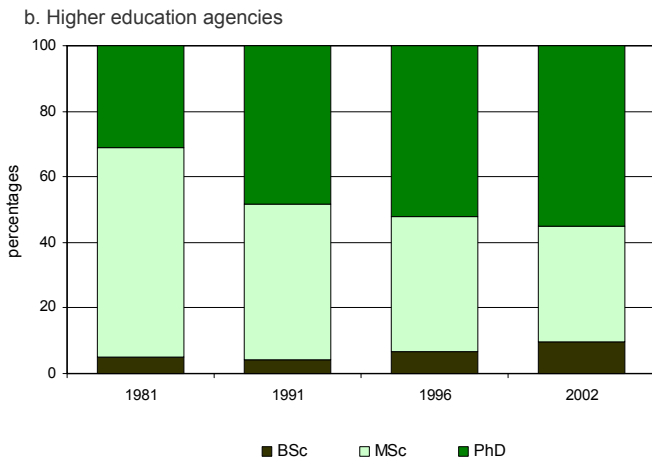


Source: Compiled by authors from ASTI survey data (IFPRI–BARC 2003-04).
Note: Figures in parentheses indicate the number of agencies in each category.

Staff qualifications, measured as the share of researchers with postgraduate degrees, remained fairly constant throughout 1981–2002 for the BARC-affiliated institutes (including BARC headquarters), but the mix changed (Figure 4a). The share of PhD holders at BARC-affiliated institutes increased considerably from 9 percent in 1981 to 21 percent in 2002. The share of BSc holders increased during the 1990s in part as a result of the aforementioned loss of senior staff abroad. From the mid-1990s, the number of BSc-qualified research staff at the BARC institutes fell significantly, from over 300 in 1996 to fewer than 180 in 2002. At BIRRI and BSRI, the number of BSc-qualified staff decreased by two-thirds over this timeframe. The share of BSc holders at the higher-education agencies was fairly low in the early 1980s (5 percent), but it trended upward because of a reduction in the number of MSc-trained researchers. For the 17 higher-education agencies in our sample as a whole, PhD-qualified researchers increased substantially, from 41 fte researchers in 1981 to 109 in 2002, almost doubling their share over the timeframe (Figure 4b).

Figure 4—Educational attainment of researchers, 1981-2002



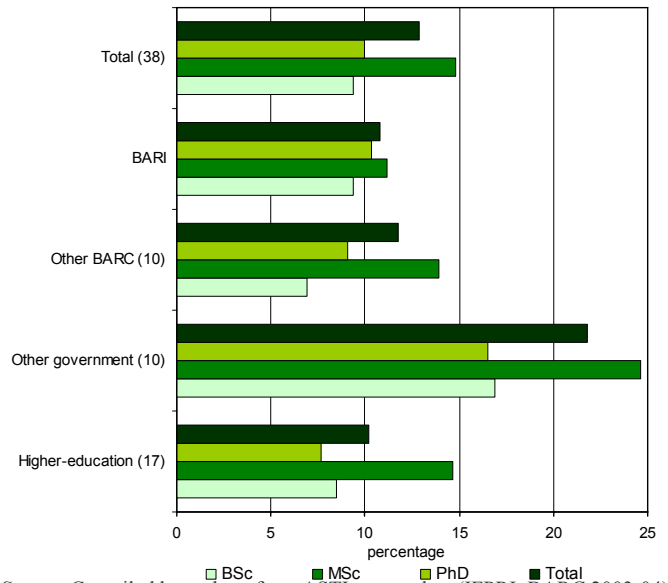


Source: Compiled by authors from ASTI survey data (IFPRI-BARC 2003-04).

During the 1980s and 1990s, successive USAID and World Bank projects were implemented, each with a human resources component. Hence many researchers received MSc and PhD training overseas. The Agricultural Research Management Project (ARMP), which was funded through a World Bank credit and which ran from 1996 to 2001, also supported postgraduate studies for researchers at the BARC-affiliated institutes. In total, 106 researchers obtained PhD degrees and 27 researchers MSc degrees from universities in Bangladesh and abroad. Finally, an IRRI-BRRI collaborative program, which was funded by various donors, supported PhD and MSc training during 1975-93. In total 67 scientists obtained PhD degrees and 79 scientists MSc degrees through this program. Since 2002, most MSc and PhD training in agricultural research was undertaken locally.

In 2002, 13 percent of the fte researchers in a 38-agency sample were female, including 10 percent of researchers holding doctorate degrees, 15 percent of researchers with MSc degrees, and 9 percent of BSc-trained researchers (Figure 5). The relatively high share of women in the other-government agency category (22 percent) stems from the high number of female researchers at IFST (50 percent in 2002). The overall share of female agricultural researchers is considerably lower than in other Asian countries, such as Malaysia and Sri Lanka where one-third of the agricultural researchers were female in 2002/03 (Stads et. al. 2005a; Stads et al. 2005b); it is also lower than in other regions of the world, except for Sub-Saharan Africa, where in 2000 the average share of female researchers was 18 percent (Beintema and Stads 2006).

Figure 5—Share of female researchers, 2002

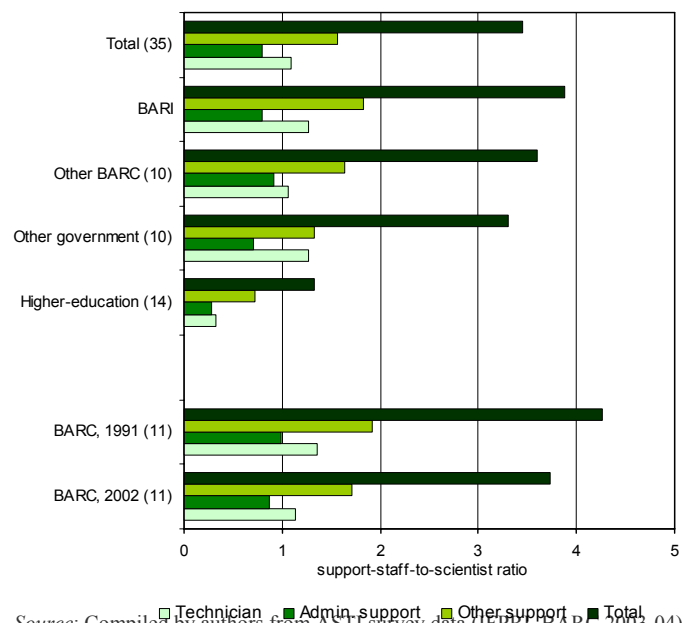


Source: Compiled by authors from ASTI survey data (IFPRI-BARC 2003-04).

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

In 2002, the average number of support staff per scientist in a 33-agency sample was 3.5—comprising 1.1 technicians, 0.8 administrative personnel, and 1.6 other support staff such as laborers, guards, and drivers (Figure 6). In 2002, the 11 BARC agencies together employed 3.7 fte research staff per researcher, compared with 4.3 about a decade earlier. Support-staff-per-scientist ratios among the BARC agencies were generally comparable. Overall, researchers at the higher-education agencies had about half the level of support staff or less than their colleagues in the government sector—a common trend in other Asian countries and world regions.

Figure 6—Support-staff-to-researcher ratios, 2002



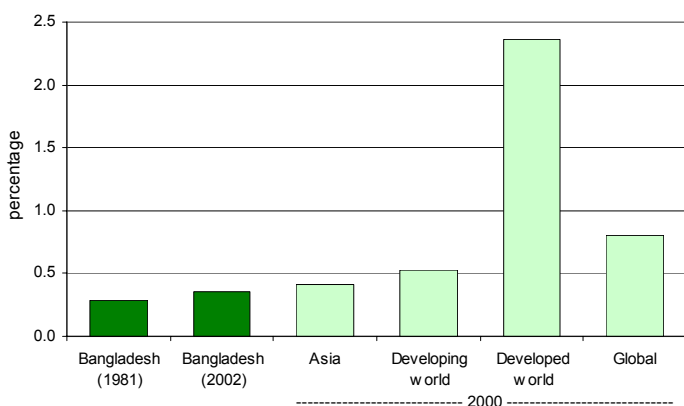
Source: Compiled by authors from ASTI survey data (IFPRI-BARC 2003-04).

Note: Figures in parentheses indicate the number of agencies in each category. Figure excludes three higher-education agencies for which data were unavailable.

Spending

Total public spending as a percent of agricultural output (AgGDP) is a common research investment indicator that helps to place a country's agricultural R&D spending in an internationally comparable context. In 2002, Bangladesh invested \$0.36 in agricultural research for every \$100 of agricultural output (Figure 7).⁷ Although the intensity of agricultural R&D investments has increased over the past two decades, from 0.28 in 1981, its level is still low compared with many other countries. The 2002 ratio for Bangladesh was slightly lower than the 2000 average reported for Asia (0.41). In general, Asia has a much lower investment intensity level than other regions in the world; the average for the developing world in 2000, for example was 0.53, while the average for Sub-Saharan Africa was 0.72 (Pardey et al. 2006).

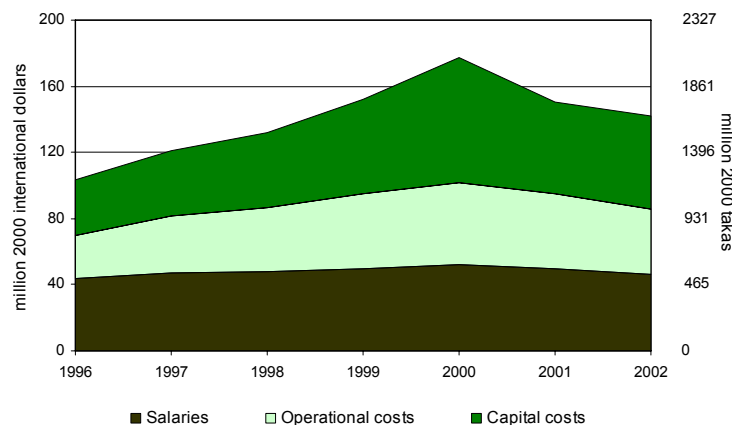
Figure 7—Bangladesh's public agricultural research intensity compared regionally and globally



Sources: Bangladesh compiled from Figure 1b; AgGDP data from World Bank (2005); other intensity ratios from Pardey et al. (2006).

During the period 1996–2002, the 11 BARC-affiliated institutes spent 34 percent of their combined funding on salaries, 29 percent on operational costs, and 37 percent on capital investments (Figure 8). The salary share is low compared with those found in most other countries where salaries generally range from around half to two-thirds of total spending. Bangladesh invests highly in its agricultural research infrastructure and equipment, and has done so for decades. The consecutive World Bank projects, for example, had substantial infrastructure and equipment components. Shares of capital expenditures fluctuated among the BARC-affiliated institutes, as well as over time. BLRI, for example, invested between 54 and 80 percent of its total funding in upgrades to its infrastructure during 1985–2000 (funded by the Government of Bangladesh, Japan International Cooperation Agency (JICA), and the World Bank), reflecting the comparatively late establishment of BLRI. Similarly, FRI was not established until the mid-1980s and therefore spent a relatively high share of its funding on infrastructure investments.

Figure 8—Cost-category shares in expenditures of the 11 BARC-affiliated institutes, 1996–2002



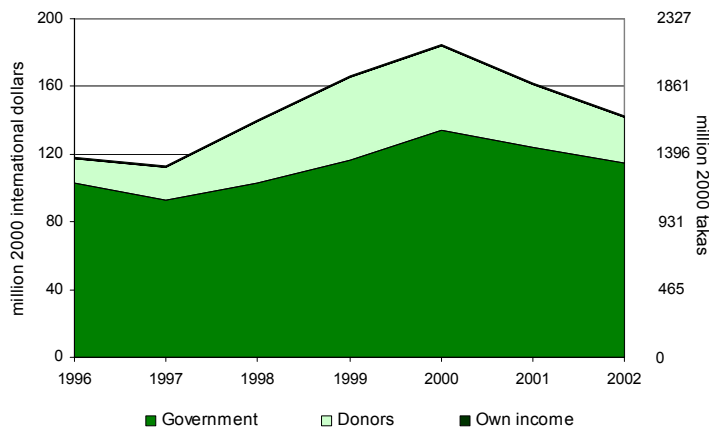
Source: Compiled by authors from ASTI survey data (IFPRI–BARC 2003–04).

FINANCING PUBLIC AGRICULTURAL R&D

Over the past decade, funding for agricultural research in Bangladesh was derived from a number of sources, principally the national government, World Bank loans, and foreign donor aid. In 2002, more than 80 percent of all funding received by the 11 BARC-affiliated institutes was contributed by direct government appropriations. Other government funding, World Bank loans, and donor contributions accounted for 19 percent, while the remaining 1 percent was provided by public enterprises and other sources (Figure 9). The 2002 share of donor funding was lower than during the late 1990s.

Government contributions to government agencies fall into two categories: revenue expenditure and the annual development expenditure from the Annual Development Programme (ADP). The ADP accounts for project aid (both as loans and grants) from bilateral and multilateral donors and the government. These allocations are disbursed by the Ministry of Finance, without the involvement of BARC. Generally, salaries and operating costs are paid for through the revenue budget, and capital costs are paid for by the ADP (the ADP does cover some salary expenses, however).

Figure 9—Funding sources of the 11 BARC-affiliated institutes, 1996–2002



Source: Compiled by authors from ASTI survey data (IFPRI–BARC 2003-04).

Since the early 1970s, the World Bank has supported agricultural development in Bangladesh through the provision of 10 loans, totaling US\$143 million, for projects focusing on various areas of the agricultural sector. Three of these projects focused on the development of agricultural research. The Agricultural Research project I (ARP-I), funded by a US\$6 million loan, ran from 1978 to 1984 and focused on strengthening BARC's role in planning, coordinating, and evaluating the country's agricultural research efforts. In addition, three regional research stations were established, contract research was conducted on various issues, and overseas and local training was provided (World Bank 1984). ARP-I was followed by the Agricultural Research Project II (ARP-II). This project ran during 1985-92, and was funded by the World Bank (through a loan of US\$24.5 million), the Government of Bangladesh, and USAID. ARP-II's main objectives were to further enhance infrastructure, equipment, and management capacity at BARC, along with BARI and BFRI; to establish two new research institutes (FRI and BLRI), and to provide professional and technical training. Most of these objectives were met, although major problems arose: not all planned contract research activities were carried out, and those that did take place often lacked interdisciplinary collaboration, and were subject to long operational delays (World Bank 1996). The evaluations of both ARP projects identified a number of concerns, such as weak development of BARC's functions, poor dissemination of developed technologies, unsustainable financing, and research inefficiency. It was felt that BARC needed more autonomy and a stronger role if it were to fulfill its role of prioritizing, planning, and evaluating research activities at the research institutes. In addition, BARC needed to develop greater competence in its management, and the research institutes needed greater autonomy to enable them to improve their responsiveness to the farmers' needs (World Bank 1996 and 2003). In order to address these and other issues,

the aforementioned ARMP was initiated in 1996, running until 2001. ARMP was funded through a World Bank loan of US\$50 million and counterpart funding from the Government of Bangladesh.⁸ The project's main objective was to improve the efficiency of the agricultural research system by generating relevant and sustainable technologies. The project comprised three components. The first, valued at US\$14 million, focused on further developing BARC's organization and management capacity and that of its affiliated research institutes. This component included institutional reform, improved priority setting and economic analysis methods, technical assistance, training, and contract research. The second component on priority research (US\$41 million) supported the research programs of the crop livestock, fisheries, and forestry institutes. The third component, on participatory farming systems research (US\$5 million), aimed to improve research–extension linkages in order to strengthen the client orientation research programs related to farming systems, as well as testing and disseminating appropriate technologies (World Bank 1996, 2003). ARMP's performance was rated as moderately unsatisfactory because the wide-ranging institutional reform deemed necessary did not occur. BARC still has no control over the allocation of resources among its crop, livestock, fisheries, and forestry institutes because financial control (including resource allocation) remains with the relevant ministries. In addition, the organization of the agricultural system was considered to be weak, based on its large number of research institutes and substations—often in the same location and each with its own local management and support facilities. ARMP was successful, however, weaknesses remain in improving priority setting, providing the potential for better resource allocation within institute programs. In addition, capacity at BARC was built, and research–extension linkages appeared to have improved moderately (World Bank 2003). As of early 2006, the World Bank and Bangladesh government are discussing a potential new project, the National Agricultural Technology Project (NATP), to be funded through a new World Bank loan. If approved, NATP will be of similar nature of the World Bank-funded NATP in India and will consist of three components: extension, research support, and value chain management. The research support component will include reform plans and a competitive grant scheme.

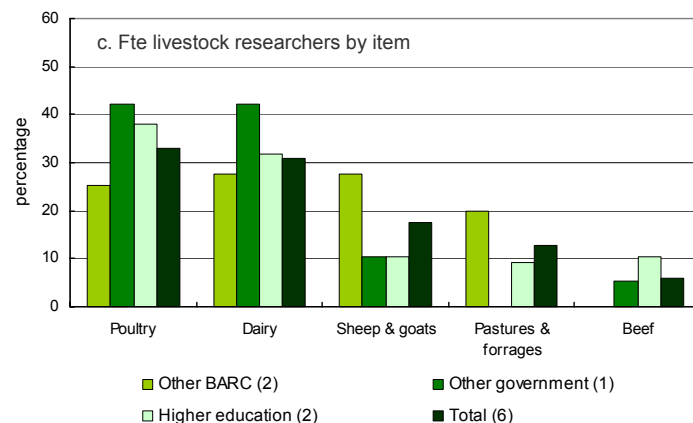
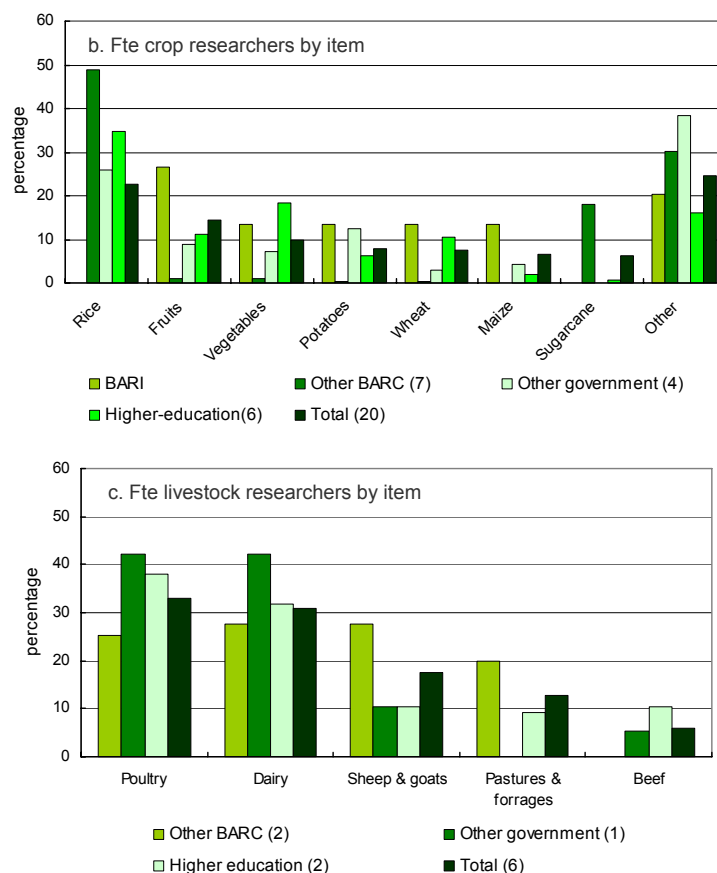
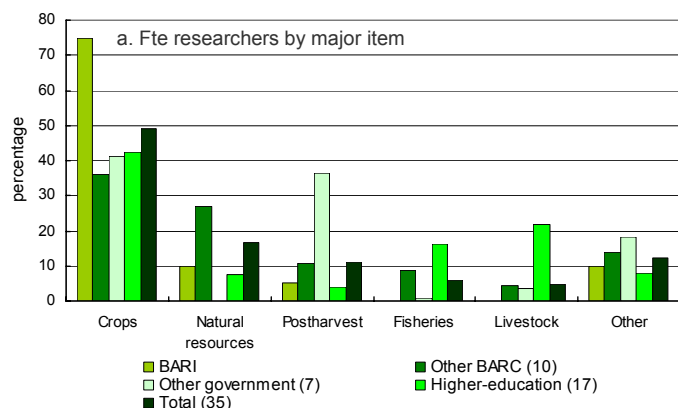
RESEARCH ORIENTATION

Commodity Focus

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

In 2002, 49 percent of the more than 1,700 fte researchers in a 35-agency sample conducted crop research, while postharvest, natural resources, and fisheries research accounted for 17, 11, and 6 percent, respectively (Figure 10a). Only 5 percent of the total fte researchers in our sample focused on livestock, which is extremely low. The combined share of researchers focusing on livestock was particularly low for the other government agencies (3 percent). Apart from BLRI and BARC headquarters, RDAB was the only other government agency involved in (limited) livestock research. The higher-education sector employed more fte livestock researchers than the government sector in 2002. These were all located at BAU and Dhaka University. Overall, livestock-related research accounted for about 20 percent of the total research staff at the 17 higher-education agencies in our sample. Rice was the focus of close to 23 percent of the total fte crop researchers in our sample, while fruits accounted for 15 percent (Figure 10b). Other major crops were vegetables, potatoes, wheat, maize, and sugarcane, each of which accounted for between 6 and 10 percent of the total fte crop researchers in our sample. Fruits were relatively more important at BARI and the other 7 BARC-affiliated institutes that were involved in crop research. Comparatively more rice research was conducted at both the other government and higher-education agencies. As previously mentioned, only 5 agencies in our 35-agency sample conducted livestock-related research; about one-third of those researchers working on livestock were involved in poultry and dairy research (Figure 10c). Other important livestock items were sheep and goats (17 percent), pastures and forages (13 percent), and beef (6 percent).

Figure 10—Commodity Focus, 2002



Source: Compiled by authors from ASTI survey data (IFPRI–BARC 2003–04).
Notes: Figures in parentheses indicate the number of agencies in each category. Figure excludes three other government agencies for which gender data were unavailable. Figure 10b only includes agencies involved in crop research; Figure 10c only includes agencies involved in livestock research.

Thematic Focus

Of the 1,675 fte researchers in a 2002 sample of 32 agencies, 12 percent focused on crop genetic improvement, 11 percent on soil research, 10 percent on postharvest research, 9 percent on crop pest and disease control, and 12 percent on other crop areas (Table 2). These shares were lower for the 15 higher-education agencies because of the comparatively higher focus on livestock research at BAU: 18 and 14 percent of the fte researchers in this sector focused on livestock genetic improvement and livestock pest and disease control, respectively.

Table 2—Thematic focus, 2002

	Numbers of researchers		Shares	
	BARC (10)	Other (22)	BARC (10)	Other (22)
	<i>(in fte's)</i>		<i>(percent)</i>	
Crop genetic improvement	177.1	29.1	13.6	7.7
Crop pest and disease control	134.9	17.5	10.4	4.7
Other crop	163.6	45.1	12.6	12.0
Livestock genetic improvement	57.1	33.3	4.4	8.9
Livestock pest and disease control	6.8	27.1	0.5	7.2
Other livestock	18.7	9.4	1.4	2.5
Soil	165.9	19.4	12.8	5.2
Water	81.8	21.2	6.3	5.6
Other natural resources	51.4	2.4	4.0	0.6
Postharvest	104.8	69.8	8.1	18.6
Other	337.9	101.3	26.0	27.0
Total	1,300.0	375.4	100	100

Source: Compiled by authors from ASTI survey data (IFPRI-BARC 2003-04).

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

CONCLUSION

Overarching responsibility for the coordination of public agricultural research in Bangladesh lies with BARC, which is responsible for planning, integration, implementation, and evaluation of research.

Like many other low-income countries, Bangladesh's agricultural research capacity has deteriorated in terms of researcher numbers and researcher qualifications as the more qualified and experienced researchers are drawn away by opportunities abroad. Despite this brain-drain, Bangladesh still has a high share of MSc- and PhD-trained research staff compared with surrounding countries like Sri Lanka and Malaysia.

Agricultural research has depended on donor funding, especially through various World Bank credit, which enabled Bangladesh to make considerable investments in its infrastructure and equipment. Nevertheless, and despite increases in recent years, the intensity of the country's agricultural research investments remains low. A primary goal of the most recent World Bank project was to improve the efficiency of the agricultural research system, but the wide-ranging institutional reform necessary for the successful achievement of this goal did not occur. BARC still has no control over the allocation of financial resources at the institutes it oversees since these are administered by four different government ministries and have individual, legally enacted management boards. In addition, the efficiency of the system continues to be poor because of its large number of, often overlapping, research stations and substations, each with its own management and support facilities. This has been recognized as an ongoing problem requiring attention, and plans to address the issue are in development.

NOTES:

1. The authors are grateful to various colleagues in Bangladesh for their assistance in data collection, and thank Nurul Alam, N. Bhyuiyan, Anwar Iqbal, Harun Rashid, and Gert-Jan Stads for useful comments on previous drafts of this brief.
2. The 40-agency sample consisted of:
 - Eleven government agencies affiliated with the Bangladesh Agricultural Research Council (BARC)—BARC headquarters; the Bangladesh Fisheries Research Institute (FRI); the Bangladesh Institute of Nuclear Agriculture (BINA); the Bangladesh Forest Research Institute (BFRI); the Bangladesh Agricultural Research Institute (BARI); the Bangladesh Sugarcane Research Institute (BSRI); the Soil Resource Development Institute (SRDI); the Bangladesh Rice Research Institute (BRRI); the Bangladesh Livestock Research Institute (BLRI); the Bangladesh Jute Research Institute (BJRI); and the Bangladesh Tea Research Institute (BTRI);
 - Four government agencies under the Bangladesh Council of Scientific and Industrial Research (BCSIR)—the Institute of Food Science and Technology (IFST); Dhaka Laboratories; Chittagong Laboratories; and Rajshahi Laboratories;
 - Six other government agencies—the Bangladesh Sericulture Research and Training Institute (BSRTI); the Institute of Food and Radiation Biology (IFRB); the Rural Development Academy (RDA); the Bangladesh Institute of Development Studies (BIDS); the Bangladesh Academy of Rural Development, Comilla (BARD); and the Cotton Development Board (CDB);
 - Seven units under the Bangladesh Agricultural University (BAU)—the Faculty of Animal Husbandry, the Faculty of Agriculture, the Faculty of Agricultural Economics and Rural Sociology, the Faculty of Agricultural Engineering and Technology, the Faculty of Fisheries, the Faculty of Veterinary Science, and the Research System Unit
 - Four units of Dhaka University—the Department of Botany; the Institute of Nutrition and Food Science; the Department of Soil, Water, and the Environment; and the Department of Aquaculture and Fisheries;
 - Six other higher education agencies—Shere-e-Bangla Agricultural University (SAU); Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU); the Institute of Biological Sciences of Rajshahi University; the Institute of Marine Sciences of the University of Chittagong; and the Bangladesh University of Engineering and Technology (BUET)'s Department of Water Resources Engineering and Institute of Flood Water Management;
 - Two private enterprises—East–West Seed Ltd. and British–American Tobacco.

This sample excludes one government agency involved in agricultural research for which we were unable to obtain data: the Irradiation and Pest Control Research Center (IPCRC).
3. With the inclusion of IPCRC, which reportedly conducts minimal agricultural research, these totals would be slightly higher.
4. Unless otherwise stated, all data on research expenditures are reported in 2000 international dollars or in 2000 takas.
5. In contrast, the agricultural research councils in India, Pakistan, and Nepal, have general council acts that apply to all affiliated institutes. Similarly, there is a uniform service rule for the scientists of all institutes that govern the service of the institutes
6. These are the Tuber Crops Research Centre, the Oilseed Research Centre, the Horticulture Research Centre, the Wheat Research Centre, the Pulses Research Centre, and the Spices Research Centre.
7. The intensity ratio mostly reported in Bangladesh is the ratio of total spending by the BARC-affiliated institutes over AgGDP (about 0.20); this study includes all 40 agencies that are involved in agricultural R&D, giving rise to a much higher intensity ratio.
8. During the 1990s, another large project—the Bangladesh Agriculture Support Services Project (ASSP), which ran from 1992 to 1999—was funded by a World Bank loan of US\$35 million. The main objective of ASSP was to increase agricultural production, particularly on food grains, and support the introduction of high-value export crops such as horticulture (World Bank 2003).

METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI and BARC 2003-04).
- The data were compiled using internationally accepted statistical procedures and definitions developed by the OECD and UNESCO for compiling R&D statistics (OECD 2002; UNESCO 1984). The authors 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. The researchers 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 2000 international dollars by deflating current local currency units with a Bangladesh GDP deflator of base year 2000 and then converting to U.S. dollars with a 2000 purchasing power parity (PPP) index, both taken from World Bank (2005). 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.
- Annual growth rates were calculated using the least-squares regression method, which takes into account all observations in a period. This results in growth rates that reflect general trends that are not disproportionately influenced by exceptional values, especially at the end point of the period.

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

REFERENCES

- ACU (Association of Commonwealth Universities). Various years. *Commonwealth universities yearbook: A directory to the universities of the British Commonwealth and the handbook of their organisation*. London.
- Ahmed, R., and Z. Karim. 2006. Agricultural R&D policy in Bangladesh: Uncertain prospects. In *Agricultural R&D in the developing world: Too little, too late?* P. G. Pardey, J. M. Alston, and R. R. Piggott, eds. Washington, D.C.: International Food Policy Research Institute. (forthcoming)
- BARC (Bangladesh Agricultural Research Council). 2001. *Bangladesh Agricultural Research Council: National coordination institution for the national agricultural research system in Bangladesh*. Dhaka.
- BARI (Bangladesh Agricultural Research Institute). 2001. *BARI*. Joydebpur, Bangladesh.
- BAU (Bangladesh Agricultural University). 1999. *An Introduction*. Mymensingh, Bangladesh.
- BCSIR (Bangladesh Council of Scientific and Industrial Research). 2002. *BCSIR R&D overview*. Dhaka.
- East West Seed. 2005. About us. <<http://www.eastwestseed.com/>> (accessed July 2005).
- Beintema, N. M., and G. J. Stads. 2006. Agricultural R&D in Sub-Saharan Africa: An era of stagnation. Washington, D.C.: IFPRI. (forthcoming)
- FAO (Food and Agriculture Organization of the United Nations). 2005. FAOSTAT. <<http://faostat.fao.org/default>> (accessed April 2005).
- IFPRI–BARC (International Food Policy Research Institute and Bangladesh Agricultural Research Council). 2003–04. Agricultural Science and Technology Indicators survey for Asia-Pacific. Unpublished surveys. IFPRI, Washington, D.C.
- Jabbar, M. A., and M. Zainul Abedin. 1989. *Bangladesh: The evolution and significance of on-farm and farming systems research in the Bangladesh Agricultural Research Institute*. OFCOR Case Study No. 3. The Hague: ISNAR.
- Karim, Z. 1999. Country status report: Bangladesh. In *National agricultural research systems in the Asia-Pacific Region: A perspective*, Asia-Pacific Association of Agricultural Research Institutions, ed. Bangkok: FAO Regional Office for Asia and the Pacific.
- OECD (Organisation for Economic Co-Operation and Development). 2002. *Frascati manual: Proposed standard practice for surveys on research and experimental development*. Paris.
- Pardey, P. G., N. M. Beintema, S. Dehmer, and S. Wood. 2006. *Agricultural research: A growing global divide?* IFPRI Food Policy Report Washington, DC: International Food Policy Research Institute (forthcoming).
- Stads, G. J., A. Tawang, and N. M. Beintema. 2005a. *Malaysia*. ASTI Country Brief No. 30. Washington, D.C.: International Food Policy Research Institute and Malaysian Agricultural Research Development Institute.
- Stads, G. J., H. P. M. Gunasena, and W. Herath. 2005b. *Sri Lanka*. ASTI Country Brief No. 32. Washington, D.C.: International Food Policy Research Institute and Sri Lanka Council for Agricultural Research Policy.
- 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.
- West, G. 2002. Food and agriculture in Bangladesh: A success story. *Economic Perspectives* 7 (2): 14–16.
- World Bank. 1984. *Project appraisal report: Bangladesh Agricultural Research II Project*. No. 4520-BD. Washington, D.C.: World Bank.
- _____. 1996. *Project appraisal report: Bangladesh Agricultural Research Management Project*. Report No. 14467-BD. Washington, D.C.: World Bank.
- _____. 2003. *Project performance assessment report: Bangladesh Agricultural Support Services Project (credit 2233-BD) and Agricultural Research Management Project (credit 2815-BD)*. Report No. 25895. Washington, D.C.: World Bank.
- _____. 2005. *World development indicators Online*. Washington, D.C.: World Bank (accessed July 2005).

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