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COTE D'IVOIRE

By Gert-Jan Stads and Nienke M. Beintema

This country brief reviews the major investment and institutional trends in agricultural research in Côte d'Ivoire using new survey data for the 1990s collected under the Agricultural Science and Technology Indicators (ASTI) initiative (IFPRI-ISNAR-CORAF 2002) and various secondary sources.¹

INSTITUTIONAL DEVELOPMENTS

Thirteen agencies were involved in agricultural research in Côte d'Ivoire in 2001, 11 of which are included in our sample.² The 9 public agencies (that is excluding the private for-profit sector) employed a total of 161 full-time equivalent (fte) researchers and spent close to 9 billion 1999 CFA francs on agricultural research and development (R&D)—equivalent to 33 million 1993 international dollars (Table 1).³ The National Agricultural Research Center (CNRA) is the principal agricultural research agency, accounting for two-thirds of total fte researchers and three-quarters of total research spending.⁴ CNRA was established as a semi-autonomous private institute in 1998 through the amalgamation of the Savanna Institute (IDESSA), the Forestry Institute (IDEFOR), and the Ivorian Center of Technological Research (CIRT) (see *A Short History of Government-Based Agricultural Research in Côte d'Ivoire* on page 2).

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

Type of agency	Spending		Researchers ^a	Share ^b		Agencies in sample ^c
	1999 CFAFs	1993 international dollars		Spending	Researchers	
	(millions)	(fte's)	(percent)	(number)		
<i>Public agencies</i>						
CNRA	6,635.7	25.0	105.0	76.9	66.9	1
Other government ^{d,e}	911.5	3.4	27.3	10.6	17.4	3
Higher education ^{e,f}	1,082.9	4.1	24.6	12.5	15.7	5
Subtotal	8,630.1	32.5	156.9	100	100	9
<i>Business enterprises^{d,e}</i>	na	na	4.0	—	—	2
Total	na	na	160.9	—	—	11

Sources: Compiled by authors from (IFPRI-ISNAR-CORAF 2003), CNRA (2002), Traoré et al. (1998), and various other secondary sources.

^a Includes national and expatriate staff.

^b Excludes business enterprises.

^c See note 2 for details of all agencies. LAZOBA and CNF are excluded from the data analysis in this brief because of data unavailability.

^d Fte researcher data for LACENA, LANADA, and the two business enterprises (HEVEGO and I2T) are for 1998.

^e Expenditures for CRO, LACENA, LANADA, and the higher-education sector are estimates.

^f The 79 faculty staff employed in the four higher-education agencies spent between 30 and 40 percent of their time on research, which represents 25 fte researchers. For a number of higher-education agencies, 2001 fte researcher data were extrapolated using 1997, 1998, or 1999 data.

KEY TRENDS

- Total agricultural research investments and staff numbers declined rapidly after 1992, primarily the result of decreased funding from France, but improved temporarily with the creation of CNRA in 1998.
- In 2001, CNRA accounted for three-quarters of the country's agricultural research spending and two-thirds of its fte researchers, but it did not meet privatization criteria set by the World Bank. This left the center largely dependent on government funding and revenues from commodity sales, which significantly constrained operations.
- Civil war, ongoing in Côte d'Ivoire since September 2002, leaves the future of the country's network of agricultural research facilities highly uncertain.
- Some private companies conduct agricultural research, but their combined efforts are apparently small.

ABOUT ASTI

The Agricultural Science and Technology Indicators (ASTI) Initiative consists of a network of national, regional, and international agricultural R&D agencies managed by IFPRI and ISNAR. The 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 Center for International Agricultural Research (ACIAR), the European Union, and the U.S. Agency for International Development (USAID).

The second National Agricultural Services Support Project (PNASA II), which began in 1998 and is led by the World Bank and , stipulated that CNRA should be 40 percent government owned and 60 percent privately owned. For administrative purposes, however, it falls under the Ministry of Higher Education and Scientific Research (MESRS).⁵ Private shares are allocated as follows: 31 percent to agricultural professional organizations,⁶ 20 percent to agro-industry, and 3 percent each to the scientific community, extension services, and the financial sector (Gage et al. 2001). It was intended that funding sources would also follow the 40 percent public/60 percent private split, but private funding has never actually met this target. In addition, government contributions to compensate for the shortfall were delayed during 1999/2000. CNRA's mandate covers crop, livestock, forestry, and postharvest research, as well as technology transfer and human resources development. Research is conducted under 22 programs across five primary research streams: perennial crops, annual crops, animal production, production systems, and technology. While headquartered in Adiopodoumé, just outside Abidjan, the center is regionally based, comprising a network of 5 regional offices, 13 research stations, 3 central laboratories, and 5 experiment and production stations. The center owns approximately 22,000 hectares of land primarily used for production in the Abidjan and Gagnoa regions (CNRA 2002). Revenues generated by production activities have been one of CNRA's main sources of funding. The civil war that began in September 2002 has virtually halted CNRA's activities and has very likely destroyed much of the center's infrastructure.

Three other government agencies conduct agricultural research, together accounting for 17 percent of the total 2001 agricultural R&D capacity. The Oceanological Research Center (CRO), which falls under the administrative responsibility of the MESRS, is the country's second-largest government research agency, having a staff of 24 fte researchers in 2001. Although originally created by the French Overseas Scientific and Technical Research Office (ORSTOM), CRO became independent of ORSTOM in 1991. The center currently consists of four departments: Maritime and Lagoon Environment, Living Aquatic Resources, Aquaculture, and Information.

Additionally, three laboratories under the Ministry of Agriculture and Animal Husbandry (MINAGRA) conduct research, though their activities were relatively minor: the

National Laboratory of Agricultural Development Support (LANADA), the Central Laboratory of Animal Nutrition (LACENA), and the Laboratory of Zoology and Animal Biology (LAZOBA). In 1998, LANADA and LACENA collectively employed only four fte researchers.

The higher-education sector in Côte d'Ivoire was restructured in 1995. The National University of Côte d'Ivoire was divided into three separate universities: the University of Abidjan-Cocody (UAC), the University of Abobo-Adjamé, and the University of Bouaké. As part of the restructuring process, the university faculties were replaced with Training and Research Units (UFR) in the expectation of better integrating teaching and research (Osseni and Silue 1997). In addition, colleges in Yamoussoukro were amalgamated to become the National Polytechnical Institute Félix Houphouët-Boigny (INP-HB).

We identified six higher-education agencies involved in agricultural research, five of which are included in our sample and which, in 2001, accounted for 16 percent of the country's total agricultural research capacity. The Advanced School of Agronomics (ESA) at INP-HB was responsible for most of these activities, employing 40 faculty staff or—adjusted to reflect time spent on research—12 fte researchers. Although teaching is the most important activity at ESA, the school carries out some forestry, water, and crops research.

We identified only two private companies undertaking agricultural research activities in Côte d'Ivoire. Before being fully privatized in 2000, the Hevea Company of Gô (HEVEGO) and the Ivorian Company of Tropical Technology (I2T) were 70 and 75 percent government-owned, respectively. We estimate that these two companies employed 4 fte researchers in 1998, but data on their research capacity since privatization was unavailable.

Data for 2002, prior to the beginning of the war, indicate that collaboration was occurring among the agricultural research agencies and with regional and international agencies. CNRA, for example, reported collaboration with UAC, the Ivorian Center of Economic and Social Research (CIRES), ESA, the Center of International Agricultural Research Cooperation for Development (CIRAD), and the international agricultural research centers.⁷ CRO is still collaborating with the French Research Institute for Development (IRD, previously ORSTOM).

A Short History of Government-Based Agricultural Research in Côte d'Ivoire

A number of CNRA's research institutes were originally established during the 1890s as "experiment gardens." After World War I, most of these gardens evolved into experiment stations that focused on a very small number of crops. When the French colonies throughout West Africa gained political independence in the late 1950s, the French regional research system collapsed. At the time of independence, most of Côte d'Ivoire's agricultural research facilities were managed and staffed by the French tropical research institutes, and, given the lack of trained staff to continue these programs, bilateral agreements were made whereby the French institutes continued to manage the stations with joint funding.

Most of the former French colonies sought to nationalize their agricultural research systems in the late 1960s and early 1970s, but Côte d'Ivoire chose to continue close collaboration with institutes such as ORSTOM and the Study and Research Group for Tropical Agricultural Development (GERDAT, CIRAD's predecessor) for a much longer period of time. By the 1980s and 1990s, further institutional changes occurred representing a departure from earlier trends. CIRT was created in 1981 to conduct research on the processing of agricultural products; IDESSA followed in 1982 and gradually took over French local research activities and facilities in the savanna zone.; in 1992, IDEFOR replaced various existing French institutes conducting forestry research; and in 1998, CIRT, IDESSA, and IDEFOR were merged to become CNRA. CRO, established in 1958 by ORSTOM, still operates under the same name.

Sources: Roseboom and Pardey (1994), Traoré (1999) and Gage et al. (2001).

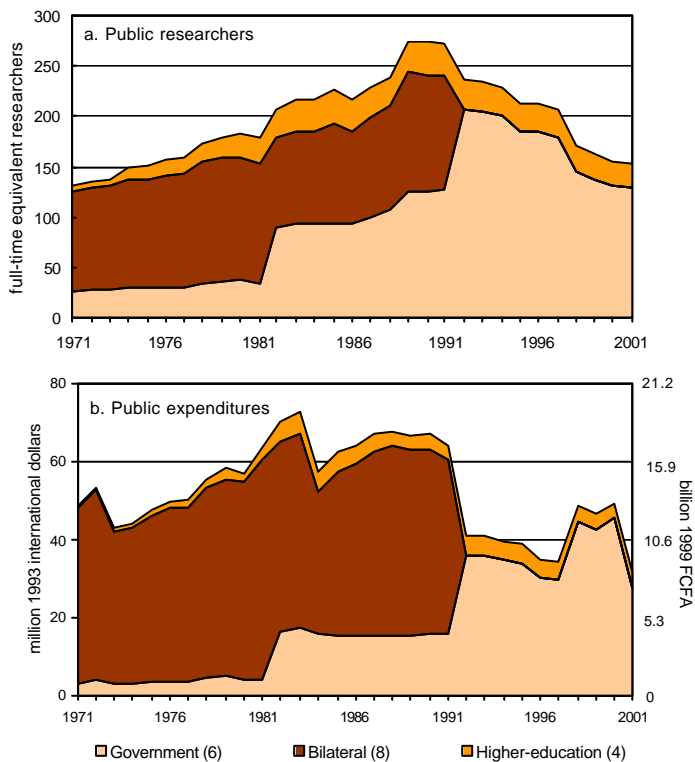
HUMAN AND FINANCIAL RESOURCES IN PUBLIC AGRICULTURAL R&D

Overall Trends

Total agricultural researcher numbers increased by 4 percent per year during the 1971-91 period but thereafter declined by 6 percent per year (Figure 1a).⁸ The decline was more severe for the government than for the higher education agencies, first, because of the departure of CIRAD staff in the early 1990s—reflecting the completion of the nationalization process of Côte d'Ivoire by the creation of IDEFOR—and, second, because IDESSA, IDEFOR, and CIRT were merged to form CNRA in 1998. At that time, many research staff were reassigned, took early retirement, or found employment elsewhere.

The expatriate share of total research staff declined substantially after the creation of IDEFOR in 1992. In 2001, only 11 expatriate fte staff conducted agricultural research compared with 97 a decade previously. Most of the expatriate researchers that remain in the country are employed at CNRA or CRO.

Figure 1^{3/4} Public agricultural R&D trends, 1971-2001



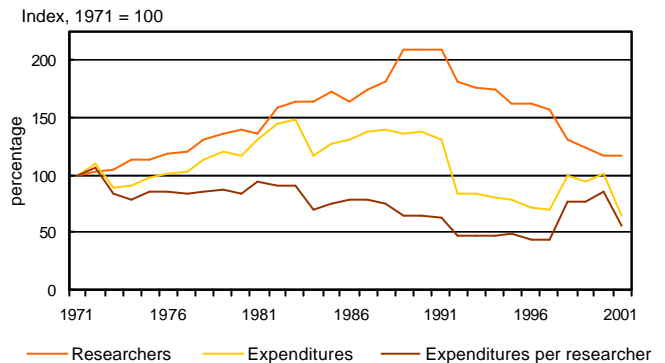
Sources: Compiled by authors from ASTI survey data (IFPRI -ISNAR-CORAF 2003), CNRA (2000, 2001, and 2002), Traoré et al. (1998), Roseboom and Pardey (1994), and various other secondary sources.

Notes: Figures in parentheses indicate the number of agencies in each category. "Government" includes CNRA, CRO, and CNRA's three predecessors—CIRT, IDEFOR, and IDESSA—but excludes the Ministry of Agriculture's laboratories, LACENA and LANADA. "Bilateral" includes CIRAD centers, some of which existed in Côte d'Ivoire until 1992. Underlying data are available at the ASTI website (www.asti.cgiar.org).

Total R&D spending shows a more erratic trend over the 1971-2001 period but decreased strongly overall with the departure of the French (Figure 1b). Total spending reached a minimum in 1997, but temporarily rose with the creation of CNRA, largely funded through the World Bank and government contributions from the PNASA II project. Disappointing revenues from commodity sales sparked by falling world market prices and the suspension of World Bank aid to Côte d'Ivoire in 2000 caused a decline in CNRA's spending in 2001. With the outbreak of civil war in September 2002 the situation only deteriorated further.

Total researcher numbers increased relative to spending, causing spending per scientist to decline and particularly so after 1981 (Figure 2). In recent years, spending per scientist temporarily improved with the increase of total spending associated with the creation of CNRA. Despite these deteriorating spending per scientist levels, compared with other African countries they remain relatively high. Ugandan researchers, for example, spent \$200,000 in 2000—by far the highest level in East Africa (Beintema and Tizikara 2002). In Côte d'Ivoire the level was \$207,000 in 2001, and in prior years it was even higher.

Figure 2^{3/4} Trends in public expenditures, researchers, and expenditures per researcher, 1971-2001

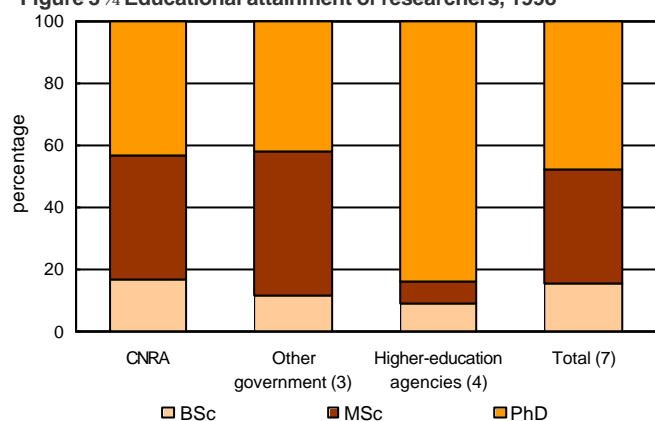


Sources: As for Figure 1.

Notes: As for Figure 1.

Human Resources

Information on the degree levels attained by researchers was only available for 1998. At that time, 83 percent of CNRA's research staff had postgraduate level training, with 44 percent holding doctorate degrees and 39 percent holding MSc degrees (Figure 3). Research staff at the three other government agencies in our sample showed a similar education profile, university research staff stood out as far better educated and holding predominantly doctorate degrees. The latter is consistent with other African countries and regions (Pardey et al. 1997 and Beintema and Pardey 2001). Many of the research staff at CNRA received their postgraduate training as part of the first National Agricultural Services Support Project (PNASA I). PNASA II also allocates funding to strengthen human resource capacity (World Bank 1998), though it is unclear how many researchers were scheduled to receive postgraduate training or whether any had actually commenced training.

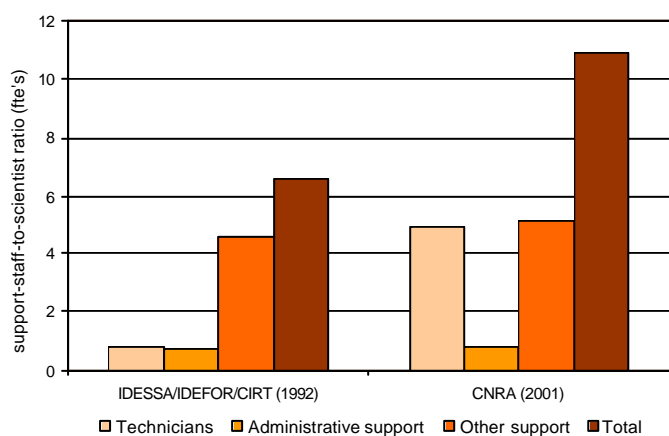
Figure 3 Educational attainment of researchers, 1998

Source: Compiled by authors from ASTI survey data (IFPRI-ISNAR-CORAF 2003) and Traoré et al. (1998).

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

Based on a seven-agency sample for 1998, on average, 8 percent of total research staff was female; shares ranged from 5 percent at CRO, to 8 percent at CNRA, to a high of 30 percent at CIRES.⁹ Six out of 8 female researchers at CNRA held MSc degrees in 2001. These levels are low compared with other African countries, most of which have corresponding shares between 15 and 25 percent. They are an improvement over equivalent levels from the late 1980s; relatively few female students enrolled at the National Advanced School for Agronomy (ENSA—ESA's predecessor) in the 1970s and their participation has been low overall ever since (Roseboom and Pardey 1994).

In 2001, the number of support staff per scientist at CNRA was 10.9, made up of 4.9 technicians, 0.8 administrative personnel, and 5.2 other support staff such as laborers, guards, drivers, and so on (Figure 4).¹⁰ In contrast, the total support staff per scientist for IDESSA, IDEFOR, and CIRT in 1991 was 6.6. These are relatively high figures compared with other countries largely because many CNRA employees are involved in production activities, and not strictly research.

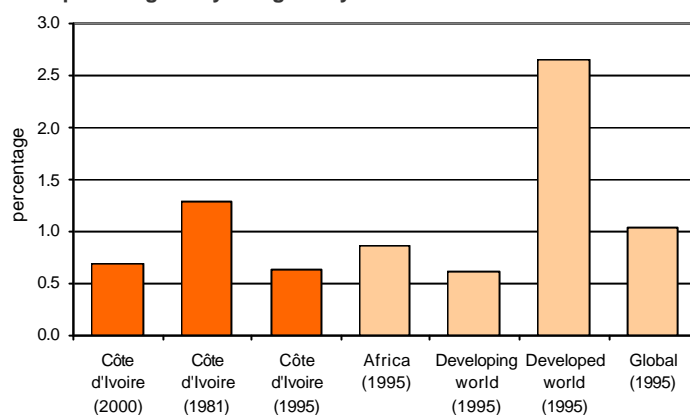
Figure 4 Support-staff-to-researcher ratios, 1992 and 2001

Source: Compiled by authors from ASTI survey data (IFPRI-ISNAR-CORAF 2003) and Roseboom and Pardey (1994).

Note: Figure excludes expatriate staff.

Spending

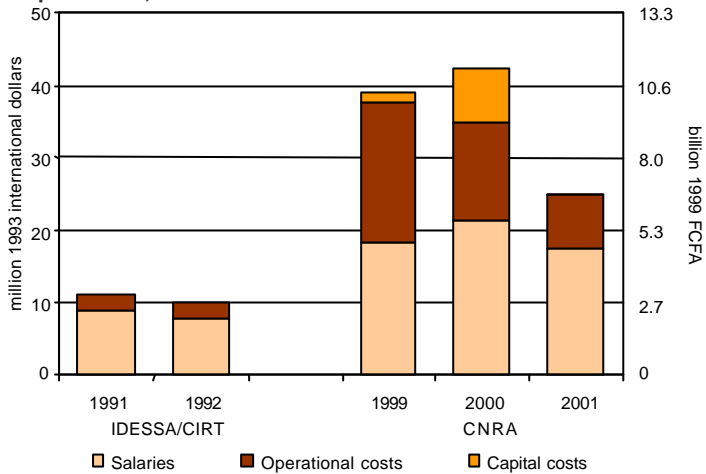
Total public spending as a percentage of agricultural output (AgGDP) is a common research investment indicator that helps to place a country's agricultural R&D spending in an internationally comparable context. In 2000, Côte d'Ivoire invested \$0.67 for every \$100 of agricultural output; considerably lower than the 1981 level of \$1.28 reflecting the departure of many CIRAD scientists (and subsequent funding) during the early 1980s, and again, the early 1990s (Figure 5). In 1995, Côte d'Ivoire's intensity ratio was 0.63 percent—similar to the average ratio for the developing world but lower the average ratio for Africa that year (0.85 percent).

Figure 5 Côte d'Ivoire's public agricultural research intensity compared regionally and globally

Sources: Côte d'Ivoire compiled from Figure 2; AgGDP from World Bank 2002; other intensity ratios from Pardey and Beintema 2001.

During 1999-2001, total salaries accounted for more than half of CNRA's spending, while the shares of operational and capital costs were 39 and 9 percent, respectively (Figure 6). In contrast, CIRT and IDESSA spent a larger relative portion of their total spending on salaries during the early 1990s (80 percent). Not all staff working for IDEFOR, IDESSA, and CIRT maintained their positions with the creation of CNRA; but the net reduction in staff numbers resulted in substantially better remuneration packages for the staff that remained. In order to provide a significant incentive to researchers fully dedicated to agricultural research, salaries are now up to 2.5 times higher than those previously paid (Gage et al. 2001). Notwithstanding, the share of total salaries in overall spending fell below pre-CNRA levels, indicating that CNRA has invested significantly in its physical infrastructure and equipment. During 2001, CNRA experienced a major financial crisis, which resulted in a halt to capital spending and a close to fifty percent reduction in operational expenditures.

Figure 6¾ Cost-category shares in IDESSA, CIRT, and CNRA's expenditures, 1991-92 and 1999-2001



Source: Compiled by authors from CNRA (2000, 2001, and 2002) and Roseboom and Pardey (1994).

Note: No information was available on cost categories for IDEFOR's spending. Data include estimated salaries for expatriate staff (see Methodology on page 8).

FINANCING PUBLIC AGRICULTURAL R&D

Agricultural research in Côte d'Ivoire has largely been funded by government revenues, commodity sales, a World Bank loan, and other donor funding. World Bank contributions took the form of two consecutive projects—PNASA I and PNASA II. PNASA I was implemented during 1994-97 to streamline and decentralize agricultural services, enhance the role of the farmer in the policymaking process, and increase the role of MINAGRA in policymaking and in monitoring agricultural development. The project succeeded in its first two goals but failed to significantly strengthen MINAGRA. PNASA I also prompted the merger of the three former agricultural extension agencies into the National Agency of Rural Development Support (ANADER).

Learning from PNASA I, PNASA II (1998-2010) was established as a follow-on project. The dominant components of the first phase of PNASA II (1998-2001) were strengthening adaptive research and extension, supporting farmer organizations by reforming ANADER, and creating a decentralized national agricultural research institution that would be 60 percent privately owned, and managed by its main clients (World Bank 1998).

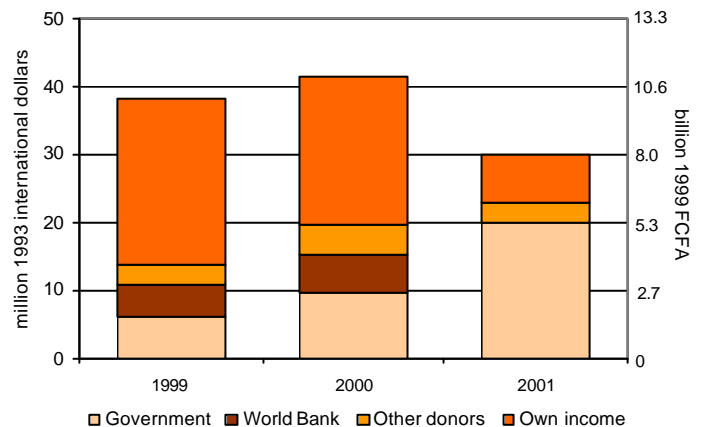
During the first phase of PNASA II, 42 percent of CNRA's 19.5 billion CFA annual budget was intended to be funded by the World Bank; 35 percent by resources generated through research contracts, commercialization of agricultural products, and research results; and 23 percent by the national government (Gage et al. 2001). In reality, however, disbursed funding was much lower. In 1999, for example, CNRA received only half its planned resources. The World Bank component was linked to the government's allocation as counterpart funding, so when the government failed to supply its full share of funding, the World

Bank allocation was eroded as well. In addition, between October 2000 and February 2002, the World Bank froze its aid to Côte d'Ivoire after the then military-led government failed to make payments in arrears for over 60 days. On top of this, the decline in world-market prices for cocoa, coffee, palm oil, and sugarcane reduced CNRA's sales revenues, and anticipated funds from farmer organizations did not materialize because of delays in the establishment of the National Agricultural Development Fund (FNDA) (Gage et al. 2001).¹¹ These factors seriously constrained CNRA's operations in recent years. In May and June of 2001, for example, CNRA could not pay salaries, and in 1999-2000 it could not cover other staff allowances, which led to strikes and other grievances (Gage et al. 2001).

As a result of the low level of disbursement by the government and the World Bank, 64 percent of CNRA's total funding in 1999 came from revenues generated internally from commodity sales. However, due to the decline in world market prices these funds have decreased considerably since then (Figure 7). Consequently, the government had to raise its contributions to CNRA in order to keep the center operational, hence the \$14 million increase (adjusted for inflation) from 1999 to 2001. In the latter year, government contributions accounted for about two thirds of CNRA's total funding.

In 2001, when World Bank contributions to CNRA were frozen, the center still received 10 percent of its funding from other donors. These other donors included the African Development Bank (ADB), the United Nations Development Programme (UNDP), France and Belgium.

Figure 7¾ CNRA's funding sources, 1999-2001



Source: Compiled by authors from CNRA (2000, 2001, and 2002).

Note: Other donors include funding from public/private enterprises.

Limited information on funding sources was available for CRO, whose funding levels were relatively stable from 1991 to 2001, with the exception of a major disruption in 1999—the year of a military coup. Direct funding from IRD to CRO has virtually halted in recent years, leaving contributions from the government as the main source of income. Recently, however, some funding has been acquired from the European Union through a joint CRO-IRD project.

PRIVATE AGRICULTURAL R&D

Agricultural R&D performed by the private sector in Côte d'Ivoire is minimal. Many of the larger private companies do not employ research staff, instead contracting research out to CNRA and other agencies. CNRA has active research agreements with Sucrivoire and the African Sugar Company (SUCAF)—the two sugar companies; the cotton companies Ivorian Textile Development Company, Ivorian Cotton Company, and Ivory Cotton; and with the Ivorian Company of Oil Seeds Trituration and Vegetable Oil Refinery (TRITURAF) (International Cotton Advisory Committee 2000).

I2T and HEVEGO were fully privatized in 2000. I2T conducts research and promotes agricultural technologies for manioc, copra, coconuts, cassava, millet, sorghum, maize, coffee, and their by-products. HEVEGO conducts some rubber research. In 1998, these two companies combined employed four full-time researchers, but no information was available on their research activities since privatization.

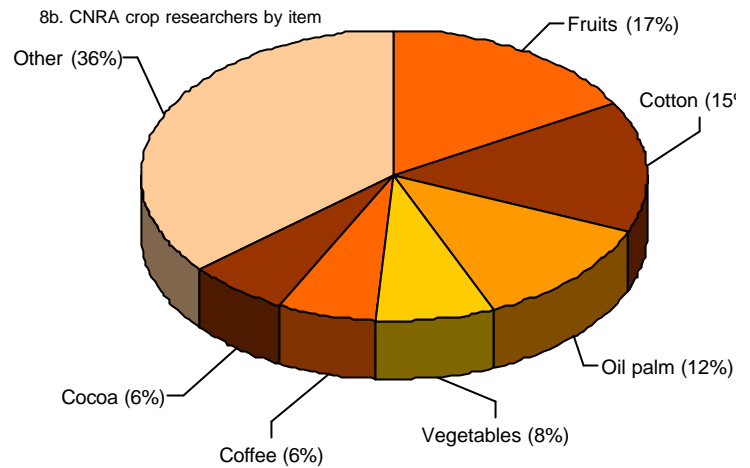
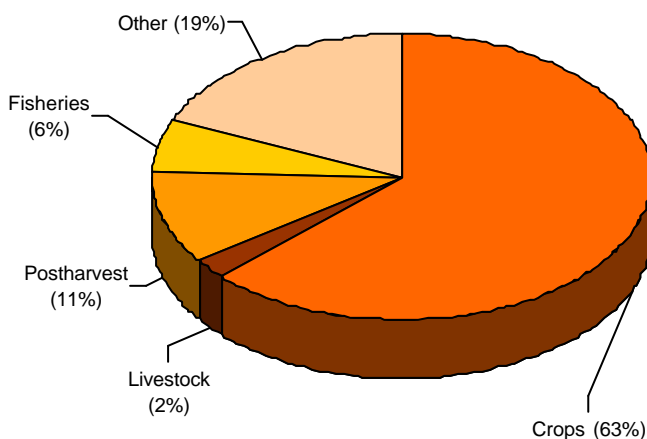
RESEARCH ORIENTATION

Commodity Focus

In 2001, close to two-thirds the 105 full-time researchers employed at CNRA conducted crop research. Postharvest research accounted for 11 percent, fisheries research for 6 percent, and livestock research for 2 percent (Figure 8a). The other category includes food safety, socioeconomic, and natural resources research. CNRA does not have a special forest management research program but conducts research in agroforestry techniques for oil palms, cocoa, rubber, and fruit trees. CNRA's primary research crops are fruits, cotton, and oil palm (Figure 8b). Other important crops, such as vegetables, coffee, and cocoa, accounted each for 6–8 percent of the total. The remaining 36 percent of CNRA's total crop researchers focus on other crops.

Figure 8¾ CNRA's commodity focus, 2001

8a. Total CNRA researchers by major item



Source: Compiled by authors from ASTI survey data (IFPRI-ISNAR-CORAF 2003).

Note: Data in Figure 8b include CNRA researchers involved in crop research only.

CRO's research focuses on brackish water and marine fisheries and aquaculture. It lost its responsibility (and some staff) for research on inland fisheries and aquaculture to CNRA in 1998.

CONCLUSION

Political unrest, falling world-market commodity prices, and, most recently, the outbreak of the civil war in September 2002 have compounded the climate of financial uncertainty within the agricultural research system in Côte d'Ivoire. CNRA as the major entity conducting research has been most severely affected. As of early 2002, funding to CNRA from producer organizations and the private sector was well below the levels agreed upon under PNASA II. Uncertainty about suspension of foreign aid, along with the deterioration of public finances, severely constrained agricultural research expenditures in Côte d'Ivoire in recent years. As long as the current crisis continues, the privatization criteria agreed in PNASA II will not be met, and CNRA will remain dependent on government funding and revenues from its own commodity sales. Hopefully this situation will be redressed once the country's political situation improves.

Despite these negative trends, investment levels in agricultural R&D are comparable to or higher than those in other African countries.

NOTES

1. The authors are grateful to Ayémou Assa, Ramata Bakayoko-Ly, Kédro Diomande, Odile Tahouo and other colleagues in Côte d'Ivoire for their time and assistance with data collection, along with Mody Bakar Barry, Sékou Doumbia, Han Roseboom, and Kouadio Tano for useful comments on drafts of this brief. Various secondary sources were relied on for data analysis and are available on request from the authors.
3. The 11-agency sample included:
 - Four government agencies/units: *Centre National de Recherche Agronomique* (CNRA), *Centre de Recherches Océanologiques* (CRO), *Laboratoire National d'Appui au Développement Agricole* (LANADA), and *Laboratoire Central de Nutrition Animale* (LACENA);
 - Five higher-education agencies: *Ecole Supérieure Agronomique* (ESA) under *Institut National Polytechnique Félix Houphouët-Boigny* (INP-HB); *Unité de Formation et de Recherche* (UFR) *de Biosciences, UFR Sciences de la Terre et des Ressources Minières*, and *Centre Ivoirien de Recherche Economique et Sociale* (CIRES) under *Université d'Abidjan-Cocody*; and UFR *Sciences de la Nature* under *Université d'Abobo-Adjamé*;
 - Two private enterprises: *Société Hévéicole du Gô* (HEVEGO) and *Société Ivoirienne de Technologie Tropicale* (I2T).
 - One government and one higher-education agency are excluded given data unavailability—*Laboratoire de Zoologie et Biologie Animale* (LAZOBA) under *Ministère de l'Agriculture et des Ressources Animales* and *Centre National Floristique* (CNF) under *Université d'Abidjan-Cocody*.
3. Unless otherwise stated, all data on research expenditures are reported in 1993 international dollars or in 1999 CFA francs.
4. English translations of institute names have been used throughout the brief except in footnote 2, where the original French is provided.
5. Following the institutional classification in the Frascati Manual (see Methodology), in this brief a research agency administered by but receiving less than half of its annual funding from the government (such as CNRA) is classified as a government agency.
6. Agricultural professional organizations include agricultural producer organizations, agribusinesses, trade associations, and other private-sector interests (Gage et al. 2001).
7. The West African Rice Development Agency (WARDA), one of the 16 centers of the Consultative Group on International Agricultural Research (CGIAR), is headquartered in Côte d'Ivoire.
8. Data are calculated as least squares growth rates.
9. The agency sample included CNRA, CRO, LANADA, LACENA, UAC, UAA, and CIRES. 1998 data for CNRA and UAC are estimates.
10. The increase in CNRA's support-staff-to-scientist ratio has concentrated primarily in the technician category, but its cause was unclear to the authors.
11. FNDA was to be established as an autonomous and sustainable financing system for agricultural research and extension services, but its implementation was delayed because of recent political unrest (Gage et al. 2001) MSc degrees was 14 and 4 researchers, respectively

METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI, ISNAR, and CORAF 2003), CNRA (2000, 2001, 2002), Traoré et al. (1998), and various secondary sources.
- 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 an Ivorian 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 (2001). 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 full-time 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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