AGRICULTURAL SCIENCE AND TECHNOLOGY INDICATORS

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Key trends in Pakistan's agricultural R&D investments

Nienke Beintema, Waqar Malik, and Muhammad Sharif

Introduction*

Agriculture forms the backbone of Pakistan's economy. The sector contributes 25 percent of the country's gross domestic product (GDP) and employs almost half of its labor force. For these reasons, agricultural productivity growth is a key factor in Pakistan's economic development and poverty alleviation objectives. In turn, agricultural research and development (R&D) is crucial in generating agricultural productivity gains through new and improved crop varieties, cropping practices, labor-saving technologies, postharvest and processing methods, and marketing mechanisms.

This brief provides an overview of the major investment trends in agricultural research in Pakistan since the early 1990s, drawing on a new set of data developed through a comprehensive survey by the International Food Policy Research Institute (IFPRI) and the Pakistan Agricultural Research Council (PARC).

Public Agricultural Research Investments

Public agricultural research in Pakistan is conducted by the federal and provincial governments and by various higher education agencies. In 2003, agricultural research investments totaled more than 2 billion Pakistani rupees (in 2000 prices)—the equivalent of 188 million international 2000 dollars (Table 1).[1] PARC, the National Agricultural Research Center (NARC), and 11 other federal agencies accounted for 38 percent of this total that year. Each of the country's four provinces has its own agricultural research facilities. In 2003, these facilities constituted a combined $96 million, or about half of all investments that year—though the Punjab region alone constituted $57 million. We identified 29 faculties, colleges, and other higher education agencies involved in agricultural research in Pakistan. Together, they accounted for 11 percent of the country's total agricultural research investments in 2003.

In 2003, Pakistan's public agricultural research agencies employed close to 3,500 full-time equivalent (fte) researchers, though once again the majority were located provincially, and particularly in the Punjab (Table 1). Given the lower ratio of spending to researchers at the provincial agencies, however, average spending per scientist was higher at the federal agencies.

Table 1—Composition of public agricultural research expenditures and total researchers, 2003

Type of agency	Spending: 2000 rupees	Spending: 2000 international dollars	Researchers
	(*millions*)		(*fte's*)
Federal government			
PARC	203	17	239
NARC	416	35	500
Other	229	19	286
Subtotal federal	*847*	*71*	*1,025*
Provincial government			
Balochistan	95	8	169
North-West Frontier Province	138	12	354
Punjab	678	57	1,163
Sindh	229	19	486
Subtotal provincial	*1,140*	*95*	*2,171*
Higher education [a]	254	21	291
Public-sector total	**2,241**	**188**	**3.487**

Sources: Beintema et al. (2006) based on data from the ASTI database.

[a] Expenditures for the higher education sector in our sample are estimates based on average expenditures per researcher at the University of Agriculture, Faisalabad, and the University of Arid Agriculture, Rawalpindi.

Total agricultural research spending fell by about one-third between 1991 and 1999, partly because of the completion of various early 1990s projects at PARC, which were funded by USAID and other donors, and partly due to declining public funding overall. As a result, average levels of spending-per-scientist declined over the period (Figure 1a). Spending levels rebounded from 1999 to 2003, largely due to the Agricultural Linkage Program (ALP), which began in 2000.[2] In contrast, NARC's spending more than doubled during the 1991–2003 period, reflecting growth at most, if not all, of the center's institutes. Total agricultural R&D spending in Balochistan and the North-West Frontier Province (NWFP) declined slightly during 1991–2003, at rates of 0.4 and 1.4 percent per year, respectively, while spending remained fairly stable in the Punjab and increased by 2.3 percent per year in Sindh over the same period. Agricultural R&D spending in the higher education sector grew at an average rate of 0.5 percent per year.

From 1991 to 2003, the total number of agricultural

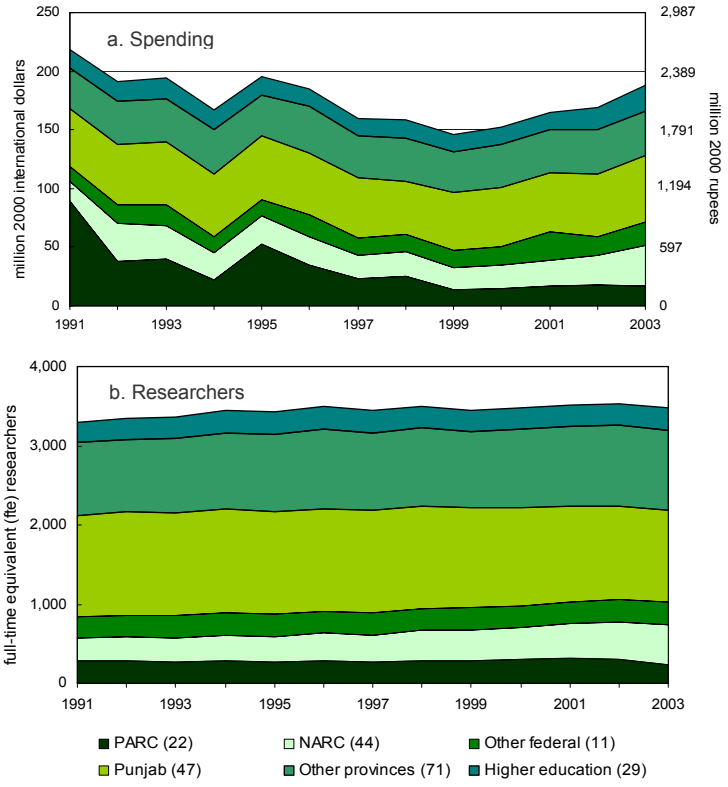
*Nienke Beintema is program head of the Agricultural Science and Technology Indicators (ASTI) initiative at the International Food Policy Research Institute (IFPRI); Muhammad Sharif and Waqar Malik are, respectively, CSO in charge and deputy director general of the Social Sciences Division at the Pakistan Agricultural Research Council (PARC). This brief is based on a forthcoming IFPRI–PARC synthesis report on Pakistan's agricultural research investments, soon to be available at the ASTI website: http://www.asti.cgiar.org.

[1] Unless otherwise stated, data on research expenditures are presented in 2000 international dollars. Expenditure estimates in current local currency units were first deflated to 2000 international dollars, using Pakistan's implicit GDP deflator (base year 2000), and then converted to international dollars using a 2000 purchasing power parity (PPP) index, both of which were taken from World Bank (2005).

[2] The program is a joint effort by the governments of Pakistan and the United States. Funding is generated through the sale of U.S. wheat and is used for activities and projects that support Pakistan's long-term goals for the agricultural sector. Funds are managed by the Agricultural Research Endowment Fund (AREF), under PARC.

researchers in Pakistan's public sector grew slowly, averaging 0.4 percent per year (Figure 1b). PARC employed 18 percent fewer researchers in 2003 compared with the 1991 level. Total researcher numbers at NARC actually increased 75 percent over this period, as longstanding vacant positions were filled at the end of a recruitment freeze (which also explains the expenditure growth discussed above). Total researcher numbers declined in the Punjab over the period, but they increased by about 10 percent in both the Balochistan and Sindh provinces. Combined researcher numbers in the higher education agencies also grew by 10 percent over the same period.

Figure 1—Public agricultural R&D trends, 1991–2003



Sources: Beintema et al. (2006) based on data from the ASTI database.
Notes: See Table 1. Figures in parentheses indicate the number of agencies and programs surveyed in each category. Expenditures for the higher education agencies in our sample are estimates based on average expenditures per researcher at the University of Agriculture in Faisalabad and the University of Arid Agriculture in Rawalpindi.

A Regional Perspective

Pakistan accounted for only 2 percent of the Asia–Pacific region's total agricultural R&D spending in 2000, down from a 6 percent in 1991 (Table 2). This resulted from the combination of reduced agricultural R&D spending in Pakistan, as already discussed, and strong gains by China and India.

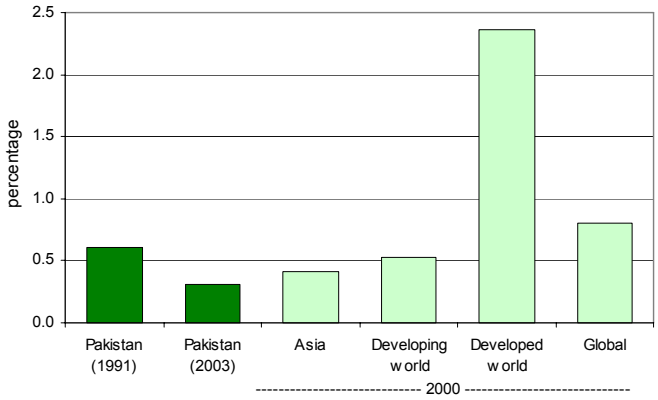
Total public spending as a percentage of agricultural output (AgGDP) is a commonly used indicator of a county's research investment levels and a useful means of comparing agricultural R&D spending across countries. In 2003, Pakistan invested $0.31 for every $100 of agricultural output, which represented a decline of 50 percent compared with its corresponding 1998 ratio of 0.61 (Figure 2). The comparable 2000 averages reported for Asia and the developing world as a whole were 0.41 and 0.53, respectively.

Table 2—Public agricultural R&D spending in Asia and the Pacific, 1981–2000

	1981	1991	2000
Total spending	(*million international dollars*)		
Pakistan	na	219	152
China	1,049	1,733	3,150
India	533	1,004	1,858
Asia and Pacific (28 countries)	*3,047*	*4,847*	*7,523*
Shares	(*percentages*)		
Pakistan	na	5.5	2.0
China	34.4	35.8	41.9
India	17.5	20.7	24.7
Other Asia and Pacific (25 countries)	*na*	*39.0*	*31.4*

Sources: Beintema et al. (2006) and Pardey et al. (2006) based on data from the ASTI database.

Figure 2—Pakistan's public agricultural research intensity compared regionally and globally



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

Private-Sector Investments

Agricultural research conducted by private companies is limited in Pakistan. We identified 13 business enterprises involved in agricultural research, accounting for a combined estimate of 6 percent of total public and private agricultural R&D spending in Pakistan in 2003.[3]

Table 1—Estimated public and private expenditures, 2003

	2000 rupees	2000 international dollars	Share
	(*millions*)		(*percentage*)
Public agencies	2,241	188	94.3
Private agencies	136	11	5.7
Total	**2.378**	**199**	**100**

Sources: Beintema et al. (2006) based on data from the ASTI database.

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[3] A number of additional private companies employed scientists, but they were mostly involved in quality control and testing rather than research.