AGRICULTURAL SCIENCE AND TECHNOLOGY INDICATORS

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MYANMAR

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This brief reviews the major investment and institutional trends in public agricultural research in Myanmar since the late 1990s, using recent data collected under the Agricultural Science and Technology Indicators (ASTI) initiative (IFPRI–NAFRI 2005).[1]

INTRODUCTION

The Union of Myanmar (formerly Burma) is the poorest nation in Asia in terms of per capita gross domestic product (GDP), which in 2004 was equivalent to US$127 (FAO-RAP 2006). As a predominantly rural country, however, Myanmar is self-sufficient in food. In 2002–03, agriculture constituted 44 percent of the country's GDP, 34 percent of its export earnings, and 61 percent of its formal employment (FAO–RAP 2006). Consequently, agriculture plays a strong role in the nation's future development planning. The principal exports are hardwoods—Myanmar accounts for roughly three-quarters of the world's teak exports, for example—and rice. Other important crops are maize, peanuts, beans, oilseeds, and sugarcane.

Given the importance of agriculture in Myanmar, agricultural research and development (R&D) is an important priority. We identified 12 agencies involved in agricultural R&D in Myanmar. In 2003, these 12 agencies employed a total of 619 full-time equivalent (fte) researchers and spent close to 400 million Myanmar kyat in 2000 constant prices, the equivalent of roughly 8 million 2000 international dollars (Table 1).[2, 3] Agricultural research in Myanmar is overseen by three separate entities: the Ministry of Agriculture and Irrigation (MoAI), the Ministry of Forestry (MoF), and the Ministry of Livestock and Fisheries (MoLF).

The Department of Agricultural Research (DAR) under MoAI is the principal government agency involved in agricultural R&D. In 2003, DAR accounted for about 40 percent of the country's agricultural research staff and 30 percent of its expenditures. DAR's research focuses on increasing crop production through improved seed, crop management, and crop protection techniques; and cropping systems tailored to suit the country's various agroecological zones. DAR comprises

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

Type of agency	Spending: 2000 Myanmar kyat	Spending: 2000 international dollars	Researchers	Share: Spending	Share: Researchers	Agencies in sample[a]
	(*millions*)		(*fte's*)	(*percent*)		(*number*)
Public agencies						
DAR	114.0	2.4	253.0	28.9	40.9	1
LBVD	137.4	2.9	100.8	34.9	16.3	1
Other government	116.8	2.5	224.1	29.6	36.2	7
Higher education[b]	26.0	0.6	40.8	6.6	6.6	3
Total	**394.2**	**8.4**	**618.7**	**100**	**100**	**12**

Source: Compiled by authors from ASTI survey data (IFPRI–DAR 2005-06).
[a] See note 2 for a list of the four agencies included in this sample.
[b] Expenditures for the higher education agencies in our sample were estimated based on the average expenditures per researcher at the nine government agencies. The 204 faculty staff employed in the two higher education agencies spent 20 percent of their time on research, resulting in 40.8 fte researchers.

KEY TRENDS

- The number of agricultural research staff rose steadily in Myanmar from 1996 to 2003, but the country's spending on agricultural R&D, adjusted for inflation, trended downward.
- The principal agricultural research agencies in Myanmar are the Department of Agriculture (DAR) and the Livestock Breeding and Veterinary Department (LBVD). In 2003, DAR was the largest in terms of research staff (40 percent of total), while LBVD was the largest in terms of spending (35 percent of total).
- Myanmar has one of Asia's lowest shares of researchers trained to the postgraduate level. In 2003, only 18 percent of all research staff held MSc degrees and only 2 percent held PhD degrees.
- Very low civil service salaries and benefits make attracting, motivating, and retaining highly qualified agricultural researchers in the public sector extremely difficult.
- Private sector involvement in agricultural R&D in Myanmar is minimal.

ABOUT ASTI

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

Primary funding for the ASTI initiative's survey round in Asia was provided by the CGIAR Finance Committee/World Bank.

six divisions focusing on rice and other cereal crops; oilseed crops and food legumes; industrial crops and horticulture; soil/water utilization and agricultural engineering; agronomy, agricultural economics, and statistics; and biotechnology, plant genetic resources, and plant protection. In addition, seven crop research centers located across the country's agroecological zones—Letpadan, Magwe, Nyaung Oo, Myittha, Kinbuntaung, Myaungmya, and Htonbo—focus on regional testing of crop varieties, cultural practices, and cropping systems (DAR 2006). Each of the six divisions is headed by a director, under the oversight of DAR's director general. The DG and division directors also form an executive committee that determines DAR's day-to-day operations. DAR is headquartered in Yezin-Pyinmana and employed 258 fte researchers in 2004.

The Livestock Breeding and Veterinary Department (LBVD) under MoLF is responsible for the development of Myanmar's livestock sector. It conducts research on biological production, veterinary medicine, artificial insemination, and reproductive disorders. In addition, it produces vaccines and provides extension services to farmers. In 2003, LBVD employed the second-largest number of agricultural fte researchers after DAR (101), but it's spending was actually higher than DAR, at 35 percent of the country's total. LBVD is headquartered in Yangon and operates four laboratories in Mandalay, Basein, Taunggyi, and Pyin Oo Lwin.

MoAI operates four other government agencies. The Myanmar Cotton and Sericulture Enterprise (MCSE), headquartered in Yangon, was established in 1994. In addition to carrying out cotton and sericulture research, it provides extension services to farmers. In 2003, the agency employed 59 fte researchers. The Applied Research Centre for Perennial Crops (ARCPC) in Mawlamying was founded in 1990 within the Myanma Perennial Crops Enterprise (MPCE), under MoAI. The center conducts research on variety improvement and production technology of plantation crops (mainly oil palm and rubber) and employed 54 fte researchers in 2003. That same year, the Vegetables and Fruit Research and Development Centre (VFRDC) in Hlegu-Yangon employed 26 fte researchers focusing on a variety of issues related to fruits and vegetables, and the Myanmar Sugarcane Enterprise (MSE) employed 6 fte researchers working on developing improved sugarcane varieties.

Three other government agencies conduct agricultural R&D in Myanmar. The Forest Research Institute (FRI), under MoF, is headquartered in Yezin and operates units on forest utilization and forest development. In 2003, FRI employed 49 fte researchers. MoLF administers both the Yangon-based R&D division of the Department of Fisheries (DoF) and the Apiculture Research and Development Unit (ARDU). DoF carries out both marine and inland fisheries research, employing 29 fte researchers in 2003; ARDU conducts research related to honeybees and bee products, and employed 1.5 fte researchers in 2003.

Three higher education agencies conduct agricultural R&D in Myanmar; together they accounted for roughly one-third of agricultural research staff and expenditures in 2003. Yezin Agricultural University (YAU) is the principal agricultural agency of higher education in Myanmar, and most agricultural scientists at the government agencies graduated from this university. In 2003, YAU employed 26 fte researchers focusing on issues related to crops, natural resources, and socioeconomics. In 2003, the University of Veterinary Science (UVS) employed 9 fte researchers focusing primarily on livestock issues, and the University of Forestry (UoF) employed 6 fte researchers concentrating, as its name indicates, on forestry research.

Agricultural R&D performed by the private sector in Myanmar is negligible. We identified only one private-sector company carrying out its own agricultural R&D, the Myanmar Arista Agro, a Japanese agro-chemical company that is a subsidiary of Nichimen Corporation. Myanmar Arista Agro is reported to carry out limited research on herbicides, insecticides, fungicides and bactericides; however, specific data were not obtainable from this company. Most other private agricultural

A Short History of Government-Based Agricultural Research

Agricultural research in Myanmar (formerly Burma) dates back to the early 20th century. The country's Department of Agriculture was established in 1906 to undertake experiments into crop adaptability, seed multiplication, and distribution. Four years later, the Burma Research Society was created for the study and promotion of the arts, science, history, and literature. The Mandalay and Mawbi farms were founded along with the Department of Agriculture, and several other experiment gardens were subsequently established across the country. Those in Upper Burma primarily focused on cotton, wheat, and rice, while those in Lower Burma concentrated on wheat, maize, sorghum, chickpeas, cowpeas, hemp, jute, and Egyptian cotton.

Formal agricultural R&D was not initiated until 1954 with the establishment of the Agriculture Research Institute (ARI) in Gyogone (Yangon). In 1971, this institute was relocated to Yezin, some 400 kilometers north of the capital. At that time ARI was restructured to form five disciplinary divisions (soils, botany, plant pathology, entomology, and agronomy) and six crop-oriented divisions. In 1990, ARI was renamed the Central Agricultural Research Institute (CARI) with satellite research farms in the country's various agroecological zones. Finally, in 2004, CARI was upgraded to become the Department of Agricultural Research (DAR) under the Ministry of Agriculture and Irrigation (MoAI).
The Veterinary Research Institute (VRI) was established in 1954. In 1994, it was restructured to become the Livestock Breeding and Veterinary Department (LBVD) under the Ministry of Livestock and Fisheries (MoLF). The Department of Fisheries (DoF) began as a Fisheries Bureau in 1948. In 1954, it was transferred to the Agricultural and Rural Development Corporation as a fisheries project, later to become the Division of Fisheries, and then to take its current form in 1990.

The Myanmar Cotton and Sericulture Enterprise (MCSE) was founded in 1994 under MoAI with the responsibility of implementing government plans for the cotton and sericulture subsectors. The Myanmar Sugarcane Enterprise (MSE) was also established in 1994 under MoAI with the aim of integrating and developing sugarcane production and processing. The Vegetables and Fruit Research and Development Centre (VFRDC) was established in 1986 by the cooperation of the governments of Japan and Myanmar.

Sources: FAO-RAP (1986); Htun Saing (2004); and IFPRI–DAR (2005–06).

companies in Myanmar outsource their research to government agencies. DAR undertakes crop trials on behalf of companies like Myanma Awba, Diamond Star, Golden Lion, Tiger Dragon, and Eyjar Shwe War. Similarly, companies such as Myanmar CP Livestock Corporation, Nay La, May Kha, and Shwe Payon engage LBVD to conduct their fodder, feed additive, and vaccine trials, as well as their quality control experiments.

Myanmar's agricultural R&D agencies engage in substantial collaboration at national, regional, and international levels. Nationally, a significant degree of cooperation exists among research agencies. DAR, LBVD, and YAU, for example, have undertaken a number of joint research programs. DAR also engages in collaborative research with a number of centers of the Consultative Group on International Agricultural Research (CGIAR), including the International Rice Research Institute (IRRI), International Maize and Wheat Improvement Center (CIMMYT), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Bioversity International, and International Institute for Tropical Agriculture (IITA). Other international partners include the World Vegetable Center (AVRDC) and the International Atomic Energy Agency (IAEA). LBVD works closely with a number of United Nations organizations, as well as the World Organisation for Animal Health (OIE) and the Department of Livestock Development (Thailand). While YAU does not have a history of collaborating with foreign agencies, with the encouragement of MoAI, linkages have been established with a number of foreign universities, including Charles Stuart University (Australia); Gadjah Mada University (Indonesia); Göttingen University (Germany); Kasetsart University and King Mongkut's University of Technology Thonburi (both of Thailand); and Kyoto University (Japan). YAU is also in the process of signing memoranda of understanding with several other foreign universities. Linkages between YAU and both ICRISAT and IRRI have also been reinforced in recent years. UVS works closely with the University Putra Malaysia, while UoF conducts joint research with the Centre for Tropical and Subtropical Agriculture and Forestry at Göttingen University, as well as the Tokyo University of Agriculture and Technology.

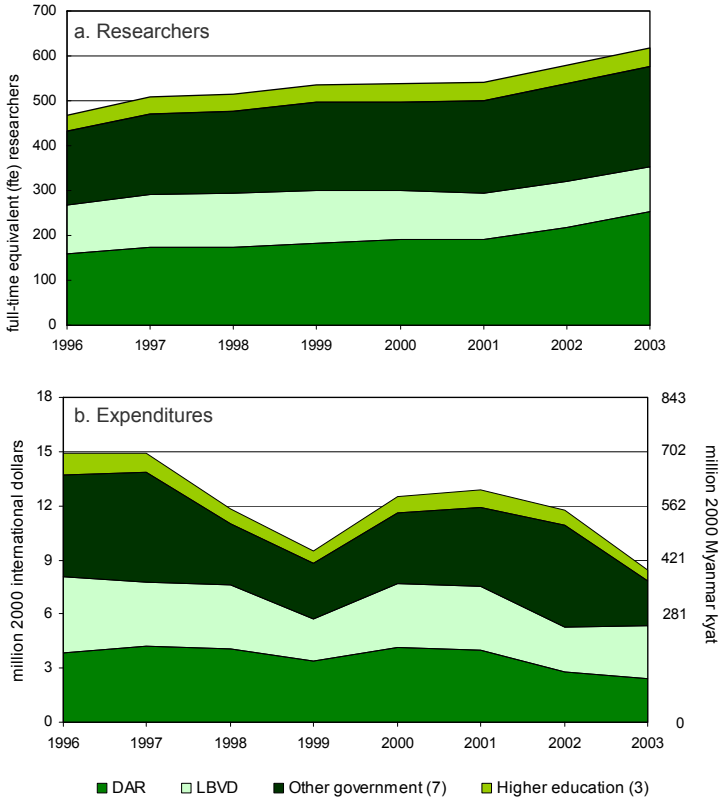
HUMAN AND FINANCIAL RESOURCES IN PUBLIC AGRICULTURAL R&D

Overall Trends

Between 1996 and 2003, total agricultural researcher numbers in Myanmar rose by 3.3 percent per year on average (Figure 1a). Growth was particularly strong at DAR, which reported an increase in its number of fte researchers of more than 60 percent during 1996–2004, from 159 to 258. This rapid increase stemmed, first, from the transfer of YAU from the Higher Education Department to MoAI in 1993, prompting the employment of graduate students at DAR in subsequent years, and second, from a 1994 agreement between MoAI and the Israeli Ministry of Agriculture, which provided on-the-job training to a number of graduate students at Arava International Center for Agriculture Training (AICAT) in Israel.[4] This opportunity served as an important incentive for many graduate students to seek employment at agencies administered by MoAI. The influx of staff trained in Israel was particular high at DAR during 2001–03. In contrast, the total number of researchers at LBVD has gradually fallen since 1999 because of the emergence of better paid veterinary positions in the private sector. The remaining government agencies combined reported a rapid increase in their total fte research staff levels, from 164 in 1996 to 224 in 2003. This rise was mainly due to recruitment efforts at MCSE, FRI, and ARCPC. Total fte research staff employed at Myanmar's three higher education agencies remained more or less stable during 1996–2003, averaging approximately 39.

Myanmar faces severe internal economic challenges. The country has been largely cut off from the outside world since the 1962 overthrow of the government and subsequent installation of a military regime in 1988, at which time most overseas development assistance was halted. In addition, Myanmar lacks monetary and fiscal stability, resulting in serious macro-economic imbalances. The presence of a large informal economy is indicative of the failure of the country's economic policy and makes the true economic situation in Myanmar difficult to assess accurately. Inflation has spiraled over the past decade, and while the official kyat–US$ exchange rate was 5.82 in 2005, the unofficial rate was 1,075 kyat.[5] Although total agricultural research spending in Myanmar increased in current prices over the years due to the high inflation rates, spending in constant prices declined considerably (Figure 1b). During 1996–2003, Myanmar's inflation-adjusted agricultural R&D expenditures fell by 5.4 percent per year on average. Total spending dropped sharply from $15 million in 1996 to $10 million in 1999, mainly as a result of declines in capital expenditures at LBVD. By 2001, spending had recovered to $13 million, based on increased expenditure by LBVD, MCSE, and VFRDC, but in 2003 levels had fallen as low as $8 million. It appears the agricultural R&D spending has rebounded somewhat since 2003, given the Government of Myanmar's strengthened commitment to public agricultural R&D. This is evidenced by the 2004 restructuring that resulted in DAR (see *A Short History of Public Agricultural Research* on page 2), accompanied by increased salary levels and operating budgets, and—to a lesser extent—increased capital investment.

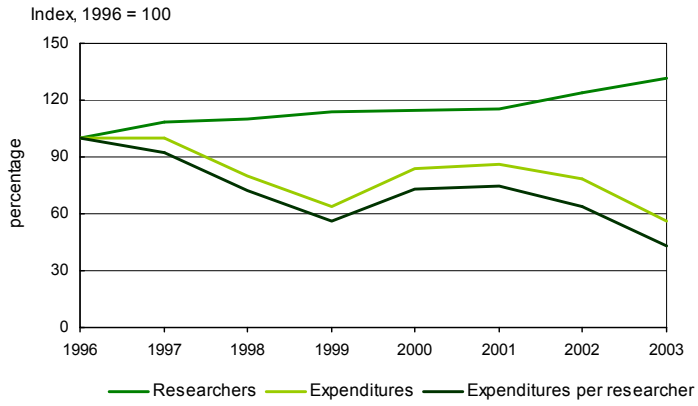
Figure 1—Public agricultural R&D trends, 1996-2003



Source: Compiled by authors from ASTI survey data (IFPRI–DAR 2005-06).
Notes: See Table 1. Figures in parentheses indicate the number of agencies in each category. Expenditures for the higher education agencies in our sample were estimated based on average expenditures per researcher at the nine government agencies. Underlying data are available at the ASTI website (www.asti.cgiar.org).

Average expenditures per agricultural researcher roughly followed total spending trends in Myanmar during 1996–2003, although they declined more strongly due to growth in the total number of researchers (Figure 2). These averages mask considerable variation across agencies. Expenditures per researcher at LBVD, for example, totaled $29,000 in 2003, which was three times higher than spending by counterparts at DAR. By way of contrast, average expenditures per agricultural researcher in Myanmar are extremely low compared with other countries in the region.

Figure 2—Trends in public expenditures, researchers, and expenditures per researcher, 1996-2003

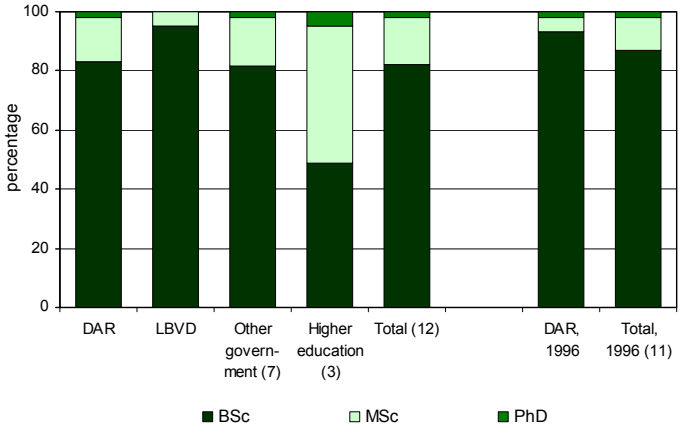


Source: See Figure 1.
Notes: See Figure 1.

Human Resources

In 2003, 18 percent of Myanmar's fte agricultural research staff was trained to the postgraduate level, and just 2 percent held PhD degrees (Figure 3). Higher education agencies worldwide consistently report higher shares of research staff holding a PhD degree than the principal government agencies, and Myanmar is no exception. In 2003, 51 percent of staff at the three higher education agencies was trained to the postgraduate level, compared with just 15 percent of scientists at government agencies. Average degree levels of agricultural scientists employed in Myanmar's government sector are among the lowest in Asia. In comparison, the 2002–03 shares of postgraduate researchers in countries like Bangladesh (87 percent), Malaysia (72 percent), and Laos (45 percent) were well above those recorded in Myanmar (Stads et al. 2005; Beintema and Kabir 2006; Stads and Manivong 2006). In the government sector, only three of the nine agencies in our sample employed research staff with doctorate degrees. However, the shares of research staff trained to the MSc level varied considerably, from less than 5 percent at ARCPC, DoF, and LBVD to 41 percent at FRI—which can be explained by the relative seniority of FRI researchers in terms of age and experience compared with other agencies in Myanmar.

Figure 3—Educational attainment of researchers by institutional category, 1996 and 2003



Source: Compiled by authors from ASTI survey data (IFPRI–DAR 2005-06).
Note: Figures in parentheses indicate the number of agencies in each category. The 1996 total excludes ARCPC.

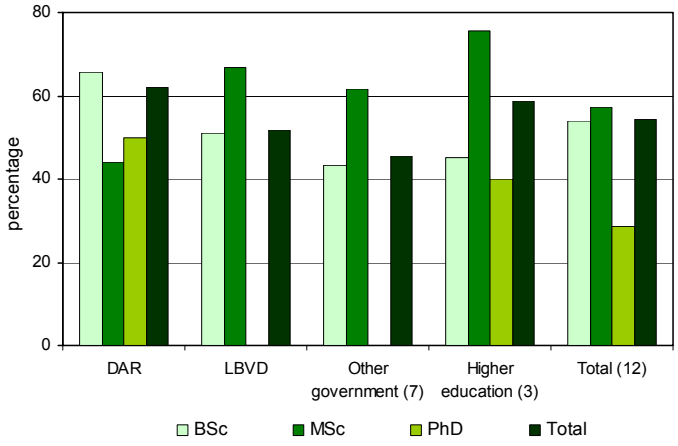
Degree levels of Myanmar agricultural research staff improved progressively from 1996 to 2003. In 1996, only 7 percent of the country's agricultural R&D staff held postgraduate degrees. Average postgraduate levels of DAR scientists rose from 7 percent in 1996 to 18 percent in 2004. This increase is largely due to a rise in the number of MSc-qualified scientists. Fluctuating between 3 and 5 ftes during 1991-2006, the total number of PhD-qualified research staff employed at DAR is very low compared with principal agricultural R&D agencies in other countries in the region. Before YAU began to offer doctorate-level training in agriculture in 2001, scientists had to travel abroad for PhD-level training. The establishment of the PhD program at YAU will likely facilitate a rise in the number of PhD-qualified scientists at DAR in the years to come. As of October 2006, seven candidates were enrolled in YAU's PhD program. Most MSc-qualified scientists employed at DAR received their degree from YAU. A number of older scientists received MSc and PhD degrees from universities in the United States, while the younger scientists typically obtained their doctorate degrees from universities in Germany or from the University of the Philippines, Los Baños. Neither DAR nor MoAI has an official training program for its scientists; however, DAR organizes 15 programs for its scientists per year, on average, focusing on crop variety and production technology improvement. MSc or PhD training abroad is typically financed by foreign donors.

Very low civil service salaries and benefits make attracting and retaining highly qualified research staff extremely difficult, particularly given opportunities for employment with international organizations, nongovernmental organizations (NGOs), and private-sector agencies. A number of senior researchers have recently taken up employment at nongovernment agencies. During 2004–05 alone, for example, DAR lost one PhD-qualified and four MSc-qualified researchers to nongovernment agencies. The limited number of qualified staff seriously constrains DAR's ability to achieve its objectives.

DAR is not the only government agency in Myanmar with few qualified staff. LBVD has not employed any PhD-qualified staff since 1997, and as of 2003 only 6 of the agency's 126 scientists were trained to the MSc level. This lack of qualified research staff has a significant impact on the quality and success of veterinary research in Myanmar. Combined data on staff qualifications at the seven remaining government agencies were similar to those at DAR.

Despite a rise in the number of women pursuing scientific careers worldwide, women still tend to be underrepresented in scientific and leadership positions (Sheridan 1998). Interestingly, Myanmar has one of the highest (if not the highest) shares in the world. In 2003, 54 percent of the fte researchers employed at Myanmar's agricultural R&D agencies were female (Figure 4). Most of these women held BSc or MSc degrees, and only 2.8 fte researchers with PhD degrees were female, representing less than 30 percent of the total number of PhD-qualified agricultural research staff. DAR reported a particularly high share of female researchers (62 percent), but this is likely a direct result of low salary levels rather than any historical or cultural factors. Civil servant salaries are so low as to preclude predominantly male household heads from being able to support their families, which creates a strong disincentive for men to seek employment at DAR and the other government agencies.

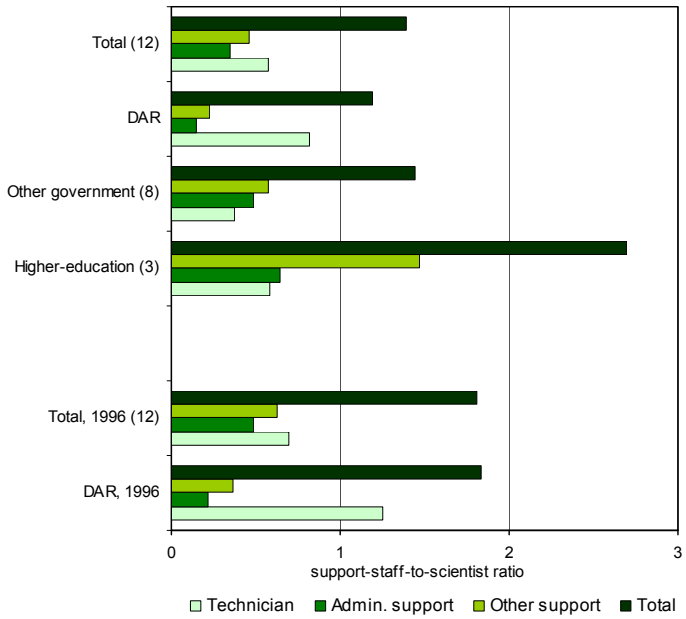
Figure 4—Share of female researchers, 2003



Source: Compiled by authors from ASTI survey data (IFPRI–DAR 2005-06).
Note: Figures in parentheses indicate the number of agencies in each category.

In 2003, the average number of support staff per scientist in our 12-agency sample was 1.4, comprising 0.6 technicians, 0.3 administrative personnel, and 0.5 other support staff such as laborers, guards, drivers, and so on (Figure 5). This number was lower than for most countries in the region. On average, the government agencies employed close to half the number of support staff per scientist (1.4) than the higher education agencies (2.7). This is in contrast to many other countries in the region in which government agencies employ a higher ratio of support staff to scientists than higher education agencies. By comparison, in 1996, the average number of support staff per scientist for the 12-agency sample was 1.8. The average number of technicians per researcher fell sharply during 1996–2003, while the average number of administrative and other support staff per scientist increased slightly.

Figure 5—Support-staff-to-researcher ratios, 1996 and 2003

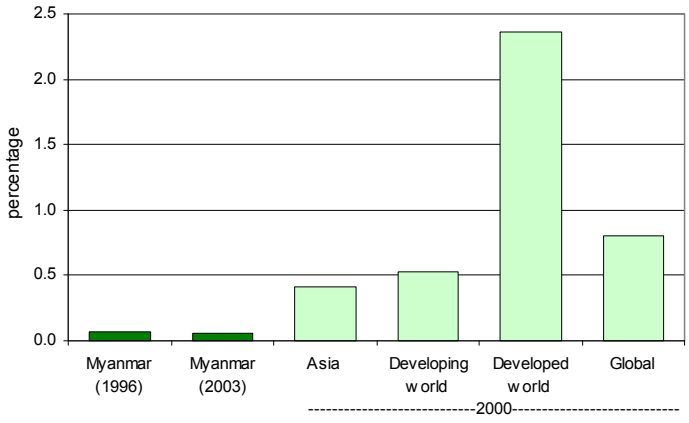


Source: Compiled by authors from ASTI survey data (IFPRI–NAFRI 2005).
Note: Figures in parentheses indicate the number of agencies in each category.

Spending

Total public spending as a percent of agricultural output (AgGDP) is a common research investment indicator that helps to place a country's agricultural R&D spending in an internationally comparable context. In 2003, Myanmar invested $0.06 for every $100 of agricultural output—similar to the corresponding ratio of $0.07 recorded for 1996 (Figure 6). This

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

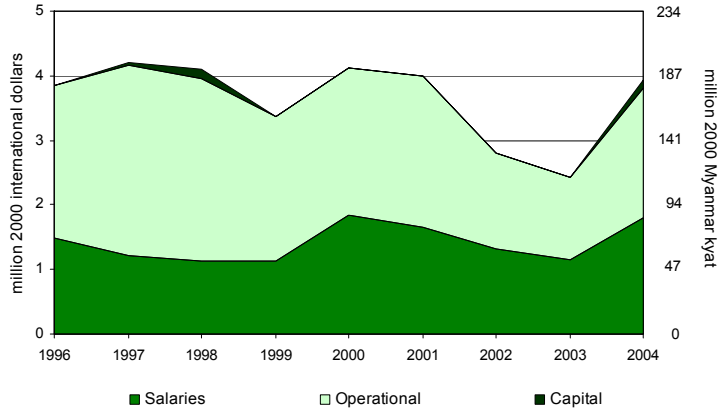


Sources: Data for Myanmar are compiled from Figure 2; AgGDP data are from World Bank (2005); all other intensity ratios are from Pardey et al. (2006).

rate of investment is among the lowest in the world. The averages for Asia and the developing world, for example, were 0.41 and 0.53 in 2000, respectively.

During 1996–2004, salaries accounted for 39 percent of DAR's total expenditures, while operating costs accounted for 60 percent and capital costs accounted for 1 percent (Figure 7). DAR's capital expenditure has been extremely low, but the 2004 restructuring of DAR indicates renewed commitment to public agricultural R&D on the part of the government, which may in turn result in higher capital investment in Myanmar's agricultural research system in the future (preliminary data for 2005–06 appear to support this trend). Though DAR's capital infrastructure is generally satisfactory, research equipment will require a lot of investment in the years to come. Operating costs remained relatively stable from 1996 to 2001, averaging $2 to $3 million, and then spiked somewhat in 2002–03 due to changes at DAR. Total salary expenditures fluctuated widely over the 1996–2004 period, but they have risen in recent years with accelerated recruitment. In 2006, civil servant salaries were reformed, providing increases to government-based R&D staff.

Figure 7— Cost-category shares in DAR's expenditures (in constant prices), 1996-2004



Source: Compiled by authors from ASTI survey data (IFPRI–DAR 2005-06).

FINANCING PUBLIC AGRICULTURAL R&D

Unlike other Southeast Asian countries with a similar state of economic development and history of political isolation such as Laos and Cambodia, agricultural research in Myanmar is almost entirely financed by the national government.[6] Myanmar's military rule was imposed in 1988 and the bulk of the country's tax revenue has since been directed toward the military. For example, in 2002, an estimated 67 percent of Myanmar's tax revenues (from a tax base of only 3.6 percent of GDP) was spent on the military, while expenditures on health and education each accounted for less than 0.5 percent of GDP. This has led to

a widespread boycott of Myanmar's military regime by the international community. Since 1989, the only U.S. aid for which Myanmar has been eligible—aside from humanitarian aid—is counter-narcotic and crop substitution assistance (Euro-Burma Office 2003). Other donors, including the European Union, Japan, and Australia, have imposed similar restrictions on the country, and aid from Japan—Myanmar's largest foreign donor—is run at maintenance level. Moreover, the International Monetary Fund (IMF), the World Bank, and the Asian Development Bank (ADB) do not extend credit to Myanmar.

In 2002, the Australian Centre for International Agricultural Research (ACIAR) explored the feasibility of collaborative research activities with Myanmar. The centre developed a small program beginning in 2003 with bilateral projects under which Australian research organizations were commissioned to undertake specific agricultural research activities in collaboration with a partner organization in Myanmar. The program cost AU$0.4 million from 2003 to 2006 (roughly US$0.3 million). With the current international situation, however, the development of new projects is now on hold. Nevertheless, Myanmar continues to benefit from spillover effects from related ACIAR projects in neighboring countries, most notably vaccines against Newcastle disease in chickens (ACIAR 2006).

Recently, the Fund for International Development under the Organization of the Petroleum Exporting Countries (OPEC) provided limited financial support for an oil crops development project, which had a small R&D component. Occasional funding from the Japan International Cooperation Agency (JICA) and the Japan International Research Center for the Agricultural Sciences (JIRCAS) becomes available in the form of scholarship programs.

University-based agricultural R&D is financed in a similar way to government-based R&D. Salary, operating, and capital costs are directly provided by the ministries overseeing the universities. Additional funding is provided by the private sector. For example, during 2003–04, Myanma Awba Group Corporation provided a 1.3 million current kyat research grant to YAU.

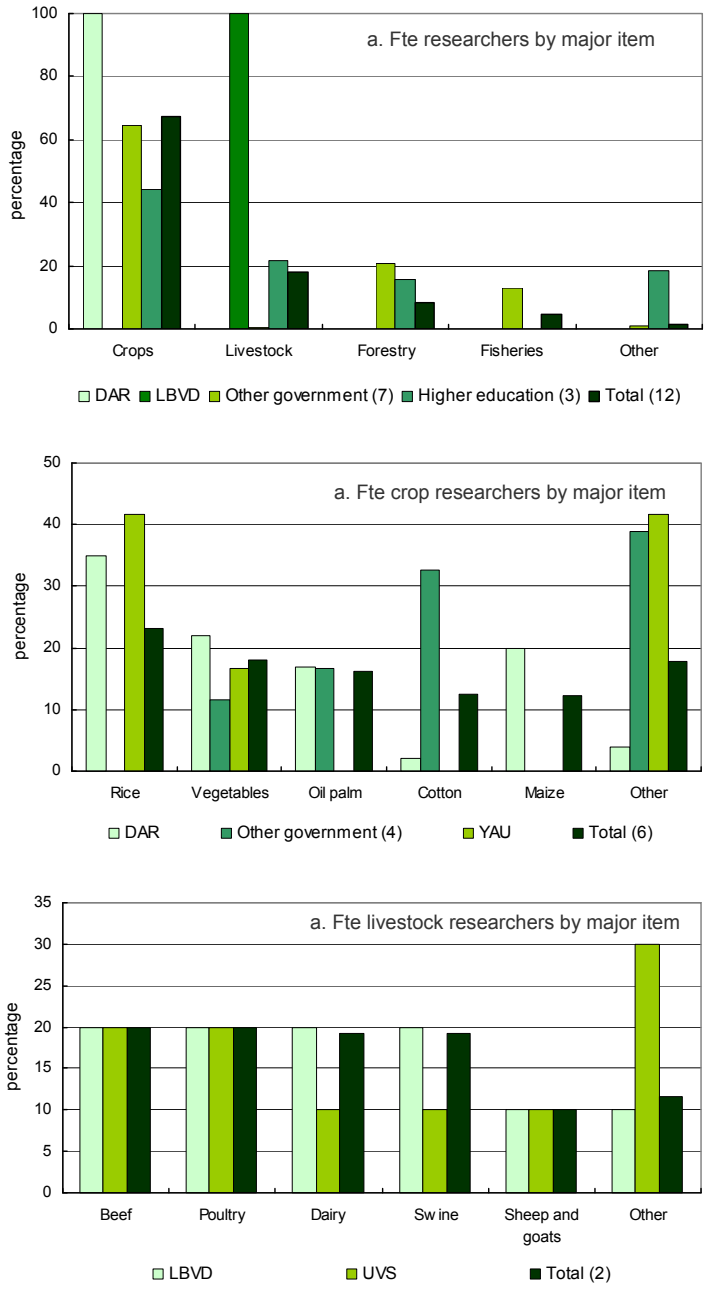
RESEARCH ORIENTATION

Commodity Focus

The allocation of resources among various lines of research is a significant policy decision, and so detailed information was collected on the number of fte researchers working in specific commodity and thematic areas. In 2003, more than two-thirds of Myanmar's 619 fte researchers conducted crop research. Livestock research accounted for 18 percent, forestry research for 9 percent, and fisheries research for 5 percent (Figure 9a). Research staff at DAR spent 100 percent of their time on crop research, while their counterparts at LBVD spent all their time on livestock research, which is unsurprising given the agencies' mandates.

Rice research accounted for close to a quarter of all research on crops in 2003 (Figure 9b). Vegetable research accounted for 18 percent, oil palm research for 16 percent, and cotton and maize research for 13 and 12 percent, respectively. While the dominance of cotton research at MCSE was expected (80 percent), the strong focus on rice research at DAR (35 percent) and YAU (42 percent) is notable. Only two agencies, LBVD and UVS, are involved in livestock research, and most of their activities focus on beef, poultry, dairy, and swine, each representing 19–20 percent of livestock research (Figure 9c).

Figure 8—Commodity Focus, 2003



Source: Compiled by authors from ASTI survey data (IFPRI–DAR 2005-06).
Notes: Figures in parentheses indicate the number of agencies in each category. Figure 8b only includes agencies involved in crop research; Figure 8c only includes agencies involved in livestock research.

Thematic Focus

In 2003, 60 percent of DAR's 253 fte researchers concentrated on crop genetic improvement, 10 percent on crop pest and disease control, and 15 percent on other crop-related themes (Table 2). The thematic focus of the 366 fte researchers at the remaining 11 agencies was quite different. In 2003, 16 percent of these researchers focused on natural resources, 13 percent focused on crop genetic improvement, and 11 percent focused on crop pest and disease control. Livestock-related themes accounted for close to 40 percent of time spent on research by these scientists.

Table 2—Thematic focus, 2003

	Numbers of researchers		Shares	
Category	**DAR**	**Other (11)**	**DAR**	**Other (3)**
	(*in fte's*)		(*percent*)	
Crop genetic improvement	151.8	47.8	60.0	13.1
Crop pest and disease control	25.3	40.1	10.0	11.0
Other crop	38.0	52.8	15.0	14.4
Livestock genetic improvement	0.0	13.9	0.0	3.8
Livestock pest and disease control	0.0	25.0	0.0	6.8
Other livestock	0.0	101.3	0.0	27.7
Soil	12.7	11.7	5.0	3.2
Water	12.7	4.3	5.0	1.2
Other natural resources	0.0	57.3	0.0	15.7
Postharvest	0.0	8.1	0.0	2.2
Other	12.7	3.5	5.0	1.0
Total	**253.0**	**365.6**	**100.0**	**100.0**

Source: Compiled by authors from ASTI survey data (IFPRI–DAR 2005-06).
Notes: Figures in parentheses indicate the number of agencies in each category.

CONCLUSION

The number of fte researchers employed in agriculture in Myanmar increased gradually during 1996–2003, but real spending on agricultural R&D declined. In 2003, Myanmar invested just 8 million dollars in 2000 international prices on agricultural R&D, which is extremely low given the country's size and the importance of the agricultural sector to the national economy. Both the country's average spending per agricultural scientist and its research intensity ratio are among the lowest in the world. Agricultural research investments in Myanmar would need to increase sevenfold for the country to be on par with the average for the Asia-Pacific region. Substantial government support would also need to be forthcoming for Myanmar to attain this goal, given the current donor boycott, which is likely to remain in place for the foreseeable future.

Myanmar is also challenged by comparatively underqualified agricultural research staff. Very low civil service salaries and benefits make attracting, motivating, and retaining highly qualified scientists extremely difficult, particularly as new job opportunities with nongovernmental organizations (NGOs) and private-sector agencies arise. Interestingly, this situation has opened the door to a large number of female researchers with BSc and, to some extent, MSc degrees. Nonetheless, the limited number of senior staff seriously constrains DAR's and LBVD's ability to achieve their organizational objectives, and despite the high numbers of female researchers at these agencies, very few women are qualified to the PhD level.

Considerable empirical evidence suggests that agricultural R&D can make a critical contribution to improving incomes and livelihoods of people in developing countries. The combination of severe public underinvestment in agricultural R&D, lack of important donor-financed projects, and shortage of PhD-qualified personnel make the effectiveness of agricultural R&D in Myanmar questionable at best. Additional funding is needed if agricultural R&D is to make a difference in Myanmar.

NOTES

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2. The 12-agency sample consisted of:
   - 9 government agencies: the Applied Research Centre for Perennial Crops (ARCPC), the Apiculture Research and Development Unit (ARDU) under the Department of Agriculture (DOA), the Department of Agricultural Research (DAR), the Department of Fisheries (DoF), the Forest Research Institute (FRI), the Livestock Breeding and Veterinary Department (LBVD), the Myanmar Cotton and Sericulture Enterprise (MCSE), the Myanmar Sugarcane Enterprise (MSE), and the Vegetables and Fruits Research and Development Centre (VFRDC);
   - 3 higher education agencies: the Yezin Agricultural University (YAU), the University of Forestry (UOF), and the University of Veterinary Science (UVS).
3. Unless otherwise stated, all data on research expenditures are reported in 2000 international dollars or 2000 Myanmar kyat.
4. Fifteen trainees were sent to Israel in 1995 for a period of 11 months; thereafter, 50 to 100 trainees received training in Israel annually.
5. Although the choice of deflator and PPP used in this study affect the magnitude of the results presented to some degree, they do not alter the conclusions.
6. The Ministry of National Planning and Economic Development (MNPED) is charged with allocating research budgets to the country's agricultural R&D agencies.

METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI and DAR 2005-06).
- The data were compiled using internationally accepted statistical procedures and definitions developed by the OECD and UNESCO for compiling R&D statistics (OECD 2002; UNESCO 1984). The authors grouped estimates using three major institutional categories—government agencies, higher-education agencies, and business enterprises, the latter comprising the subcategories private enterprises and nonprofit institutions. The researchers defined public agricultural research to include government agencies, higher-education agencies, and nonprofit institutions, thereby excluding private enterprises. Private research includes research performed by private-for-profit enterprises developing pre, on, and postfarm technologies related to agriculture.
- Agricultural research includes crops, livestock, forestry, and fisheries research plus agriculturally related natural resources research, all measured on a performer basis.
- Financial data were converted to 2000 international dollars by deflating current local currency units with a Myanmar GDP deflator of base year 2000 and then converting to U.S. dollars with a 2000 purchasing power parity (PPP) index, both taken from World Bank (2005). PPP's are synthetic exchange rates used to reflect the purchasing power of currencies, typically comparing prices among a broader range of goods and services than conventional exchange rates.
- Annual growth rates were calculated using the least-squares regression method, which takes into account all observations in a period. This results in growth rates that reflect general trends that are not disproportionately influenced by exceptional values, especially at the end point of the period.

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

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