

BRAZIL

NEW DEVELOPMENTS IN THE ORGANIZATION AND FUNDING OF PUBLIC AGRICULTURAL RESEARCH

Nienke Beintema, Flavio Avila, and Cristina Fachini

Country Note • October 2010

This country note provides an overview of the major investment and capacity trends in public agricultural research in Brazil since the early 1980s, with a particular focus on the Brazilian Agricultural Research Corporation (Embrapa) and the São Paulo Agency for Agribusiness Technology (APTA). The note provides important updates on trends in the organization, funding, and capacity of Brazil's public agricultural research previously published by Beintema, Avila, and Pardey (2001).

INSTITUTIONAL COMPOSITION

Brazil has one of the most well-developed and well-funded agricultural research systems in the developing world, ranking third in terms of public agricultural research and development (R&D) investments after China and India. The organization of agricultural R&D in Brazil is complex, not only because of its size and the number of agencies involved, but also because of the dual role of the federal and state governments. In 2006, Brazil spent 1.8 billion reais or 1.3 billion PPP dollars on agricultural R&D (both in 2005 constant prices), and human resource capacity in public agricultural R&D totaled 5,376 full-time equivalent (FTE) researchers (Table 1). Note that unless otherwise stated, all dollar values in this note are based on purchasing power parity (PPP) exchange rates.¹ PPPs reflect the purchasing power of currencies more effectively than do standard exchange rates because they compare the prices of a broader range of local—as opposed to internationally traded—goods and services. (For more information, see ASTI's website at www.asti.cgiar.org.)

Established in 1972 as a semiautonomous body under the Ministry of Agriculture, Livestock, and Food Supply (MAPA), Embrapa forms the foundation of Brazil's agricultural research system. Its status as a corporation was intended to promote more flexibility in terms of management and funding mechanisms, but in practice this independence has been eroded over time. In 2006, the corporation accounted for an estimated 57 percent of the country's public agricultural R&D spending and 42 percent of its research staff (Table 1). Embrapa conducts applied research following national priorities. As of early 2010, it comprised 15 central units and 42 research centers located across the country. The agency's most recent additions are the Agroenergy Center (established in 2008) and four other centers; the Strategic Studies and Capacity Strengthening, Embrapa Mato Grosso, Fishery, Aquaculture and Agricultural Systems, and Palms and Flooded

Key Trends

- Brazil ranks third in the developing world in terms of public agricultural research and development (R&D) investments after China and India.
- After a period of stable or declining expenditure levels, total public agricultural R&D spending has increased substantially in recent years due to the Brazilian federal government's renewed commitment to agricultural R&D.
- As a result the Brazilian Agricultural Research Corporation (Embrapa), the country's main agricultural research agency, saw its spending levels increase by 28 percent during 2009. Embrapa's total staff is expected to increase by more than 1,200.
- Brazil's state government research agencies have not been funded as well as Embrapa, but the agencies are expected to benefit from the intended increased federal support that includes funds for improving research performance at the state level.
- Embrapa is also increasing its international collaborations, particularly in North America, Western Europe, and a large number of developing countries in South and Central America and Africa.

Plains (created in 2009). These additions were prompted by the Federal Government through the Program for Strengthening Growth (PAC).

The activities undertaken by Embrapa are complemented by a network of agricultural research agencies in 17 of the country's 26 states, whose activities focus on applied research addressing state priorities. In 2006, these 17 agencies accounted for a combined total of 21 percent of spending and 37 percent of staffing in public agricultural research. Agricultural research in São Paulo, the largest of the 17 states with agricultural research facilities, is conducted by APTA, a state government agency under the Secretary of Agriculture. The research system of São Paulo is the country's oldest. The Agronomic Institute (IAC) and the Biological Institute (IB) were established in 1887 and 1927, respectively, while the remaining four institutes were

Table 1—Institutional composition of public agricultural R&D spending and staffing, 2006

Type of agency	Total spending			Total staffing	
	Reais	PPP dollars	Share	Number	Share
	(million 2005 prices)		(%)	(FTEs)	(%)
Embrapa (1)	1,013.2	746.8	57	2,215.0	41
APTA (7)	123.1	90.7	7	871.0	16
Other state government (15)	256.2	188.8	14	1,169.6	22
Other government and nonprofit (6)	90.5	66.7	5	239.9	4
Higher education (estimated)	290.3	213.9	16	879.9	16
Total (estimated)	1,773.2	1,307.0	100	5,375.5	100

Sources: Compiled by authors from Beintema, Avila, and Pardey (2001) and data provided by Embrapa, APTA, and surveys of a large number of state and other government agencies and nonprofit institutions.

Notes: A list of all agencies is available at <<http://www.asti.cgiar.org/brazil>>. Figures in parentheses indicate the number of agencies in each category. Actual data for the higher education sector were unavailable, so these totals were estimated using 1996 shares of FTE researchers and spending in the higher education sector from Beintema, Avila, and Pardey (2001). Overall totals are higher than those presented in Stads and Beintema (2009) due to improved data coverage for the state government agencies.

established in the 1960s. APTA was established in 2002 in an effort to increase the flexibility of management practices and attract private funding. At this time, the system was reorganized by region and research focus. APTA comprises six research departments, which were separate institutes prior to 2002: IAC, IB, Zootechnical Institute (IZ), Fisheries Institute (IP), Agricultural Economics Institute (IEA), and Food Technology Institute (ITAL). In addition, APTA has one regional research department comprising a network of 15 regional centers.

The remaining 16 states each have one government agency involved in agricultural research. After São Paulo, the larger of the state research agencies—employing between 100 and 200 FTE researchers—are the Agricultural Research and Rural Extension Corporation of the State of Santa Catarina (EPAGRI), the Agriculture and Livestock Research Corporation of the State of Minas Gerais (EPAMIG), the State Agricultural Research Foundation (FEPAGRO), which is located in Rio Grande do Sul, and the Agronomic Institute of the State of Paraná (IAPAR). Rather than conducting their own research (which would be prohibitively expensive), most of the other state-based agricultural research agencies adapt and validate technologies developed by other organizations based either in Brazil or abroad. Research and extension agencies in several states were merged in the late 1990s and emphasize extension activities rather than research. During the 1990s, the Council of State Organizations for Agricultural Research (CONSEPA) was created by the state agencies to facilitate research coordination and to lobby the state and federal governments for greater support.

Brazil is the largest coffee and sugarcane producer in the world, and the second-largest producer of soybeans (following the United States). Other important cash crops are cocoa and citrus fruits. Research on these crops is organized in a variety of ways:

- Sugarcane research is conducted by a nonprofit organization, the Technological Sugarcane Center (CTC), which has become a world leader, not least because of its pioneering investigations into genetically modified sugarcane varieties. CTC was previously part of the Cooperative for Sugarcane, Sugar, and Alcohol Producers of the State of São Paulo (COPERSUCAR) but now has greater autonomy and is part of a large network of research centers and private laboratories, including an important germplasm bank. Embrapa has also increased its sugarcane research through the establishment of the aforementioned Agroenergy Center, which focuses on researching the use of sugarcane for fuel.
- Citrus research is conducted by the Fund for Citrus Plant Protection (FUNDECITRUS), which is financed through a tax on citrus production. FUNDECITRUS funds citrus research conducted by various Brazilian research agencies, but it also conducts its own research at the Citrus Research Center. IAC in São Paulo conducts citrus research as well.
- Cocoa research is conducted by the Research Center for Cocoa (CEPEC) under the Executive Commission for the Renewal of Cocoa Crop (CEPLAC), which is in turn administered by MAPA and is currently being restructured.
- In 1997, the country’s 10 traditional coffee research agencies established the Consortium of National Research and Development of Coffee (PNP&D Café) as the scientific and research arm of the Advisory Board for Coffee Policy (CDPC), established in 1996. In 1999 Embrapa created the Office of Program for Coffee Support (SAPC) to coordinate PNP&D Café’s technical activities. SAPC involves a network of more than 40 research, extension, and higher education institutions that focus on coffee, as well as representatives from agribusiness.

In addition to FUNDECITRUS, COPERSUGAR, and CEPLAC, a few other federal government agencies and nonprofit institutions are engaged in agricultural research. (For more information, see www.asti.cgiar.org/brazil.)

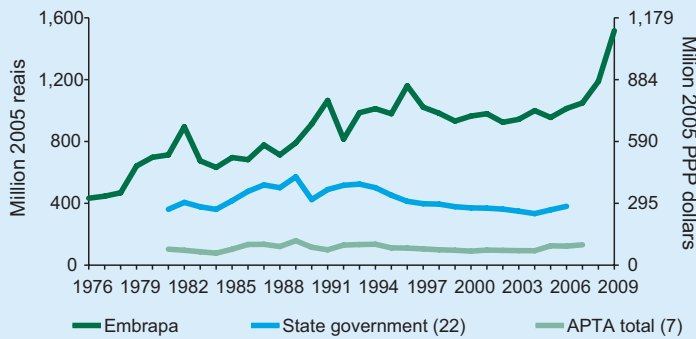
Beintema, Avila, and Pardey (2001) reported more than 100 faculties and schools in Brazil engaged in agricultural research. Unfortunately, only a few of these entities provided data for the current study. Staffing levels at the agencies that did provide data were comparable with the 1996 levels reported in the 2001 study, so we estimated current levels in the higher education sector based on those levels (that is, an average of 16 percent of both national spending and staffing based on FTE researchers). Given the limited up-to-date information on the higher education sector’s involvement in agricultural research, the remainder of this note focuses on recent developments at Embrapa and the state government agencies, particularly in São Paulo.

HUMAN AND FINANCIAL RESOURCES

Long-Term Trends

From its establishment in 1972 until the mid-1990s, Embrapa’s total spending increased substantially, peaking in 1996 at 1.2 billion reais compared with 0.7 billion in 1981 (in 2005 constant

Figure 1—Composition of public agricultural research spending, 1976–2009

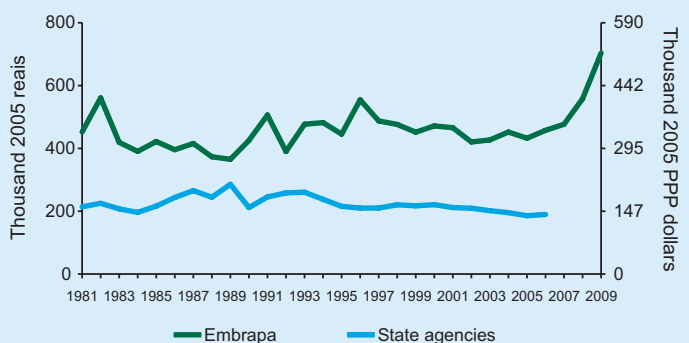


Sources and notes: See Table 1.

prices; Figure 1). Yearly spending was erratic, nevertheless, featuring significant declines in 1983 and 1992. During the second half of the 1990s, total spending contracted to an average yearly rate of 2.8 percent growth. After 2001, despite yearly fluctuations, spending remained fairly constant on average. But since 2008 total spending levels have increased substantially as a result of increased budget allocations. Total spending that year, adjusted for inflation, was very similar to the levels reported during the 1996 peak. In 2009, Embrapa's spending increased by 28 percent, totaling 1.5 billion reais or 1.1 billion PPP dollars, in 2005 prices.

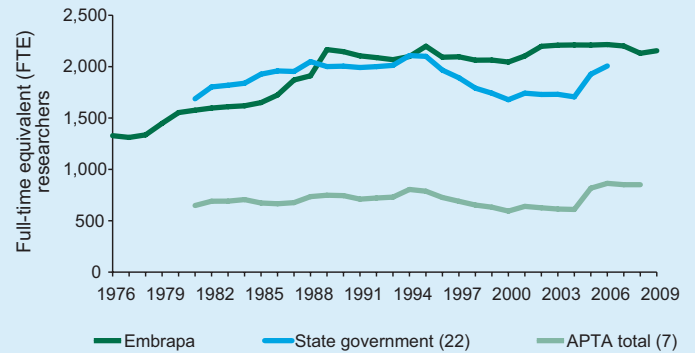
The state government agencies also experienced funding increases during the 1980s, resulting in combined spending growth of 3.5 percent per year. Thereafter, total spending by the state government agencies declined from slightly above 500 million reais in the early 1990s to 333 million reais (in 2005 prices) in 2004. This decline was the combined result of the closure of a few state agencies, the merger of others with their respective state agricultural extension agencies, and reduced government support overall. During 2004–06 total spending rebounded somewhat, mainly due to increased spending by APTA. On the whole, Embrapa reported a significantly higher rate of spending growth during 1981–2006 compared with the combined

Figure 3—Expenditures per researcher, 1981–2009



Sources and notes: See Table 1.

Figure 2—Composition of public agricultural research staff, 1976–2009



Sources and notes: See Table 1.

spending of the state agencies. As a result, Embrapa's spending grew from 1.9 times higher than the state agencies in the early 1980s to 2.7 times higher during 2001–06.

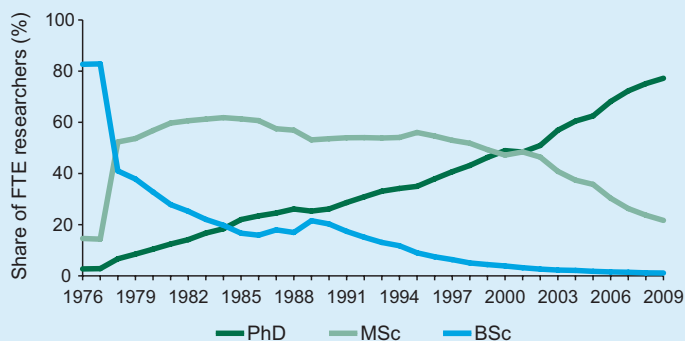
Concurrently with Embrapa's increased spending in the 1970s and 1980s, its research staffing levels also increased considerably. After 1989, however—again, mirroring spending patterns—growth stagnated (Figure 2). Understandably, until the mid-1980s, combined staffing levels at the long-established state agencies surpassed those of Embrapa. The trend was then reversed from the mid-1990s onward. Total FTE researcher numbers in the state government sector declined from over 2,000 in the mid-1990s to less than 1,700 in the early 2000s, although in recent years this number has expanded somewhat, mostly due to increased research staffing in São Paulo. Given that Embrapa's overall funding levels are significantly higher than those of the state agencies (combined), its spending per researcher level is also about twice as high (Figure 3).

Human Resource Development

Brazil's agricultural research staff comprises a relatively higher number of PhD- and MSc-qualified researchers compared with other Latin American countries. In 2008, for example, 24 percent of Brazil's research staff were trained to the MSc level, and 75 percent held PhD degrees (Figure 4). In 2008, 60 and 28 percent of the research staff at the APTA agencies were trained to the MSc and PhD degree levels, respectively (Figure 5). Around 12 percent of Embrapa's PhD-qualified researchers also received postdoctoral training. In comparison, 24 and 31 percent of the researchers in a sample of 14 Latin American countries (including Brazil) held PhD and MSc degrees, respectively, and the next country with the most highly qualified agricultural research staff was Mexico, which in 2006 reported PhD and MSc shares of 38 and 40 percent, respectively (Stads and Beintema 2009).

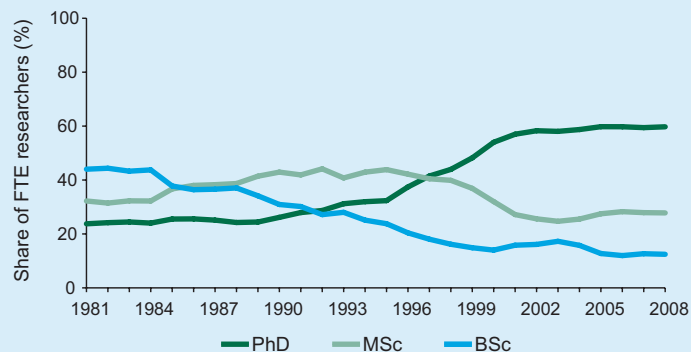
The current picture represents a significant shift from the situation in Brazil several decades ago. In 1976 only 3 percent of all Embrapa's researchers held PhD degrees, increasing to 12 percent in 1981, 29 percent in 1991, and 48 percent in 2001. In 2009, more than three-quarters of Embrapa's researchers were trained to the PhD level, 22 percent held MSc degrees, and only 1 percent held BSc degrees. Note, however, that these data exclude technicians or other support staff with BSc or higher degrees.

Figure 4—Distribution of Embrapa researchers by degree level, 1976–2009



Source: Compiled by authors from data provided by Embrapa.

Figure 5—Distribution of APTA researchers by degree, 1981–2008



Source: Compiled by authors from data provided by APTA.

Consistent growth in the number of PhD- and MSc-qualified researchers at Embrapa was the result of substantial investments in training. In addition, the agency received considerable financial support from the Inter-American Development Bank and the World Bank (through their respective loans). Beintema, Avila, and Pardey (2001) report that, during the period 1996–98, 144 researchers were undertaking MSc, PhD, or postgraduate training each year.

Brazilian universities began offering postgraduate courses much earlier than other Latin American countries. As a result, most Embrapa researchers obtained their MSc degrees at Brazilian universities during the 1980s and 1990s, whereas about half of them obtained their PhD degrees abroad (Beintema, Avila, and Pardey 2001). This trend has changed in recent years because the majority of researchers hired by Embrapa have already obtained PhD degrees. Most researchers that go abroad to study undertake postdoctoral training.

The share of PhD-qualified research staff also increased substantially in São Paulo, but at a slower pace. The share remained fairly constant during 1981–90, fluctuating between 24 and 26 percent, but it increased considerably during the 1990s, reaching 57 percent in 2001. In 2008, 60 percent of APTA’s researchers held PhD degrees, while 28 and 12 percent were trained to the MSc and BSc levels, respectively. Given that Brazilian universities now offer PhD programs, no incentive programs have promoted training abroad since the 1990s (other than for postdoctoral training). Like Embrapa, APTA predominantly hires PhD-qualified staff, which will hopefully increase its share of well-qualified staff in the years to come (depending on staff retirement and departure rates).

Funding Sources and Mechanisms

Embrapa is primarily funded by the federal government (Figure 6). During 2000–07, close to 90 percent of Embrapa’s funding was provided through direct government allocations, 4 percent was generated through the sale of products and services (that is, seed, royalties, and research contracts with private and public organizations), and 2 percent was derived from other external sources. In addition to this direct funding, Embrapa receives indirect funding from partners in agricultural research and

technology transfer activities. These include funds for scholarships (MSc, PhD, and postdoctoral) directly from funding organizations at the federal level—such as the National Council of Technological and Scientific Development (CNPq) and Coordination of Improvement of Higher Education Personnel (CAPES)—and at the state level—such as the Science and Technology Fund Foundation. The remainder of the indirect funds comes from the private sector assigned to cover the costs of technology transfer events, publications, and also include some donations. Embrapa’s overall level of indirect funding averaged 3–4 percent in the late-1990s and increased to around 4–6 percent during 2000–09.

Since its inception, Embrapa has received four loans from the IDB and four from the World Bank. With the exception of the last two loans—Prodetab (World Bank) and Agrofuturo (IDB)—the funding was used to improve Embrapa’s infrastructure and train its research staff. The World Bank’s fourth loan, which began in 1996, was the first to support competitive funding of research projects proposed by Embrapa centers and its partners (state organizations, universities, and so on). The IDB’s fourth loan, which began in 2006, is valued at US\$60 million and targets research, infrastructure, and training and includes US\$27 million in counterpart funding from the Brazilian government. This loan also has a competitive research fund of \$14 million, but it only applies to research projects led by Embrapa research centers. This loan is scheduled for completion in 2011 and is currently being restructured based on a recent mid-term evaluation (Silva 2009).

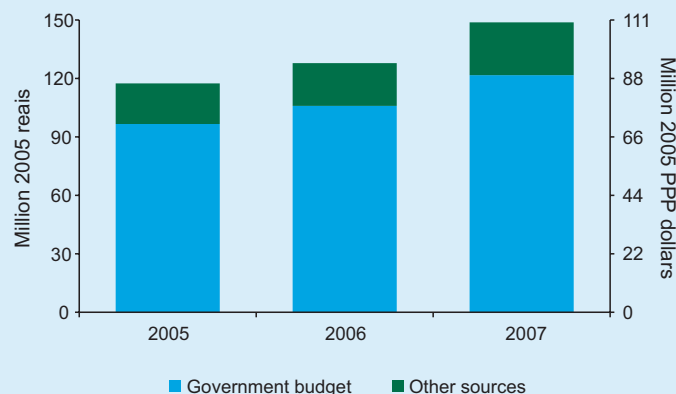
During 2005–08, more than 80 percent of APTA’s funding was received through direct government allocations. The remainder of the funding was derived through federal and local government funding agencies, private donors, nongovernmental organizations (NGOs), and international donors. The most important of these external sources is the São Paulo Research Support Foundation (FAPESP), which provides competitive funding for research grants and fellowships and is itself funded through a 1 percent levy of the state’s tax revenues. APTA also receives funds from two private foundations in São Paulo, the Foundation for Agricultural Research Support (FUNDAG) and the Foundation for Agricultural Development and Research (FUNDEPAG) (Beintema, Avila, and Pardey 2001).

Figure 6—Embrapa's funding sources, 2000–09



Source : Compiled by authors from data provided by Embrapa.

Figure 7—APTA's funding sources, 2005–07



Source: Compiled by authors from data provided by APTA.

NEW DEVELOPMENTS IN PUBLIC AGRICULTURAL RESEARCH

Revitalizing the R&D System

Since the mid-2000s, Embrapa has modified its operations to ensure that Brazilian agricultural research remains on the cutting edge of new knowledge and generates appropriate technologies in response to consumer and producer demands (Embrapa 2007). Embrapa is establishing new research units, developing international partnerships, and assisting the state research agencies in revitalizing their research capacities. It is also strengthening its technology transfer activities, an initiative made possible by strong financial support from the federal government through the aforementioned PAC, a program that runs from 2008 to 2011 and involves infrastructure investments across the country following a number of strategic priorities (Embrapa 2009).

For Embrapa, the PAC component involves a new portfolio of research projects, institutional innovation, and governance, as well as the revitalization and modernization of the agency's intellectual capacity and infrastructure, which has eroded over time due to declining financial support. For the state agencies, PAC resources will enable the laboratories and experiment fields to be modernized and new vehicles, machinery, and agricultural equipment to be purchased.

Embrapa's 2008–10 funding of 650 million reais (around US\$350 million) under PAC will contribute to the agency's strategic plan for 2008–23 and allow it to surpass funding levels recorded in the mid-1990s. Embrapa will increase its overall staff numbers by 1,211, at least one-third of which will be either MSc- or PhD-qualified. The PAC also included the creation of four new research centers as indicated earlier.

Another activity under PAC is a review of Embrapa's institutional and governance models, with a view of enhancing Embrapa's ability to respond to changing circumstances. Given Embrapa's important role in Brazil's international cooperation policy, funds will also be provided to strengthen the agency's international outreach, specifically relating to tropical agriculture in Africa and Latin America.

In 2006, the Center for Management and Strategic Studies (CGEE), which is linked to the Ministry of Science and Technology, prepared a study identifying the main weaknesses of the state agricultural research agencies (CGEE 2006). The study led to the federal government's decision to allocate 263 million reais (around US\$140 million) under PAC—which is managed by Embrapa—to the strengthening of the infrastructure of the state organizations during 2008–10. In addition, CGEE developed a plan in collaboration with CONSEPA to implement a strategic program within each state agency (CGEE 2009). Each of the 17 states linked to CONSEPA prepared a strategic program under a standard framework provided by CGEE. This program will give state organizations a means of restructuring the agency's management system and enhancing research quality in the medium- and long-term. Given these two important federal government initiatives, real improvement in the performance of agricultural R&D is expected.

Building Embrapa's International Partnerships

Agribusiness, particularly agricultural production, has provided an important stimulus to economic development of Brazil. An estimated 85 percent of advances in agriculture and related sciences are generated in North America, Western Europe, and Asia. Not only is the adoption of this knowledge essential, the generation of new innovations for tropical agriculture is also important for the sustained competitiveness of the Brazilian agribusiness sector.

In addition to traditional forms of knowledge sharing like training programs and specialized consultancies, virtual laboratories (called Labex) were established abroad to expedite and intensify scientific cooperation with developed countries and maintain an open channel for information flows. The first laboratory, Labex United States, was established in 1998 via an agreement with the Agricultural Research Service (ARS) of the United States Department of Agriculture (USDA). Labex Europe was created in 2002 via an agreement with Foundation Agropolis in Montpellier, France. Labex Europe was soon expanded to include a branch at the University of Wageningen, the

Netherlands, and, as of mid 2010, another branch in Rothamsted, England, is in development. In 2009, Labex Korea was established in cooperation with the Rural Development Administration (RDA) of South Korea. The main objectives of these virtual laboratories are to build connectivity with international research networks and increase Embrapa's international visibility and research quality. Additional benefits are greater numbers of international publications by Embrapa's researchers and significantly higher funding for international projects.

Embrapa carries out several cooperation projects in South American and African countries with the aim of providing support to agricultural research, technology transfer and capacity building. Embrapa's office for the Americas is located in Panama; it also operates an office in Venezuela to support a bilateral cooperation project. Embrapa established an office in Accra in 2007 as the focus of its Africa-based activities. One of the main projects currently in progress offers assistance to the Angolan government's structuring of an R&D institution based on Embrapa. Another relevant project in Africa in partnership with the Brazilian Cooperation Agency (ABC) supports cotton production in Benin, Burkina-Faso, Chad, and Mali. Furthermore, to maximize results in Africa, Embrapa is negotiating tripartite projects involving both African and developed countries.

Performance Evaluation and Award System

In 1996, Embrapa conceptualized, developed, and adopted a results-based performance evaluation and awards system (Embrapa 1996). This system integrates institutional, team, and individual goals using evaluation targets based on criteria and indicators negotiated between the Embrapa board and its centralized and decentralized units (research centers and services). The awards system makes a clear distinction between regular individual wage increases resulting from promotions, which are permanently incorporated into the salaries, and results-based bonuses given to the depending on their yearly performance, which are not necessarily repeated in the following year. The program aims to increase productivity and fulfill the institutional mission of generating and disseminating technologies to Brazil's agricultural sector. At the same time, it rewards the research centers, teams, and individual staff members, and motivates them as they face new challenges (Portugal et al. 1999). Recent analysis by Avila et al. (2008) indicates that the performance of Embrapa's research centers improved during 1996–2007 across all of the system's criteria (efficacy, efficiency, impact assessment, management, partnership, and funding). The system's success is evident in the fact that the Performance Measurement System of the Consultative Group on International Agricultural Research (CGIAR), which has been adopted over the past five years, was largely modeled after it (CGIAR 2010).

BRAZIL'S AGRICULTURAL R&D INVESTMENT IN A GLOBAL CONTEXT

The latest available data on public agricultural R&D investments for 2000 indicate a global total of approximately 25.1 billion 2005 PPP dollars (Table 2). Of this amount, 13.5 billion was spent in 40 high-income countries (53 percent), 9.1 billion was spent in 82 middle-income countries (36 percent), and 2.6 billion in 49 low-

income countries (11 percent). Although the high-income countries increased their public agricultural R&D spending in absolute terms, their share of the global spending decreased by 4 percent (Beintema and Stads 2010). Public agricultural research has become increasingly concentrated in just a handful of countries, especially for research targeting the developing world (defined here as low- and middle-income countries).

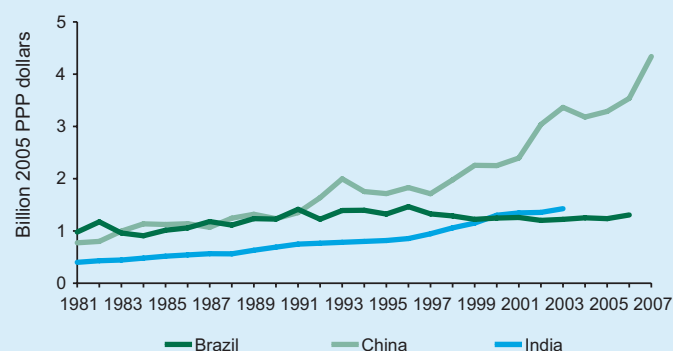
Brazil, China, and India accounted for 41 percent of total spending on agricultural R&D in developing countries in 2000 compared with 35 percent in 1981 (excluding Eastern Europe and Former Soviet States for which no 1981 data were available). Brazil experienced negative annual growth during the 1990s (–1 percent), whereas China and India reported growth of 4 and 6 percent per year, respectively. New evidence shows that growth

Table 2—Public agricultural R&D spending by region and major countries, 2000

Country category	Spending (million 2005 PPP dollars)	Shares (%)
A. Country grouping by income class		
Low-income countries (49)	2,646	11
Middle-income countries (82)	9,056	36
High-income countries (40)	13,456	53
Total (171)	25,158	100
B. Low- and middle-income countries by region		
Sub-Saharan Africa (45)	1,239	5
China	2,250	9
India	1,301	5
Asia–Pacific (26)	5,120	20
Brazil	1,247	5
Latin America and the Caribbean (25)	2,755	11
West Asia and North Africa (12)	1,412	6
Eastern Europe and Former Soviet States (23)	1,177	5
Subtotal (133)	11,702	47

Sources: Calculated from ASTI datasets and a number of secondary sources as published in Beintema and Stads (2010).

Figure 8—Public agricultural R&D spending Brazil, China and India, 1981–2007



Source: Beintema and Stads (2010).

continued in the 2000s in India and China (Figure 8) as well as Brazil in more recent years, as demonstrated in this country note. In 1981, Brazil's public agricultural R&D spending was higher than levels in either China or India. China surpassed Brazil's spending levels in the early 1990s and close to tripled Brazil's spending by 2006, the last year for which data for Brazil as a whole are available. India surpassed Brazil's spending in the early 2000s, and despite Brazil's recent increase in public agricultural R&D funding, India's levels are expected to remain above those of Brazil. Nevertheless, given the large disparities in population and agricultural employment, Brazil is spending 20 times more per agricultural worker.

CONCLUSION

Many developing and developed countries are experiencing stagnant and even declining investment in public agricultural research. Expenditure is increasing in only a few of the larger and often more advanced developing countries. Brazil ranks third in the developing world in terms of public agricultural R&D investments after China and India. After a period of stable or declining expenditure levels, total public agricultural R&D spending has increased substantially in recent years due to renewed commitment to agricultural R&D on the part of the Brazilian government. Embrapa's 2009 spending, for example, was 28 percent higher than its 2008 spending (adjusted for inflation), its highest level, since inauguration. Historically, Embrapa has been better funded than Brazil's state government agencies, but the state centers are expected to benefit from increased federal support intended to revitalize Brazil's agricultural research system and improve performance at the state level.

Embrapa has undergone restructuring to ensure that the country's agricultural sector remains competitive. Modifications include enhancing human and institutional capacities, improving institutional structures, and strengthening the performance and evaluation system. Embrapa is also increasing its international collaborations, particularly in North America, Western Europe, and a large number of developing countries in South and Central America and Africa.

NOTE

¹ Financial data in constant 2005 US dollars are also accessible via ASTI's data tool, available at <<http://www.asti.cgiar.org/data>>.

REFERENCES

- Avila, A. F. D., E. G. Gomes, G. S. Souza, and L. Yeganiantz. 2008. Performance evaluation of Embrapa's research centers: Experience and learning processes. Paper presented at the international workshop "Methodological Innovations in Impact Assessment of Agricultural Research," Brasília, November 12–14.
- Beintema, N. M., and G. J. Stads. 2010. Public agricultural R&D investments and capacities in developing countries: Recent evidence for 2000 and beyond. ASTI background note prepared for the Global Conference on Agricultural Research for Development (GCARD), Montpellier, March 27–30, 2010. Washington, D.C.: International Food Policy Research Institute.
- Beintema, N. M., A.F.D. Avila, and P. G. Pardey. 2001. *Agricultural R&D in Brazil: Policy, investments, and institutional profile*. Washington, D.C.: IFPRI, Embrapa, and FONTAGRO.
- CGEE (Centro de Gestão e Estudos Estratégicos). 2006. *Estudo sobre o papel das Organizações Estaduais de Pesquisa Agropecuária: OEPAS*. Brasília.
- _____. 2009. *Organizações Estaduais de Pesquisa Agropecuária (OEPAS): Estruturando instrumentos de planejamento para a sua consolidação*. Brasília.
- Embrapa. Gabinete do Presidente. 1996. Boletim de Comunicações Administrativas. BCA - No. 59/96. Resolução Normativa Nº 50/96 - Manual do Sistema de Avaliação e Premiação por Resultados. EMBRAPA, Brasília, 1996.
- _____. 2007. *Tropical agriculture: Brazil building the future*. Brasília.
- Embrapa, Secretaria-Executiva do PAC 2009. *Embrapa: fortalecendo a pesquisa agropecuária nacional*. Brasília.
- Portugal, A. D., A. F. D. Avila, E. Contini, and G. S. E Souza. 1999. Sistema de avaliação e premiação por resultados. *Revista do Serviço Público*. Brasília: 49 (3): 59–83.
- Science Council of the CGIAR (Consultative Group for International Agricultural Research). 2010. *CGIAR performance measurement: Experience and lessons learnt from the past five years*. Rome.
- Silva, A.M.C. 2009. *Avaliação de Meio Termo do Programa de Inovação Tecnológica e Novas Formas de Gestão na Pesquisa Agropecuária (Agrofuturo)*. Campinas.
- Stads, G. J. and N. M. Beintema. 2009. *Public agricultural research in Latin America and the Caribbean: Investment and capacity trends*. ASTI Synthesis Report. Washington, D.C.: International Food Policy Research Institute and Inter-American Development Bank.
- World Bank. 2008. *World development indicators 2008*. Washington, D.C. CD-ROM.

IFPRI-ROME

Agricultural Science and Technology Indicators (ASTI) initiative
c/o ESA, Food and Agriculture Organization (FAO)
Viale delle Terme di Caracalla • 00153 Rome, Italy
Telephone: +39-06-570-53192 / 56334 • Skype: ifpriromeoffice
Fax: +39-06-570-55522 • Email: asti@cgiar.org
www.asti.cgiar.org



Facilitated by:

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
2033 K Street, NW • Washington, DC 20006-1002 USA
Tel: +1-202-862-5600 • Skype: ifprihomeoffice
Fax: +1-202-467-4439 • Email: ifpri@cgiar.org
www.ifpri.org

IFPRI is one of 15 agricultural research centers that receive their principal funding from governments, private foundations, and international and regional organizations, most of which are members of the Consultative Group on International Agricultural Research (www.cgiar.org).

Embrapa is the principal agricultural research agency in Brazil. The institute was established in 1973 and its mission is to provide feasible solutions for the sustainable development of the Brazilian agribusiness by generating, adapting and transferring knowledge and technology that benefits the Brazilian Society. To learn more about Embrapa visit <http://www.embrapa.br>.

The Agricultural Science and Technology Indicators (ASTI) initiative compiles, analyzes, and publishes data on institutional developments, investments, and human resources in agricultural R&D in low- and middle-income countries. The ASTI initiative is managed by the International Food Policy Research Institute (IFPRI) and involves collaborative alliances with many national and regional R&D agencies, as well as international institutions. The initiative, which is funded by the Bill & Melinda Gates Foundation with additional support from IFPRI, is widely recognized as the most authoritative source of information on the support for and structure of agricultural R&D worldwide. To learn more about the ASTI initiative visit www.asti.cgiar.org.

The authors thank the agricultural research agencies that participated in the ASTI–Embrapa survey, without whose commitment this country note would not have been possible. The authors also thank Federica Di Marcantonio and Michael Rahija for their research assistance and Kathleen Flaherty and Gert-Jan Stads for input and comments on a draft of the note. ASTI gratefully acknowledges the generous support from the Brazilian Agricultural Research Corporation and the Knowledge Partnership Korea Fund for Technology and Innovation (KPKF) through the Inter-American Development Bank (IDB).

Copyright © 2010 International Food Policy Research Institute and Empresa Brasileira de Pesquisa Agropecuária. Sections of this report may be reproduced without the express permission of, but with acknowledgement to, IFPRI and Embrapa. For permission to republish, contact ifpri-copyright@cgiar.org.

This Country Note has been prepared as an output for the ASTI initiative and has not been peer reviewed. Any opinions stated herein are those of the authors and do not necessarily reflect the policies or opinions of IFPRI or Embrapa.