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ARGENTINA

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Quantitative data are important in measuring, monitoring, and benchmarking the inputs, outputs, and performance of agricultural science and technology (S&T) systems. They are an indispensable tool when it comes to assessing the contribution of agricultural S&T to agricultural growth and, more generally, economic growth. S&T indicators assist research managers and policymakers in policy formulation and decision-making on strategic planning, priority setting, monitoring, and evaluation. They also provide information to government and other institutions (e.g., policy research institutes, universities, and the private sector) involved in the public debate on the state of agricultural S&T at national, regional, and international levels. This country brief reviews the major investment, capacity, and institutional trends in public agricultural research in Argentina since 1981, using data collected under the Agricultural Science and Technology Indicators (ASTI) initiative conducted by the International Food Policy Research Institute (IFPRI) and the National Institute of Agricultural Technology (INTA) in 2007-08.[1] It provides important updates on trends in Argentina's public agricultural research collected by the ASTI initiative during the mid-1990s.

INTRODUCTION

The Republic of Argentina is the world's eighth largest nation, covering an area of 2.8 million square kilometers. However, with a population of just 40 million, the country is relatively sparsely populated. Although it was one of the wealthiest countries in the world a century ago, Argentina suffered from recurring economic crises during most of the twentieth century and is now an upper-middle-income country. Its economy is Latin America's third largest, after Brazil's and Mexico's. Because of vast longitudinal and elevation amplitudes, Argentina is subject to a variety of climates, ranging from

Table 1 - Composition of public agricultural R&D expenditures and researchers, 2006

Type of agency	Total spending: 2005 Argentine pesos	Total spending: 2005 international dollars	Total researchers	Share: Spending	Share: Researchers	Agencies in sample[a]
	(millions)		*(FTE's)*	*(percentage)*		*(number)*
INTA	333.3	262.5	1,910.0	58.5	48.5	1
INIDEP	19.9	15.7	101.0	3.5	2.6	1
CONICET[b]	8.7	6.9	170.5	1.5	4.3	26
Higher education[c]	207.5	163.4	1,758.9	36.4	44.6	46
Total	**569.5**	**448.4**	**3,940.3**	**100**	**100**	**74**

Sources: Compiled by authors from survey data (IFPRI-INTA 2007-08) and CONICET (2009).

[a] See note 2 for a list of the 74 agencies included in the sample.
[b] Staff at the 26 CONICET agencies spent between 30 and 100 percent of their time on research, leading to 170.5 FTE researchers. Expenditures for CADIC, CENPAT, CITEFA-CIPEIN, IANIGLA, IBYF, INFIVE, INGEBI, PROPLAME-PRHIDEB, and IADIZA are estimates based on expenditures of the other CONICET agencies.
[c] Staff at the 46 higher education agencies spent between 10 and 75 percent of their time on research, leading to 1,758.9 FTE researchers. Expenditures for the higher education agencies are estimates based on average expenditures per researcher at the government agencies.

KEY TRENDS

- Total public agricultural R&D capacity in Argentina has rapidly increased since the country emerged from the 1999-2002 economic crisis.
- INTA's total number of research staff more than doubled during 2004-07, mainly due to a large influx of BSc holders.
- Total agricultural R&D spending in Argentina has also risen rapidly since the turn of the century, due mainly to increased investments by INTA.
- The national government funds the lion's share of agricultural R&D in Argentina, either through general appropriations, indirect IDB contributions, or through competitive funds.
- Argentina occupies top ranks among its Latin American counterparts when it comes to agricultural R&D spending as a percentage of agricultural GDP, research capacity per capita, and the share of female agricultural research staff.

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 Knowledge, Capacity and Innovation (KCI) 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 prívate 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's activities in Latin America was provided by the Inter-American Development Bank (IDB), the World Bank via the Consultative Group of International Agricultural Research (CGIAR), and the International Food Policy Research Institute (IFPRI).

the subtropical North to the subpolar South. The country is one of the largest agricultural producers in the world. Though the shares of industrial (28 percent) and services output (69 percent) are much higher than the share of the agricultural sector (3 percent), the latter accounted for close to one-third of all exports and employed 7 percent of the population (World Bank 2008). Around 10 percent of the country is cultivated, while about half of it is used for livestock grazing. Soy (and its byproducts) is the country's principal export crop, followed by cereals (wheat, maize, and sorghum) and fruits. Besides, Argentina is the world's fifth-largest wine producer and wine exports have risen steadily over the past decade. Argentineans are the world's leading per capita beef consumers. Close to 5 million tons of meat is produced in Argentina on an annual basis and beef and other meats are some of the most important agricultural export products of the country. Fisheries and logging each account for 2 percent of exports (INDEC 2009).

Increased investment in a competitive and more efficient Argentinean agricultural sector may result in higher income in the long run for the sector. It goes without saying that agricultural research and development (R&D) can play a tremendous role in this regard. R&D is key to improving agricultural productivity and has shown very high returns on investment in all regions across the world. Improved productivity and enhanced crop and livestock varieties can ultimately make Argentina more competitive in international markets as well as reduce rural poverty. A well-developed national agricultural research system and adequate levels of investments are important prerequisites in this regard.

SCIENCE AND TECHNOLOGY POLICY

In December 2007, the Argentinean Secretary for Science, Technology, and Innovation of Production (SECyT) was upgraded to the Ministry of Science, Technology, and Innovation of Production (MinCyT). The upgrading of SECYT to full ministerial rank underlines the great importance attributed to knowledge and innovation for Argentina's future. It is expected that national S&T policies will now be further developed. The new minister already indicated the intention to reorganize the country's currently fragmented S&T system by putting greater emphasis on multidisciplinarity and flagship initiatives that mobilize all stakeholders. The intention is to position Argentina in the high-value added segment of the global economy and thus invest heavily in the development of its S&T system while at the same time connecting it more strongly to the productive and service sectors. Argentina's S&T budget totaled US$3,007 million in 2008, which represents a 20 percent increase (in real terms) over the country's budget in 2007 (RICyT 2009). In February 2008, a new US$450 million plan to upgrade the country's research infrastructure was launched. Twenty institutes spread over the country are expected to benefit from this plan during 2008-12.

The Federal Council for Science, Technology and Innovation (CoFeCyT) and the Interinstitutional Council for Science and Technology (CICyT) are Argentina's main advisory bodies in the S&T field, along with the Advisory Commission for the National Plan for Science, Technology and Innovation of the MinCyT. CICyT links together the main research agencies in the country. Another important institution is the National Agency for the Promotion of Science and Technology (ANPCyT; colloquially called The Agency). It was established in 1996 in order to enhance innovation in the private sector. Through its two funds—the Fund for Scientific and Technological Research (FONCyT) and the Argentinean Technological Fund (FONTAR)—the Agency promotes the financing of projects designed to improve the social, economic, and cultural conditions in Argentina.

Total (agricultural and nonagricultural) research and development (R&D) spending in Argentina doubled from $1,226 million in 1996 to $2,318 million (in constant prices) in 2006. Despite this rapid increase, total R&D spending accounted for just 0.49 percent of the country's GDP in 2006. This is lower than many other countries in Latin America with similar states of development, such as Brazil (0.82) and Chile (0.68). In 2006 business enterprises performed 31 percent of Argentinean R&D, while the government and higher education sectors accounted for 40 and 27 percent, respectively (RICYT 2009).

INSTITUTIONAL DEVELOPMENTS IN PUBLIC AGRICULTURAL R&D

The current study identified 74 public sector agencies involved in agricultural research in Argentina in 2006.[2] Combined, these agencies employed 3,940 full-time equivalent (FTE) researchers and spent 570 million constant 2005 Argentine pesos on agricultural R&D, the equivalent of 448 million international dollars in 2005 constant prices, using a purchasing power parity (PPP) index (Table 1).[3] PPPs are synthetic exchange rates used to reflect the purchasing power of currencies and typically compare prices among a broader basket of goods and services than do conventional exchange rates.[4] The National Institute of Agricultural Technology (INTA) is by far the most important player in agricultural R&D in Argentina.[5] In 2006, the agency employed 1,910 FTE researchers and spent $262 million (in 2005 constant prices), accounting for roughly half of the country's agricultural research staff and close to 60 percent of expenditures. INTA is a public decentralized body under the Secretariat of Agriculture, Livestock, Fisheries, and Food of the Ministry of Economics and Production with operative and financial autonomy. It focuses on technological and organizational innovation in the agricultural, livestock, agro-food, and agro-industrial system. Besides conducting agricultural R&D, the institute is also a strong player in the field of extension and technology transfer and it plays a key role in linking public and private players to innovation opportunities on a local, regional, national, and international, basis. Headquartered in Buenos Aires, INTA is organized in 15 regional centers that interact closely with local producers and that conduct research focused on regional production needs. Besides these regional centers, the institute operates four so-called research centers, each of which has a number of institutes it oversees. These four research centers are the Veterinary and Agronomic Sciences Research Center, the Natural Resources Research Center, the Agro-Industrial Research Center, and the Research and Technological Center for Familiar Agriculture. INTA also operates 47 agricultural experiment stations and 260 agricultural extension units that cover the whole country. INTA is governed by a Board of Directors that consists of representatives from the public sector and farmer organizations. The regional and research all have "sub-boards" as well.

INTA's National Directorate is responsible for the institute's management and administration and carries out the policies issued by the Board of Directors.

The National Institute of Fisheries Research and Development (INIDEP) is Argentina's main government body involved in fisheries research. Headquartered in Mar del Plata in Buenos Aires Province, INIDEP is placed under the Secretariat of Agriculture, Livestock, Fisheries, and Food. In 2006, the institute employed 101 FTE research staff.

Created in 1958, the National Council for Scientific and Technical Research (CONICET) is Argentina's principal body charged with the promotion of S&T. It is an autonomous agency within the jurisdiction of the National Secretariat of Science and Technology under the Ministry of Education. CONICET's activities focus on five key areas: Agriculture, engineering, and primary raw materials; biology and health; exact and natural sciences; social and human sciences; and technology. CONICET employs roughly 5,200 researchers, more than 5,600 becarios (see the section on Human Resources) and 2,300 technicians involved in scientific research, spread over a very large number of centers and institutes scattered over the country. Only 26 of these agencies are involved in (limited) agricultural research and combined, they employed 170 FTE agricultural research staff in 2006. The capacity of the individual agencies is rather small. The largest CONICET agencies with an agricultural R&D mandate include the Institute of Molecular and Cellular Biology of Rosario (IBR) and the Institute for Research in Genetic Engineering and Molecular Biology (INGEBI), both of which employed 17 FTE agricultural research staff in 2006.

Although Argentina's universities are mainly involved in education, they are also the important sites of basic and applied agricultural research in the country. Forty-six higher education agencies have been identified as being involved in agricultural R&D activities in the country. Combined, these 46 agencies employed more than 1,750 FTE researchers in 2006, or 45 percent of the country's total agricultural research staff. The largest universities in Argentinean agricultural R&D in terms of FTE agricultural research staff are the University of Buenos Aires (UBA), the National University of La Plata (UNLP), the National University of Tucumán (UNT), the National University of Río Cuarto (UNRC), and the National University of the Center of Buenos Aires Province (UNCPBA).

UBA is the oldest and largest university in Argentina and one of the country's leading scientific institutes in basic sciences. The University's Faculty of Agronomy (245 FTEs) and Faculty of Veterinary Sciences (27 FTEs) are involved in crop, livestock, and natural resources research and work closely with the National Agency for Science and Technology Promotion (ANPCyT) and CONICET. UBA's S&T Directorate is charged with fostering and transferring results of technologies developed in the University to public and private organisms that can exploit them. UNLP's 153 FTE research staff mainly focus on livestock research, while UNRC's Faculty of Agriculture and Veterinary Sciences (130 FTEs) carries out research on a wider mix of themes, including cereals, livestock, and natural resources. The 130 FTE researchers of UNT's Faculty of Agriculture and Zootechnics concentrate mostly on natural resources and livestock themes, while their colleagues at UNCPBA (100 FTEs) carry out research on cereals, soybean, and livestock, among other themes.

The private for-profit sector plays an allegedly important role in Argentinian agricultural research. Many multinational seed and agrochemical producers actively conduct agricultural R&D in the country, as do a number of national companies. Bayer Crop Science, for instance, operates a center in Buenos Aires Province where experts test new active ingredients in their early development phase in local crops and optimize them for Argentine conditions. Monsanto also operates two agrochemical research plants in Buenos Aires Province and has introduced

A Short History of Public Agricultural Research in Argentina

Agricultural research was first conducted in Argentina in the early 1900s through experimental stations. The Office of Experiment Stations under the Ministry of Agriculture oversaw these stations, which were organized into five regional groupings. Most of the research agencies currently in existence in Argentina were established in the 1950s. INTA was created in 1956, with the objective of improving rural development and achieving higher levels of productivity through the generation, adaptation, and diffusion of technology within the agricultural sector. Other non-agricultural research agencies created in that decade include the National Industrial Technology Institute (INTI), to respond to manufacturing industry needs, and the National Atomic Energy Commission (CNEA), which strongly influenced the development of scientific and technical capabilities in the country, especially in the energy and metallurgy sectors. In 1958, the National Scientific and Technical Research Council (CONICET) was established to promote S&T among the national public institutions and universities.

Despite the contribution of the agricultural sector to the economy, agricultural R&D was not a priority of the government during the 1930s, 40s, and 50s. The creation of INTA marked a change in the level of interest in advancing agriculture in Argentina. INTA improved outreach to producers through its extension and technology transfer activities.

In the area of marine research, a coastal marine biology laboratory was founded in 1898 in Punta Mogotes, Mar del Plata. The next significant development for marine research occurred in 1960, when researchers from various universities founded the Institute of Marine Biology. INIDEP originated from this institute, and was established by the government in 1977 to manage fisheries and aquaculture research.

Higher education and research has a long history in Argentina, beginning with the founding of several universities in the 1800s. The earliest agricultural education facility was the School of Agronomy and Veterinary Science of Buenos Aires Province in Santa Catalina, which opened in 1883, becoming the Faculty of Agronomy and Veterinary Science when it was joined with the newly founded University of La Plata in 1905. The faculty was then divided into two in 1921. The beginning of agricultural education and research at the largest university, the University of Buenos Aires, occurred with the creation of the Higher Institute of Agronomy and Veterinary Science in 1904. The Institute was elevated to faculty status at the university in 1909. In 1972, the faculty was split into two, Agronomy and Veterinary Science. The creation of these early faculties seems to have been primarily motivated by the growing livestock industry in Argentina. In more recent times, however, the focus of universities has been on basic research, rather than applied.

Source: IFPRI-INTA 2000.

genetically engineered soybeans that are currently grown on vast tracts of land. The Argentinean government actively encourages private sector agricultural research. ANPCyT's FONTAR provides financial support to private sector S&T initiatives, and INTA regularly enters into joint ventures with private agricultural firms for the development of innovations. Contractual agreements specify the technical and financial contributions of each as well as the IPR sharing arrangements for the knowledge and technologies. Little information, however, could be accessed on capacity or expenditure trends in the private agricultural R&D in Argentina. Private for-profit agencies are, therefore, excluded from further analysis in this brief.

National and international linkages and cooperation

Argentina's agricultural R&D agencies participate in a significant amount of collaborative research nationally, regionally, and internationally. INTA is actively engaged in a large number of multilateral and bilateral cooperation agreements. It develops and carries out research and technology transfer programs through a number of agreements with public entities, R&D and technology transfer agencies, international cooperation agencies, and national and foreign (public and private) universities. Besides, INTA works closely with a variety of international agencies and leverages technology generated by international research centers under the Consultative Group for International Agricultural Research (CGIAR). INTA is an active member of various regional and international forums, including the Cooperative Program for Technological Development of Agriculture in the Southern Cone (PROCISUR) and the Regional Fund for Agricultural Technology (FONTAGRO).

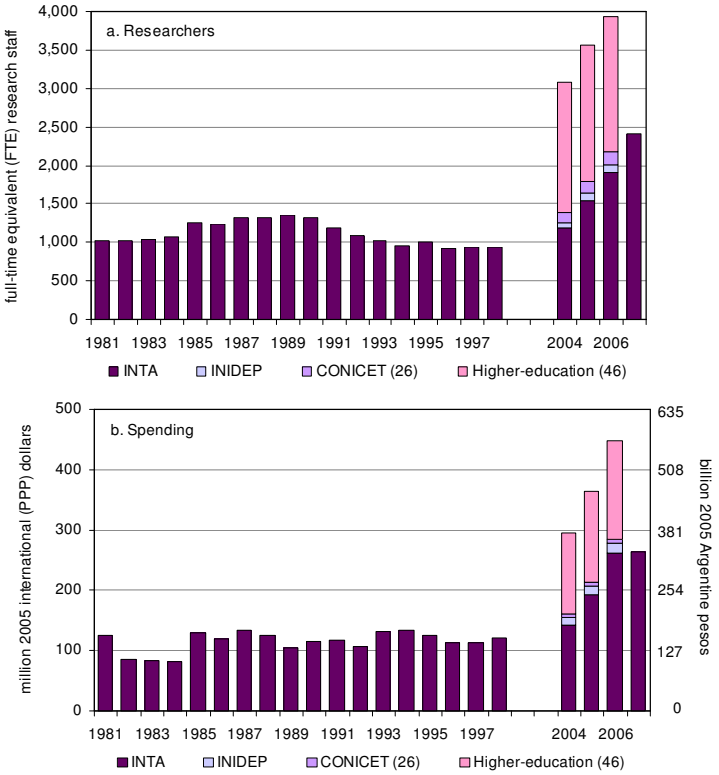
CONICET has various cooperation agreements with counterpart institutes promoting S&T in over twenty countries in the Americas, Europe, and Asia. Activities include joint R&D projects and sharing of highly qualified staff. The establishment of the so-called "Area of International Relations" in 2005 allowed UBA's Faculty of Agronomy to expand its borders and to strengthen its ties with the academic and scientific world. By entering into a recent cooperation agreement between UBA and the Secretariat for Institutional Relations of Argentina's Foreign Ministry, both agencies committed themselves to a coordinated effort to encourage exchange with foreign agencies dedicated to R&D and academic training. More than 50 foreign embassies in Argentina were approached to enhance S&T cooperation. The remaining public agencies and universities also have their own departments to enhance linkages, both nationally and internationally. This enables them to deepen the relationship and interaction with R&D agencies, the productive sector, and the public sector.

HUMAN AND FINANCIAL RESOURCES IN PUBLIC AGRICULTURAL R&D

Overall trends

Argentina's total agricultural research capacity has risen rapidly after the 1999-2002 economic crisis (Figure 1a). This increase is mainly due to strong growth in INTA's researcher totals, which rose from 1,180 FTEs in 2004 to 2,410 in 2007 following a large injection of national government and Inter-American Development Bank (IDB) funds in support of agricultural R&D. It should be noted, however, that the majority of these newly hired researchers are young scientists that are appointed shortly after completing BSc training in college. Though growth in agricultural R&D capacity for the other agencies was much slower than for INTA (62 percent during 2004-06), all three categories reported growth in recent years. INIDEP's research capacity increased by 38 percent, CONICET's by 18 percent, and the higher education agencies combined by 5 percent during 2004-06. Due to the rapid rise of INTA research staff in recent years, the institutional structure of agricultural R&D in Argentina has changed considerably. In 2004, the higher education sector accounted for 55 percent of agricultural R&D staff in Argentina. Two years later, this share had dropped to 45 percent. Conversely, the role of the government agencies in public agricultural R&D increased.

Figure 1—Longterm composition of public agricultural researchers 1981-2007



Sources: Compiled by authors from ASTI survey data (IFPRI-INTA 2000 and 2007-08) and CONICET (2009).
Notes: See Table 1. Figures in parentheses indicate the number of agencies in each category.

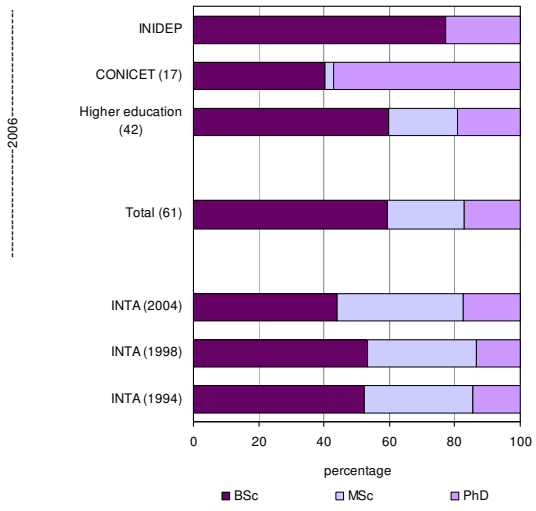
Argentinean research institutes have been severely affected by the country's economic crisis of 1999-2002. Many have had insufficient funds to continue their work, and some research projects have been delayed or stopped altogether. However, agricultural R&D spending in Argentina quickly recovered in the years following the economic crisis, largely due to increased spending by INTA. The Néstor Kirchner administration (2003-07) has substantially increased its support to agricultural R&D. Besides, since 2003, IDB has also financed an important Science and Technology (S&T) project that led to an influx of funding for S&T more generally, and for agricultural research in

particular. During 2002-06, Argentina's total agricultural R&D expenditures more than doubled (Figure 1b). Once again, this increase is largely due to a boost in spending by INTA. The institute's expenditures rose from $141 million in 2004 to $263 million in 2006 and stayed at this level in 2007. Spending by INIDEP and the country's higher education agencies also rose, albeit at slower rates than at INTA. Total agricultural R&D spending by CONICET agencies, on the other hand, remained stable during 2004-06.

Human resources

In 2006, 41 percent of the 3,793 FTE researchers in a 61-agency sample of Argentinean agricultural R&D agencies were trained to the postgraduate level, and 17 percent held PhD degrees (Figure 2). It is important to note that these figures include becarios. Becarios are research trainees/interns that are not part of official staff, but they account for an important share of Argentinean agricultural and (non-agricultural) research staff. Young university graduates at INTA, for example, start their careers as becarios, regardless of whether they have a BSc, MSc, or PhD degree. Typically after a few years, these becarios are promoted and become regular INTA staff. INIDEP, CONICET and the universities also employ a large number of becarios. Becarios at CONICET agencies typically remain becarios for a much longer period of time than their counterparts at INTA. In addition to becarios, there are a lot of long-term consultants working for INTA that do not appear on the official staff list either. Many of these consultants have become permanent staff in recent years with the increase in financial support from the Argentinean government. It is important to note that becarios and consultants are included in staff data analysis in this brief.

Figure 2—Educational attainment of research staff by institutional category, 1994 - 2006

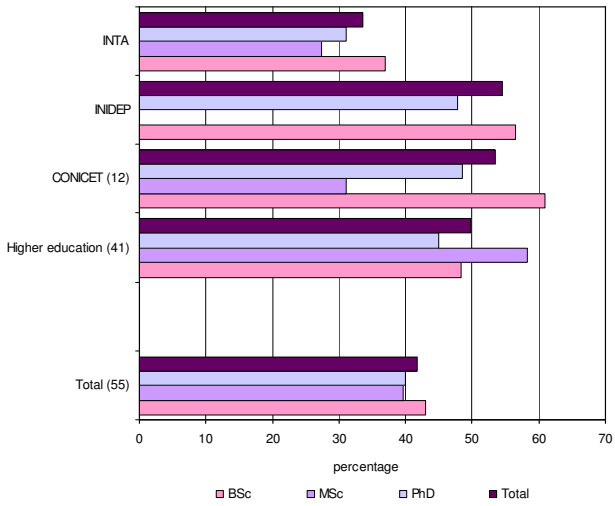


Sources: Compiled by authors from ASTI survey data (IFPRI-INTA 2000 and 2007-08).
Note: Figures in parentheses indicate the number of agencies in each category.

Compared to many other countries in Latin America, average degree levels in Argentina are relatively low. In neighboring Chile and Uruguay, for example, the share of agricultural research staff with postgraduate training in 2006 was 62 and 55 percent, respectively (Stads and Beintema 2009). The reason for the relatively low average qualification levels of Argentinean agricultural scientists can be ascribed to the influx of 500 young BSc holders in INTA between 2004 and 2006, causing the institute's share of postgraduate holders to drop from 56 to 41 percent. With 364 PhD holders in 2007 (up from 247 one year earlier and just 127 in 1998), INTA disposes of a very qualified research staff pool nonetheless. Average degree levels varied widely among the other agency categories. At the CONICET agencies, for example, 57 percent of research staff held PhD degrees in 2006, while at INIDEP, more than three-quarters of agricultural researchers were trained to the BSc level. The 2006 share of postgraduate holders in the higher education sector (40 percent) is slightly lower than in the government sector, which is in sharp contrast with observations in most low and middle income countries worldwide.

Despite an increase in the number of women pursuing scientific careers worldwide, women still tend to be underrepresented in senior scientific and leadership positions (IAC 2006). Argentina appears to be somewhat of an exception. In 2006, 42 percent of Argentina's total FTE researchers in a 55-agency sample were women, a share that is well above the average for Latin America as a whole (31 percent; Stads and Beintema 2009). These averages mask some important cross-agency variations. INIDEP and CONICET employed more female than male agricultural researchers. In contrast, just 1 out of every 3 INTA scientists is a woman (Figure 3). Unlike many other countries in the region, average qualification levels of female Argentinean researchers are barely lower than those of their male colleagues.

Figure 3—Share of female researchers, 2006

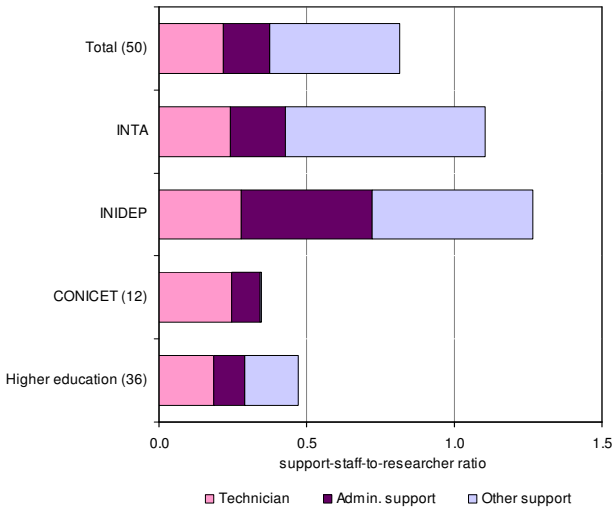


Source: Compiled by authors from ASTI survey data (IFPRI-INTA 2007-08).
Note: Figures in parentheses indicate the number of agencies in each category.

In 2006, the average number of support staff per scientist in a 129-agency sample for which data were available was 0.8, comprising 0.2 technicians, 0.2 administrative personnel, and 0.4 other support staff such as laborers, guards, and drivers (Figure 4). Average support staff per scientist was above the 1.0 mark at INIDEP and INTA, but just 0.3 and 0.5 at CONICET and the higher education agencies combined. Argentinean support staff shares are among the lowest in Latin America, probably due to the large number of young BSc holders and

becarios employed at INTA and some of the other agencies that fulfill a semi-support role.

Figure 4—Support-staff-to-researcher ratios, 2006

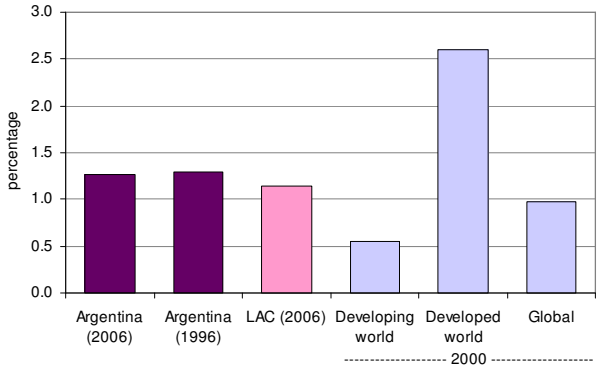


Source: Compiled by authors from ASTI survey data (IFPRI-INTA 2007-08).
Note: Figures in parentheses indicate the number of agencies in each category.

Spending

Total public agricultural R&D spending as a percentage of agricultural output (AgGDP) is a commonly used indicator of a county's research investment levels and a useful means of comparing agricultural R&D spending across countries. In 2006, Argentina invested $1.27 on agricultural research for every $100 of agricultural output, which was double the corresponding ratio for the early 2000s during the height of the economic crisis when agricultural output and R&D spending were very low, but similar to the 1996 level (Figure 5). By way of comparison, the 2006 intensity ratios for other countries in the region, such as Uruguay (1.99), Brazil (1.68) were higher than the one for Argentina, while those for Chile (1.22) and Paraguay (0.20) were lower (Stads and Beintema 2009). The 2006 ratio for Argentina was higher than the reported 2006 average for Latin America and the Caribbean (1.14),and the 2000 ratios for the developing world (0.55) and global averages (0.98; Beintema and Stads 2008).

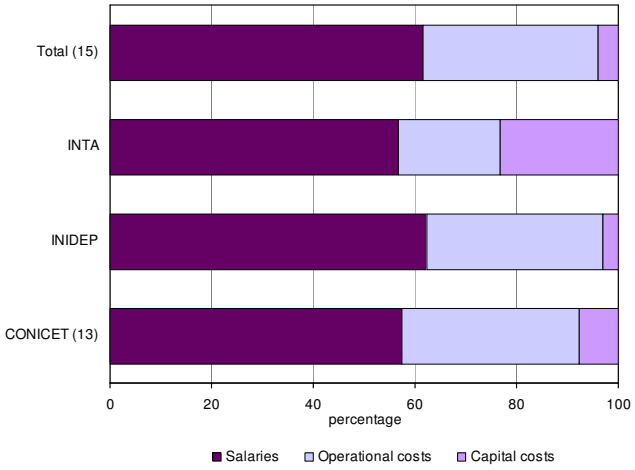
Figure 5—Argentina's agricultural research intensity compared regionally and globally



Sources: Argentina data compiled from Figure1b; AgGDP data from World Bank (2008); all other intensity ratios are from Beintema and Stads (2008).
Note: LAC stands for Latin America and the Caribbean.

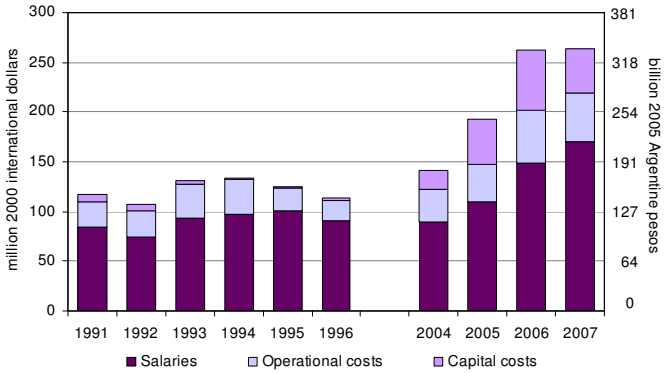
The allocation of research budgets across salaries, operating costs, and capital costs affects the efficiency of agricultural R&D, and therefore detailed data on cost categories of government agencies were collected as part of this study. In 2006, salaries accounted for 57 percent of INTA's expenditures, operating costs for 20 percent, and capital costs for 23 percent (Figure 6 and Figure 7). In comparison, a decade earlier, salaries accounted for 80 percent of the institute's total spending. After a decade without noteworthy capital investments, INTA boosted its laboratory equipment expenditures in more recent years, following a large influx of (government and IDB) funding. The 2006 share of capital expenditures at INTA was much higher than at INIDEP (3 percent) and the CONICET agencies combined (8 percent).

Figure 6—Cost-category shares in government agencies' expenditures, 2006



Source: Compiled by authors from ASTI survey data (IFPRI-INTA 2007-08).

Figure 7—Cost-category shares in INTA's expenditures, 1991-1996 and 2004-2007



Sources: Compiled by authors from ASTI survey data (IFPRI-INTA 2000 and 2007-08).

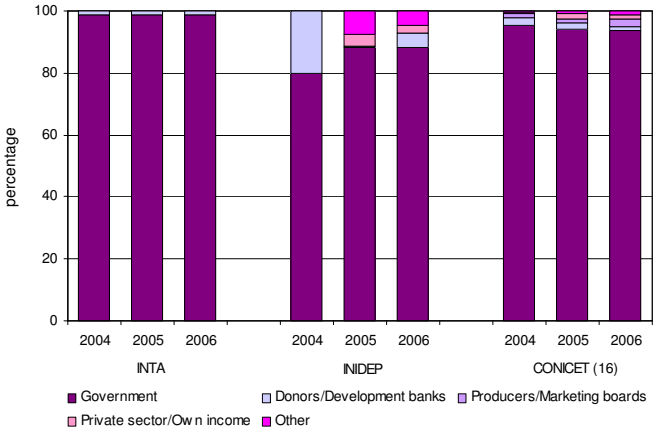
FINANCING PUBLIC AGRICULTURAL R&D

Public agricultural research in Argentina is largely financed by the national government with donors and multilateral development banks, producer organizations, and the private sector accounting for minimal shares of the total. During the 1980s, INTA automatically received between 1.5 and 3.0 percent of the country's total annual agricultural export

proceeds from the national government. The Carlos Meném administration (1989-99), however, abolished this system and INTA became directly dependent on allocations from the Secretary of Agriculture. Government funding during those years was just enough to cover salary expenditures, while costs for actual research programs needed to be secured elsewhere. The Meném administration even had plans to close down INTA, but this spurred widespread resistance. Agricultural R&D funding remained low during the years of the economic crisis, but increased rapidly during the years of the Néstor Kirchner administration (2003-07). During this period, INTA gained financial autonomy from the Secretary of Agriculture when a system was introduced whereby the institute receives 0.35 percent of Argentina's total (agricultural and non-agricultural) imports, as well as a very small share of the country's exports, from the national government. This system remains in place until this day.

Exact shares of funding sources of agricultural R&D of government agencies in Argentina are not easy to determine. IDB is an important donor to S&T in Argentina in general, but the exact amounts of IDB funding to agricultural research are difficult to establish, as the funds are transferred through a complex system involving various agencies under the (recently founded) Ministry of Science and Technology, including ANPCyT. Figure 8 shows that 99 percent of INTA's funds are provided through the national government, but one should note that this share includes indirect IDB funds. Although the share of government funding at INIDEP and the CONICET agencies is slightly lower than at INTA, the share of government funding in total agricultural R&D funding in Argentina is very high compared to most other Latin American countries where larger shares of agricultural R&D are financed through producer organizations or internally generated resources (Stads and Beintema 2009).

Figure 8—Funding sources, 2004-06



Source: Compiled by authors from ASTI survey data (IFPRI-INTA 2007-08).
Note: Figures in parentheses indicate the number of agencies in each category.

The injection of IDB funds has allowed for some long overdue research equipment upgrades in agricultural R&D agencies. In 2003, Argentina received a US$20 million IDB loan to revive scientific areas worst affected by the country's low S&T investments during 1990-2002. The three-year loan provided new equipment and training for scientists and others working in INTA and Argentinean universities in the fields of biotechnology, genomics, agroindustry, the protection of genetic resources, and environmental management. INTA is currently in direct negotiation with IDB on a separate loan to finance necessary upgrading of infrastructure and equipment, training, and strategic projects. Other donors to agricultural research in Argentina include the European Union and the World Bank, the funds of which are also managed by ANPCYT.

Competitive funds

As previously mentioned, ANPCyT operates two funds to promote basic and applied S&T in Argentina's public and private sector: FONCyT and FONTAR. FONCyT was established in 1996 and it is a competitive fund that awards grants to a broad spectrum of public sector initiatives in the S&T field after public calls for proposals. Eligible initiatives include basic and applied R&D projects, upgrading of R&D equipment and laboratories, staff training, and the organization of scientific meetings. The proposals and their relevance are evaluated according to strict quality guidelines and procedures. During 2000-04, FONCyT financed more than 2,000 projects with a total cost of 288 million current Argentinean pesos. Approximately 13 percent of these projects are related to crops, livestock, forestry, and fisheries research. During 1996-2004, 54 percent of all FONCyT funds were assigned to the country's universities and 24 percent to CONICET institutes (ANPCyT 2009a).

FONTAR is a competitive fund that aims to stimulate private sector S&T in Argentina. It typically finances projects that raise the technological or competitive level or of a company (such as the development of new products, processes or services or the conduct of pilot trials), but it also provides funds for staff training in new technologies, patenting costs, or for upgrading laboratory equipment of public sector agencies so that they are in a better position to carry out on-demand research for the private sector. FONTAR assists these companies through loans, tax incentives and subsidies. Eligible projects may be executed by the companies themselves, or be outsourced to universities or public sector institutions. The beneficiaries must provide counterpart resources. During 2003-07, FONTAR supported 2,513 projects with a total cost of 735 million current Argentine pesos. 6 percent of this total was assigned to food and beverage projects and 5 percent to agriculture and livestock projects (ANPCyT 2009b).

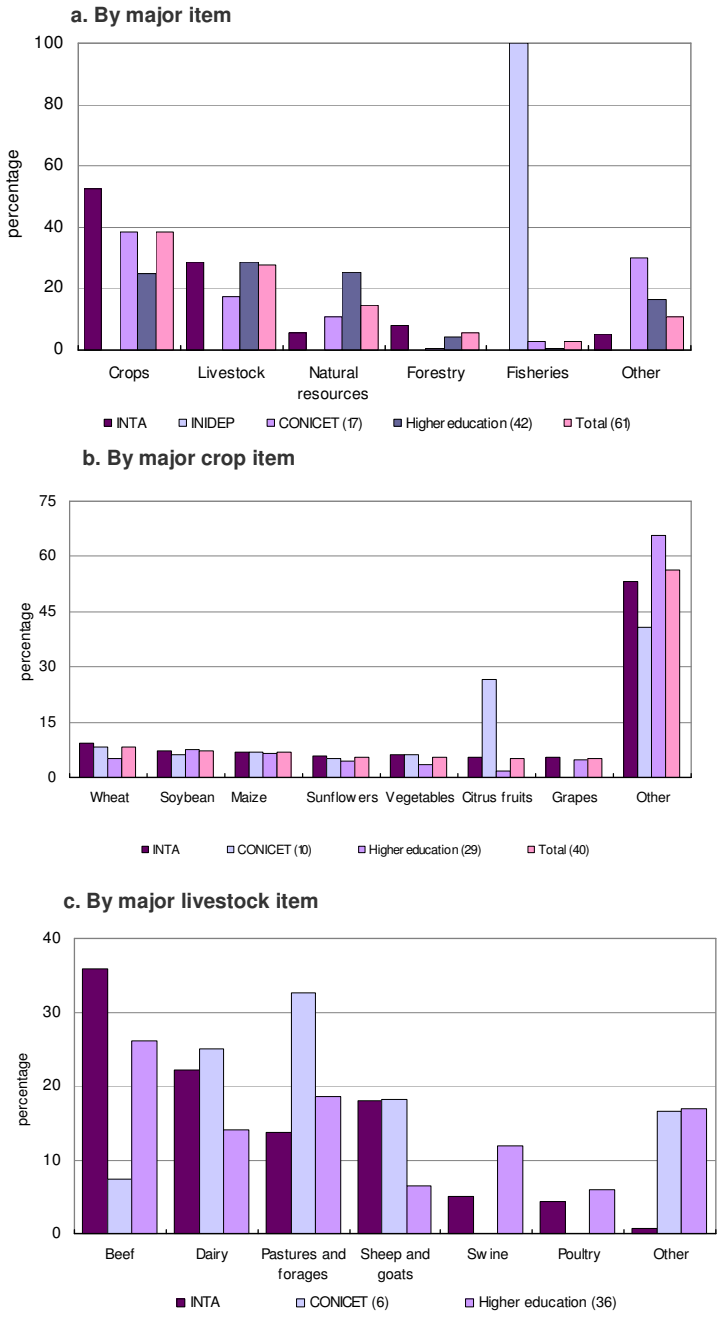
RESEARCH ORIENTATION

Commodity Focus

The allocation of resources across various lines of research is a significant policy decision; hence the survey collected detailed information on the number of FTE researchers working in specific commodity areas. In 2006, close to 40 percent of the 3,804 FTE researchers in a 61-agency sample conducted crop research. Livestock research accounted for 28 percent, natural resources research for 14 percent, forestry research for 6 percent, and fisheries research for just 3 percent (Figure 9a). More than two-thirds of the country's crop research is carried out by INTA. Wheat accounted for 8 percent of all research conducted on crops in Argentina. Other important crops include soybean, maize, sunflowers, vegetables, citrus fruits, and grapes (5 to 7 percent each) (Figure 9b). Most of the country's livestock researchers focus on beef (31 percent), dairy (19

percent), pastures and forages (16 percent), sheep and goats (13 percent), swine (8 percent), and poultry (5 percent) (Figure 9c). Livestock research plays a relatively more important role in the higher education agencies than crop research.

Figure 9—Commodity focus, 2006



Source: Compiled by authors from ASTI survey data (IFPRI-INTA 2007-08).
Notes: Figures in parentheses indicate the number of agencies in each category. Figure 9b only includes agencies involved in crop research; Figure 9c only includes agencies involved in livestock research.

CONCLUSION

Total public agricultural R&D capacity in Argentina has rapidly increased since the country emerged from the 1999-2002 economic crisis. This increase is mainly due to strong growth in INTA's researcher totals, which rose from 1,180 FTEs in 2004 to 2,410 in 2007 following a large injection of national government and IDB funds in support of agricultural R&D. It should be noted, however, that most of INTA's recently hired researchers hold BSc degrees. In 2006, the country as a whole employed close to 4,000 FTE agricultural research staff, making it the third largest agricultural R&D system in Latin America after Brazil and Mexico.

Total agricultural R&D spending in Argentina has also risen rapidly since the turn of the century, due mainly to increased investments by INTA. In 2006, Argentina spent $448 million (in 2005 PPP prices), compared to $296 million two years earlier. Over the course of the past 15 years, INTA has gone from being a poorly funded institute on the verge of being closed down to a well-functioning and well-funded institute producing world-class research. Agricultural R&D in Argentina has become increasingly demand driven, it is increasingly funded through competitive schemes, and it has played a key role in stepping up the country's agricultural production and exports over the past decade. The country occupies top ranks among its Latin American counterparts when it comes to agricultural R&D spending as a percentage of agricultural GDP, research capacity per capita, and the share of female agricultural research staff. Sustainable funding for agricultural R&D is key to ensuring that the extraordinary advances that the country has made over the past decade are not eroded in the future.

NOTES

1. The authors are grateful to numerous colleagues in Argentina for their time and assistance with the data collection and thank Nienke Beintema, Susana Mirassou, and Mara Saucede for their useful comments on drafts of this brief.
2. The 74-agency sample consisted of 28 government agencies and 46 higher education agencies. For a complete overview of the Argentinean agricultural R&D agencies, see the Argentina country profile on the ASTI website http://www.asti.cgiar.org/profiles/argentina.aspx.
3. Unless otherwise stated, all data on research expenditures are reported in 2005 international dollars or in 2005 Argentine pesos.
4. Like the International Monetary Fund and the World Bank, ASTI presents all its macroeconomic data in PPP dollars.
5. English translations of agency names have been used throughout the brief except for note 2. The original names in Spanish can be found on http://www.asti.cgiar.org/profiles/argentina.aspx.
6. Argentine universities do not offer BSc degrees in the strict sense of the word. Especialización and universitario degrees are considered to be equivalents of BSc degrees for the purpose of this study.

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METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI-INTA2007-08) and Beintema et al. (2000).
- The data were compiled using internationally accepted statistical procedures and definitions developed by the OECD and UNESCO for compiling R&D statistics (OCDE 2002; UNESCO 1984). The authors grouped estimates using three major institutional categories-government agencies, higher-education agencies, and busineess 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 non profit institutions, thereby excluding prívate enterprises. Private research includes research performed by prívate-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 perfomer basis..
- Financial data were converted to 2005 international dollars by deflating current local currency units with an Argentinean GDP deflator of base year 2005 and then converting to U.S. dollars with a 2005 purchasing power parity (PPP) index, taken from World Bank (2008). PPP's are synthetic Exchange rates used to reflect the purchasing power of currencies, tipically 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 reflec 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.

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