

# GABON

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*This country brief reviews the major investment and institutional trends in public agricultural research in Gabon since the early 1990s using new data collected under the Agricultural Science and Technology Indicators (ASTI) initiative (IFPRI-ISNAR-CORAF/WECARD 2002-03).<sup>1</sup>*

## INSTITUTIONAL DEVELOPMENTS

Despite its sparse population and dense forest coverage (around 85 percent of its landmass), Gabon is one of Africa's most prosperous countries. Traditionally, Gabon's economy has depended on the export of oil, manganese, and timber. But progressive depletion of the nation's oil resources and closure of its uranium mine in 1999 precipitated economic recession and forced the diversification of Gabon's economy. As a result, the agricultural sector—and along with it, agricultural research and development (R&D)—gained prominence (Mignot 2000). Gabon's agricultural research capacity is among the smallest in Sub-Saharan Africa. In 2002, only seven agencies were conducting agricultural research. These agencies employed a combined total of 54 full-time equivalent (fte) researchers and spent roughly 800 million 1999 CFA francs—equivalent to 2 million 1993 international dollars (Table 1).<sup>2,3</sup>

The National Scientific and Technological Research Center (CENAREST) is Gabon's principal research body.<sup>4</sup> It comprises five institutes, three of which are involved in agricultural R&D: the Agricultural and Forestry Research Institute (IRAF), the Technological Research Institute (IRT), and the Tropical Ecology Research Institute (IRET).<sup>5</sup> In 2001, these institutes accounted for approximately three-quarters of the country's total agricultural research expenditures and staff. CENAREST was established in 1976 under the oversight of three ministries—the Ministry of Higher Education, Research, and Technological Innovation (MESRIT), the Ministry of Agriculture, Livestock, and Rural Development (MAEDR), and the Ministry of Forestry Economics, Water, and Fisheries, charged with the Environment

**Table 1—Composition of agricultural research expenditures and total researchers, 2001**

Type of agency	Spending		Total Researchers <sup>a</sup> (fte's)	Share		Agencies in sample <sup>b</sup> (number)
	1999 CFA francs (millions)	1993 international dollars		Spending (percent)	Researchers	
CENAREST	644.02	1.52	42.0	77.2	77.2	3
CIAM <sup>c,d</sup>	12.27	0.03	0.8	1.5	1.5	1
Higher education <sup>c,e</sup>	177.87	0.42	11.6	21.3	21.3	3
<b>Total</b>	<b>834.16</b>	<b>1.97</b>	<b>54.4</b>	<b>100</b>	<b>100</b>	<b>7</b>

Source: Compiled by authors from ASTI survey data (IFPRI-ISNAR-CORAF/WECARD 2002-03) and MESRIT 2003.

<sup>a</sup> Includes national and expatriate research staff.

<sup>b</sup> See note 2 for a list of the seven agencies in our sample.

<sup>c</sup> The expenditures for CIAM and the higher education agencies are estimates based on the average expenditures per researcher for CENAREST agencies.

<sup>d</sup> The 8 researchers at CIAM spent 10 percent of their time on research, resulting in 0.8 fte researchers.

<sup>e</sup> The staff at the 3 higher education agencies spent between 15 and 33 percent of their time on research, resulting in 11.6 fte researchers.

## KEY TRENDS

- Despite steadily rising total spending and researcher numbers during 1991–2002, Gabon's agricultural research capacity remains among the smallest in Sub-Saharan Africa.
- The three agricultural research institutes under CENAREST, Gabon's primary agricultural research body, accounted for more than three-quarters of the country's total agricultural research spending and staff in 2002.
- Capital investments in CENAREST's institutes were nonexistent from 1991–1997; increased funding thereafter from the national government and through a CIFOR-led initiative enabled essential renovations to basic physical infrastructure.
- Unlike most other African countries, the overall share of Gabonese researchers holding PhD degrees decreased significantly throughout 1991–2002, mainly because of deteriorating qualification levels of INSAB staff.

## ABOUT ASTI

The Agricultural Science and Technology Indicators (ASTI) initiative comprises a network of national, regional, and international agricultural R&D agencies and is managed by the 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 was provided by the CGIAR Finance Committee/World Bank with additional support from the Australian Centre for International Agricultural Research (ACIAR), the European Union, and the U.S. Agency for International Development (USAID).

and the Protection of Nature (MEFEPEPN) (See *A Short History of Government-Based Agricultural Research* below).

CENAREST's mandate is to design and carry out research programs, ensure the coordination of the country's research activities, support training for national researchers, and establish a scientific and technical information network. Each of its institutes is a semi-autonomous body, managing its own budget (Nzang Oyono 2003).

With 22 fte researchers in 2002, IRAF is the largest institute under CENAREST. IRAF, which is headquartered in Libreville, comprises four departments: the General Agricultural Department, the Rural Economy Department, the Forestry Sciences Department, and the Zootechnical Department (Nzang Oyono 2003). Each department consists of several research units and laboratories. Besides its headquarters in Libreville, IRAF also holds an important research station in Ndouaniang at 80 kilometres from the capital. IRT, also headquartered in Libreville, shares administrative facilities with IRAF. In 2002 it employed 11 fte researchers focusing primarily on postharvest activities, such as conservation technologies and crop transformation. IRET conducts research on forest soils, flora, and fauna and employed 9 fte researchers in 2002. The vast majority of the institute's research activities are carried out at its experimental station in Ipassa-Makokou.

The Crop Material Introduction, Adaptation, and Multiplication Center (CIAM), established in 1975, is Gabon's only government agency undertaking agricultural research not associated with CENAREST. It is administered by MAEDR, and in 2002 employed 0.8 fte researchers, conducting a limited amount of crop research.

The three higher-education agencies involved in agricultural R&D in Gabon employed over 20 percent of the country's agricultural researchers in 2002. The Higher National Agronomy and Biotechnology Institute (INSAB) under the University of Science and Technology of Masuku (USTM) was established in September 2002, replacing the Department of Agricultural Engineering of the Polytechnic School of Masuku. INSAB is administered jointly by MESRIT and MAEDR and in 2002 employed 9 fte researchers focusing on sago, soils, and postharvest activities. The two other higher-education agencies identified for this study are the National Water and Forestry School (ENEF) and the Earth Sciences and Environment Research Unit (URESTE), both under the University of

Masuku. These two agencies conduct research on water, forestry, and soils, and in 2002 employed 1.4 and 1.3 fte researchers, respectively.

We did not identify any private-sector agencies conducting agricultural research in Gabon during 1991–2002. However, the African Sugar Company of Gabon (SUCAF) and the Gabon Agricultural Development Company (AGROGABON) outsource their respective sugar and oil palm research to the CENAREST institutes. CENAREST also works closely with the Center for International Forestry Research (CIFOR), the Free University of Brussels (ULB), the University of Wageningen in the Netherlands, the World Agroforestry Center (ICRAF), the West Africa Rice Development Association (WARDA), and the Center of International Agricultural Research Cooperation for Development (CIRAD) from France. Cooperation includes joint research projects and training. CENAREST also collaborates with a number of neighboring countries through various regional networks of the West and Central African Council for Agricultural Research and Development (CORAF/WECARD). INSAB has collaboration agreements with certain foreign universities, including the University of Dschang in Cameroon and the University of Liège (ULG) in Belgium. INSAB also works closely with the CENAREST institutes.

## HUMAN AND FINANCIAL RESOURCES IN AGRICULTURAL R&D

### Overall Trends

Gabon's total number of agricultural researchers increased by 6.6 percent per year on average during 1991–2002 (Figure 1a).<sup>6</sup> This growth occurred solely within the government agencies, where fte researcher numbers rose from an extremely low level of 17 in 1991 to 43 in 2002. The total number of researchers at the higher-education agencies, on the other hand, remained more or less stable throughout the period. Gabon's overall low agricultural researcher numbers compared with other African countries reflect the government's traditional focus on other priorities (as previously mentioned) and—despite the more recent growth—this staffing limitation remains one of the principal inhibiting factors to effective agricultural R&D in the country.

## A Short History of Government-Based Agricultural Research

Agricultural research in Gabon did not really begin until the 1950s, when a number of French tropical research institutes were established, including the Overseas Scientific and Technical Research Organization (ORSTOM) and various other institutes that now fall under the International Agricultural Research Center for Development (CIRAD). Like many African countries, on achieving independence in 1960 Gabon signed a bilateral agreement with its former colonizer, France, to preserve the existing research system. It was not until 1972 that Gabon created its own national directorate of agricultural research. Four years later, this directorate created the National Scientific and Technical Research Center (CENAREST), the country's principal scientific policy body to this day. In 1977, the scientific cooperation treaty with France was renegotiated, and the activities of the former French institutes were redeployed to five new national research institutes, three of which were involved in agricultural research: the Agricultural and Forestry Research Institute (IRAF), the Technological Research Institute (IRT), and the Tropical Ecology Research Institute (IRET). No major institutional changes have been made to these three institutes since that time.

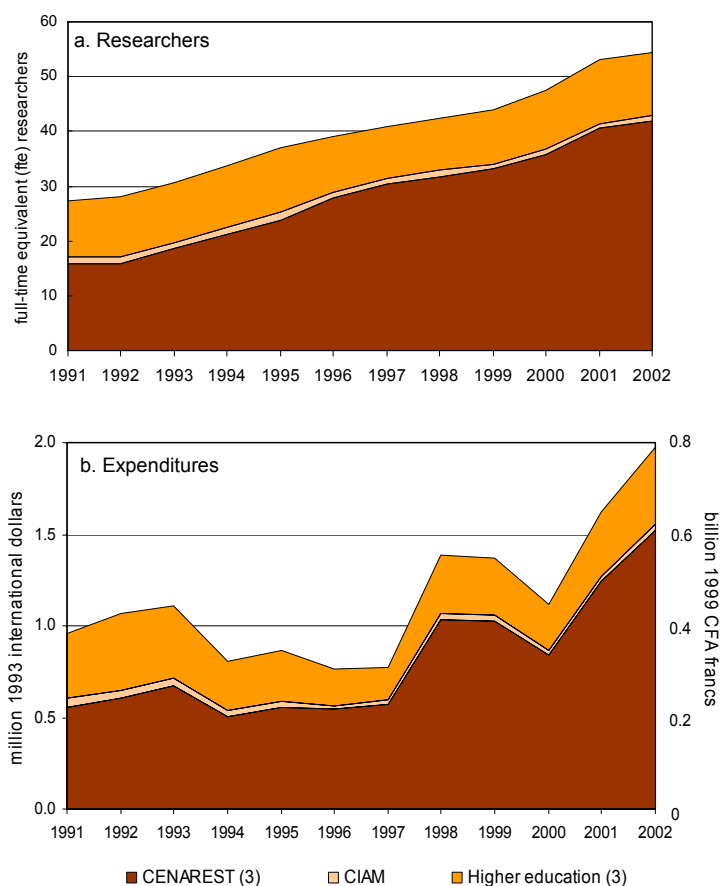
In 1975, the (since renamed) Ministry of Agriculture, Water and Forests, and Rural Development (MAEFDR) established the Crop Material Introduction, Adaptation, and Multiplication Center (CIAM) with support from the Food and Agriculture Organization of the United Nations (FAO). Like the CENAREST institutes, CIAM's organizational structure has changed little since its inception.

Source: FAO 1993.

The share of expatriate agricultural researchers in Gabon declined gradually from 13 percent in 1991 to 5 percent in 2002, which is comparable with many African countries. Most expatriates were active at INSAB, which in 2002 employed 1.7 fte's or, in terms of personnel, two researchers from Canada, two from Belgium, and one from China. IRAF and IRET employed no expatriates during 1991–2002, and IRT employed only one, from the United States, toward the end of this period.

The level of agricultural R&D spending increased by 5.7 percent per year between 1991 and 2002, although the overall upward trend was irregular (Figure 1b). In 1991 and during 1994–97, expenditures fell below the \$1 million mark, which is extremely low compared with most African countries. After 1997, agricultural research spending once again began to rise, reaching \$2 million by 2002 because of increased financial support from the Government of Gabon and additional funding through a multi-donor initiative involving CIFOR (see the section on financing public agricultural R&D for details).

**Figure 1—Public agricultural R&D trends, 1991–2002**



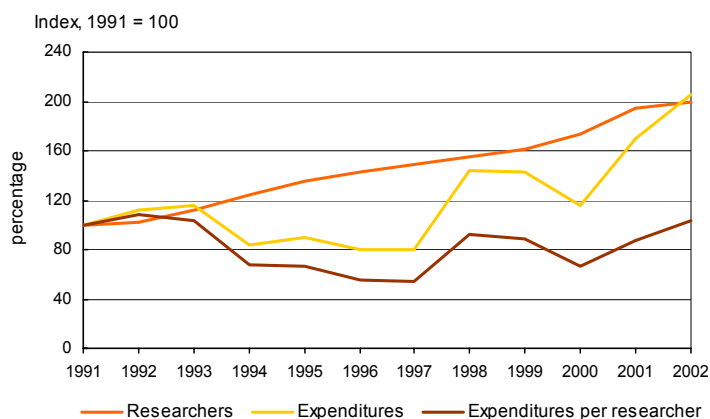
Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WE CARD 2002–03) and MESRIT 2003.

Notes: Figures in parentheses indicate the number of agencies in each category. Expenditures for CIAM and the higher education agencies are estimates based on combined average expenditures per researcher for the CENAREST agencies. Underlying data are available on the ASTI website (<http://www.asti.cgiar.org>).

Although the upward expenditure trend suggests positive advances, spending over the last decade or so was more about regaining lost ground. A considerable component of total agricultural R&D spending was for the restoration of IRET's Makokou research station and IRAF/IRTs' joint administrative building in Libreville. CENAREST reported no capital expenditure prior to 1998, which explains the poor state of its infrastructure and the need for major construction and renovation works thereafter. Increased spending in recent years therefore does not necessarily represent increased expenditure on actual research programs.

Average expenditures per researcher during 1991–2002 mirrored the erratic rise in total expenditures in combination with the steadily increasing agricultural researcher numbers over the same period. Despite these irregularities, average spending per researcher in 1991 and 2002 remained at a similar level of around \$35,000, though once again this was well below the West and Central African average (Figure 2).

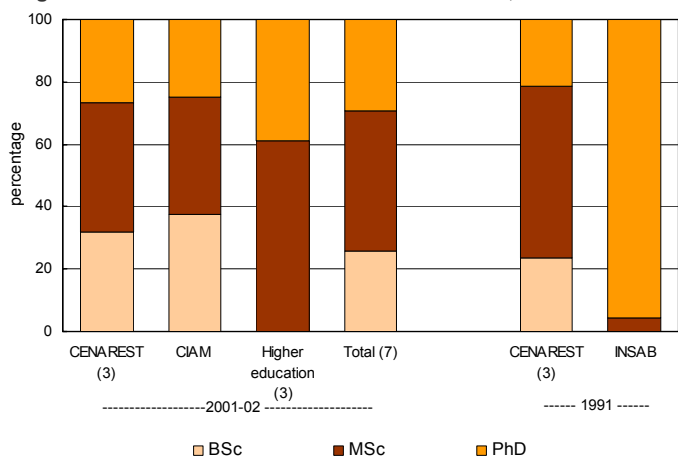
**Figure 2—Trends in public expenditures, researchers, and expenditures per researcher, 1991–2002**



Source: Figure 1.

## Human Resources

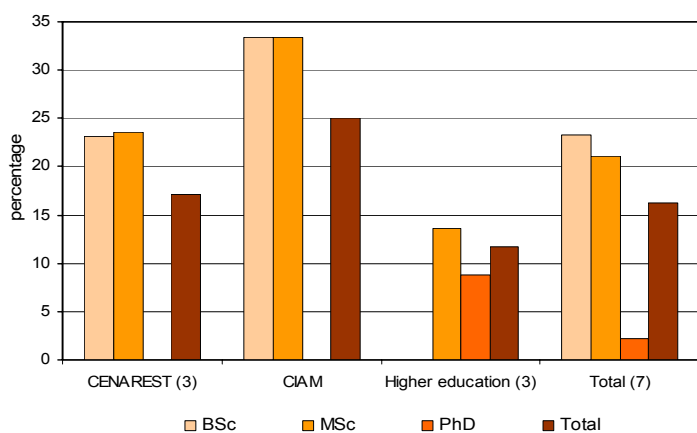
In 2001–02, close to three-quarters of the national researchers had postgraduate training, with 29 percent holding PhD degrees (Figure 3). Research staff at the higher-education agencies were more highly qualified than their counterparts at the government agencies, which is consistent with findings in most other African countries (Beintema 2003). In 1991, 77 percent of CENAREST's research staff had postgraduate training, compared with 68 percent in 2002. The share of CENAREST researchers with a PhD degree increased slightly, however, from 21 percent in 1991 to 27 percent in 2002. In contrast, the share of INSAB researchers trained to the PhD level fell sharply over this time: 96 percent of INSAB researchers held PhD degrees in 1991 (6.3 fte's) compared with just 50 percent in 2001 (3.7 fte's). The main reason for drop in these qualification levels is that many highly qualified staff are enticed by better paid positions in nonresearch fields.

**Figure 3—Educational attainment of researchers, 1991 and 2001-02**

Sources: Compiled by authors from ASTI survey data (IFPRI-INSAR-CORAF/WECARD 2002-03) and MESRIT 2003.

Notes: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff.

Comparable with many other West and Central African countries, 16 percent of Gabon's researchers were female in 2001-02 (Figure 4). CIAM had the highest share of female researchers (25 percent), followed by IRT (20 percent) and IRAF (18 percent). The higher-education agencies employed relatively fewer female researchers than the government agencies. In terms of qualifications, nearly a quarter of the researchers at the CENAREST institutes with a BSc or MSc degree were female. However, no female researchers with PhD degrees were employed at any of the CENAREST institutes. The only female agricultural researcher with a PhD in Gabon in 2001-02 was employed by INSAB.

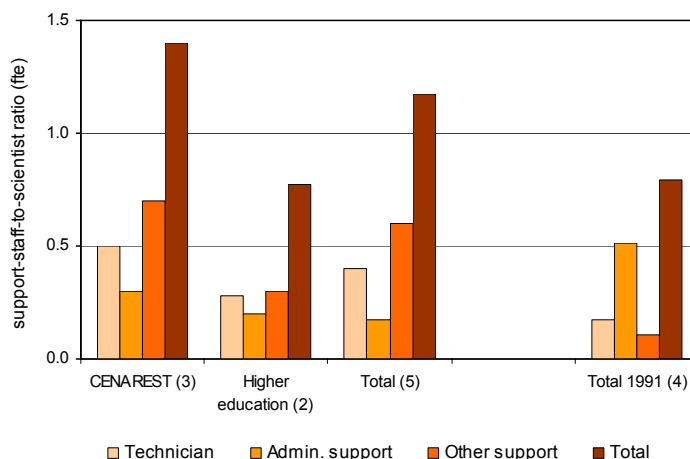
**Figure 4—Share of female researchers, 2001-02**

Source: Compiled by authors from ASTI survey data (IFPRI-INSAR-CORAF/WECARD 2002-03).

Note: Figures in parentheses indicate the number of agencies in each category. Data excludes expatriate staff.

In 2001, the average number of support staff per scientist in a five-agency sample was 1.2, comprising 0.4 technician, 0.2 administrative personnel, and 0.6 other support staff such as laborers, guards, drivers and so on (Figure 5). The support-staff-to-researcher ratio was lower at the higher-education agencies included in our sample (0.8) than at the CENAREST institutes

(1.4). This last figure, however, masks large variations at the institute level: in 2001-02 IRT employed 2.1 support staff per researcher, whereas IRAF and IRET only employed 1.2 and 0.9, respectively. Although Gabon's average support-staff-to-scientist ratio is well below the African average, a small increase in the country's support-staff-to-scientist ratio appears to have occurred during 1991-2002.

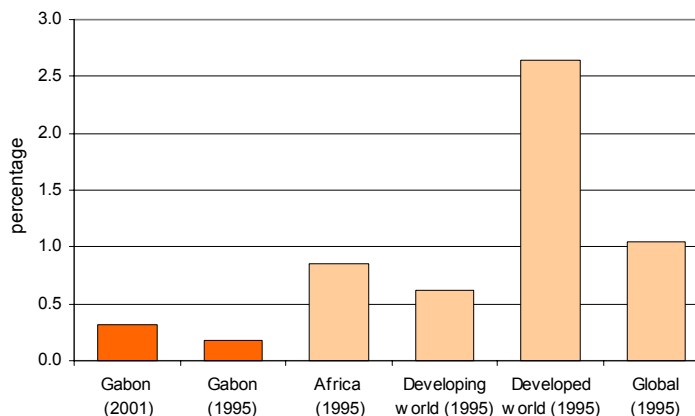
**Figure 5—Support-staff-to-researcher ratios, 1991 and 2001**

Source: Compiled by authors from ASTI survey data (IFPRI-INSAR-CORAF/WECARD 2002-03).

Notes: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff.

## Spending

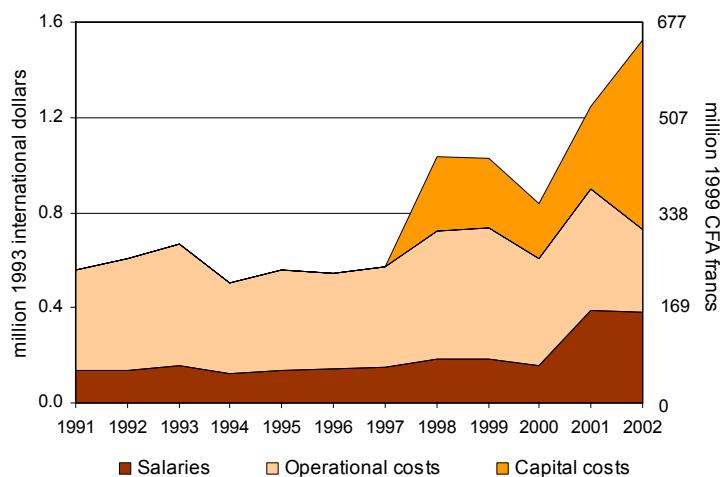
Total public spending as a percentage of agricultural output (AgGDP) is a common research investment indicator that helps to place a country's agricultural R&D spending in an internationally comparable context. In 2001, Gabon invested \$0.32 for every \$100 of agricultural output; nearly twice the country's ratio for 1995 (0.18), given the increased government and donor funds that enabled renovations to CENAREST's infrastructure from 1997 onward, as already discussed (Figure 6). By means of comparison, Gabon's 1995 research intensity ratio was much lower than the corresponding ratios for Africa (0.85) and the developing world (0.62).

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

Sources: Gabon compiled from Figure 1b; AgGDP from World Bank (2003); other intensity ratios from Pardey and Beintema (2001).

Unlike the majority of principal research agencies in other African countries, salary expenditures at the CENAREST institutes accounted for a relatively small share of total expenditures (23 percent) during 1991–2002. Operating costs and capital investments accounted for 56 and 21 percent, respectively (Figure 7). However, these shares could be somewhat misleading because some support staff appear to be included under CENAREST's operating expenses rather than under salaries and wages. Capital expenditures started with the significant injection of funding after 1998 (600 million current CFA francs) for the rehabilitation of IRET's tropical ecology center in Makokou through the CIFOR-led initiative mentioned earlier (and discussed in detail in the section on financing). Other major construction and renovations began on CENAREST buildings in Libreville in 2002 after the national government provided the necessary funding. In addition, between 1991 and 2001, the national government also allocated 20 million current CFA francs per year to each of CENAREST's institutes for their research programs. Given the significant injection of funding for infrastructure in 2002, no additional funding was earmarked by the government for the institutes' research programs that year. In 2003, however, government contributions for research programs returned to 6 million current CFA francs per institute. All other operating costs (electricity, telephone, cleaning, and so on) are also paid by the national government and totaled 350 million current CFA francs on average per year between 2001 and 2003.

**Figure 7—Cost-category shares in INERA's expenditures, 1991–2002**



Source: Compiled by authors from ASTI survey (IFPRI–ISNAR–CORAF/WECARD 2002–03).

Note: Data include estimated salaries for expatriate staff (see *Methodology* on page 7).

## FINANCING PUBLIC AGRICULTURAL R&D

Agricultural research conducted by the CENAREST institutes is largely financed by contributions from the national government through the Ministry of Planning, funding from (foreign) donors, and income generated through contract-based research for private enterprises, such as SUCAF and AGROGABON, previously mentioned. In addition to financial support from the Government of Gabon, CIAM also relied on support from the Food and Agriculture Organization of the United Nations (FAO). Agricultural R&D activities at the University of Masuku

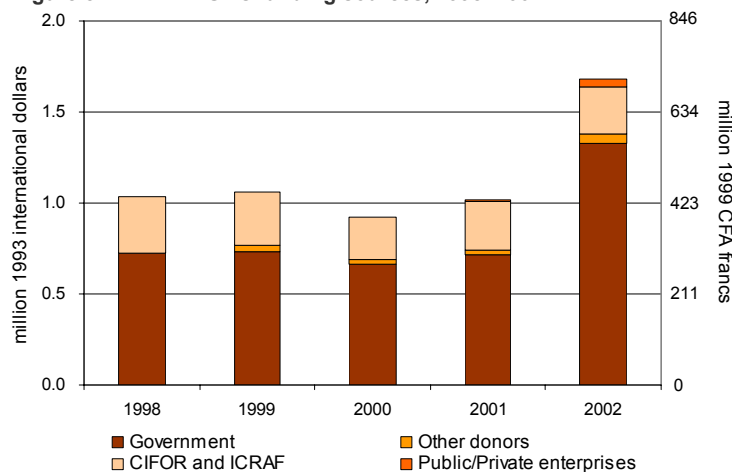
were largely financed by the national government, with minor shares provided from France through the Institute of Research for Development (IRD) and the Fund of Aid and Cooperation (FAC). ENEF received funding from the World Bank, through the Forest Environment Project (PFE) described below, and the German government, through the ENEF Rehabilitation Project (RENEF) (MESRIT 2003; MEFEPEPN 2000).<sup>7</sup>

Unlike the majority of African countries, no large World Bank projects supporting agricultural R&D were implemented in Gabon during the 1990s. PFE was the only World Bank-financed project to include a limited research component. Effected between 1993 and 2002, PFE focused on strengthening MEFEPEPN and its forestry policy, particularly in terms of the sustainable management of forestry resources. The project's total budget was US\$38.5 million and—in addition to a World Bank loan (US\$22.5 million)—comprised contributions from the Gabonese government, the European Union, the French and German governments, and the World Wildlife Fund (WWF). PFE had a relatively small forestry and environment research component of US\$2.1 million, but only US\$0.9 million was disbursed by the end of the project because of the withdrawal of the European Union and WWF whose funding was intended to be allocated to the project's research component. Hence the research objectives of the project were only partially achieved. PFE did, however, finance the scientific monitoring of the Ekouk Okoumé plantations and the purchase of conservation cabinets for the national herbarium. In addition, the 1997 PFE-financed study on research results and research strategy will provide a framework for future funding (World Bank 2002). ENEF was the only agency in our sample that profited from PFE funding during the 1990s.

## National Scientific and Technological Research Center (CENAREST)

Between 1998 and 2002, government contributions accounted for close to three-quarters of the CENAREST institutes' total budget. 24 percent was provided largely by funds from the CIFOR initiative and the remainder came from other donors and private enterprises (Figure 8).

**Figure 8—CENAREST's funding sources, 1998–2002**



Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).

During the late 1980s, when the Man and Biosphere program of the United Nations Educational, Scientific and Cultural Organization (UNESCO) was headquartered at IRET's Makokou station, IRET's forestry research activities were numerous. But because of diminishing government support, many of the institute's research activities were halted in the 1990s. Realizing how important the institute was for the development of Gabon's forestry sector, CIFOR—with financial support from the European Commission, the Central African Forestry Ecosystems (COFAC) Project and WWF—took action to address IRET's bleak financial situation. Consequently, 600 million current CFA francs were allocated to the rehabilitation of the IRET station in Makokou between 1998 and 2003. This station has now been completely renovated and CIFOR is assisting the reestablishment of forestry research activities there. In the future, the Makokou station will be part of a global network of agencies involved in the conservation of tropical forestry resources. It will also provide training for young scientists in the area of forestry (CIFOR 2002).

In terms of other donor support, FAC financed a 14 million current CFA franc feasibility study on nonlignous forestry products at IRAF in 2002. ELF-Gabon (an oil company called Total Gabon until September 2003) supported an IRAF study on fish biodiversity in Bas-Ogooué, providing 32 million current CFA francs between 2001 and 2003 that enabled construction of an integrated farm in Ndouaniang.<sup>8</sup> The Central African Regional Program for the Environment (CARPE), financed by the United States Agency for International Development (USAID) and running from 1998 until 2002, provided support to IRAF for a fish diversity project in the lower Ogooué valley costing US\$50,000 over the five years. IRAF also received 4 million current CFA francs through an ICRAF regional project on diversifying farmer production systems through the domestication of local fruit trees and medicinal plants. IRT reported minor financial support through CORAF/WECARD and CIRAD. Other CENAREST donors include WARDA, the Regional Rice Research and Development Network for West and Central Africa (ROCARIZ), Cornell University, the International Tropical Timber Organization (ITTO), the International Institute of Tropical Agriculture (IITA), the Technical Center for Agricultural and Rural Cooperation (CTA), UNESCO, and various organizations from France.

Future funding to CENAREST institutes remains uncertain. CENAREST has increasingly turned toward regional, subregional, and international agencies for support for its research projects. Many research stations remain in serious need of renovation. Once all the infrastructure of these stations is upgraded, it will be easier to generate funds internally. Steps to involve producer organizations in the financing of agricultural research have also been initiated by the institutes. However, if agriculture is to become one of the country's primary economic sectors, the national government's contribution to agricultural R&D will need to be drastically increased.

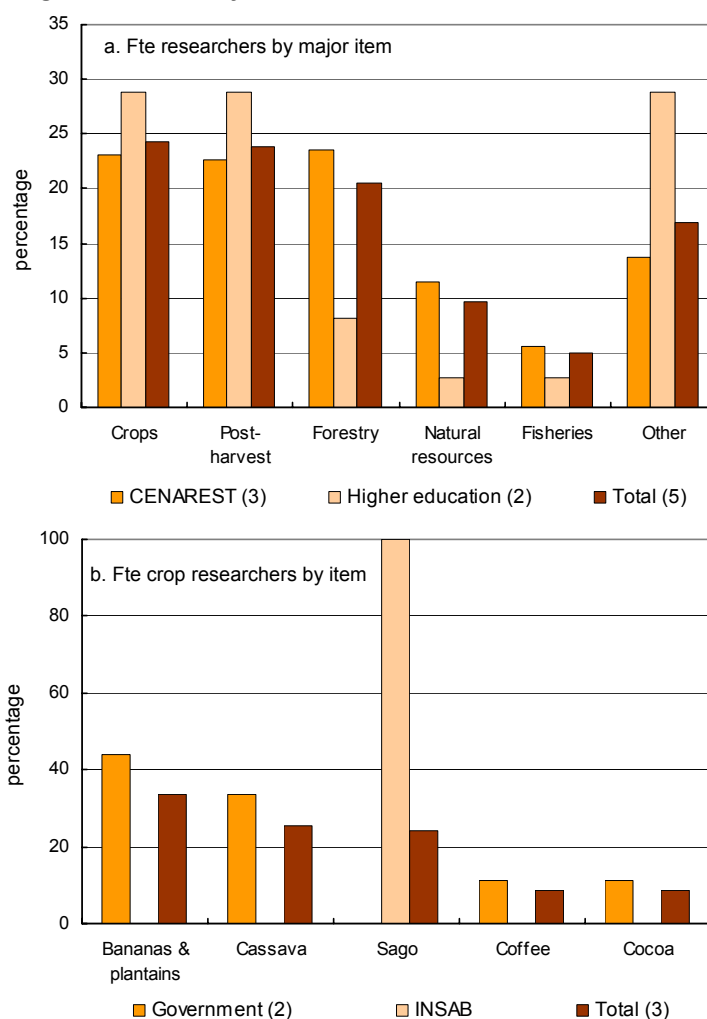
## RESEARCH ORIENTATION

### Commodity Focus

The allocation of resources among various lines of research is a significant policy decision; hence detailed information was collected on the number of fte researchers working in specific commodity and thematic areas.

Based on a five-agency sample for 2001, agricultural research in Gabon concentrated primarily on crops, postharvest, and forestry research, with each accounting for between 20 and 25 percent of activities (Figure 9a). An additional 10 percent of the country's researchers focused on natural resources, and 5 percent focused on activities related to fisheries. Of note, livestock represents a low share compared with many other African countries. In 2002, IRAF's Zootechnical Department counted only one fte researcher. About a third of all crop research related to bananas and plantains; cassava and sago accounted for a quarter each, and coffee and cocoa were also prominent, representing 8 percent each (Figure 9b).

Figure 9—Commodity Focus, 2001



Source: Compiled by authors from ASTI survey data (IFPRI-INSAR-CORAF/WECARD 2002-03).

Note: Figures in parentheses indicate the number of agencies in each category. Figure 9b only includes the three agencies involved in crop research.

## CONCLUSION

Agriculture in Gabon has traditionally been overshadowed by more economically attractive sectors such as mining and oil, with the result that the country's agricultural expenditures and researcher numbers have remained exceptionally low compared with many other African countries. With a declining natural resource base in mining and oil, however, agriculture has gained prominence in recent years.

Both donor funding, particularly in support of forestry research, and national government funding have grown, with the result that many of CENAREST's facilities have recently been renovated or are undergoing renovations. Similarly, total agricultural researcher numbers at the CENAREST institutes have risen, and total agricultural research expenditures more than doubled between 1997 and 2002. Nevertheless, given

capital expenditure for agricultural research was nonexistent during 1991–97, the subsequent growth represents much-needed regaining of lost ground. Nevertheless, additional national government funding will still be needed if the agricultural sector is to effectively contribute to the economy and enable Gabon to become self sufficient in terms of food production. Further work needs to be done in establishing adequate agricultural policies and research structures, and in securing adequate funding to bring the national agricultural research system in line with other countries in the region, and then maintain it. Sufficient incentives need to be offered to attract and keep qualified agricultural research staff, thereby redressing the brain drain into other sectors that has occurred over the past decade.

## NOTES

1. The authors are grateful to numerous colleagues in Gabon for their time and assistance with the data collection, and thank Nienke Beintema, Jean François Koumba, Dieudonné Moubamba, and Christian Ntoutoume for their useful comments on previous drafts of this brief.
2. The seven-agency sample consisted of:
  - four government agencies/units—*Institut de Recherches Agronomiques et Forestières (IRAF)*, *Institut de Recherche Technologique (IRT)*, and *Institut de Recherche en Écologie Tropicale (IRET)*, all under *Centre National de la Recherche Scientifique et Technologique (CENAREST)*, and *Centre d'Introduction, d'Adaptation et de Multiplication du Matériel Végétal (CIAM)*; as well as
  - three higher education agencies—*Institut National Supérieur d'Agronomie et de Biotechnologies (INSAB)* and *Unité de Recherches en Sciences de la Terre et de l'Environnement (URESTE)*, both under *Université des Sciences et Techniques de Masuku (USTM)*, and *École Nationale des Eaux et Forêts (ENEF)*.
3. Unless otherwise stated, all data on research expenditures are reported in 1993 international dollars or in 1999 CFA francs.
4. English translations of agency names have been used throughout the brief except in note 2, where the original French is provided.
5. The two other institutes under CENAREST are the Pharmacopoeia and the Traditional Medicine Institute (IPHAMETRA) and the Human Sciences Research Institute (IRSH).
6. Annual growth rates are 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.
7. ENEF received 10 billion current CFA francs through PFE between 1994 and 1999; 8 billion was provided through a World Bank loan and 2 billion was contributed by the national government. Between 1992 and 2001, ENEF received 1.85 billion current CFA francs as part of the RENEF project.
8. The funds were spread out over three years: 4 million CFA francs in 2001; 12 million in 2002, and 16 million in 2003.

## METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI, ISNAR, and CORAF/WECARD 2002-03).
- The data were compiled using internationally accepted statistical procedures and definitions developed by the OECD and UNESCO for compiling R&D statistics (OECD 1994; UNESCO 1984). We 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. We 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 1993 international dollars by deflating current local currency units with a Gabonese GDP deflator of base year 1993 and then converting to U.S. dollars with a 1993 purchasing power parity (PPP) index, both taken from World Bank (2003). 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.
- The salaries and living expenses of many expatriate researchers working on donor-supported projects are paid directly by the donor agency and are often excluded in the financial reports of the agricultural R&D agencies. These *implicit* costs have been estimated using the average cost per researcher in 1985 to be \$160,000 1993 international dollars and backcasting this figure using the rate of change in real personnel costs per fte researcher in the US state agricultural experiment station system. This extrapolation procedure has the assumption that the personnel-cost trend for US researchers is a reasonable proxy of the trend in real costs of internationally recruited staff in the agricultural R&D agencies.

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

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