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MADAGASCAR

RECENT DEVELOPMENTS IN PUBLIC AGRICULTURAL RESEARCH

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

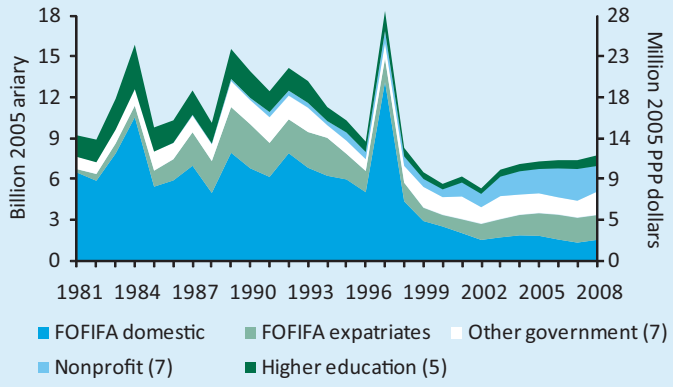
During 2000-08, annual public national agricultural research and development (R&D) expenditures in Madagascar were significantly lower than the levels reported in the 1990s. The completion of the World Bank–led National Agricultural Research Project (NARP) in 1999 prompted a sudden decline in overall spending levels. However, since 2002, the country's total agricultural research spending has rebounded somewhat. In 2008, Madagascar spent 7.7 billion ariary or 11.9 million PPP dollars on agricultural R&D, both in 2005 constant prices (Figure 1; Table 1). Unless otherwise stated, all prices in this note are based on purchasing power parity (PPP) exchange rates, which reflect the purchasing power of currencies more effectively than do standard exchange rates because they compare the prices of a broader range of local—as opposed to internationally traded—goods and services.[1] Total agricultural R&D capacity levels in Madagascar changed little between 2000 and 2008 despite significant shifts in institutional-level agricultural R&D staffing. In 2008, the country employed 212 full-time equivalent (FTE) research staff (Figure 2).

The National Center of Applied Research and Rural Development (FOFIFA) is Madagascar's principal agricultural R&D agency and it holds a broad mandate covering crop, livestock, forestry,

Key Trends Since 2000

- The completion of the World Bank–funded National Agricultural Research Project in 1999 prompted a sudden decline in Madagascar's overall agricultural R&D expenditures. Spending levels have recovered somewhat in more recent years due to enhanced in-kind technical support from France in the form of a relatively large presence of French Agricultural Research Center for International Development (CIRAD) expatriate research staff.
- Despite important institute-level shifts, Madagascar's national agricultural research capacity has remained relatively unchanged during 2001-08, at levels around 210 full-time equivalent (FTE) researchers.
- The National Center of Applied Research and Rural Development (FOFIFA)'s share of national agricultural R&D expenditures fell from 69 percent in 1998 to 43 percent in 2008, and its donor dependence remains high. Concurrently, the relative shares of other government agencies and the nonprofit sector in total agricultural R&D spending have risen over the past decade.
- Given the high average age of research staff, a key priority for agricultural R&D in Madagascar is training for its younger scientists.

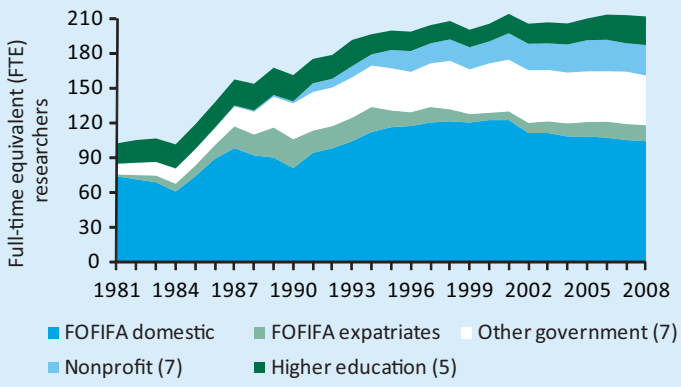
Figure 1—Public agricultural R&D spending adjusted for inflation, 1981–2008



Sources: IFPRI-FOFIFA 2009; and Beintema, Castelo Magalhães, and Randriamanamisa 2003.

Note: Figures in parentheses indicate the number of agencies in each category. For more information on coverage and estimation procedures, see the Madagascar country page on ASTI's website at asti.cgiar.org/madagascar.

Figure 2—Public agricultural research staff in full-time equivalents, 1981–2008



Sources: IFPRI-FOFIFA 2009; and Beintema, Castelo Magalhães, and Randriamanamisa 2003.

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

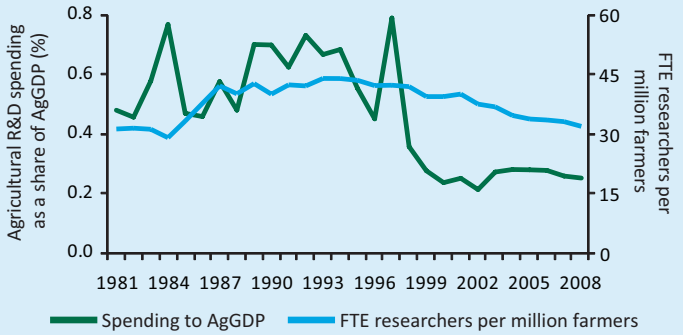
Table 1—Overview of levels of public agricultural R&D spending and research staff, 2008

Type of agency	Total spending			Total staffing	
	Ariary	PPP dollars	Share	Number	Share
	(million 2005 prices)		(%)	(FTEs)	(%)
FOFIFA					
Domestic	1,496.9	2.3	19	104.0	49
Expatriates	1,818.8	2.8	24	14.0	7
Subtotal FOFIFA	**3,315.7**	**5.1**	**43**	**118.0**	**56**
Other government (7)	1,692.7	2.6	22	43.1	20
Nonprofit (7)	1,936.7	3.0	25	26.4	12
Higher education (5)	771.9	1.2	10	24.8	12
Total (20)	**7,717.0**	**11.9**	**100**	**212.4**	**100**

Source: IFPRI–FOFIFA 2009.

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

Figure 3—Intensity of agricultural research spending and capacity, 1981–2008



Sources: Calculated by authors from IFPRI-FOFIFA 2009; Beintema, Castelo Magalhães, and Randriamanamisa 2003; FAO 2009; and World Bank 2009.

postharvest, and socioeconomic research. To a large extent, FOFIFA relied on funding from a World Bank loan under NARP throughout most of the 1990s. NARP aimed to stimulate a decentralized, multidisciplinary approach to research while at the same time rationalizing staffing levels and disseminating research findings and their impact through regional offices. Total research staff levels at FOFIFA have steadily declined since the completion of NARP in 1999. By 2008, the center employed 118 FTEs (including 14 expatriates from the French Agricultural Research Center for International Development [CIRAD]), compared with 132 a decade earlier. This reduction is largely attributable to staff retirements or the loss of staff to non-governmental organizations (NGOs) and international R&D agencies, which are able to offer more lucrative opportunities. The sudden peak in FOFIFA's expenditures in 1997 was the result of the late disbursement of NARP funding from the World Bank, which had to be spent that year (Beintema, Castelo Magalhães, and Randriamanamisa 2003). When NARP ended, FOFIFA's yearly spending plummeted.

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- More details on institutional developments in agricultural research on Madagascar are available in the 2003 country brief at asti.cgiar.org/pdf/madagascar_CB6.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/madagascar/datatrends.

www.asti.cgiar.org/madagascar

Since 2002, however, the institute's total expenditure levels have picked up again, not as a result of an increase in government funding or direct donor support, but due to an increased presence of CIRAD expatriate staff working closely with FOFIFA scientists on research projects related to forestry, rice production, and animal health. CIRAD's presence in Madagascar is the second largest outside France (CIRAD 2010). Given the high salaries of expatriate staff compared to local scientists, technical assistance from France takes up a large share of FOFIFA's (and Madagascar's) overall agricultural R&D investments.

Interestingly, the role of other government agencies and the nonprofit sector in public agricultural R&D in Madagascar has steadily risen since the early 1980s in response to increased funding opportunities in these sectors. Traditionally, the country's NGOs focused on training farmers, producing improved seed, offering extension activities, and granting agricultural credit, but NGO–led agricultural R&D activities have gradually become more prevalent since the late-1990s, with agencies like Tamatave Technical and Horticultural Center (CTHT) and Tany sy Fampandrosoana (TAFA) playing an increasingly prominent role. In 2008, the nonprofit sector accounted for a quarter of the country's agricultural R&D investments and 12 percent of its staffing. That year, the "other government" category accounted for 22 percent of agricultural R&D spending and 20 percent of staffing. The principal government agencies other than FOFIFA are the National Center for Applied Pharmaceutical Research (CNARP, employing 11 FTEs), the National Environmental Research Center (CNRE, employing 8 FTEs), and the National Industrial and Technological Research Center (CNRIT, also employing 8 FTEs).

The higher education sector's share of agricultural research in Madagascar rose between 2000 and 2008, from 8 to 12 percent. The four units charged with agricultural R&D under the University of Antananarivo reported increases in their agricultural R&D capacity, together employing 23 FTEs in 2008. The University of Toliary undertakes limited fisheries research and employed 2 FTEs in 2008. The role of the private (for-profit) sector in agricultural research is reportedly very limited in Madagascar, but since no data could be obtained for this sector, it is excluded from further analysis in this note.

In 2008, 29 percent of agricultural researchers (excluding expatriate researchers) were female on average, representing a slight improvement over the 24 percent share recorded in 2001

(IFPRI-FOFIFA 2009). At 44 percent, the share of female scientists at higher education sector is significantly higher than shares in either the government or nonprofit sectors. Overall, support-staff-to-researcher ratios virtually remained unchanged between 2001 and 2008 although significant shifts occurred at the agency level. In 2008, the national ratio averaged 0.8 technicians, 0.7 administrative support staff, and 0.8 other support staff for each researcher. Agencies like TAFA, IMVAVET, CNRO, and CNARP reported ratios well above the 4.0 mark, whereas FOFIFA's ratio averaged 2.3 (IFPRI-FOFIFA 2009).

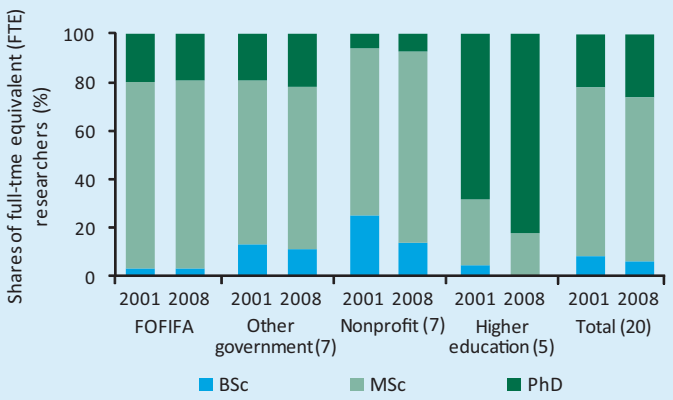
Total public spending on agricultural R&D as a percentage of value of agricultural output (AgGDP), or research intensity—a commonly used indicator of comparative agricultural R&D spending across countries—fell steadily in response to the country's declining R&D investments after 2000. In the early 1990s, intensity ratios above 0.70 were not uncommon, but in 2008 the country only invested $0.25 on agricultural R&D for every $100 of agricultural output (Figure 3). Predictably, the number of FTE researchers per million farmers also declined, from 40 in 2000 to 32 in 2008, but this decline is not as great.

INSTITUTIONAL STRUCTURE AND POLICY ENVIRONMENT

Very few changes have occurred in the institutional structure of Madagascar's agricultural research since the turn of the millennium. FOFIFA continues to dominate public agricultural R&D, although, as mentioned above, activities by the nonprofit and higher education sectors have increased over time. One important institutional-level change occurred in 2008, when the national Ministry of Agriculture took over the administration of FOFIFA from the Ministry of Scientific Research.

The Malagasy government has launched a number of important agricultural and rural policy initiatives since 2000, including the Rural Development Action Plan (PADR); the Strategy Document for Poverty Reduction (DSRP); Vision Madagascar Naturellement, and most recently the Madagascar Action Plan (MAP). Each of these initiatives focuses on reducing poverty, protecting the environment, ensuring good governance, and stimulating economic and export growth. Given the important share it contributes to national GDP, agriculture plays a key role in each of these initiatives. Moreover, each of the initiatives acknowledges agricultural R&D's important role in achieving the national goals of poverty reduction and economic growth. To this end, the initiatives focus on strengthening institutions, enhancing collaboration, promoting demand-driven research, and ensuring close linkages between the national research agenda and Madagascar's medium- and long-term needs.

Figure 4—Researcher qualifications by institutional category, 2001 and 2008



Sources: IFPRI-FOFIFA 2009 ; and Beintema, Castelo Magalhães, and Randriamanamisa 2003.

Notes: Figures in parentheses indicate the number of agencies included in each category. Expatriate research staff is excluded.

ASTI Website Interaction

- A list of the eight government, seven nonprofit, and five higher education agencies included in this brief are available at asti.cgiar.org/madagascar/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/madagascar/datacoverage.
- More relevant resources on agricultural R&D in Madagascar are available at asti.cgiar.org/madagascar.

www.asti.cgiar.org/madagascar

RESEARCH STAFF QUALIFICATIONS

In 2008, 96 percent of Madagascar's agricultural research staff were trained to the postgraduate level, with 27 percent holding PhD degrees (Figure 4). Unlike many other countries in Africa, Madagascar's female agricultural researchers qualified to the PhD level are not underrepresented.

The overall share of scientists with PhD degrees was significantly higher at the higher education agencies than at the government agencies, which is consistent with findings in other African countries. Although many FOFIFA researchers received PhD and MSc training under NARP in the 1990s through bilateral agreements unrelated to the World Bank loan (Beintema, Castelo Magalhães, and Randriamanamisa 2003), some capacity erosion has occurred since then. In 2001, FOFIFA employed 24 local scientists with PhD degrees compared with 20 scientists in 2008. This reduction largely resulted from staff retirement and departures to the University of Antananarivo and other departments under the Ministry of Agriculture. Nevertheless, efforts have been made to maintain FOFIFA's capacity at acceptable levels. NARP included an important training component for FOFIFA staff in the 1990s, and between 2004 and 2008 10 FOFIFA researchers received PhD training and 5 received (MSc equivalent) DEA training as part of projects funded by foreign donors (the European Union, France, Japan, and so

on). Most of these grants targeted women and young scientists, and training occurred at the University of Antananarivo or abroad (most notably France and the United States). FOFIFA's retirement age is 60 years, but researchers have the option of working until they turn 65. Given that the average age of FOFIFA researchers was 53 years in 2009, staff training is an urgent priority.

Total PhD capacity in the higher education sector significantly increased during 2003–08. In 2008, 82 percent of agricultural researchers at the University of Antananarivo and the University of Toliary held PhD degrees. The qualifications levels of research staff in the other government and nonprofit categories, on the other hand, remained relatively static.

INVESTMENT TRENDS

Cost Categories

The allocation of research budgets across salaries, operating costs, and capital investments affects the efficiency of agricultural R&D, so detailed data were collected on government agency cost categories. During 2001–08, salaries accounted for half of FOFIFA's expenditures, whereas operating and capital costs represented 41 percent and 8 percent, respectively (Figure 5). Salaries represented a much smaller share at the other government and nonprofit agencies (a combined 27 percent) largely due to high operating and capital costs at TAFA and CTHT. Capital expenditures at FOFIFA were highly erratic, ranging from 0.6 percent in 2002 to 14 percent in 2007. In general, salaries and fixed operating costs are funded by the national government, whereas the costs of research, training, and equipment are largely donor-funded. As a result, the completion of NARP in 1999 had a serious impact on FOFIFA's capital expenditures. During 1991–99, the center spent 3.6 million PPP dollars on average per year (in 2005 constant prices) on research equipment, vehicles, computers, laboratory maintenance, and so on, compared with just 0.2 million per year during 2000–08.

Funding Sources

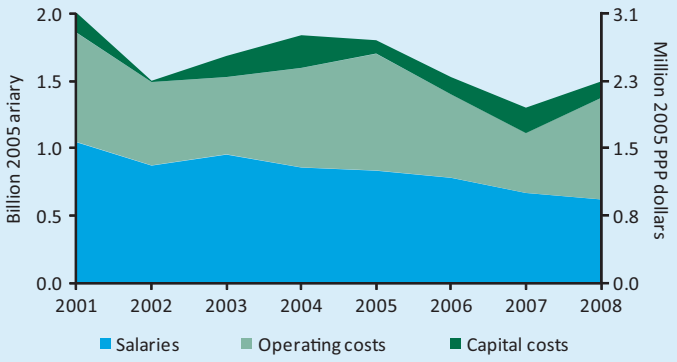
Agricultural R&D funding in Madagascar is derived from a variety of sources, including the national government, foreign donors, development bank loans, and the sale of goods and services. During 2001–08, 37 percent the combined expenditures of FOFIFA, CNRE, CNRO, CNARP, and IMVAVET were financed through direct national government allocations (Figure 6). Donor contributions, development bank loans, and the sale of goods and services each accounted for roughly 20 percent of the combined funding of the five institutes.

Total donor support to FOFIFA (including technical support from CIRAD in the form of expatriate salaries) has diminished significantly in absolute terms since the termination of NARP in 1999. Between 1991 and 2000, donors and development banks contributed 5.9 million dollars of FOFIFA's annual budget on average (in 2005 prices), compared with just 2.2 million per year during 2001–08. Although various donor projects supporting agricultural R&D have been implemented in Madagascar since the completion of NARP, none have come close to the magnitude of NARP, and the Malagasy government has yet to fill the gap. In fact, yearly government contributions to FOFIFA were lower during 2000–08 in real prices than they were in the 1990s. The other government agencies are much less donor-dependent: CNRO and CNARP receive the bulk of their funding from the national government, CNRE generates a significant share of its funds internally, and IMVAVET generates the bulk of its funds through the sale of vaccines. (IMVAVET also received a large grant from the European Union in 2008 to upgrade its stations.)

For most of the 1980s, 1990s, and 2000s, the World Bank has been involved in the development of Madagascar's agricultural research sector. The Rural Development Support Project (RDSP), which began in 2001, aims to increase incomes and reduce poverty in rural areas, while preserving the natural resource base. The project is part of PADR, a broad-based program approved by the Malagasy government in 1999 to promote sustainable growth in agricultural production, foster food security, and enhance access to basic services in the rural areas. RDSP consists of five components and has a total cost of US$106.0 million, US$89.0 million of which is financed through a World Bank loan. A total of US$11.9 million is earmarked for research and extension activities, together with the establishment of a competitive research grant program and a sponsored research program, both of which are discussed below (World Bank 2001).

Grants by the Competitive Agricultural Research Fund (FCRA) are based on proposals submitted by qualified farmers, producer

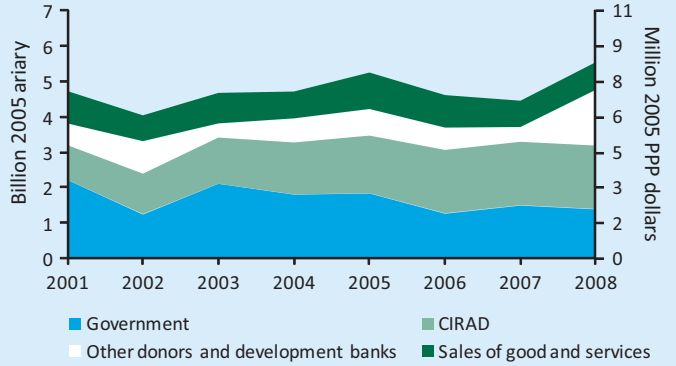
Figure 5—FOFIFA's spending by cost category adjusted for inflation, 2001-08



Source: IFPRI–FOFIFA 2009.

Note: Salary expenditures of expatriate research staff are excluded.

Figure 6—Funding sources of main government agencies, 2001–08



Source: IFPRI-FOFIFA 2009.

Notes: Five government agencies are included in the sample: FOFIFA, CNRE, CNRO, CNARP, and IMVAVET. CIRAD funding represents salaries of expatriate staff employed at FOFIFA.

organizations, government research institutes, NGOs, universities, the private sector, and other institutions active in agricultural research and extension. FCRA was introduced in 2005 and supports proposals ranging from US$5,000 to US$50,000 for periods of up to three years. A 15-member interdisciplinary Autonomous Steering Committee (ASC) is responsible for the selection and follow-up of competitive research proposals, and participating institutions must contribute a minimum of 15–20 percent of the total cost of proposed activities (World Bank 2001). During 2005–08, 26 projects were financed by FCRA, 4 of which were granted to FOFIFA. FCRA aims to stimulate cooperation between the various R&D agencies, but unlike many other countries with similar World Bank–instigated competitive funding mechanisms, research proposals submitted by a single institute are allowed. FCRA was temporarily suspended in 2008 in favor of farmer training and seed production.

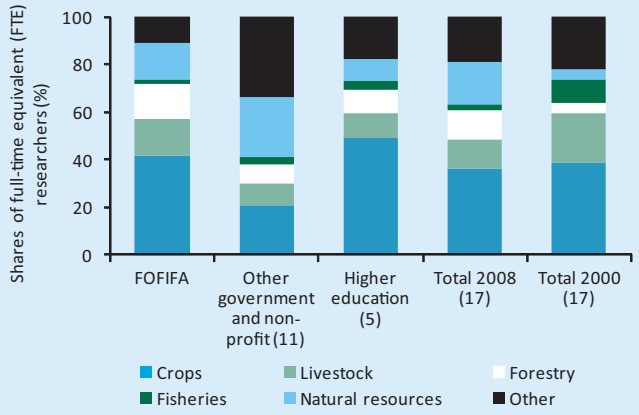
RDSP was originally scheduled to run until 2007/08 but was extended to 2011 based on its success. An additional US$1.5 million is earmarked to support applied agricultural research and extension focusing on the following areas: (a) the preparation of a National Agricultural Research Strategy; (b) an institutional audit of FOFIFA and FCRA to identify necessary reforms for improving organization, staffing, internal processes, and financing mechanisms; (c) grants for priority, demand-driven agricultural research designed to address thematic or long-term constraints to the intensification, diversification, or sustainability of agricultural production systems; (d) grants to establish on-farm demonstration plots and to disseminate new technologies; and (e) grants for the production and multiplication of improved seed and planting material for the distribution to producer organizations (World Bank 2008).

As previously mentioned CIRAD has a large presence in Madagascar and plays a very important role in providing technical assistance to FOFIFA and the University of Antananarivo. CIRAD's research program has been set up in accordance with the principles of MAP and it is closely aligned with the research programs of its Malagasy partners. The institute has funded a large project on rice growing in high-altitude zones. In addition, its officers provide many courses at the University of Antananarivo and supervise a large number of PhD theses of Malagasy students (CIRAD 2010).

Aside from World Bank and CIRAD support, a number of other donors contributed to FOFIFA during 2000–08, most notably the European Union, which funded a number of forestry and biomass energy projects, and the Japan International Cooperation Agency (JICA), which also supported a number of rice research initiatives. Other donors include the Food and Agriculture Organization of the United Nations (FAO), the private Japanese Ueshima Coffee Corporation, and the African Development Bank (ADB).

A large share of the nonprofit sector's agricultural research activities is funded through bilateral sources. TAFA, for instance, receives the bulk of its resources from CIRAD and the French government. Multilateral donors such as ADB and FAO also play an important role in financing agricultural R&D in the nonprofit sector. Research activities led by the University of Antananarivo are largely funded by the European Union and the Government of France.

Figure 7—Research focus by major commodity area, 2008



Source: IFPRI–FOFIFA 2009.

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

ALLOCATION OF RESEARCH ACROSS THEMES AND COMMODITIES

The allocation of resources across various lines of research is a significant policy decision, so detailed information was collected on the number of FTE researchers working in specific commodity and thematic areas.

In 2008, close to 40 percent of Madagascar's agricultural researchers were involved in crop research (Figure 7). Natural resources research accounted for 17 percent, livestock research for 13 percent, forestry research for 12 percent, and fisheries research for 3 percent. The remaining researchers concentrated on socioeconomic, postharvest, or other issues. Natural resources research, in particular, has gained prominence in Madagascar since 2000.

Commodity Focus

By far, the most researched crop in Madagascar is rice, which accounted for 22 percent of total crop and livestock research combined in 2008. Most of the country's rice research is carried

Table 2—Crop and livestock research focus by major item, 2008

	FOFIFA	Other government and nonprofit (11)	Higher education (5)	Total (17)
Crop items	Shares of FTE researchers (%)			
Rice	24.7	8.5	31.3	22.4
Fruits	4.6	25.1	3.6	8.7
Coffee	9.3	0.3	—	6.0
Vegetables	6.2	0.8	5.8	5.0
Maize	4.6	2.0	10.5	5.0
Ornamentals	—	14.0	5.7	3.7
Other crop	24.2	21.6	25.0	23.8
Livestock items				
Beef	18.6	15.3	3.9	15.7
Dairy	1.5	—	3.9	1.6
Poultry	—	7.0	3.1	1.9
Swine	—	4.2	2.3	1.2
Other livestock	6.2	1.4	5.0	5.0
Total crop and livestock	100	100	100	100

Source: IFPRI–FOFIFA 2009.

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

out by FOFIFA with the support of CIRAD and JICA. Other important crops include fruit (9 percent in 2008), coffee (6 percent), vegetables (5 percent), and maize (5 percent) (Table 2). In 2008 the country's livestock researchers primarily concentrated on beef (16 percent) of total crop and livestock research).

CONCLUSION

Over the past few decades, agricultural R&D in Madagascar has largely been dependent on donor funding, including consecutive projects financed through World Bank loans and in-kind technical support from France in the form of a relatively large presence of CIRAD expatriate research staff. The completion of NARP and reduced government support led to a sudden decline in the country's overall agricultural R&D expenditures in the late 1990s, but enhanced technical cooperation from CIRAD in more recent years caused the country's overall agricultural R&D spending levels to recover somewhat. In 2008, Madagascar spent 7.7 billion ariary or 11.9 million PPP dollars on agricultural R&D (in 2005 constant prices), the equivalent of 0.25 percent of its agricultural GDP. It is however important to note that without the inclusion of salaries of 14 CIRAD research staff from France, these totals would be nearly 25 percent lower.

Although overall agricultural R&D staffing levels have remained relatively stable about 210 FTEs in recent years, the institutional composition of agricultural R&D staff has exhibited important shifts. Between 2000 and 2008, FOFIFA lost close to 20 percent of its local research staff, and despite significant investments in training of human resources under NARP in the 1990s and bilateral grants in the 2000s, the center has lost a large number of PhD- and MSc-qualified researchers in recent years. Many more of the institute's most senior researchers are due for retirement in the coming years, making hiring and training young scientists one of FOFIFA's top priorities in the short to medium term.

The launch of various ambitious government-led agricultural and rural policy initiatives stressing the importance of agricultural R&D have not translated into increased in government or donor funding. Without a major increase in funding, many of the agricultural R&D capacity and infrastructure gains achieved over the past 15 years are at risk of being quickly eroded.

NOTES

[1] Financial data are also available in current local currencies or constant 2005 US dollars in the ASTI data tool (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).

FOFIFA is Madagascar's principal agricultural R&D center charged with agricultural research. The center was established in 1974 and falls under the administrative coordination of the country's Ministry of Agriculture, Livestock, and Fisheries. The institute holds a broad mandate covering crop, livestock, forestry, postharvest, and socioeconomic research. To learn more about FOFIFA visit http://www.fofifa.mg/le_fff.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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