

MAURITIUS

RECENT DEVELOPMENTS IN PUBLIC AGRICULTURAL RESEARCH

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LONG-TERM INVESTMENT AND CAPACITY TRENDS IN PUBLIC AGRICULTURAL R&D

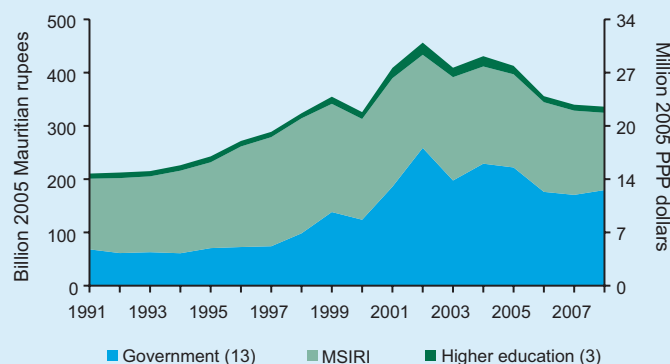
After a period of steady increases throughout the 1990s, public agricultural research and development (R&D) expenditures in Mauritius began to decline from 2002. In 2008, the country invested 336 million Mauritian rupees or 23 million PPP dollars on agricultural R&D, compared with 456 million rupees or 31 million PPP dollars in 2002 (in 2005 prices), representing a decrease of about 25 percent (Figure 1; Table 1). Note that, unless otherwise stated, all dollar values in this note are based on PPP exchange rates.¹ PPPs reflect the purchasing power of currencies more effectively than do standard exchange rates because they compare prices of a broader range of local—as opposed to internationally traded—goods and services. Despite the gradual declines in agricultural R&D investments, Mauritius expanded its agricultural research capacity somewhat since the turn of the millennium to 178 full-time equivalent (FTE) researchers in 2008.

The principal crop in Mauritius is sugarcane, a factor that is reflected in the institutional structure of the nation's agricultural R&D system. The Mauritius Sugar Industry Research Institute (MSIRI) is the country's largest agricultural research agency, accounting for more than one-third of total agricultural R&D staff and expenditures in 2008. MSIRI was established by sugarcane

Key Trends Since 2000

- Total public agricultural R&D spending in Mauritius fell by almost 25 percent during 2001–08, largely due to declining expenditures by the Mauritius Sugar Industry Research Institute (MSIRI), the country's largest agricultural R&D agency. MSIRI, which is largely funded through a tax on sugar exports, was negatively affected by declining production and world sugar prices.
- Nonsugarcane research is chiefly funded by the national government.
- In contrast to spending trends, total agricultural R&D capacity rose somewhat on average, during 2000–08, reaching 178 full-time equivalent (FTE) researchers.
- Average qualifications of agricultural research staff, in terms of higher degrees improved during the 2000–08 period.

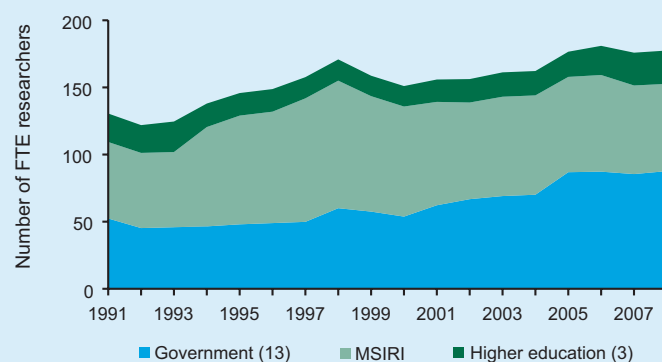
Figure 1—Public agricultural R&D spending adjusted for inflation, 1991–2008



Sources: IFPRI–FARC 2009–10 and Beintema, Ramkissoon, and Icochea 2003.

Notes: Figures in parentheses indicate the number of agencies in each category. The agency sample comprises one government agency that ceded operations in 1991. For more information on coverage and estimation procedures, see the Mauritius country page on ASTI's website at asti.cgiar.org/mauritius.

Figure 2—Public agricultural research staff in full-time equivalents, 1991–2008



Sources: IFPRI–FARC 2009–10 and Beintema, Ramkissoon, and Icochea 2003.

Notes: Figures in parentheses indicate the number of agencies in each category. The agency sample comprises one government agency that ceded operations in 1991. Data include expatriate researchers active at R&D agencies in Mauritius.

Table 1—Overview of public agricultural R&D spending and research staff levels, 2008

Type of agency	Total spending			Total staffing	
	Mauritian rupees	PPP dollars	Shares	Number	Shares
	(million 2005 prices)		(%)	(FTEs)	(%)
AREU	75.8	5.2	22.6	46.8	26.4
Other government (11)	103.7	7.1	30.8	40.9	23.0
MSIRI	145.1	9.9	43.2	65.0	36.6
Higher education (3)	11.5	0.8	3.4	24.8	14.0
Total (16)	336.1	22.9	100	177.5	100

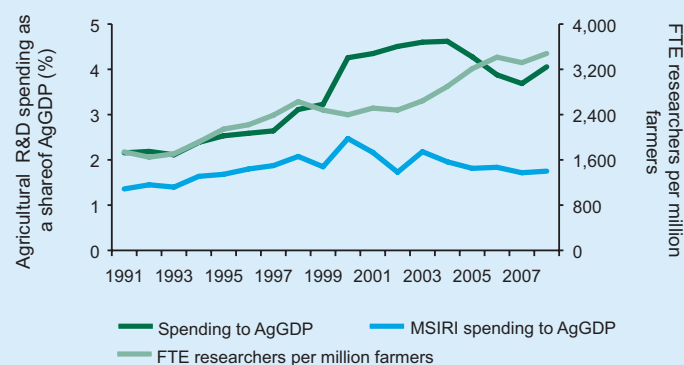
Source: IFPRI–FARC 2009–10.

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

producers in 1953 as a private, nonprofit agency to promote the technical progress of the sugar industry through research. The institute is governed by a Board of Directors comprising representatives of growers, millers, the Chamber of Agriculture, and the government. MSIRI consists of four departments: Agronomy, Biology, Engineering, and Resource Management and also offers a variety of agricultural training programs (MSIRI 2010). The institute is almost entirely funded by a tax on the proceeds of sugar production, including all earnings from both local sales and exports (see the section on funding sources for more information). Falling world sugar prices combined with a cut in the European Union's guaranteed sugar price caused sugarcane production levels to plunge and MSIRI's funding to fall significantly in recent years. Concurrently, the institute has downsized since the late-1990s via a recruitment freeze, with the result that staffing levels fell from 95 FTE researchers in 1998, to 65 in 2008.

Twelve government agencies were identified as being involved in agricultural R&D in Mauritius. Combined, they accounted for roughly half the country's public agricultural R&D capacity and investments in 2008. The largest government agency is the Agricultural Research and Extension Unit (AREU),

Figure 3—Intensity of agricultural research spending and capacity, 1991–2008



Sources: Calculated by authors from IFPRI–FARC 2009–10; Beintema, Ramkissoon, and Icochea 2003; FAO 2009; and World Bank 2009.

which is charged with conducting research on nonsugarcane-related crops and livestock, as well as providing extension services to farmers. In 2008, AREU employed 47 FTE researchers, up from 30 in 2001. AREU's laboratory infrastructure was expanded and further improved with the accreditation of its plant pathology laboratory and the establishment of a molecular biology laboratory in 2009. AREU is administered by the Food and Agricultural Research Council (FARC), a parastatal organization responsible for coordinating, promoting, and monitoring research related to agriculture, forestry, fisheries, and food production. FARC also has a tissue culture laboratory and nursery facilities to support some research on bananas and ornamentals (3 FTE research staff in 2000) and, in addition, controls a competitive fund to finance short-term agricultural research projects (Beintema, Ramkissoon, and Icochea 2003).

The Mauritius Oceanography Institute (MOI) was established in January 2000 to rationalize and coordinate R&D activities related to marine resources and aquatic farming systems. MOI's research capacity increased from just 6 FTE researchers when it was established, to 17 in 2008. The institute's capital expenditures were particularly high during the early years of its existence. The Albion Fisheries Research Center (AFRC) is the country's principal performer of marine fisheries research. Eight FTE researchers were active at AFRC in 2008. The remaining nine government agencies involved in agricultural R&D in Mauritius each employed 6 FTE researchers or fewer.

The higher education sector plays a relatively limited role in Mauritian agricultural R&D, accounting for just 14 percent of total agricultural research capacity in 2008. Three faculties under the University of Mauritius are involved in agricultural R&D: the Faculty of Agriculture, the Department of Biological Sciences of the Faculty of Science, and the Department of Sugar and Chemical Engineering of the Faculty of Engineering. During 2001–08, the total number of agricultural R&D staff at the University of Mauritius rose from 17 to 25 FTEs.

No private companies involved in agricultural R&D were identified as part of this study. However, two enterprises have signed agreements with AREU and MSIRI to make use of their respective agricultural R&D facilities. The first, Aadicon Biotechnology, collaborates with FARC/AREU on R&D and training related to bio-fertilizer and biocontrol agents to promote organic agriculture. Its original project on reproductive embryo transfer

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- More details on institutional developments in agricultural research in Mauritius are available in the 2004 country brief at asti.cgiar.org/pdf/Mauritius_CB7.pdf.
- Underlying datasets can be downloaded using ASTI's data tool at www.asti.cgiar.org/data.
- This brief presents aggregated data; additional graphs with more detailed data are available at asti.cgiar.org/mauritius/datatrends.

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and artificial insemination has just been completed. Vita Rice Ltd., a seed company, has launched an extensive hybrid rice improvement and production program, essentially to cater for Africa. Vita Rice has signed collaborative research agreements with MSIRI and FARC/AREU and has set up a Food Security Development Centre (FSDC) in Mauritius, of which MSIRI and FARC/AREU each own a 10-percent share.

During 2001–08, the overall share of female agricultural researchers in Mauritius increased slightly, from 35 to 37 percent, representing one of the highest shares in Sub-Saharan Africa (ASTI–FARC 2009–10). Over the same time period, the average ratio of support staff to researchers dropped from 4.1 to 3.6. In 2008, the country employed 0.7 technicians, 0.4 administrative support staff, and 2.5 other support staff for every FTE researcher (ASTI–FARC 2009–10). This average masks significant cross-agency variation: the higher education agencies, for instance, employ fewer support staff given that research is secondary to their teaching mandates.

Total public agricultural R&D spending as a percentage of agricultural output (AgGDP) is a commonly used indicator to compare agricultural R&D spending across countries. After a decade of growth during 1991–2000, the agricultural research intensity ratio in Mauritius decreased slightly. In 2008, the country spent \$4.06 for every \$100 of agricultural output compared with \$4.35 in 2001. Nonetheless, this is still—by far—the highest intensity ratio in Sub-Saharan Africa, reflecting the country's high level of investment in sugarcane research. In fact, total expenditures by MSIRI alone accounted for close to 2 percent of the country's AgGDP. The number of agricultural FTE researchers per million farmers increased from 2,514 to 3,480 during 2001–08, again, the highest level in Sub-Saharan Africa. This result stemmed from an increase in the number of agricultural FTE researchers and a contraction in the numbers of farmers.

INSTITUTIONAL STRUCTURE AND POLICY ENVIRONMENT

Few institutional changes occurred in the structure of agricultural R&D in Mauritius from 2000 until 2008. The policy environment of public agricultural R&D did, however, undergo some important

ASTI Website Interaction

-  A list of the 12 government agencies, the nonprofit agency, and the 3 higher education agencies included in this brief is available at asti.cgiar.org/mauritius/agencies.
-  Detailed definitions of PPPs, FTEs, and other methodologies employed by ASTI are available at asti.cgiar.org/methodology.
-  The data in this brief are predominantly derived from surveys. Some data are from secondary sources or were estimated. More information on data coverage is available at asti.cgiar.org/mauritius/datacoverage.
-  More relevant resources on agricultural R&D in Mauritius are available at asti.cgiar.org/mauritius.

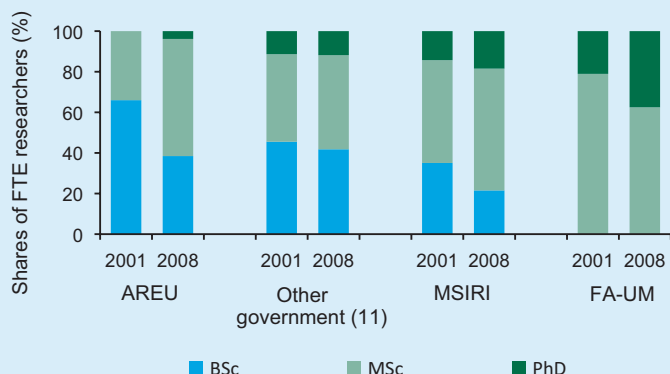
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shifts. In 2005, legislation relating to FARC was amended to extend the Council's mandate to establish agricultural development projects based on emerging technologies, such as the expansion of tissue-culture applications and hydroponics in the crop and fruit subsectors. Given that FARC's budget for research funding has diminished, its role in planning, steering, monitoring, and advising the country's agricultural research agencies has become more prominent.

In 2008 a new Ministry of Industry, Science, and Research was created, and following the 2010 general election the Ministry of Tertiary Education, Science, Research, and Technology (MoTESR&T), was created. While attempting to avoid undue duplication of activities by other ministries, the new Ministry will focus on expanding capacity in the higher education sector and defining policy and strategy for science, research, and technology in Mauritius. The country's government agricultural R&D agencies remain under the Ministry of Agro-Industry and Food Security, from which they will continue to receive the bulk of their funding; but MoTESR&T may provide specific programmatic funding in priority areas.

Following the aforementioned cut in guaranteed sugar prices by the European Union, falling production levels, and—in particular—the global food crisis, the (current) Ministry of Agro-Industry and Food Security's 2008 strategy paper emphasized the need to diversify the nation's agricultural sector and focus on research. The Ministry also approved a strategic plan for food security, which provides significant funding for activities to enhance domestic food production. Four agricultural R&D projects to be monitored by FARC have been approved so far.

Figure 4—Degree level of researchers by institutional category, 2001 and 2008



Source: IFPRI–FARC 2009–10.

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

DEGREE LEVELS AND TRAINING OF RESEARCH STAFF

Average qualifications of agricultural research staff in Mauritius, in terms of degree levels, improved during 2001–08. The overall share of PhD-qualified staff rose from 11 to 13 percent, whereas the share of MSc-qualified staff increased from 47 to 56 percent (Figure 4). On average, staff employed in the higher education sector were more highly qualified than those employed at MSIRI or the government agencies, a finding that is consistent with those of other developing countries around the world. The absolute number of PhD- and MSc-qualified staff at MSIRI remained relatively stable during 2001–08 at around 12. In contrast, AREU recorded a significant increase in its degree-qualified R&D staff. In 2008, the unit employed 3 staff members with PhD degrees and 45 with MSc degrees, compared with none with PhD degrees and only 17 with MSc degrees in 2001. All Mauritian agricultural R&D agencies require further degree-level training for their staff, but administrative and budgetary constraints limit opportunities (especially at AREU/FARC and AFRC). The University of Mauritius does provide PhD-level training in agriculture, which some agency staff are taking advantage of, mostly on a part-time basis, and the country's Tertiary Education Commission offers financial assistance for approved postgraduate training in the form of a partial grant or monthly stipend.

MSIRI considers training to be an ongoing requirement because new projects call for different skills, and researchers need to adapt to changing techniques and methods in order to increase the overall reliability and accuracy of results—particularly in the fields of biotechnology and information and communications technologies. MSIRI therefore strongly encourages its staff to take advantage of the institute's facilities, and to embark on PhD training at recognized universities. The incentives offered include payment of university fees and, if the student is registered at a foreign university, travel to Mauritius for the supervisor. The research project must, however, align with MSIRI's R&D programs and be undertaken within the country. MOI fully sponsors MPhil or PhD training undertaken by its staff members at the University of Mauritius. In the past, many MOI scientists were trained at the U.K.'s Southampton University

and the University of Wales. Some staff also receive on-the-job training for specific projects.

It is important to note that AREU and AFRC do not classify all their BSc- and MSc-qualified staff as researchers; some are employed as technicians (Figure 5). In 2008, less than two-thirds of the BSc- and MSc-qualified staff at AREU and AFRC were classified as researchers. Employment in agricultural R&D agencies has become highly competitive, resulting in the employment of large numbers of overqualified staff in technical support positions.

At AREU, the average age of R&D staff is approximately 40 years. The availability of government funding is the only factor that limits recruitment efforts from time to time. The average age of scientists at MSIRI is much higher, at 48 years and rising. MSIRI has been in a process of downsizing since the late-1990s due to funding constraints, so departing and retiring researchers have not been replaced. If the institute is to deliver its mandate, however, this issue requires urgent attention, either through recruitment of new staff or the provision of training to existing staff (obviously a lengthy process).

INVESTMENT TRENDS

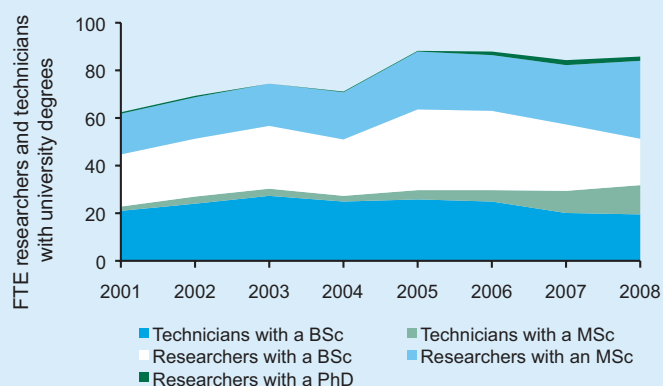
Cost Categories

Since the allocation of research budgets across salaries, operating costs, and capital expenses affects the efficiency of agricultural R&D, detailed cost category data were collected from the government agencies and MSIRI as part of this study. AREU spent the highest share of its budget on salaries in 2008 (77 percent) and the lowest share on capital investments (3 percent). Relative cost category shares at MSIRI and the government agencies were similar to those at AREU in 2008, although capital investments were slightly higher. MOI recorded unusually high capital investments, at 43 percent of the institute's budget in 2008, due to high investment on laboratory equipment.

Funding Sources

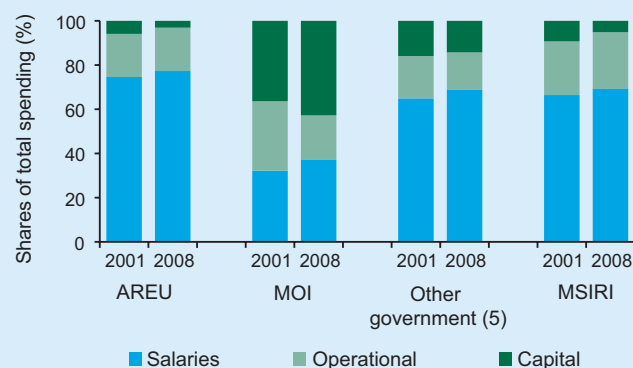
During 2001–08, more than 90 percent of public agricultural R&D in Mauritius, excluding the higher education sector,

Figure 5—Full-time equivalent researcher and technician trends at AREU and AFRC, 2001–08



Source: IFPRI–FARC 2009–10.

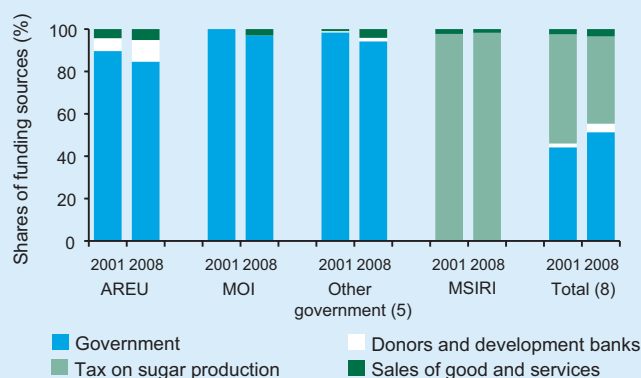
Figure 6—Agricultural R&D spending by cost category shares, 2001 and 2008



Source: IFPRI–FARC 2009–10.

Notes: Figures in parentheses indicate the number of agencies included in each category. Five small government agencies were excluded from the sample because of data unavailability.

Figure 7—Funding shares of government and nonprofit agencies, 2001 and 2008



Source: IFPRI–FARC 2009–10.

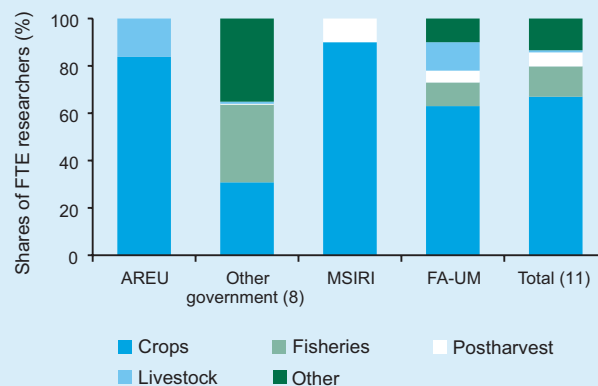
Notes: Figures in parentheses indicate the number of agencies included in each category. Five small government agencies were excluded from the sample because of data unavailability.

was financed through direct contributions from the national government or through the aforementioned tax on sugar production. The remaining funding was derived through donors or was generated internally (Figure 7). AREU, MOI, and the other government agencies received the majority of their funding from the Mauritian government. In 2008, the government funded 85 percent of agricultural R&D activities conducted by AREU and more than 90 percent of those undertaken by MOI and the other government agencies. The remaining funds were received from donors, through development bank loans, or through the sale of goods and services. During 2001–08, AREU reported funding from the International Atomic Energy Agency (IAEA), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), the Technical Center for Agricultural and Rural Cooperation (CTA), and the International Society for Horticultural Science (ISHS), while MOI reported funding from the Swedish International Development Cooperation Agency (Sida) through the Western Indian Ocean Marine Science Association (WIOMSA). Donors providing funding for agricultural R&D activities at AFRC include the Norwegian Agency for Development Cooperation (NORAD), the International Fund for Agricultural Development (IFAD), UNDP, FAO, the Japan International Cooperation Agency (JICA), and the World Bank loan-funded South West Indian Ocean Fisheries Project (SWIOFP).

Mauritius has been a major beneficiary of the European Union's guaranteed sugar prices and quota since 1975, but the recent restructuring of the EU's sugar regime led to a downward spiral of these guaranteed sugar prices by 36 percent between 2005 and 2009. Given that MSIRI is almost entirely funded by a tax on sugarcane production (98 percent in 2008), revenues generated by the tax fell by almost 30 percent during 2001–08, from 13.9 million PPP dollars or 203.3 million rupees, to 9.4 million PPP dollars or 138.5 million rupees (in 2005 prices). These declines can also be attributed in part to changes in EU policy regulating sugar production, marketing, and trade in the European Union. Many Mauritian sugar growers are now calling for a decrease in their contributions, although this has yet to materialize.

Despite declining funding, MSIRI will receive compensation from the European Union under the European Development Fund (EDF). Beginning in 2010, the European Commission is funding a Sugar Research Program to increase the competitiveness of the

Figure 8—Research focus by major commodity area, 2008



Source: IFPRI–FARC 2009–10.

Notes: Figures in parentheses indicate the number of agencies included in each category. Three small government and two higher education agencies were excluded from the sample because of data unavailability.

sugar industries in African, Caribbean, and Pacific countries. For Mauritius, 13 million Euros have been earmarked for research activities. This program comprises 11 projects, 8 of which will be led by MSIRI. The objectives are improving varieties, decreasing production costs, ensuring sustainable production, promoting sugar derivatives including energy production, building capacity, promoting collaboration, and disseminating information.

RESEARCH ALLOCATION

The allocation of resources across various lines of research is a significant policy decision; hence detailed survey information was collected on the number of FTE researchers working in specific commodity and thematic areas. In 2008, two-thirds of the country's agricultural researchers were involved in crop research (Figure 8). Fisheries research accounted for 13 percent and postharvest research for 6 percent. The remaining researchers

Table 2—Focus of crop and livestock research by major item, 2008

	AREU	Other government (8)	MSIRI	FA-UM	Total (11)
Shares of FTE researchers (%)					
Crop items					
Sugarcane	—	171.6	93.2	—	68.6
Vegetables	35.6	22.9	—	17.4	5.6
Fruits other than bananas	17.8	19.1	—	6.9	4.0
Potatoes	3.0	—	4.5	3.5	3.6
Ornamentals	3.0	13.0	0.0	12.5	3.4
Bananas and plantains	3.0	10.5	0.0	3.5	2.1
Other crops	29.6	33.3	2.3	45.9	11.6
Livestock items					
Dairy	4.4	0.2	—	0.7	0.1
Sheep and goats	3.7	0.2	—	0.7	0.1
Other livestock	—	0.8	—	8.9	0.9
Total crop and livestock	100	272	100	100	100

Source: IFPRI–FARC 2009–10.

Notes: Figures in parentheses indicate the number of agencies included in each category. Three small government and two higher education agencies were excluded from the sample because of data unavailability.

concentrated their efforts on natural resources, forestry, and livestock.

Commodity Focus

Despite falling production levels, sugarcane remains the most researched crop in Mauritius by far, accounting for 69 percent of total crop and livestock research in 2008. The remaining researchers focused on potatoes and other vegetables (9.2 percent); bananas, plantains, and other fruits (6.1 percent); and ornamentals (3.4 percent). Livestock research accounts for a negligible share of total agricultural research in Mauritius.

CONCLUSION

Historically, agricultural R&D in Mauritius has been funded through national sources. Sugarcane research is financed through a tax on sugar production, while nonsugarcane research is primarily funded by the national government. In 2008, Mauritius invested 336 million rupees or 23 million PPP dollars in agricultural R&D (in 2005 prices)—an extremely large amount given the country's size. Agricultural R&D spending as a share of agricultural output, at more than 4 percent in 2008, is by far the highest level of any country in Sub-Saharan Africa. In comparison, average investment levels in most African countries are well below 1 percent of AgGDP.

Despite these high levels of investment, public agricultural R&D expenditures in Mauritius have gradually fallen since reaching a peak in 2002. Capital investments at MOI, which was only established in 2000, were exceptionally high in 2002 but fell thereafter. Spending at MSIRI, the country's largest agricultural R&D agency, also fell during 2001–08 due to reduced world sugar prices and production levels, which caused a 30 percent contraction in the institute's principal funding source, a tax on the proceeds of sugarcane production, during this timeframe.

In contrast, human resource capacity in agricultural R&D gradually increased between 2000 and 2008. Rapidly falling scientist numbers at MSIRI were offset by increasing researcher numbers at

AREU. This reflects official government policy aiming to diversify the country's economy away from sugarcane production. Average qualification levels of agricultural scientists have also improved, though the share of PhD-qualified staff is relatively low compared with many other African countries.

Overall, agricultural R&D in Mauritius is very well-staffed and funded. The national government realizes the important role that agricultural R&D plays in the development of the agricultural sector and the economy more generally, and has various well-functioning policies and funding mechanisms in place to support the sector.

NOTES

¹ Financial data are also available in current local currencies or constant 2005 U.S. dollars via ASTI's data tool, available at www.asti.cgiar.org/data.

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

FARC is responsible for coordinating, promoting, and monitoring research related to agriculture, forestry, fisheries, and food production in Mauritius. It was established in 1985 and falls under the Ministry of Agro-Industry and Food Security. To learn more about FARC visit <http://www.gov.mu/portal/sites/ncb/moa/farc/index.htm>.

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

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