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MAURITANIA

By Gert-Jan Stads, Abdoulaye Lo, and Boubacar Cissé Diallo

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

INSTITUTIONAL DEVELOPMENTS

Located at the extreme west of the Sahara desert and with a population density of less than seven people per square mile, the Islamic Republic of Mauritania is one of the world's most sparsely populated countries. More than 90 percent of its land surface is desert or semi-desert, leaving only a small area in the south and the east of the country available for rainfed crop farming. Consequently, livestock farming is strongly emphasized as is wild-caught fisheries along the country's coastline. Like many African countries, the agricultural sector supports a significant share of Mauritania's labor force (about 70 percent), making agricultural research and development (R&D) an important factor in the pursuit of food self-sufficiency and improved living conditions. In 2001, seven agencies conducted agricultural R&D in Mauritania. Together these agencies employed 98 full-time equivalent (fte) researchers and spent roughly 400 million 1999 Mauritanian ouguiyas—equivalent to 9 million 1993 international dollars (Table 1).^{2,3} Unlike many countries in the region that have a single agricultural R&D institute, Mauritania has three agencies that undertake the majority of the country's crop, livestock, and fisheries research: the National Agricultural Research and Development Center (CNRADA), the National Livestock and Veterinary Research Center (CNERV), and the Mauritanian Institute of Oceanographic Research and Fisheries (IMROP), respectively.⁴

In 2001, CNRADA accounted for 43 percent of the country's total fte researchers and 32 percent of agricultural R&D expenditures. In addition to its headquarters

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

| Type of agency | Spending | | Researchers ^a (fte's) | Share | | Agencies in sample ^b (number) |
|-------------------------------|-----------------------------|----------------------------|-------------------------------------|-----------------------|-------------|---|
| | 1999 ouguiyas (millions) | 1993 international dollars | | Spending (percent) | Researchers | |
| CNRADA | 121.9 | 2.8 | 42.0 | 31.9 | 43.0 | 1 |
| CNERV | 72.8 | 1.7 | 18.0 | 19.1 | 18.4 | 1 |
| IMROP ^c | 152.9 | 3.6 | 28.7 | 40.1 | 29.4 | 1 |
| CLAA ^d | 3.0 | 0.1 | 1.1 | 0.8 | 1.1 | 1 |
| Higher education ^e | 31.1 | 0.7 | 8.0 | 8.1 | 8.1 | 3 |
| Total | 381.7 | 8.9 | 97.7 | 100 | 100 | 7 |

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

^aIncludes national and expatriate staff.

^bSee note 2 for a list of the 7 agencies included in the sample.

^cThe 41 staff at IMROP spent about 70 percent of their time on research, resulting in 28.7 fte researchers.

^dExpenditures for CLAA are estimates based on averages for CNRADA. The center's staff spent about 15 percent of their time on research, resulting in 1.1 fte researchers.

^eExpenditures for the higher-education agencies are estimates based on averages for the government agencies. The 56 staff at the higher-education agencies spent between 10 and 15 percent of their time on research, resulting in 8.0 fte researchers.

KEY TRENDS

- Agricultural researcher numbers in Mauritania increased steadily throughout the 1990s; expenditures followed the same trend, but declined slightly in 2001.
- Three centers focusing on crop, livestock, and fisheries research, respectively, account for over 90 percent of the country's agricultural researchers and expenditures: the National Agricultural Research and Development Center (CNRADA), the National Livestock and Veterinary Research Center (CNERV), and the Mauritanian Institute of Oceanographic Research and Fisheries (IMROP).
- Fisheries research dominates, in terms of spending, especially since the 2002 signing of a fisheries treaty between Mauritania and the European Union.
- The future of CNRADA's and CNERV's funding is uncertain since the cessation of the World Bank supported PSA project in 2000. Many research activities have been halted, and many researchers have sought employment elsewhere.

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).

in Kaédi on the Senegal River, CNRADA comprises 12 research stations, 4 regional offices, and 3 laboratories located across the country's various agroecological zones. The center was established in 1974 and it is placed under the administrative responsibility of the Ministry of Rural Development and the Environment (MDRE) (See *A Short History of Government-Based Agricultural Research* below).

Also administered by MDRE, CNERV accounted for close to 20 percent of Mauritania's total fte researchers and agricultural R&D expenditures in 2001. Its mandate includes genetic improvement of livestock, diagnosis and detection of animal diseases, epidemiological research of livestock ailments, meat product control, and the analysis of forages. CNERV is headquartered in Nouakchott and equally disposes of a regional station in Kaédi.

Both CNRADA and CNERV underwent restructuring in 2000 as part of the Agricultural Services Project (PSA)—an agricultural research development project predominantly funded by a World Bank loan—and in accordance with the Government of Mauritania's National Agricultural Research Program (PNRA). PSA's principal objectives were to strengthen CNRADA and CNERV and to improve the coordination and collaboration between them (World Bank 1994). More specifically, the reorganization was intended to stimulate on-farm and applied research and to establish direct links between research and extension by creating five new research programs at CNRADA and CNERV focusing on irrigation-based production systems, rain- and riverfed production systems, desert oases systems, sylvo-pastoral systems, and peri-urban production systems (CNRADA 2003; CNERV 2001).

Despite these advances, the cessation of PSA in December 2000 has left CNRADA in severe financial crisis, and a large number of researchers have left the center for employment elsewhere. PSA assisted CNERV more on an institutional level, rather than a financial level, but the center has nevertheless been negatively affected by the completion of the project.

With 2001 expenditures representing 40 percent of Mauritania's total agricultural R&D spending, IMROP is the largest of the country's agricultural research agencies in financial terms. IMROP is administered by the Ministry of Fisheries and Maritime Economics (MPEM) and is based in

Nouadhibou. It employs 29 fte researchers, essentially focusing on aquatic resources, fisheries technologies, and the coastal environment. Until April 2002, IMROP was the National Center of Oceanographic Research and Fisheries (CNROP). It was granted institute status with the signing of a treaty between Mauritania and the European Union under which Mauritania exports large quantities of pelagic fish, prawns, cod and tuna to Europe and the European Union has invested extensively in the institute's infrastructure, including the recruitment of new researchers, such that IMROP's laboratories now meet international standards. Funding from the European Union along with increased government financing represents a mere tripling of CNROP's former budget.

One other government agency, the Anti-Locust Center (CLAA), conducts limited research into monitoring and combating locust plagues. CLAA is administered by the Livestock and Agriculture Directorate of MDRE and in 2001 employed one fte researcher.

The three higher-education agencies involved in Mauritanian agricultural R&D accounted for 8 percent of total fte researchers in 2001, a relatively low share compared with most other West African countries. The University of Nouakchott conducts the majority of research in the higher-education sector. With no agriculture faculty, agricultural R&D activities fall under the Department of Biology of the Faculty of Technical Sciences—focusing on crop genetic improvement, nutritional sciences, animal ecobiology, maritime pollution, entomology, and parasitology—and the Department of Geography of the Faculty of Arts and Human Sciences—focusing mainly on climatology, pedology, soils, and agrarian geography. In addition to teaching, the National School of Agricultural Training and Extension (ENFVA), under MDRE, carries out limited socio-economic agricultural research.

No private-sector agencies conducting agricultural research—either profit or nonprofit—were identified for the period 1991–2001. CNRADA, however, works in close cooperation with the Mauritanian Association of Agriculturists and Stockbreeders and CNERV conducts research on behalf of the Association of Milk Producers, the National Group of Pastoral Associations (GNAP), and the milk companies TIVISKI and Top Lait.

A Short History of Government-Based Agricultural Research

Agricultural research activities commenced in Mauritania in 1949 with exploratory research by the French colonial government focusing on date palms and the production systems of the Senegal River and the country's oases. These operations led to the creation of Mauritania's first research station in Kankossa in 1952 by the French Colonial Fruit and Citrus Institute (IFAC, later IRFA/CIRAD). Between 1960—when Mauritania attained its independence—and 1972, the French Tropical Agriculture and Food Crops Research Institute (IRAT) conducted research on rainfed and riverfed food crops from its station in Kaédi, at that time a subsidiary of the Agricultural Research Center of Bambey in Senegal.

Interest in agricultural research was kindled in the 1970s. Responsibility for agricultural research activities was housed within the Ministry of Planning and Research from 1971 until 1973 and was subsequently taken over by the Study and Planning Directorate of the Ministry of Economics and Finance. In 1973–74, the Ministry of Rural Development (the precursor of today's MDRE) created two agricultural research centers—the National Livestock and Veterinary Research Center (CNERV) in Nouakchott and the National Agricultural Research and Development Center (CNRADA) in Kaédi. CNRADA took over the research activities of IRFA and IRAT, fully nationalizing the country's agricultural R&D.

The Fisheries Laboratory of Nouadhibou was founded in 1952, became the national Center of Oceanographic Research and Fisheries (CNROP) in 1978, and, with the signing of a fisheries treaty between the European Union and Mauritania in 2002, obtained institute status as the Mauritanian Institute of Oceanographic Research and Fisheries (IMROP).

Source: FAO (1993).

Cooperation between CNRADA, CNERV, and the University of Nouakchott has been significantly enhanced since the implementation of PNRA in 1997 discussed earlier. Important international linkages also exist between CNRADA/CNERV and the agricultural research institutes of neighboring countries including the Senegalese Agricultural Research Institute (ISRA), the Institute of Rural Economics (IER) of Mali, and the Agricultural and Veterinary Institute Hassan II (IAV) of Morocco. CNRADA maintains fruitful relationships with various centers of the Consultative Group on International Agricultural Research (CGIAR), as well as with the African Network for Horticultural Development (RADHORT), the West and Central African Millet Research Network (ROCAFREMI), the West and Central African Sorghum Research Network (ROCARS), and the West and Central African Rice Research and Development Network (ROCARIZ) (CNRADA 2003). CNERV collaborates with the French International Agricultural Research Center for Development (CIRAD), the International Center for Livestock Research and Development in Sub-Humid Zones (CIRDES), and the Sahel Institute (INSAH) (CNERV 2001). IMROP collaborates with various West African fisheries research centers, as well as with European institutes such as the French Research Institute for Sea Exploitation (IFREMER). The University of Nouakchott leads a project in collaboration with various French and Spanish universities that supports research in areas such as desertification, the Nouakchott coastline, and the desalination of sea water (AMI 2002).

HUMAN AND FINANCIAL RESOURCES IN AGRICULTURAL R&D

Overall Trends

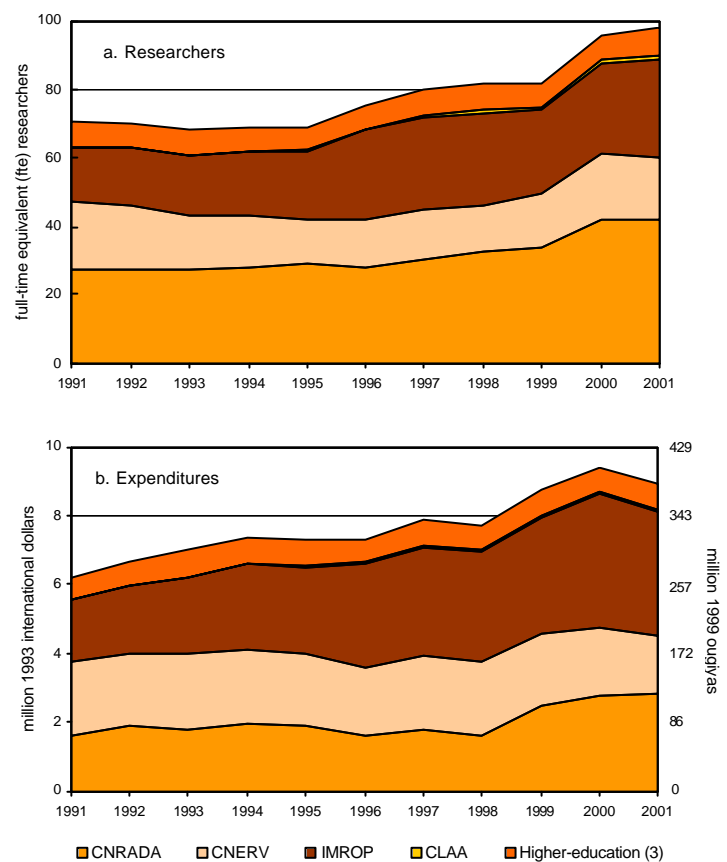
Between 1991 and 2001, the total number of agricultural researchers and agricultural R&D expenditures increased by 3.6 and 3.7 percent per year, respectively.⁵ The total number of fte researchers in the government agencies rose from 63 in 1991 to 90 in 2001, largely as a result of PSA funding for the recruitment of researchers. The total number of fte researchers in the higher-education sector remained relatively stable around 7 over the same period (Figure 1a). After the completion of PSA in 2000, some CNRADA and CNERV researchers found employment in Senegal and subregional research institutes, where funding was considered more secure. These reductions were offset by increases at IMROP in 2002 after the signing of the European Union–Mauritania fisheries treaty described above.

In 2001, 4.3 fte researchers active in Mauritania were expatriates, accounting for 4 percent of the country's fte researchers—lower than the 10 percent reported 10 years earlier. The majority of expatriates employed at CNERV and the three higher-education agencies have since left the country. CNERV employed no expatriates in 2001, down from four a decade earlier; IMROP employed 2.8 expatriates in 2001, up from 0.7 fte in 1991; and CNRADA's expatriate researcher levels remained relatively stable throughout the period 1991–2001 at around 1. The three expatriates active at ENFVA until 1994 were Sudanese, funded by the Arab Organization for Agricultural Development (AOAD) (World Bank 1994). Other

expatriates active in Mauritania throughout the 1990s were mostly French.

During the 1990s, agricultural R&D expenditures increased by about one-third from \$6.2 million in 1991 to \$9.4 million in 2000 (Figure 1b). In 2001, CNRADA's total spending continued to increase (mainly as a result of World Bank funding through the Integrated Development Project for Irrigated Agriculture—IDPIAM), but spending at CNERV fell considerably. Total Mauritanian agricultural R&D spending in 2001 was \$8.9 million, still considerably higher than the corresponding level for the early 1990s. Since 2001, IMROP's expenditures have increased considerably with the signing of the fisheries treaty with the European Union in 2002 and totaled over \$13 million in 2003.

Figure 1^{3/4} Agricultural R&D trends, 1991-2001

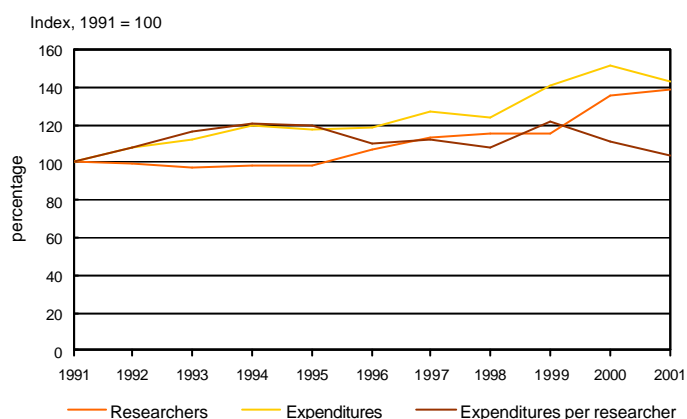


Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).

Notes: Figures in parentheses indicate the number of agencies in each category. Expenditures for CLAA are estimates based on averages for CNRADA. Expenditures for the higher-education agencies are estimates based on combined averages for the government agencies. Underlying data are available at the ASTI website (<http://www.asti.cgiar.org>).

During the first half of the 1990s, the growth of total agricultural R&D expenditures was stronger than the growth of total fte researchers, resulting in a steady rise in expenditures per researcher to a peak of \$107,000 in 1994. Thereafter researcher numbers increased faster than R&D expenditures causing expenditures per researcher to fall; this trend became more pronounced in 1999–2001 with levels reaching \$91,000 in 2001, still slightly higher than in 1991 (Figure 2). Total expenditures per researcher apparently rose again after the signing of the fisheries treaty in 2002.

Figure 2 Trends in expenditures, researchers, and expenditures per researcher, 1991–2001



Source: Figure 1.

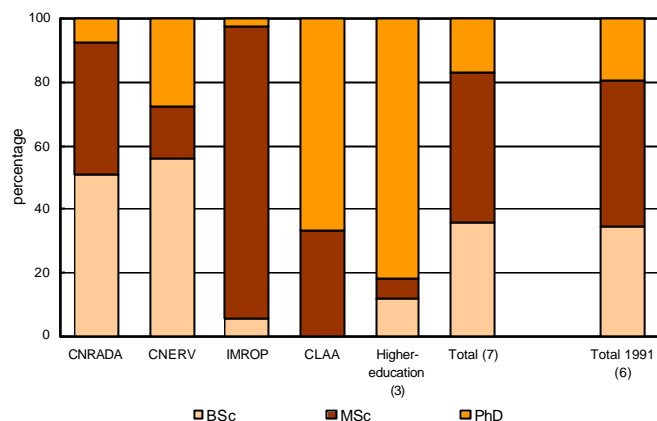
Human Resources

In 2001, 64 percent of the 94 fte researchers in a 7-agency sample were trained to the postgraduate level and 17 percent held a doctorate degree (Figure 3). In general, researchers at the higher-education agencies were more highly educated than their counterparts in the government agencies, which is in line with findings in most other African countries (Beintema 2003). Of note is the high share of researchers with MSc degrees at IMROP (92 percent). Overall qualifications of agricultural staff in Mauritania—measured by the share of researchers with PhD and MSc degrees—decreased slightly in the 1990s, mainly as a result of a relative decline in CNERV researchers trained to the postgraduate level.

The World Bank considered the low education levels of researchers at CNRADA and CNERV as a principal inhibiting factor to effective crop and livestock R&D in Mauritania. In response, PSA allocated funding for short-term, customized training for researchers in regional organizations and international agricultural research centers. At the completion of PSA in 2000, 18 researchers at either CNRADA or CNERV had received such training. Numerous CNRADA researchers, for example, benefited from methodological support and on-the-job training at a West Africa Rice Development Association (WARDA) station in Senegal as part of a joint project in which a number of new rice technologies were tested (World Bank 2001). Tertiary education for numerous CNERV researchers, undertaken locally and abroad, was financed through the African Development Bank (ADB) and the French government. Limited career opportunities at CNRADA and CNERV resulting

from a lack of effective training programs were cited as the primary reason for researchers' interest in careers at IMROP or abroad. Between 1998 and 2002, nine IMROP researchers benefited from specialization courses financed by the government (AMI 2003), and the European Union treaty provided support for ongoing training for IMROP.

Figure 3 Educational attainment of researchers, 2001

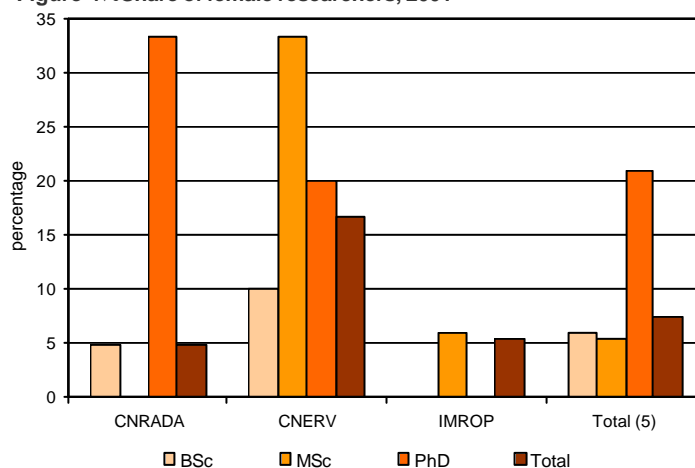


Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).

Notes: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff. 1991 data exclude CLAA (established in 1995).

In 2001, 7 percent of the 87 fte researchers in a five-agency sample were female (Figure 4). This share is considerably lower than the corresponding share in many other African countries (Beintema 2003). CNERV has the highest share of female researchers, at 17 percent, followed by IMROP and CNRADA, each with female researcher shares of 5 percent.⁶ In 2001, neither CLAA nor ENFVA employed any female researchers. In terms of qualifications, one third of CNRADA's PhD researchers and one third of CNERV's MSc researchers were female.

Figure 4 Share of female researchers, 2001

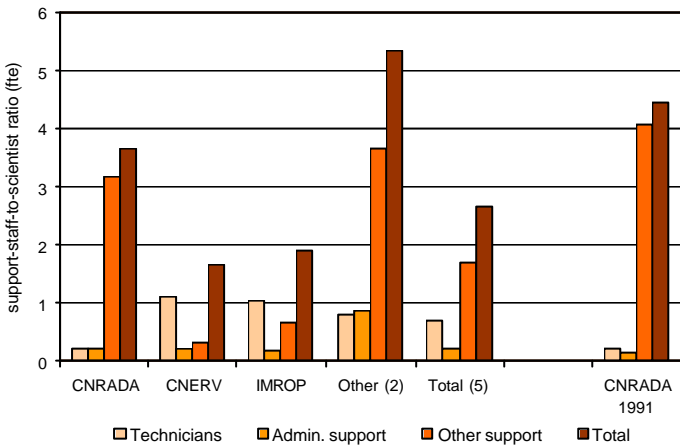


Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).

Note: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff. Totals include CLAA and ENFVA, neither of which employed female researchers in 2001.

In 2001, the average number of support staff per researcher in a five-agency sample was 2.7, consisting of 0.7 technicians, 0.2 administrative personnel, and 1.7 other support staff (laborers, guards, drivers, and so on) (Figure 5). The number of technicians per researcher at CNRADA was 0.2 compared with 1.1 at CNERV and IMROP, though CNRADA's other support staff numbers were higher than those at the other government agencies. The only agency for which 1991 support staff data was available was CNRADA; that year it employed 4.5 support staff per researcher, higher than the corresponding figure of 3.7 for 2001. The decline resulted entirely from a relative decline in the numbers of other support staff.

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

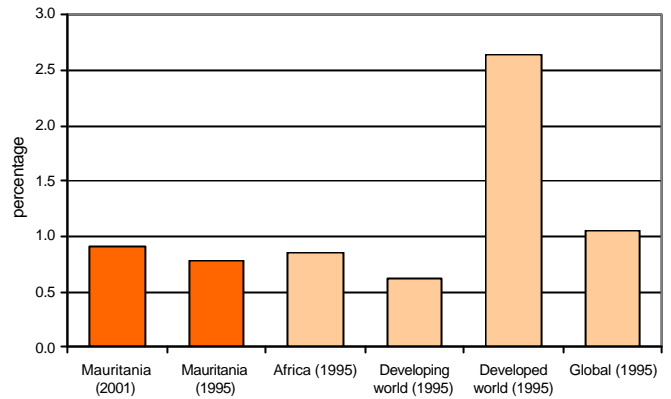


Source: Compiled by authors from ASTI survey data (IFPRI-INSAR-CORAF/WECARD 2002-03).
Notes: Figures in parentheses indicate the number of agencies in each category. Data exclude expatriate staff. "Other" includes CLAA and ENFVA.

Spending

Total public spending as a percentage of agricultural output (AgGDP) is a commonly used indicator of a country's agricultural R&D spending in comparison with international equivalents. In 2001, Mauritania invested \$0.92 for every \$100 of agricultural output, which was higher than the country's ratio five years earlier (0.78). This ratio was also higher than the average ratio for Africa (0.85) or the developing world (0.62) in 1995 (Figure 6).

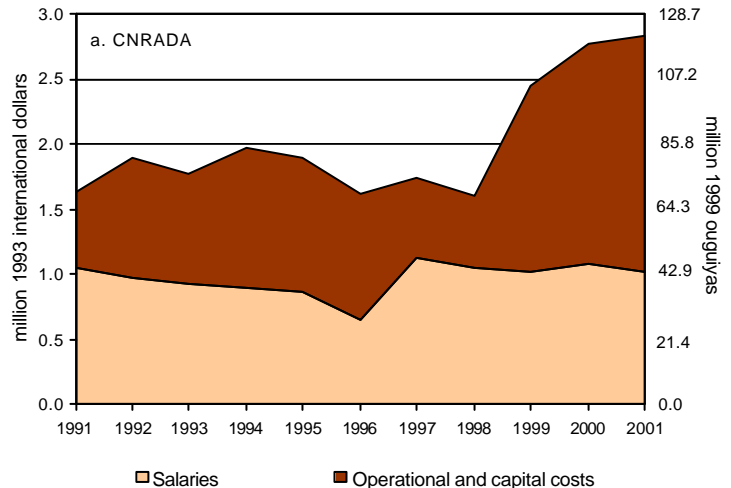
Figure 6 Mauritania's public agricultural research intensity compared regionally and globally

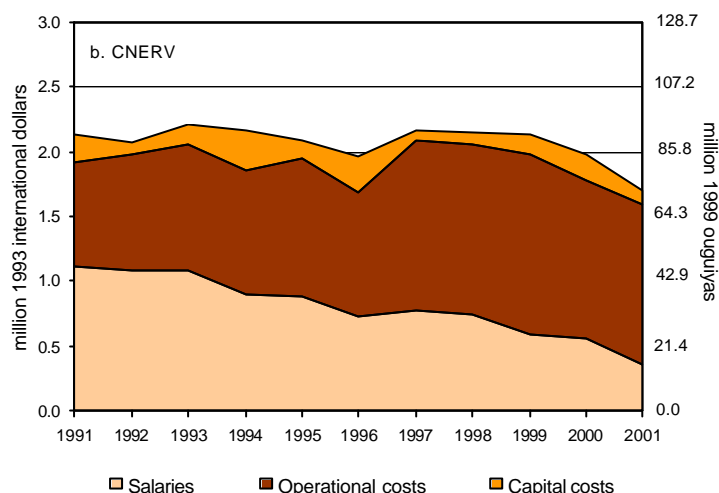


Sources: Mauritania compiled from Figure 1b; AgGDP from World Bank (2003); other intensity ratios from Pardey and Beintema (2001).

Unsurprisingly, wages were an important component of total expenditures at all three of the main government agencies. CNRADA's spending on salaries, though fairly constant in absolute terms during 1991-2001, declined in relative terms from 64 to 36 percent (Figure 7a). CNERV's salary expenditure, however, declined considerably in absolute and relative terms throughout the period reaching \$360,000 in 2001, about one-third of the 1991 total (Figure 7b). This difference can be explained, at least in part, by the increase in total researchers at CNRADA compared with near stagnating levels at CNERV. In addition, CNRADA's share of operating and capital costs rose toward the end of the 1990s with the implementation of PSA. Since 2000, with the nonrenewal of phase 2, CNRADA and CNERV have been left with serious financial difficulties. The drop in budget was more pronounced for CNRADA than for CNERV because CNRADA received more financial support through PSA in the first place. Between 2001 and 2003, CNERV's total expenditures decreased by 35 percent. During the same period the Mauritanian government had to increase its funding to CNRADA by 20 percent in order to keep the center operational. In contrast, IMROP is in a much better position because of the fisheries treaty with the European Union, through which its research budget has more than tripled since 2002.

Figure 7 Cost-category shares in CNRADA's and CNERV's expenditures, 1991-2001





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

Notes: Data include estimated salaries for expatriate staff (see *Methodology* on page 9).

FINANCING AGRICULTURAL R&D

Throughout 1991–2001, funding for agricultural R&D in Mauritania came from four primary sources: the national government, loans from the World Bank, contributions from other donors, and self-generated resources. As already mentioned, the World Bank contributed to the restructuring of Mauritania’s agriculture sector through loans supporting PSA, which ran from 1995 until 2000 and targeted CNRADA, CNERV, the departments of the University of Nouakchott, extension services, and ENFVA. The project was intended to be the first five-year segment of a longer term national program to improve the provision of agricultural services and strengthen the links between agricultural research, extension, and training. The total project budget was US\$19.8 million, comprising a US\$18.2 million loan from the World Bank, US\$1.1 million from the national government, and US\$0.5 million from other donors. The agricultural research component of PSA, with a cost of US\$3 million, was allocated to address the main problems with the country’s agricultural R&D structure: low researcher numbers at CNERV and CNRADA, low researcher qualification at CNRADA, a shortage of animal production specialists at CNERV, low levels of public research funding, and the lack of a research policy and strategy. PSA also allocated funding for researcher training in regional research organizations and international agricultural research centers and for certain operating and capital costs for CNRADA and CNERV. Another component of PSA was the establishment of the National Agricultural Research Council (CNRA), primarily to improve the coordination between CNRADA, CNERV, and the other agencies that conduct agricultural research (World Bank 1994). Financial mismanagement, misuse of project vehicles, and non-compliance with World Bank procurement rules have negatively affected the project, and were the cause of suspension periods between November 1997 and September 1998 and September

2000 and November 2000 (World Bank 2001). As it happened, the research component of PSA became only effective in the middle of 1997, much later than initially expected because certain pre-conditions—including restructuring of the centers, effective functioning of PNRA, and establishment of a scientific technical committee—had to be met first. As a result, CNRADA only received its intended funds toward the end of the project, whereas CNERV received very little funding at all. However, at US\$3.2 million, the total amount disbursed for the research component of the project was higher than the budgeted amount. CNRADA’s research stations have been rehabilitated, and are now well equipped as a result of PSA financing (World Bank 2001). Disagreements between the national government and the World Bank over various clauses have halted the further implementation of the second phase of the project (PSA -II), which planned a merger of CNRADA and CNERV. In preparation for the merger, a plan was recently launched to establish a single administrative council for the two centers. Regardless of the future of PSA -II, a merger between CNRADA and CNERV remains feasible.

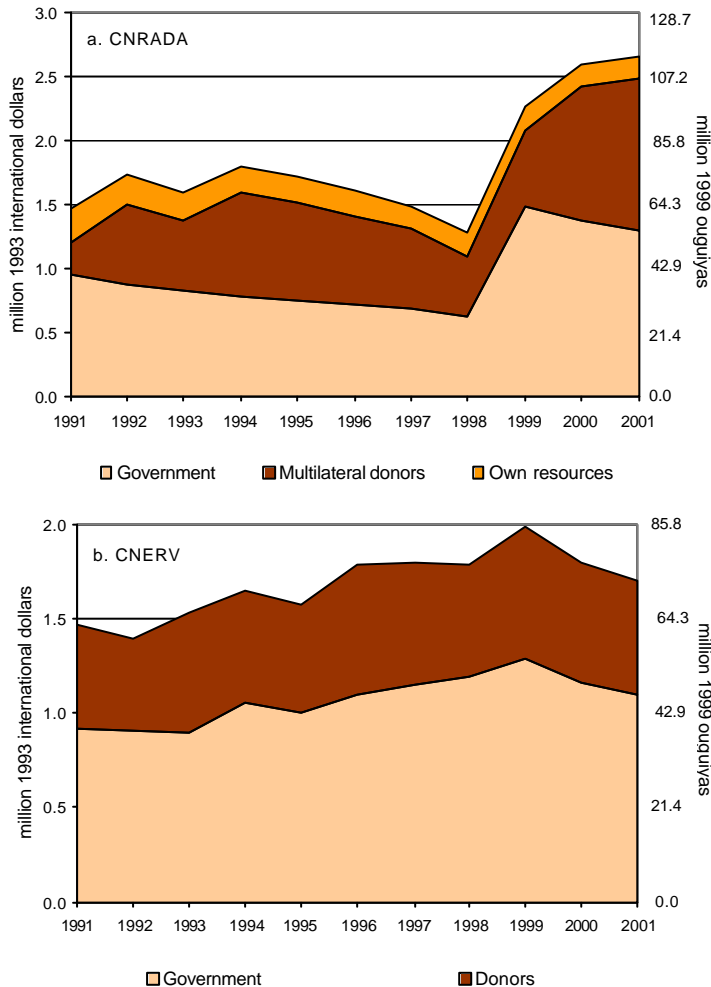
Another World Bank project was initiated in 2000: the Integrated Development Project for Irrigated Agriculture in Mauritania (IDPIAM). This project is scheduled to run through 2010 and has a total budget of US\$136 million (of which US\$102 will be funded through a World Bank loan). IDPIAM’s overall objective is to improve agricultural value-added, income, and employment opportunities for the Mauritanian population living in the Senegal River Valley. The project has allocated over US\$2 million for R&D activities to be carried out by CNRADA in collaboration with CIRAD and WARDA. R&D activities will focus on the improvement of new pumping systems, the testing of equipment, and studying farmer acceptance of new techniques for draining and lowering salinity developed by researchers. (World Bank 1999). A third World Bank project was implemented in Mauritania during the 1990s, the Rainfed Natural Resource Management Project (PGRNP), but it affected agricultural research activities only indirectly.

During 1991–98, CNRADA’s funding remained relatively stable in nominal terms. Yearly government contributions of 26 million ouguiyas funded salaries, while the balance of expenditures was provided by multilateral donors or were self generated (Figure 8a). PSA funding came about in 1998 but—as already discussed—quickly halted in 2000. Limited funding through PGRNP was received in 2001. Other CNRADA donors in the 1990s included the Food and Agriculture Organization of the United Nations (FAO), the Arab Fund for Economic and Social Development (AFESD), the International Fund for Agricultural Development (IFAD), INSAH, WARDA, ROCARS, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and the Semi-Arid Food Grain Research and Development (SAFGRAD) project.

Funding for CNERV gradually increased throughout 1991–99 but declined thereafter (Figure 8b). Approximately two-thirds of the center’s funding was provided by the national government, while one-third was contributed by donors including the World Bank, ADB, and the French government. After the cessation of PSA, CNERV received some World Bank

funding through PGRNP, albeit limited. CNRADA and CNERV researchers are categorized as public servants rather than as researchers like their counterparts at IMROP, making the funding of research programs by the national government less secure. The government is currently negotiating a milk treaty with the European Union, similar to the existing fisheries treaty with IMROP, and the hope is that, like IMROP, CNERV will become an institute, obtain researcher status for its researchers, and maintain stable, longer term funding. Without such prospects, CNERV's financial future remains highly uncertain.

Figure 8¾ CNRADA's and CNERV's funding sources, 1991–2001



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

Note: CNERV's funding levels are lower than expenditure levels because estimated salaries for expatriates are not included.

Detailed funding data for IMROP were unavailable, though we do know that Mauritania's government views the fisheries sector as a priority given its impact on the country's national economy in terms of exports and employment. Government contributions to IMROP increased by 55 percent during 1997–2002 (AMI 2003), and with the signing of the European Union treaty in 2002, its annual budget more than tripled to \$13

million. Other donors to IMROP include France, Japan, the Netherlands, the United Nations Industrial Development Organization (UNIDO), and the FAO.

Agricultural research activities conducted by the higher education agencies were largely financed by the national government, with small additional amounts from European universities. CLAA reported funding from France, Japan, the U.S. Agency for International Development (USAID), Germany, AFESD, ADB, and the Islamic Development Bank (IDB).

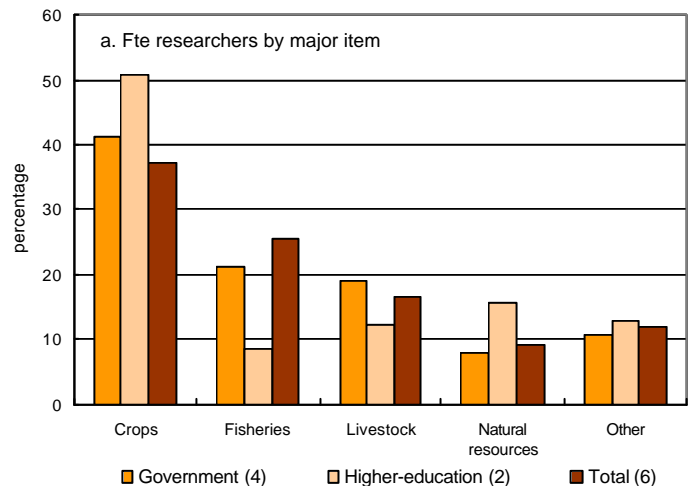
RESEARCH ORIENTATION

Commodity Focus

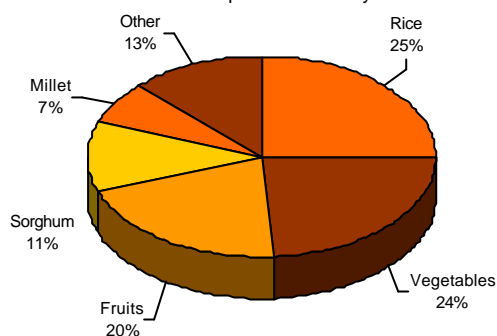
The allocation of resources across various lines of research is a significant policy decision; hence detailed survey information was collected on the number of fte researchers working in specific commodity and thematic areas.

In 2001, more than one-third of the 109 fte researchers in a 6-agency sample carried out crops research (Figure 9a). Fisheries accounted for a quarter of all agricultural research conducted; livestock for 16 percent; and natural resources for 9 percent. The fte researchers at the two departments of the University of Nouakchott spent relatively more time on crop research than their counterparts in the government sector. CNRADA accounted for 91 percent of the total fte crop researchers in our sample; in 2001, rice, vegetables, and fruit each represented between 20 and 25 percent of research conducted there (Figure 9b). Other important crops included sorghum, millet, maize, and wheat. CNERV's livestock researchers accounted for 86 percent of total fte livestock researchers in our sample and focused one-third of their time on beef, with lesser proportions on sheep and goats, pastures and forages, and poultry (Figure 9c).

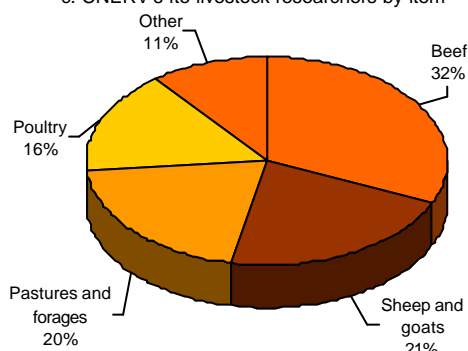
Figure 9¾ Commodity Focus, 2001



b. CNRADA's fte crop researchers by item



c. CNERV's fte livestock researchers by item



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

Notes: Figures in parentheses indicate the number of agencies in each category. "Total" in Figure 9a excludes ENFVA.

Thematic Focus

In 2001, 23 percent of Mauritania's researchers focused on natural resources (mainly fisheries), 7 percent focused on crop genetic improvement, and 5 percent focused on crop pest and disease control (Table 2). The majority of the remainder of the country's researchers concentrated on other crops and livestock. Nearly 40 percent of the fte researchers employed at five agencies in our sample could not be allocated to specific research themes.

Table 2^{3/4} Thematic focus, 2001

| | Numbers of researchers | | Shares | |
|------------------------------------|------------------------|-------------|------------------|------------|
| | CNRADA & CNERV | Total (5) | CNRADA & CNERV | Total (5) |
| | <i>(in fte's)</i> | | <i>(percent)</i> | |
| Crop genetic improvement | 6.3 | 6.3 | 10.5 | 6.7 |
| Crop pest and disease control | 4.2 | 4.2 | 7.0 | 4.5 |
| Other crop | 12.3 | 12.3 | 20.5 | 13.2 |
| Livestock genetic improvement | 3.6 | 3.6 | 6.0 | 3.9 |
| Livestock pest and disease control | 0.0 | 0.0 | 0.0 | 0.0 |
| Other livestock | 9.0 | 9.2 | 15.0 | 9.8 |
| Soil | 2.1 | 2.4 | 3.5 | 2.6 |
| Water | 2.1 | 2.4 | 3.5 | 2.6 |
| Other natural resources | 0.0 | 16.7 | 0.0 | 17.9 |
| Postharvest | 0.0 | 0.2 | 0.0 | 0.2 |
| Other | 20.4 | 36.1 | 34.0 | 38.7 |
| Total | 60.0 | 93.3 | 100 | 100 |

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

Notes: Figures in parentheses indicate the number of agencies in each category. "Total" excludes the Department of Biology of the University of Nouakchott and ENFVA.

CONCLUSION

Since the beginning of the 1990s, Mauritania's agricultural researcher numbers have steadily increased, though in recent years increasing researcher numbers at IMROP mask decreasing researcher numbers at CNERV and CNRADA. Agricultural research budgets followed this overall upward trend up until 2000, after which expenditure totals fell. Expenditures rebounded with the signing of a fisheries treaty between the European Union and Mauritania in 2002.

CNRADA and CNERV face serious financial difficulty. With the cessation of World Bank funded PSA in 2000 many research activities at these centers have been halted, precipitating an exodus of researchers seeking opportunities elsewhere. A merger between CNRADA and CNERV is possible, as is the initiation of a second phase of PSA. Another promising possibility is the establishment of a milk treaty between the European Union and Mauritania along the lines of the existing fisheries treaty. For the time being, however, the future remains uncertain.

In contrast, IMROP has thrived in recent years because of the fisheries treaty, which has enabled IMROP to achieve institute status and to attract substantial secure funding not only from the European Union and the national government but also from a variety of additional donors.

Agricultural R&D in Mauritania can be described as employing a relatively small number of crop and livestock researchers, low levels of highly qualified researchers, and low levels of female researchers compared with neighboring countries. It also distinguishes itself from its neighbors in having three main government agencies involved in agricultural R&D as opposed to the more usual one, and in having quite a low share of agricultural research conducted within higher-education agencies.

NOTES

1. The authors are grateful to numerous colleagues in Mauritania for their time and assistance with the data collection, and thank Nienke Beintema, Bah Ould Moctar and Dia Amadou Tiane for useful comments on drafts of this brief.
2. The 7-agency sample consisted of:
 - 4 government agencies/units: *Centre National de Recherche Agronomique et du Développement Agricole (CNRADA)*, *Centre National de l'Élevage et des Recherches Vétérinaires (CNERV)*, *Institut Mauritanien de Recherches Océanographiques et des Pêches (IMROP)*, and *Centre de Lutte Antiacridienne (CLAA)*; and
 - 3 higher -education agencies: *Département de Biologie, Faculté des Sciences et Techniques* and *Département de Géographie, Faculté des Lettres et Sciences Humaines*, both under *Université de Nouakchott*, and *École Nationale de Formation et de Vulgarisation Agricoles (ENFVA)*.
3. Unless otherwise stated, all data on research expenditures are reported in 1993 international dollars or in 1999 ouguiyas.
4. English translations of research agency names have been used throughout the brief except in note 2, which provides the original French names.
5. Data are calculated as least square growth rates.
6. Interestingly, despite its low share of female researchers, CNRADA's current director is female.

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 Mauritanian 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 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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