

THE GAMBIA

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This country brief reviews the major investment and institutional trends in public agricultural research in The Gambia since the early 1990s, including a new set of survey data collected under the Agricultural Science and Technology Indicators (ASTI) initiative (IFPRI-ISNAR-CORAF/WECARD 2002-03).¹

INSTITUTIONAL DEVELOPMENTS

The Gambia, one of Africa's smallest countries, forms a narrow strip of land approximately 250 miles (400 kilometers) by 20 miles (30 kilometers), surrounded by Senegal except for a short stretch of the Atlantic coastline. The river Gambia, from which the country derives its name, is navigable and forms the country's main commercial artery. The country's economy relies heavily on agriculture. In 2002, 80 percent of The Gambia's active population—mainly resource poor smallholders—was employed in the agricultural sector, which was responsible for about 40 percent of the country's exports (FAO 2004). Groundnuts are the primary cash crop, and rice and millet are the primary food crops. Consequently, agricultural research and development (R&D) is an important factor in the country's pursuit of food security and improved livelihood. In 2001, nine agencies were engaged in agricultural research in The Gambia, all of which are included in our sample.² Combined, these nine agencies employed a total of 48 full-time equivalent (fte) researchers and spent 2.6 million 1999 Gambian dalasis on agricultural R&D—equivalent to 1.1 million

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

Type of agency	Spending		Researchers ^a	Share		Agencies in sample ^b
	1999 Gambian dalasis (millions)	1993 international dollars		Spending (percent)	Researchers	
<i>Public agencies</i>						
NARI	1.81	0.80	29.0	69.8	60.1	1
Other government ^{c,d}	0.50	0.22	12.8	19.4	26.5	5
Higher education ^{d,e}	0.21	0.09	5.5	8.3	11.3	2
Subtotal	2.52	1.12	47.3	97.5	97.9	8
<i>Business enterprises^d</i>						
Business enterprises ^d	0.07	0.03	1.0	2.5	2.1	1
Total	2.59	1.15	48.3	100	100	9

Sources: Compiled by authors from ASTI survey data (IFPRI-ISNAR-CORAF/WECARD 2002-03) and FAO (1998).

^a Includes national and expatriate research staff.

^b See note 2 for a list of the nine agencies included in our sample.

^c Researcher totals for DLS, DFOR, and DWR were extrapolated using 1996 data from FAO (1998). The staff at the other government agencies spent between 25 and 100 percent of their time on research, resulting in 12.8 fte researchers.

^d The expenditures for the other government agencies, the higher-education agencies, and the business enterprises are estimates based on the average expenditures per researcher for NARI.

^e The staff at the higher-education agencies spent between 20 and 40 percent of their time on research, resulting in 5.5 fte researchers.

KEY TRENDS

- During 1991-2001, the total number of agricultural researchers in The Gambia rose by nearly 50 percent, whereas total agricultural R&D expenditures and funding were down by more than half.
- The main agricultural R&D agency is the National Agricultural Research Institute (NARI), accounting for about two-thirds of The Gambia's agricultural researchers and R&D expenditures.
- With the completion of the Agricultural Services Project (ASP) in 1999, the Gambian agricultural research sector was left to face a bleak financial situation. The country's expenditures-per-agricultural researcher levels and its research intensity ratio are now among Africa's lowest.
- Compared with many African countries, agricultural research staff in The Gambia are significantly less qualified.
- The involvement of the private sector in The Gambia's agricultural R&D is minimal, representing 2 percent of agricultural research staff and spending in 2001.

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).

1993 international dollars (Table 1).^{3,4}

The National Agricultural Research Institute (NARI) is The Gambia's principal agricultural research agency. In 2001, it accounted for 60 percent of the country's agricultural researchers and 70 percent of its agricultural research spending. The institute conducts adaptive and applied research on crops, livestock, forestry, fisheries, and other natural resources to provide technological solutions for producers and to inform policymakers on options for sustainably increasing agricultural productivity, while protecting the environment and natural resource base. As an outcome of a World Bank development project (the Agricultural Services Project, or ASP, discussed further in the section on financing), NARI was established in 1993, at which time it took over the crop research activities of the former Department of Agricultural Research (DAR) (See *A Short History of Government-Based Agricultural Research* below). Administered by the Department of State for Agriculture (DOSA) and headquartered in Brikama near the capital Banjul, NARI operates 10 research programs. Activities are divided across three regional research stations—corresponding to the country's agroecological zones, Kaur, Sapu, and Brikama—with each station overseeing a variety of substations (FAO 1998). NARI is an autonomous public agency under the supervision of the National Agricultural Research Board (NARB), which is responsible for overall policy guidance, priority setting, and global and subsectoral program resource allocation in accordance with the country's national development goals (World Bank 2000).

Five other government agencies conducted agricultural research in 2001, together accounting for nearly 20 percent of the country's agricultural R&D spending and over 25 percent of its fte researchers. The Department of Fisheries investigates improvements in fish processing methods and stock assessment and employed 4.5 fte researchers in 2001 (FAO 1999); the Department of Water Resources (DWR), under the Ministry of Natural Resources and Environment (MNR&E), conducts limited water and soil research and employed an estimated 3.8 fte researchers that year; the Department of Forestry, under the Department of State for Fisheries and Natural Resources, conducts limited socioeconomic research and employed an estimated 2.5 fte's in 2001; the Department of Livestock Services (DLS), under DOSA, undertakes livestock research, and the Food and Nutrition Unit (FNU) of DOSA's Department

of Agricultural Services conducts postharvest research; each of these last two agencies employed an estimated 1.0 fte researchers in 2001.⁴

The higher-education sector plays a limited role in agricultural research in The Gambia, and accounted for about 10 percent of the country's agricultural R&D spending and fte researchers in 2001. The Faculty of Science and Agriculture of the University of The Gambia (UTG) was established in 2001, employing 4.0 fte researchers that year who focused mainly on issues relating to food safety, food quality, and postharvest activities. The Gambia College School of Agriculture (GCSA), located alongside NARI's headquarters in Brikama, conducts limited agricultural research and employed 1.6 fte researchers in 2002.

Agricultural R&D performed by the private sector in The Gambia is minimal. Many of the larger companies do not employ research staff but instead contract out research to NARI and other agencies. NARI has active research contracts with Premier Agro Oil, Farmland, and Radville Farm, for which it conducts seed and groundnut research. We identified one private company conducting its own agricultural research activities, The Gambia Horticultural Enterprise (GHE) Ltd., established in 1990. In addition to being The Gambia's largest private distributor of agrochemicals, the company grows and exports off-season fresh fruits and vegetables to Europe. GHE conducts limited crop research, and in 2002 employed 1.0 fte researchers.

Linkages between research, extension, and farmers' organizations are generally poorly developed in The Gambia because of weak farmers' organizations and the nonexistence of an effective national-level farmer organization (CORAF/WECARD–DFID–CIRAD n.d.). In addition to national partners such as UTG, GCSA, and the government agencies, NARI closely cooperates on research activities with various regional and international partners, including the International Institute of Tropical Agriculture (IITA), the Semi-Arid Food Grain Research and Development Program (SAFGRAD), the Africa Rice Center (WARDA), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the International Livestock Research Institute (ILRI), the United Nations Development Programme (UNDP), the Overseas Development Institute (ODI) of the United Kingdom, the Sahel Institute (INSAH), the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), and

A Short History of Government-Based Agricultural Research

The only agricultural research conducted in The Gambia until its independence from British rule in 1965 was on groundnuts, the country's most important export product. After independence, research activities were diversified, but they were generally conducted within the framework of development projects and did not incorporate appropriate coordination or oversight by the relevant ministries. In 1977, the Department of Agriculture (DOA) established the Agricultural Research Service (ARS)—the country's first agency responsible for the coordination and implementation of crop research.

In 1985, the national government launched The Gambia Agricultural Research and Diversification Project (GARD) supported by USAID, the primary purpose of which was to strengthen and improve the Gambian agricultural research system. Three years later, ARS was replaced by the Department of Agricultural Research (DAR), and the National Agricultural Research Board (NARB) was installed. At that time, DAR was responsible for crop research, and the Department of Livestock Service (DLS) undertook livestock research, and the Department of Planning (DOP) hosted social science research.

In 1993, the Agricultural Services Project (ASP) rationalized the Gambian agricultural research system by unifying crop, livestock, forestry, and natural resources management research under the umbrella of NARB. DAR and many of DLS research staff were regrouped into the independent National Agricultural Research Institute (NARI) the same year.

Sources: World Bank (1992) and FAO (1993).

various U.S. universities. GCSA maintains a close relationship with the Nova Scotia Agricultural College (NSCA) in Canada. Although UTG is a relatively young university, initial linkages have already been established with universities in other English-speaking countries in West Africa, such as Ghana and Nigeria, as well as the universities of Dakar and Saint Louis in neighboring Senegal. International linkages include the University of Bergen, Norway and St. Mary's College of Maryland, United States.

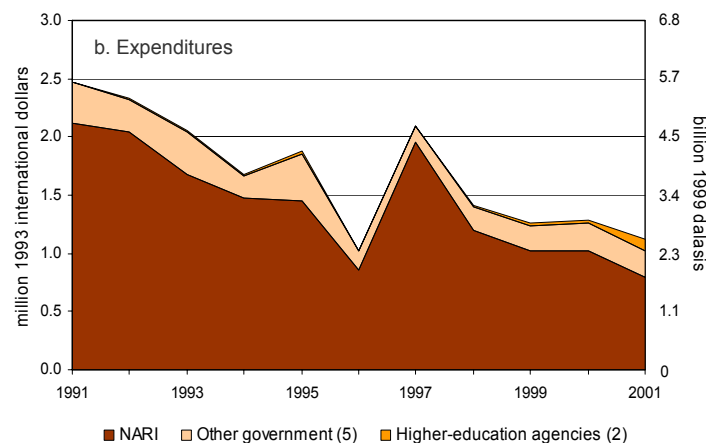
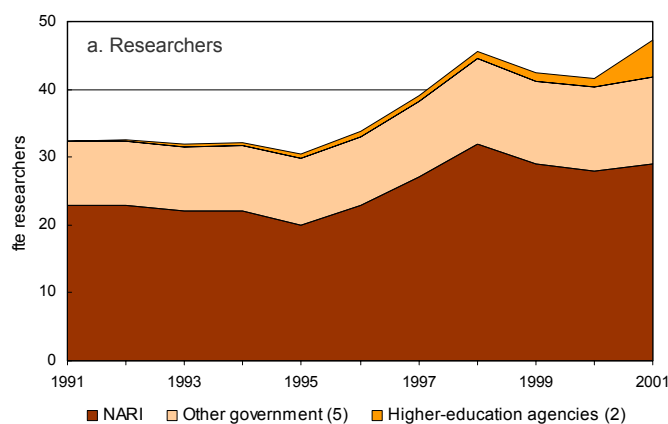
HUMAN AND FINANCIAL RESOURCES IN AGRICULTURAL R&D

Overall Trends

The total number of public agricultural researchers increased in The Gambia by an average of 4.4 percent per year during 1991–2001 (Figure 1a),⁵ with numbers growing at NARI and all the other government and higher-education agencies. With the broadening of NARI's research focus beyond DAR's concentration on crops, researcher numbers at NARI increased from 22 fte's at the launch of ASP in 1993, to 32 fte's by 1998. However, at the completion of ASP in 1999, numbers began to fall as NARI was forced to retrench staff as a result of budgetary constraints. Researcher numbers in the higher-education sector increased in recent years, mainly because of the initiation of research activities by the Faculty of Science and Agriculture of UTG, which was established in 2001. While DAR employed four expatriate researchers in 1991, only one (from the United Kingdom) was employed by NARI in 2001.

Total agricultural R&D expenditures exhibited an erratic downward trend during 1991–2001 (Figure 1b). Total spending decreased by 13.9 percent per year, on average from 1991 until 1996. Spending rose in 1997 as the result of an influx of ASP funds to NARI for upgrades to its research infrastructure. After 1997, the downward trend continued with expenditures falling by 15.2 percent per year on average from 1997 to 2001, when they reached \$1.15 million.

Figure 1—Public agricultural R&D trends, 1991-2001

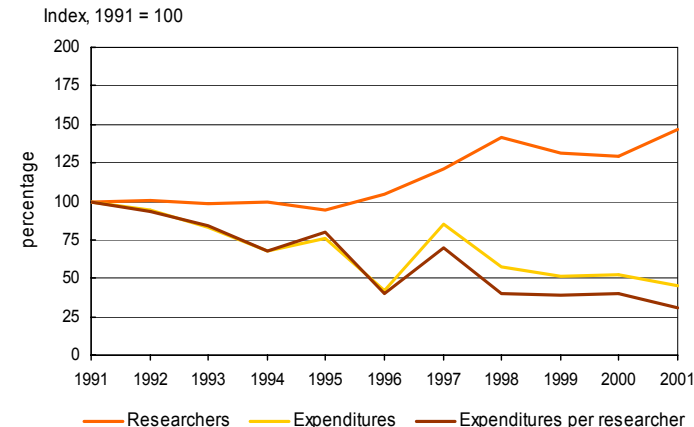


Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03) and FAO (1998).

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

Total researcher numbers increased compared with expenditures, with the result that expenditures per researcher fell from \$77,000 in 1991 to \$24,000 in 2001 (Figure 2), making The Gambia's average expenditures per researcher far less than the West African average of \$88,000 (Beintema and Stads 2005).⁶

Figure 2—Trends in public expenditures, researchers, and expenditures per researcher, 1991-2001



Sources: Figure 1.

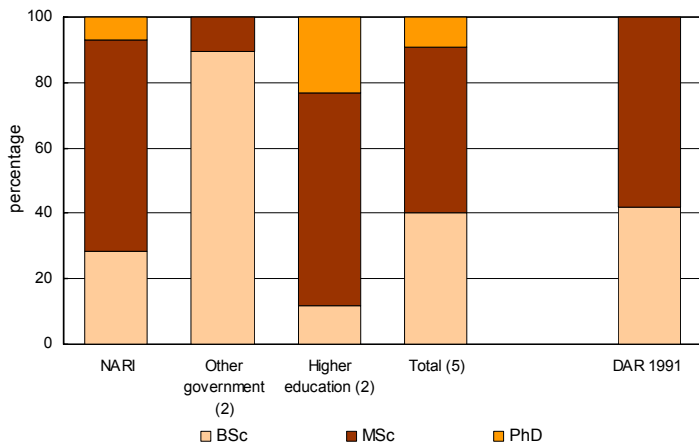
Notes: Figure 1.

Human Resources

In 2001, 65 percent of the 39 fte researchers included in a five-agency sample held postgraduate degrees (Figure 3). Only 8 percent of The Gambia's agricultural researchers were trained to the PhD level, which is well below the West African average of 32 percent (Beintema and Stads 2005). A larger proportion of higher-education agency staff held PhD degrees (21 percent)

compared with staff at NARI and the other two government agencies (7 and 0 percent, respectively), which is in line with findings in other countries in Africa and elsewhere (Beintema and Stads 2005). Despite The Gambia's low share of postgraduate researchers compared with most other West African countries, education levels of NARI researchers (and its predecessor DAR) improved significantly throughout the 1990s. In 1991, 58 percent of DAR's researchers held MSc degrees, while none held PhD degrees. Ten years later, 64 percent of NARI's researchers held MSc degrees, and 7 percent held PhD degrees. ASP contained an important training component through local, regional, and overseas institutions, under which three DAR/NARI researchers received BSc-level training, 15 received MSc-level training, and 2 received PhD-level training; in addition, 10 DLS staff received BSc-level training and 20 received MSc-level training (World Bank 2000).

Figure 3—Educational attainment of researchers, 1991 and 2001



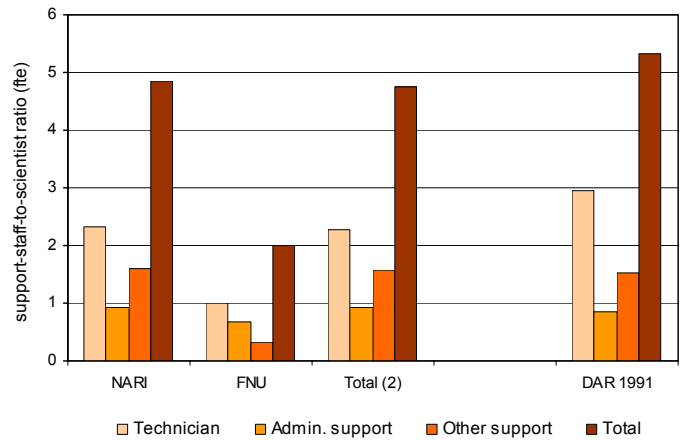
Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).

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

Little information could be ascertained on the number of female researchers at agricultural research institutions in The Gambia. NARI employed only one female researcher with a MSc degree, whereas FNU employed no female researchers at all. No information was available on the number of female researchers at the other government and higher-education agencies. Notably, however, the Dean of the Faculty of Science and Agriculture at UTG is female.

In 2001, the average number of support staff per scientist in a two-agency sample consisting of NARI and FNU was 4.8, comprising 2.3 technicians, 0.9 administrative personnel, and 1.6 other support staff such as laborers, drivers, and guards (Figure 4). NARI's support-staff-to-researcher ratio, at 4.9, was higher than FNU's ratio of 2.0. The ratio of support staff per scientist at NARI decreased slightly throughout the 1990s. This was mainly the result of reductions in the number of technical support staff, many of whom took up education or employment abroad.

Figure 4—Support-staff-to-researcher ratios, 1991 and 2001



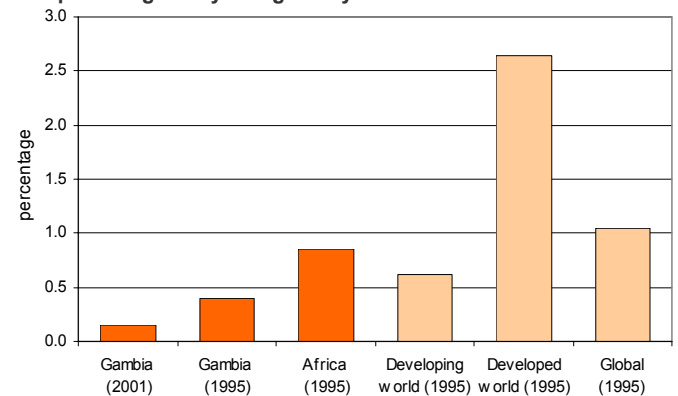
Source: Compiled by authors from ASTI survey (IFPRI–ISNAR–CORAF/WECARD 2002–03).

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 commonly used indicator of a country's agricultural R&D spending in comparison with international equivalents. In 2001, The Gambia invested \$0.15 for every \$100 of agricultural output—one the lowest research intensity ratios of any country in Africa (Figure 5). By way of comparison, The Gambia's 1995 ratio, at 0.40, was much lower than the average for Africa (0.85) or for the developing world (0.62) that same year. In terms of The Gambia itself, the 2001 ratio was less than a quarter of the country's research intensity ratio of 0.64 a decade earlier, reflecting the serious decline in agricultural R&D expenditures after the completion of ASP.

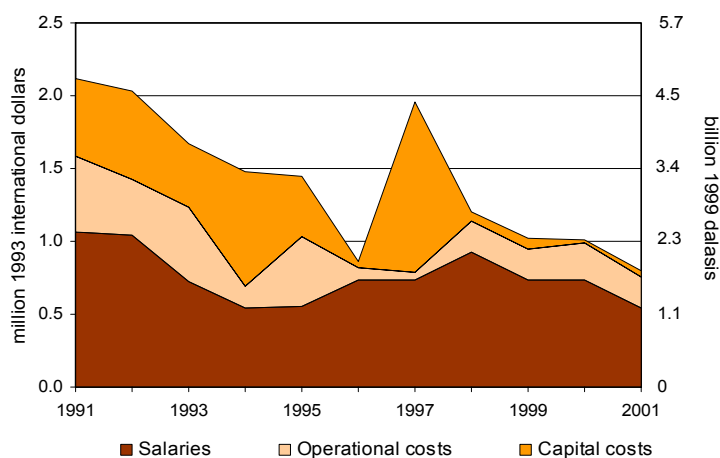
Figure 5—The Gambia's public agricultural research intensity compared regionally and globally



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

During 1991–2001, salaries accounted for over half of NARI's expenditures, while operating and capital costs constituted 20 and 27 percent, respectively (Figure 6). These figures mask large yearly fluctuations, however. Capital costs in particular followed a very erratic trend, accounting for between 3 and 53 percent of annual spending. In the first half of the 1990s, NARI was largely dependent on World Bank funding through the second Agricultural Development Project (ADPII) and ASP—projects that funded large shares of the institute's infrastructural development, including equipment and vehicles; hence the comparatively high share of capital expenditure over that period.

Figure 6—DAR/NARI expenditures by cost category share, 1991–2001



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

Note: Data include estimated salaries for expatriate staff (see *Methodology* on page 8).

FINANCING PUBLIC AGRICULTURAL R&D

Agricultural research in The Gambia is largely financed by the national government, loans from the World Bank, aid from other (foreign) donors, and public/private enterprises. In addition to national government funding, the Department of Fisheries relied on funding from the European Union, Italy, and Japan, and UNDP; the Department of Forestry reported funding from the German government through the Central River Division Forestry Project (CRDFPII); and FNU received funding from CILSS and the National Nutrition Agency (NaNA). GCSA's research activities were partially funded by the Canadian government through the Sustainable Food Security project.

As previously mentioned, two consecutive World Bank projects contributed considerably to financing and restructuring The Gambia's agricultural research sector during the 1990s.⁷ ADPII, which had a total budget of US\$9.4 million and ran from 1984 until 1993, included a small agricultural research component. In addition to the World Bank loan, the project was funded by the International Fund for Agricultural Development (IFAD) and the Italian government. The project's principal objectives were to consolidate the positive advances achieved under the World Bank's Rural Development Project (RDP) of 1972–82, to assist the national government with major sectoral reforms, and to increase the overall production of upland crops

by strengthening support institutions and improving input supply, research, and seed multiplication. The Ministry of Agriculture was successfully restructured under ADPII, and extension services were also considerably strengthened (World Bank 1992). Many research staff also received formal training abroad under this project.

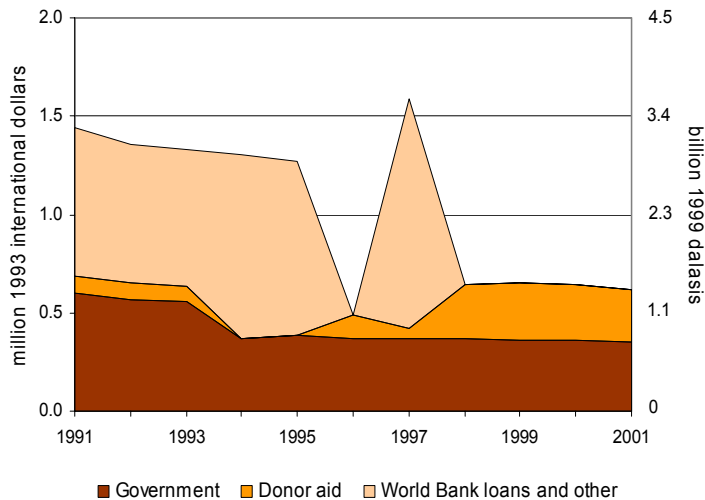
The second World Bank project, ASP, ran from October 1993 to March 1999. It aimed to generate increased agricultural productivity and sustained growth of the smallfarmer incomes by strengthening support services for agricultural research and extension, training, and the development of farmer self-reliance and empowerment. The agricultural research component of the project focused on strengthening DOSA and its subdepartments, establishing NARI as an independent and financially viable institution, and supporting GCSA in better providing in-service training for extension staff. The total project budget was US\$17.2 million, comprising a US\$12.3 million loan from the World Bank, US\$3.6 million from IFAD, and US\$1.3 million from the Gambian government. At the project's completion, the government's contribution had grown to US\$3.0 million, mostly due to increased operating and training expenditures. The resulting total project cost was US\$18.9 million. The budgeted agricultural research component for ASP was US\$4.2 million; actual disbursements at the conclusion of the project totaled US\$6.3 million. The project's overall objective of generating sustained agricultural productivity gains and growth in smallfarmer incomes was deemed not to have been achieved; however, the project was considered successful in terms of establishing NARI and in strengthening DOSA's technical capacity, at least at the central level. The planned sustainable funding mechanism for NARI—the Gambian Agricultural Research Fund (GARF)—was not established, however, because of uncertainty within NARI as to how such a fund should operate. Several attempts were made to establish a sustainable funding mechanism for NARI over the project's timeframe, however lack of guidance from the World Bank, and, ultimately, lack of remaining funding in the project budget meant that the plan had to be abandoned (World Bank 1992 and 2000).

Despite the temporary 1997 increase in NARI's funding as a result of ASP, funding actually declined overall from \$1.4 million in 1991 to just \$0.6 million in 2001 (Figure 7). During 1991–2001, average funding provided by the Gambian government represented 41 percent of the institute's total financial resources, while contributions via World Bank loans accounted for nearly one-third of the total. Since 1994, government funding has stabilized at around \$0.4 million per year, which is allocated to salaries and some of the institute's operating costs. All other expenses, including capital and operating expenses for research programs are financed by foreign donors, public and private enterprises (through research contracts, for example), and the institute's own resources.

Many important donor projects helped to reform The Gambia's agricultural sector over the past 20 years. The United States Agency for International Development (USAID) was a consistent donor to the country generally, and specifically to its agricultural sector. USAID financed research activities conducted by DAR under the Integrated Pest Management Project (1970s), The Gambia Mixed Farming and Resource

Management Project (1981–86), and The Gambia Agricultural Research and Diversification Project (GARD). GARD, the last project supported by USAID, ran from June 1985 until December 1992 and was implemented by the University of Wisconsin. The project assisted the Gambian government in training its researchers and developing extension services to meet the needs of farmers. GARD also succeeded in creating an agricultural research management system, in establishing well-focused research programs, and in facilitating linkages between Gambian scientists and regional and international centers (Jallow 1994). DAR received 18 million dalasis through GARD.

Figure 7—Funding sources for DAR/NARI, 1991–2001



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

Notes: Donor aid includes all donors except the World Bank. Other includes funds from public/private enterprises.

In recent years, an increasing share of NARI's total budget was financed by donors other than the World Bank and USAID. SAFGRAD, the International Sorghum and Millet Collaborative Research Support Program (INTSORMIL), ICRISAT, IITA, and WARDA all provided financial support for NARI's crop research activities; the Department for International Development (DFID, U.K.) provided funding for research into seed priming technology; and the Natural Resource Management InterCRSP (NRM InterCRSP, United States) provided funding for research into soil fertility management. Other important donors to NARI included the governments of Canada and China, the International Plant Genetic Resources Institute (IPGRI), IFAD, the African Development Bank (ADB), the World Agroforestry Center, and the University of Hawaii. As mentioned, NARI's research programs were highly dependent on funding from these donors given that the national government only funds salaries and a portion of operating costs. With no new significant donor projects on the horizon, and the national government not in a position to increase its annual contributions, NARI is likely to remain significantly underfunded in the coming years, severely constraining its ability to address areas of national priority, such as rural development and poverty reduction.

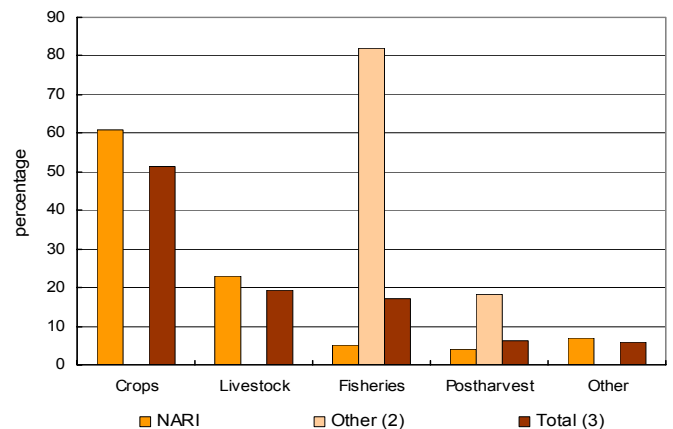
RESEARCH ORIENTATION

Commodity Focus

Because the allocation of resources to different lines of research is an important aspect of policy, detailed information was collected on the number of field researchers working in specific commodity and thematic areas.

In 2001, more than half the 35 field researchers in the three-agency sample (for which we were able to obtain data) conducted crop research. Livestock accounted for 19 percent of the researchers, fisheries research for 17 percent, and postharvest research for 6 percent (Figure 8). DAR's research staff mainly focused their research efforts on crops. Despite NARI's expanded mandate, its research focus is still biased toward crops (World Bank 2000). In 2001, the most researched crops at NARI were groundnuts (25 percent), millet (16 percent), and rice (13 percent) (Figure 9a). Other important crops include corn, cassava, and fruit, each representing between 6 and 9 percent of the crop research undertaken. NARI's livestock researchers focused primarily on beef (35 percent) and sheep and goats (35 percent), followed by dairy (22 percent), swine (4 percent), and poultry (4 percent) (Figure 9b).

Figure 8—Commodity focus by major item, 2001

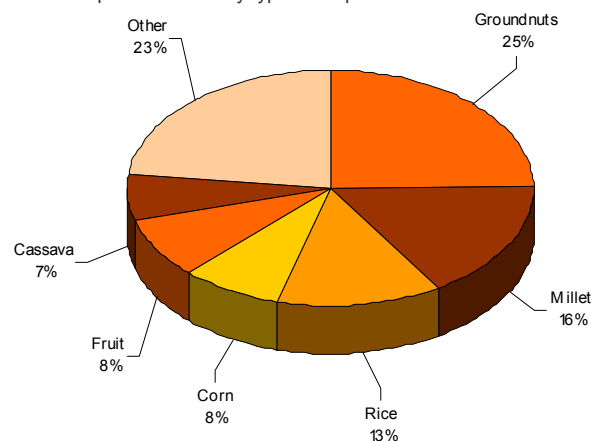


Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR–CORAF/WECARD 2002–03).

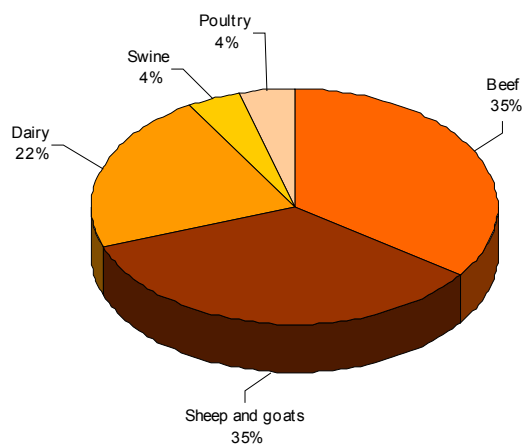
Notes: Figures in parentheses indicate the number of agencies in each category. "Other" includes FNU and DFISH.

Figure 9—NARI's commodity research focus

a. NARI crop researchers by type of crop



b. NARI livestock researchers by type of livestock



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

CONCLUSION

Total agricultural researcher numbers in The Gambia rose by nearly 50 percent during 1991–2001. This was mainly due to the establishment of NARI in 1993, and the associated recruitment of additional staff to fulfill the institute's broader research mandate compared with its predecessor DAR, combined with the establishment of the Faculty of Science and Agriculture at UTG. Despite this expansion, however, the country's

agricultural R&D expenditures actually contracted by more than half over the same period, largely because of the completion of the major World Bank-led initiative, ASP. ASP was funded by a World Bank loan and contributions from IFAD and the Gambian government. The project led to the creation of NARI, and provided substantial financial support for capital and operating infrastructure (such as building works, equipment, vehicles and training).

The completion of ASP in March of 1999 left the Gambian agricultural research sector in a bleak financial situation that is seriously affecting NARI in particular. NARI's 2001 funding level had dropped by 60 percent compared with funding to DAR 10 years earlier. The same year, expenditures per researcher averaged \$24,000 and the country's research intensity ratio was only 0.15, placing The Gambia among the lowest investors in agricultural research in Africa. In addition to its low investment in agricultural R&D, The Gambia compares unfavorably in terms of other key indicators as well: the country's agricultural research staff are far less qualified than their counterparts in most other African countries, and its female researcher share is one of the lowest in Africa. The national government provides funding for salaries and limited operating costs only, hence NARI's research programs are highly dependent on foreign donor support. Without new foreign donor projects or increased government funding, Gambian agricultural research agencies are unlikely to have a real impact on the country's rural development and poverty reduction. Moreover, gains achieved through prior projects in establishing the country's agricultural research system will inevitably be eroded.

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NOTES

1. The authors are grateful to numerous colleagues in The Gambia for their time and assistance with data collection, and thank Ponniah Anandajayasekeram, Ernest Aube, Nienke Beintema, Musa Bojang, and Mamadi Ceesay for useful comments on drafts of this brief.
2. The nine-agency sample consisted of
 - Six government agencies/units: the National Agricultural Research Institute (NARI), the Department of Livestock Services (DLS), the Department of Fisheries (DFIS), the Department of Forestry (DFOR), the Department of Water Resources (DWR), and the Food and Nutrition Unit (FNU) of the Department of Agricultural Services (DAS);
 - Two higher education agencies: the Faculty of Science and Agriculture of the University of The Gambia (UTG), and the Gambia College School of Agriculture (GCSA);
 - One private enterprise: the Gambia Horticultural Enterprise (GHE).
3. Unless otherwise stated, all data on research expenditures are reported in 1993 international dollars or in 1999 dalasis.
4. Additional agricultural research in The Gambia was conducted by Action Aid The Gambia (AATG), an affiliate of Action Aid U.K. The organization is involved in poverty eradication programs and conducts limited agricultural research. The agency is not included in our sample because it is not a national agency.
5. 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.
6. The West African average is based on data from a weighted sample of 14 West African countries: Benin, Burkina Faso, Côte d'Ivoire, Gabon, The Gambia, Ghana, Guinea, Mali, Mauritania, Niger, Nigeria, Republic of Congo, Senegal, and Togo.
7. ADPII was a follow-up to the Agricultural Development Project (ADP) of the 1970s, which facilitated the development of 500 hectares of double-cropped irrigated rice. The project did not have a research component (World Bank 1992).

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 Gambian 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 fee 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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