NIGERIA

By Nienke M. Beintema and Gbolagade B. Ayoola

This country brief reviews the major investment and institutional trends in Nigeria's agricultural research system since the early 1970s, including a new set of survey data for the 1990s collected through the Agricultural Science and Technology Indicators (ASTI) initiative (IFPRI–ISNAR 2001–02).[1]

INSTITUTIONAL DEVELOPMENTS

Nigeria has the largest population of all Sub-Saharan African countries, at close to 130 million people. As of 2000, it also had the largest regional share of agricultural gross domestic product (AgGDP), at 17 percent. The agricultural sector provides the primary means of employment for Nigerians, accounting for one-third of both total GDP and labor force (FAO 2003; World Bank 2003). In the past, the Nigerian government's strategy for stimulating agricultural production was protecting the sector with bans on agricultural imports and subsidies on inputs. Agricultural research in Nigeria is performed by, and mostly funded by, the government. Many institutional changes have occurred during the past decade as an attempt to address the lack of funding and stability in the organization of agricultural research. We identified 81 government and higher-education agencies engaged in agricultural research in Nigeria in 2000; together they employed over 1,352 full-time equivalent (fte) researchers and spent 3.6 billion 1999 naira on agricultural research and development (R&D)—equivalent to $106 million in 1993 international prices (Table 1).[2, 3]

Close to two-thirds of Nigeria's research capacity rests with the 22 government agencies, 15 of which fall under the responsibility of the Agricultural Sciences Department (ASD) within the Federal Ministry of Agriculture and Rural Development (FMARD).[4] ASD is responsible for the coordination, planning, and evaluation of the activities of these 15 research institutes. Five agencies fall under the responsibility of the Federal Ministry of Science and Technology (FMST),[5] the Forestry Research Institute of Nigeria (FRIN) is housed within the Federal Ministry of the Environment,[6] and the Nigerian Institute for Social and Economic Research (NISER) falls under the National Planning Commission within the Office of the

KEY TRENDS

- There are 22 government agencies involved in agricultural research in Nigeria, accounting for about two-thirds of the country's total researchers and spending.

- A significant number of higher-education agencies conduct agricultural research but many have only limited capacity.

- Funding for agricultural research is primarily funded by the government.

- Nigerian agricultural research is characterized by institutional instability, funding uncertainty, and limited coordination and planning. A recently completed project, funded by a World Bank loan, attempted to alleviate some of these problems but achieved only limited success.

- Given lack of incentives, the private sector's involvement in agricultural research is negligible.

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).

Table 1—Composition of agricultural research expenditures and total researchers, 2000

Type of agency	Spending		Researchers[a]	Share		Agencies in sample[b]
	1999 naira	1993 international dollars		Spending	Researchers	
	(*millions*)		(*fte's*)	(*percent*)		(*number*)
Government	2,215.3	65.8	839.4	62.1	62.1	22
Higher education[c,]	1,352.6	40.2	512.5	37.9	37.9	59
Total	**3,567.9**	**106.0**	**1,351.9**	**100**	**100**	**81**

Sources: Compiled by authors from ASTI survey data (IFPRI–ISNAR 2001–02).

[a] Include national and expatriate staff.

[b] See note 2 for a list of the 81 agencies included in the sample.

[c] Expenditures for the higher-education sector are estimates based on average expenditures per researcher for the government sector. The 1,700 faculty staff employed in the 59 higher-education agencies spent between 10 and 100 percent of their time on research, resulting in the 512.5 fte researcher total.

President. Each of the 22 government agencies is semi-autonomous and is governed by a Board. High member turnover resulted in the dissolution of the boards in 1992, but they were reinstated in 1999. Structural effectiveness since that time is difficult to gauge, as is the extent to which stakeholders such as farmer groups and the private sector are being represented (World Bank and FMARD 2000).

For the first two decades after independence in 1960, Nigeria's agricultural research performance was strong, but since the early 1980s—in part due to falling oil prices—it has weakened significantly. Restructuring occurred, and funding dropped sharply and became insecure, in turn affecting infrastructure and resources. Management problems arose as well, manifesting in lack priority-setting; administrative overlap; poor coordination, monitoring, and evaluation; and late and slow adoption of information technologies and management information systems (Ikpi 1995; Idachaba 1998; World Bank and FMARD 2000).

The National Agricultural Research Project (NARP), which was funded through a World Bank loan and ran from 1994 to 1999, aimed to address these problems but had only limited success, largely because of the absence of planned counterpart funding from the Nigerian government and unsatisfactory management of the project's financial assets (World Bank 2000). A component of NARP was the development of the National Agricultural Research Strategy Plan (NARSP) for 1996–2010 to improve the effectiveness and quality of research outputs. This necessitated substantial restructuring of the planning, management, and execution of Nigerian agricultural research, including rationalizing both the number of research stations and the number of personnel employed. At the initiation of the project, the government institutes encompassed about 100 substations, though not all were operational (or operating effectively) because of funding limitations. The plan was to merge a large number of the stations and close others (Shaib et al. 1997), but as of early 2003, this has not been carried out.

In 2002, FMARD prepared a "New Agricultural Policy," again aiming to rationalize the agricultural research system, making it more focused and demand-driven. This new strategy is based on public funding for agricultural research, including biotechnology and biological pest control. The latter endeavors offer little incentive to the private sector given inherent high capital outlays and the prevailing low returns on agricultural research investments. Research outputs under the new system would be disseminated to farmers through state and local government extension services and from large- to small-scale farmers.

Nigeria has numerous universities. We identified 59 higher-education agencies conducting agricultural or agriculture-related research, encompassing agricultural universities, schools, faculties, institutes, and departments. The faculties of agriculture and veterinary medicine under the four older universities—Ahmadu Bello University, the University of Ibadan, the University of Nigeria, and Obafemi Awolowo University—are the primary higher-education agencies involved in agricultural research. They accounted for close to one-third of the 513 total fte researchers employed in the higher-education sector in 2000. In addition, three universities of agriculture in Makurdi, Umudike, and Abeokuta also play important roles in Nigeria's agricultural research.

Despite the high number of higher-education agencies conducting agricultural research in Nigeria, the capacity of most higher-education agencies—in terms of fte researcher numbers—is very small. In 2000, more than half of the 59 higher-education agencies in our sample employed fewer than 5 fte researchers, nearly a quarter employed fewer than 2, and only 3 higher-education agencies employed 25 to 50 fte researchers (Table 2). In contrast, only 1 government agency

A Short History of Government-Based Agricultural Research

Agricultural research in Nigeria was initiated with the establishment of a botanical garden in Lagos during the late 19th century. This garden was part of a network of gardens established under British rule, focusing on the introduction of new crops. In 1903 the Forestry and Botanical (later Agricultural) Department for southern Nigeria was created, but in 1912 it was split into two regional departments resulting in the establishment of a Department of Agriculture for northern Nigeria. Then in 1914, with Nigeria's unification, the two departments were merged to form a new Department of Agriculture. Progress was made in terms of infrastructure and human resources resulting in new research stations, more research personnel, and a more technical research program that included plant breeding and plant pathology. Research continued to focus, however, on export crops like cotton and cocoa.

The Forestry and Veterinary Departments were also established in 1914, but only began undertaking research activities in 1920. Fishery research came much later, in 1941, with the establishment of the Fisheries Development Branch by the Department of Agriculture.

Agricultural research was largely the domain of the local colonial government until World War II, during which time the British government sought a more active role in the promotion of science and technology in its colonies. This led to the creation of several regional agricultural research organizations in West Africa that complemented or partially replaced existing facilities and which were part of the West African Interterritorial Research Organisation (WAIFRO). Three of these—the West African Institute for Oilpalm Research (WAIFOR), the West Africa Institute for Trypanosomiasis Research (WAITR), and the West African Stored Products Research Unit (WASPRU)—were located in Nigeria. In contrast to the successful inter-territorial collaboration in East Africa, WAIFRO collapsed soon after the political independence of its member states when the regional institutes were nationalized.

After Nigeria achieved independence in 1960, research activities were regionalized, which eliminated federal government involvement. These regional efforts, however, did not yield the expected results prompting the federal government to once again intervene in the 1960s, which was followed by major reorganization and expansion in the 1970s. The Research Institutes Establishment Order was enacted, under which many research stations and departments were upgraded to national institutes. The research institutes underwent further significant reorganization, including mergers, resulting in the current structure.

Sources: Roseboom et al. (1994).

(NACGRAB) employed fewer than 5 fte researchers, while 16 agencies employed 10 to 25 fte researchers, and 5 agencies (NVRI, FIIRO, NIFOR, RRIN, and NCRI) employed more than 50 fte researchers.[7]

Table 2¾Variation in agency size, 2000

	Number of agencies	Share in subtotal
	(number)	*(percent)*
Government agencies:		
> 50 fte researchers	5	22.7
25–50 fte researchers	0	0.0
10–24 fte researchers	16	72.7
5–9 fte researchers	0	0.0
< 5 fte researchers	1	4.5
Higher-education agencies:		
> 50 fte researchers	0	0.0
25–50 fte researchers	3	5.1
10–24 fte researchers	16	27.1
5–9 fte researchers	10	16.9
< 5 fte researchers	30	50.8
2–4 fte researchers	16	27.1
< 2 fte researchers	14	23.7

Source:Compiled by authors from ASTI survey data (IFPRI–ISNAR–2001–02).

Private-sector involvement in Nigerian agricultural research to 2000 was negligible and remains unchanged. Some seed companies has small research activities, mainly varietal testing. A few agro-industrial companies (involving agricultural chemicals, farm machinery, food processing, brewing, and seed companies) fund some adaptive research activities through the public-sector agencies in areas of their interest (Okunmadewa and Olayemi 2002). This low private-sector involvement stems from lack of incentives in terms of returns on investments because public research agencies share their research results at no charge (Voh 1999). Political instability in Nigeria has also hindered private-sector involvement, and lengthy release and approval process for new varieties act as further disincentives to the initiation of research activities by private companies (World Bank and FMARD 2000).

NARP's objective to strengthen collaboration between and among government and higher-education agencies has succeeded to some degree. Following the development of NARSP, 29 nationally coordinated research programs (NCRPs) were created, covering various commodities and research areas. Certain research institutes were selected to coordinate particular NCRPs based on their national mandate. Other institutes and universities doing research on the same commodity or research theme were appointed as collaborating institutes. This resulted in the strengthening of research linkages between the various agricultural research institutes, as well as with the universities (World Bank 2000). Collaboration is occurring between some government agencies and a number of the centers of the Consultative Group on International Agricultural Research (CGIAR), particularly with the International Institute for Tropical Agriculture (IITA), located in Ibadan.[8]

HUMAN AND FINANCIAL RESOURCES IN PUBLIC AGRICULTURAL R&D

Overall Trends

After a period of strong growth in the 1970s, with an average annual growth rate of more than 10 percent,[9] total numbers of agricultural researchers grew only minimally during the 1980s, then stagnated in the early 1990s (Figure 1a). The higher-education agencies were responsible for the limited growth that occurred in the last two decades of the 20th century because many new universities were established during that time. In 2000, the higher-education agencies together employed over 500 fte researchers—twice the number employed in the mid-1980s. Combined fte researcher numbers at the government agencies declined in the late 1980s and early 1990s, which was in part the result of a financial crisis at these research institutes. In addition, the establishment of many new faculties and colleges offering attractive salary packages would have enticed research staff away from the government research institutes. At the same time, a freeze on public-sector recruitment in response to funding limitations left the government institutes with depleted staffing and no means of redress. Although the freeze is not longer in force, funds have not been released for the much-needed recruitment of research staff.

In 2000, less than 1 percent of the total number of researchers at the government agencies were expatriates, representing one of the lowest ratios in Sub-Saharan Africa. This is evidence of the rapid nationalization of Nigeria's research staff in the years following independence. Soon after independence in the early 1960s, the share of expatriate researchers was 65 percent; this share fell to 34 percent in the late 1960s, and to only 2 percent by the early 1980s (Roseboom et al. 1994).

Total agricultural R&D spending exhibited negative average growth at a rate of 2 percent per year over the past three decades. After a few years of growth in the early 1970s, total spending dropped by two-thirds from an average of about $130 million in the mid-1970s to less than $50 million in the mid-1990s (Figure 1b). This was the result of unstable and declining government contributions to agricultural research, ultimately affecting the funding levels of the government and higher-education agencies. A recent increase in the salary levels of government and university staff, and an increase in government contributions to agricultural research, total spending has increased in recent years.

Figure 1¾Public agricultural R&D trends, 1971-2000

a. FTE researchers

b. Expenditures

☐ Government (22)   ■ Higher education (59)
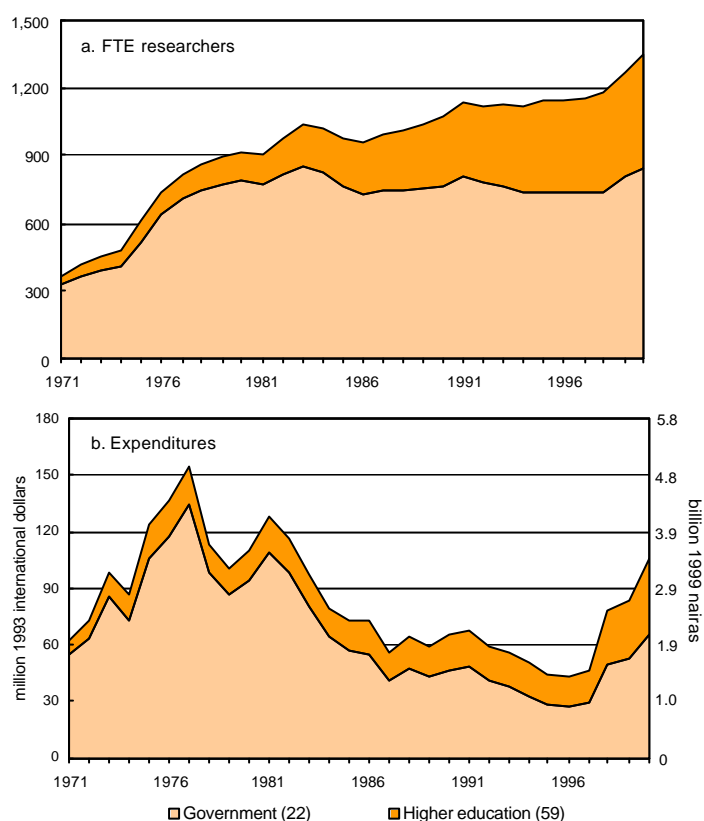
Sources: Compiled by authors from ASTI survey data (IFPRI –ISNAR 2001–02), ACU (various years) and Roseboom et al. (1994), and ACU (various years).
*Note*s: See Table 1. Figures in parentheses indicate the number of agencies in each category. Underlying data are available at the ASTI website (www.asti.cgiar.org).

The decline of total spending relative to total fte researcher numbers resulted in a decline in spending per scientist by half, from $171,000 in 1971 to $78,000 in 2000 (Figure 2), though the 2000 figure was still twice the level of spending per scientist in the mid-1990s.

Figure 2¾Long-term public agricultural R&D trends, 1971–2000

Index, 1971 = 100

⎯ Researchers   ⎯ Expenditures   ⎯ Expenditures per researcher
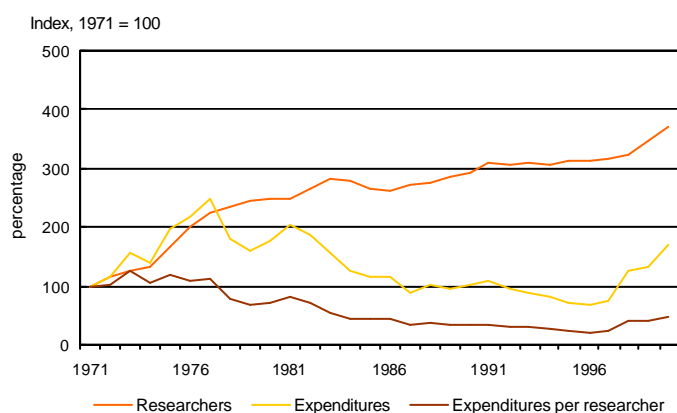
Source: Figure 1.
Note: See Table 1. Figures in parentheses indicate the number of agencies in each category. Underlying data are available at the ASTI website (www.asti.cgiar.org).

Human Resources

In 2000, 80 percent of the 1,138 fte researchers in a 57-agency sample had postgraduate-level training, with one-third holding doctorate degrees (Figure 3). A higher proportion of university staff held postgraduate degrees compared with staff at other agencies, consistent with other African countries (Beintema 2003). The decrease from 85 percent in 1991 was entirely the result of a decrease in the number of government research staff holding MSc and PhD degrees, while those with BSc degrees increased during the same 10-year period. In a sample of 19 government agencies, 76 percent of the fte researchers had postgraduate-level training in 2000 compared with 85 percent in 1991. This can be explained by the aforementioned transfer of (mostly senior) research staff to the higher-education sector, the freeze on recruitment during the 1990s, and the lack of funding for staff training. Like other World Bank funded agricultural research projects, NARP included a capacity building component, but few researchers actually received training under the project. Research staff qualifications will only continue to degrade without adequate funding for capacity building; this is particularly true given the relatively high portions of senior staff approaching retirement age.

Figure 3¾ Educational attainment of researchers, 1991 and 2000
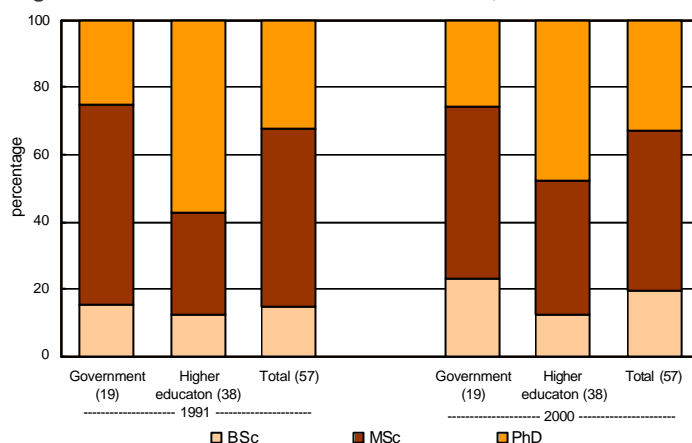
☐ BSc   ■ MSc   ☐ PhD

Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR 2001–02).
Note: Number of agencies in sample shown in brackets. Figure excludes expatriate staff.

The 2000 averages mask notable variation among the various government agencies. For example, less than half the researchers employed at three agencies (NACGRAB, NARICT, and NVRI) held postgraduate degrees, while at a further five agencies (CRIN, LCRT, NOIMR, NRCRI, and NSPRI) more than 90 percent were trained to MSc and PhD levels.

Not surprisingly, a higher proportion of university staff held postgraduate degrees compared with counterparts at the government agencies. This is consistent with other African countries and regions (Beintema 2003). Although, the share of fte researchers with postgraduate degrees in the higher-education sector remained stable during the 1990s, its composition changed. In 2000, close to half the total fte researchers employed in a sample of 38 higher-education agencies held doctorate degrees, but this was still 10 percent lower than the corresponding share in 1991.

Many Nigerian universities have well-established postgraduate programs enabling them to provide training for their researchers; hence most postgraduate degrees were obtained in Nigeria rather than abroad. Nigeria stands in contrast to the majority of African countries in this regard.

One of the objectives under NARP was to establish a human resource development program (HRDP) through the preparation of a detailed inventory of staffing at the government institutes, skills gap analysis, and identification of future training needs. However, the completion of HRDP was delayed considerably, and this, combined with the project's financial problems, led to a partial suspension of the long-term training component. Of the 38 researchers undertaking NARP financed MSc training, only 9 succeeded in obtaining their degrees and none of the 74 researchers pursuing NARP financed PhD training received their degree (World Bank 2000).

In 2000, 22 percent of the all fte researchers in a 58-agency sample were female, including 14 percent of all researchers holding doctorate degrees, 24 percent of those holding MSc degrees, and 29 percent of those holding BSc degrees (Figure 4). The shares of female researchers vary considerably across the government agencies, from 4 percent at NAERLS to over 40 percent at FIIRO, NACGRAB, and PDI. Shares of female researchers vary less across the higher-education agencies, though these agencies employed relatively fewer female researchers than at the government agencies (15 and 24 percent, respectively). This was particularly so for university staff holding PhD degrees—only 9 percent were female. This contrasts with many other African countries whose higher-education sectors often employ higher numbers of highly qualified female research staff relative to other sectors. Overall, the share of female researchers has increased over the years. During 1986–91, the corresponding shares for the government and higher-education agencies were 13 and 6 percent, respectively (Roseboom et al. 1994).
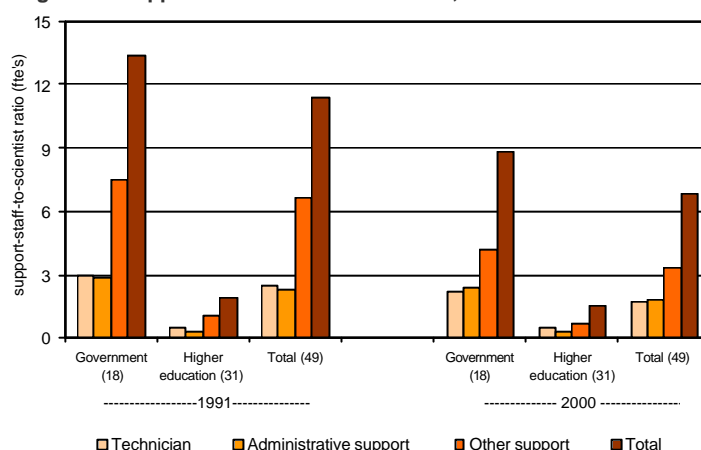
Figure 4¾Share of female researchers, 2000
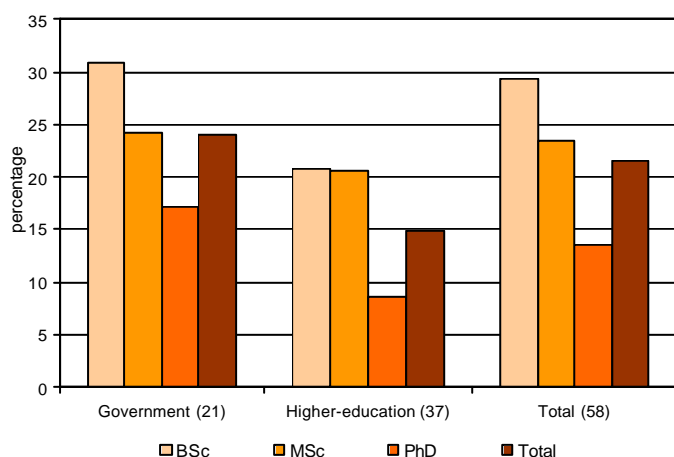
Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR 2001–02).
Note: Number of agencies in sample shown in brackets. Figure excludes expatriate staff.

In 2000, the average number of support staff per scientist for a 49-agency sample was 7.0—comprising 1.8 technical staff, 1.9 administrative personnel, and 3.3 other support staff such as laborers, guards, drivers and so on (Figure 5). The support-staff-per-scientist ratio of 1.5 for the higher-education agencies was substantially lower than the corresponding ratio for the government agencies; however, this average masks wide variation among government agencies. In 2000, the number of support staff to researchers ranged from 22.6 at LCRI to fewer than 2.0 at IAR, NIOMR, and NISER.

Given staffing rationalization, an 18 government-agency sample employed about 2,500 fewer support staff in 2000 compared with corresponding 1991 levels, resulting in a one-third reduction in the support-staff-per-scientist ratio over the 10-year period (8.8 compared with 13.4). Retrenchments in this category predominantly occurred at NIFOR and NRCRI, where each institute lowered its support staff by about 1,000 people. For NIFOR, this has translates to a 2000 support-staff-per-scientist ratio that is one-third of the 1991 ratio (11.6 compared with 30.2).

**Figure 5¾Support-staff-to-researcher ratios, 1991 and 2000**

Source: Compiled by authors from ASTI survey data (IFPRI–ISNAR 2001–02).
Note: Number of agencies in sample shown in brackets. Figure excludes expatriate staff.

Spending

Total public spending as a percentage of agricultural output (AgGDP) is a commonly used research investment indicator for comparing a country's agricultural R&D spending with those of other nations or regions. In 2000, Nigeria invested $0.38 for every $100 of agricultural output, which was higher than the (very low) $0.16 level five years earlier, but far from the 1981 level of $0.81 (Figure 6). The 1995 ratio was considerably lower than the average ratios for Africa or the developing world ($0.85 and $0.62, respectively).

Figure 6¾ Nigeria's public agricultural research intensity compared regionally and globally
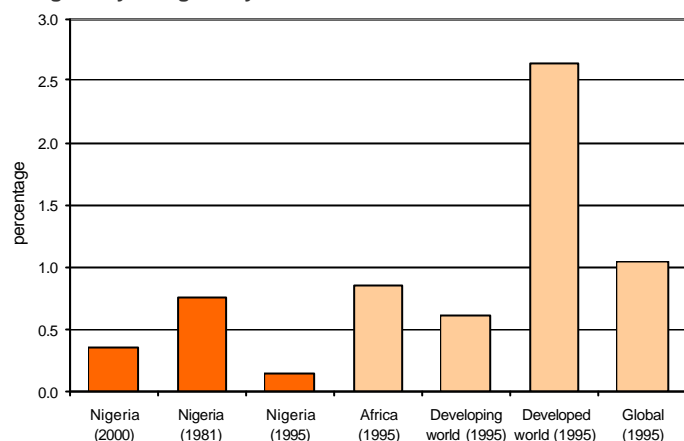

Sources: Nigeria compiled from Figure 1b; AgGDP from World Bank (2003); other intensity ratios from Pardey and Beintema 2001.

During 1991–2000, salaries accounted on average for 55 percent of total spending for the 14 government agencies for which detailed financial data were available; operational and capital costs averaged 22 and 23 percent of total spending, respectively (Figure 7). Total spending (adjusted for inflation) decreased considerably during the first half of the 1990s given sharply declining government contributions. In the mid-1990s, total salary expenditure, adjusted for inflation, fell considerably but rebounded after 1998 with the salary increases to government employees. In 2000, the 14 government-agency sample spent a combined $32 million on salaries, which was three-times the 1996 level. Total operational costs, including rent and utilities, followed a similar pattern with the exception of the recent recovery, which did not extend to operation expenses. This continuing low level of capital and recurrent funding has precluded institutes from maintaining their infrastructure, training staff, and even paying their utilities or purchasing basic research inputs such as seeds (Voh 1999). In 2002, for example, NIHORT's operational funding amounted to about 700,000 naira, but its yearly electricity bill was 550,000 naira. Many institutes had to resort to using their capital budget—supposedly for underwriting experiments, training, travel, and so on—to pay their utility bills and other fixed costs that should have been covered by the recurrent budget.

NARP also included a rehabilitation component to upgrade the infrastructure and funds for repair and upgrade of equipment at various government institutes. Many new activities were initiated, including the construction of buildings; repair and upgrading of existing buildings; and the purchase of assorted equipment, vehicles, and computers. Over 10,000 pieces of equipment were purchased, much of it second-hand, but a sizable proportion was later to disappear. As of early 2000, over 60 percent of the vehicles were out of order because of inappropriate maintenance or lack of spare parts, and many vehicles vanished from research institutes. Not all of the planned construction was completed within the project's timeframe, and some projects were completed with substantial outstanding debts that could not be paid because of lack of government counterpart funding (World Bank 2000).

Figure 7¾ Expenditures by cost category for 17 government agencies, 1991–2000
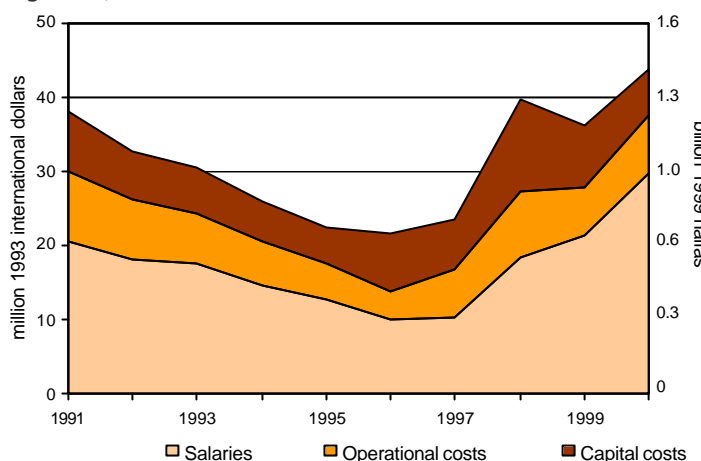
*Source*: Compiled by authors from ASTI survey data (IFPRI –ISNAR 2001–02). *Note*: Data include estimated salaries for expatriate staff (see *Methodology* on page 10).

FINANCING PUBLIC AGRICULTURAL R&D

As already stated, agricultural research in Nigeria is largely funded by the government, although during the implementation of NARP during the 1990s, funding from the World Bank was considerable. In recent years, the Nigerian government has become more flexible in allowing institutes to generate their own income. Six of the 14 government agencies for which detailed financial data were available contributed to their own income, but only in small amounts, averaging 6 percent in 2000 (though such shares have apparently fallen off in more recent years).

Nigeria's budgeting process has been described as complex and lacking transparency (Herz 1996). Each institute provides a workplan with an associated budgeted to FMARD. FMARD submits a consolidated budget to the Ministry of Finance, which makes its own adjustments, then the budget is sent to the National Assembly by the president to be passed as an appropriation bill. The final, approved budget often bears little resemblance to the planned budget, and long delays and shortfalls in the disbursement of funding can occur. During 1992–99 for example, on average, slightly more than half of the proposed recurrent budget was released, while only 5 percent of the proposed capital allocation was disbursed (Figure 8).

Figure 8¾Proposed and actual agricultural resear ch budgets, 1992–99
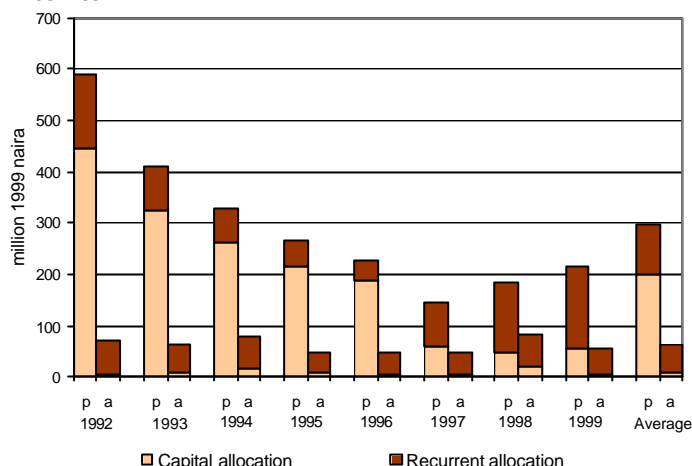
Source: Voh (1999).
Note: *p* indicates proposed budget; *a*, actual budget.

NARP commenced in 1992, initially running until December 1998, after which it was extended one year. Its principal objectives were to improve the effectiveness of agricultural research and address some of the aforementioned weaknesses. The project supported the development of the national agricultural research strategy plan (1996-2010); infrastructure for some of the research agencies; operating costs for research activities; development of coordinated (mainly commodity-based) national research programs at both the government and higher-education agencies; and improved links across research, extension, and farmers (World Bank and FMA&RD 2000). NARP's budget totaled US$104.1 million, US$74.0 million through the World Bank loan and US$26.1 million through counterpart funding from the federal government, which was intended to be raised from a percentage of the country's oil revenues. This funding mechanism never eventuated. The total costs at the end of the project were US$89.7 million with only US$7.8 million being disbursed by the government. Unsurprisingly, this significant shortfall has hindered, and in some cases completely stalled, the imple mentation of the project. In addition, the project funds were mismanaged, especially in the area of procurement, which resulted in a substantial loss. NARP was also negatively affected by a high turnover of project coordinators (six in total from November 1993 to November 1999). Finally, at NARP's conclusion, ongoing government and donor support was not forthcoming as originally planned, so that programs initiated under NARP collapsed thereafter (World Bank 2000). The World Bank decided it would not provide new financial support to Nigerian agricultural research until the government identified and prosecuted those responsible for the prior mismanagement (Terry 2004). Despite all its problems, NARP had a number of positive outcomes, including the aforementioned increased collaboration among various Nigerian agricultural research agencies and between agencies and various CGIAR centers.

Despite the growth in the total number of higher-education agencies related to agricultural sciences, the agricultural research activities in these higher-education sector has even more severe funding and infrastructure shortages. Research activities are often associated with university graduate programs and are mainly funded through small research grants from university sources, but some obtained funding from external sources as well (World Bank and FMARD 2000).
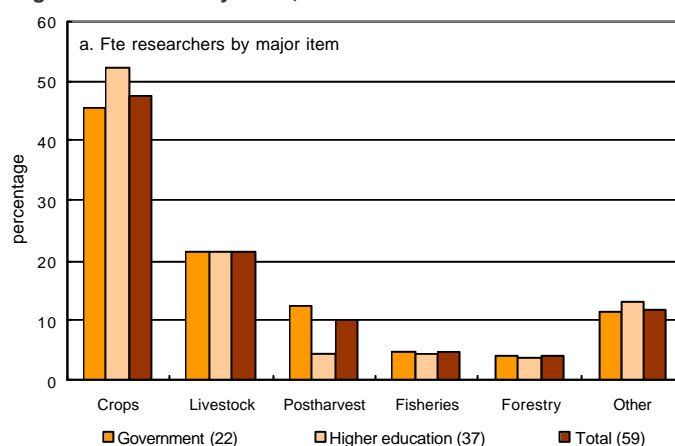
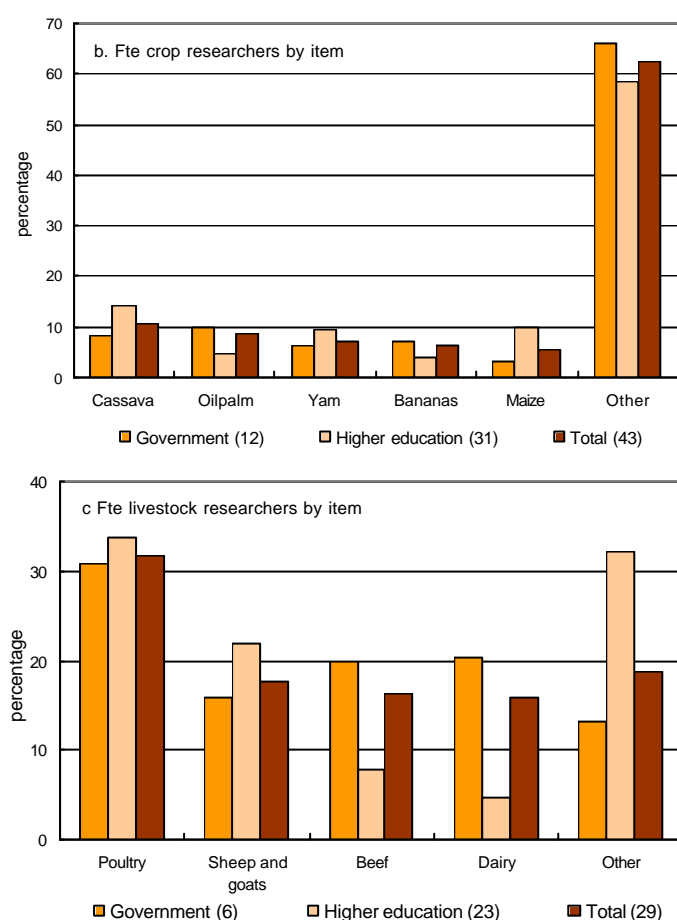## RESEARCH ORIENTATION

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 2000, close to half of the 1,252 fte researchers in a 59-agency sample conducted crop research (Figure 9a). Livestock research was conducted by 22 percent of t he researchers, while postharvest, fisheries, and forestry was conducted by 10, 5, and 4 percent, respectively. The researchers in the higher-education sector spent relatively more time on crop research than the sample average (52 percent), while the researchers at the 22 government agencies, combined, spent slightly more time on postharvest research than their colleagues at the higher-education sector (12 percent). The major crops involved were cassava, oilpalm, yam, bananas, and maize, each of which were the focus of 5 to 10 percent of the total fte crop researchers in our sample (Figure 9b); however, 56 percent of researchers were working on a wide variety of other crops, illustrating the diversity of Nigeria's agricultural production. About one third of the livestock researchers conducted poultry research (Figure 9c). Other important livestock items were sheep and goats (18 percent), beef, and dairy (16 percent each).

Figure 9¾Commodity focus, 2000

a. Fte researchers by major item

b. Fte crop researchers by item

percentage

Cassava, Oilpalm, Yam, Bananas, Maize, Other

■ Government (12)　■ Higher education (31)　■ Total (43)

c Fte livestock researchers by item

percentage

Poultry, Sheep and goats, Beef, Dairy, Other

■ Government (6)　■ Higher education (23)　■ Total (29)

Sources: Compiled by authors from ASTI survey data (IFPRI –ISNAR 2001–02).

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

Thematic Focus

In 2000, 17 and 19 percent of the total fte researchers in a 20 government-agency sample were working on crop genetic improvement and livestock pest and disease control, respectively, while 13 percent were focused on postharvest research (Table 3). The remainder of researchers in the 20 government agencies in our sample focused on a wide variety of themes including livestock, soil, water, other crop, and other natural resources research. Crop themes were also important research areas for the 39 higher-education agencies in our sample.

During the development of NARSP no attention was given to the important role biotechnology research could play in Nigeria's agricultural sector. Recently, this omission was addressed with the establishment of the National Biotechnology Development Agency (NBDA) (Terry 2004).

Table 3¾Thematic focus, 2000

	Numbers of researchers		Shares	
	Govern-ment (20)	Higher education (39)	Govern-ment (20)	higher education (39)
	(*in fte's*)		(*percent*)	
Crop genetic improvement	139.2	25.8	16.9	7.1
Crop pest and disease control	55.0	40.5	6.7	11.2
Other crop	85.1	60.8	10.4	16.8
Livestock genetic improvement	40.1	25.2	4.9	7.0
Livestock pest and disease control	154.6	12.3	18.8	3.4
Other livestock	26.1	37.5	3.2	10.3
Soil	18.8	25.4	2.3	7.0
Water	8.1	11.8	1.0	3.2
Other natural resources	19.1	10.8	2.3	3.0
Postharvest	109.3	22.8	13.3	6.3
Other	165.7	89.4	20.2	24.7
Total	**821.0**	**362.3**	**100**	**100**

Source: Compiled by authors from ASTI survey data (IFPRI –ISNAR 2001–02).

CONCLUSION

In the three decades to 2000, agricultural research in Nigeria was characterized by institutional instability, declining funding availability, and general uncertainty. After a few years of growth in the early 1970s, total spending fell by two-thirds between the mid-1970s and mid-1990s but has increased in recent years largely due to a World Bank loan and increases in civil salaries. Nevertheless, the institutes continue to lack appropriate levels of funding for their research activities. Over the years, the quality of staff at the government research agencies has deteriorated, with many senior scientists, particularly those with PhD degrees, moving into the university sector or abroad. These well-qualified scientists could not be replaced because of a freeze on government recruitment and lack of funding for training. NARP was an attempt to address management, financial, and human resource problems within the Nigerian agricultural research system, but the project achieved only limited success (mainly in the area of national and international collaboration), largely because of the absence of intended counterpart funding from the Nigerian government and unsatisfactory management of the project's finances. Since NARP's completion in 1999, additional funding has not been forthcoming to enable its original programs to be maintained. Nevertheless, overall funding for agricultural research has increased in recent years, but only as a result of a substantial increase in civil service salaries in 2000.

NOTES

1. The authors are grateful to Godwin Abu, Dayo Ayeni, Ebenezer Ekefan, Solomon Haruna, Sola Solomon, and numerous other colleagues in Nigeria for their time and assistance with data collection; Olympia Icochea and Tatiana Prada Owen for their assistance with data processing; and Derek Byerlee, Victor Chude, and Eugene Terry for useful comments on drafts of this brief.

2. The 81-agency sample consisted of:
   - 22 government agencies: the Cocoa Research Institute of Nigeria (CRIN); the Federal Institute of Industrial Research in Oshodi (FIIRO); the Forest Research Institute of Nigeria (FRIN); the Institute of Agricultural Research (IAR); the Institute of Agriculture Research and Training (IAR&T); the Lake Chad Research Institute (LCRI); the National Centre for Genetic Research and Biotechnology (NACGRB); the National Agricultural Extension–Research Liaison Service (NAERLS); the National Animal Production Research Institute (NAPRI); the National Research Institute of Chemical Technology (NARICT); the National Cereals Research Institute (NCRI); the National Institute for Freshwater Fisheries Research (NIFFR); the Nigerian Institute for Oil Palm Research (NIFOR); the National Horticultural Research Institute (NIHORT); the Nigerian Institute for Oceanography and Marine Research (NIOMR); the Nigerian Institute of Social and Economic Research (NISER); the National Institute for Trypanosomiasis Research (NITR); the National Root Crops Research Institute (NRCRI); the National Stored Products Research Institute (NSPRI); the National Veterinary Research Institute (NVRI); the Products Development Institute (PDI); and the Rubber Research Institute of Nigeria (RRIN); and
   - 59 higher-education agencies, of which the major ones are the University of Ibadan's Faculty of Agriculture and Forestry, and Faculty of Veterinary Medicine; Ahmadu Bello University's Faculty of Agriculture and faculty of Veterinary Medicine; the University of Nigeria's Faculty of Agriculture, Obafemi Awolowo University's Faculty of Agriculture; the School of Agriculture and Agricultural Technology of the Federal University of Technology in Akure; the University of Agriculture at Abeokuta; the University of Agriculture at Makurdi; the Michael Okpara University of Agriculture at Umudike; and the Faculty of Agriculture of Rivers State University of Science & Technology. For a complete list of the higher-education agencies, see the Nigerian country profile on the ASTI website (http://www.asti.cgiar.org/profiles/nigeria.cfm?arow=141).

   No nonprofit institutions or private for-profit businesses were identified as being involved in agricultural research.

3. Unless otherwise stated, all data on research expenditures are reported in 1993 prices and in international dollars or in 1999 naira.

4. FMARD was established in June 1999 through a merger of the former Federal Ministry of Agriculture and Natural Resources and the Department of Rural Development. The Department of Rural Development was in turn part of the former Federal Ministry of Water Resources and Rural Development.

5. These five agencies are FIIRO, NACGRAB, NARICT, NITR, and PDI.

6. In January 2001, FRIN was transferred from FMARD to the Federal Ministry of the Environment.

7. See note 2 for the full names of government institutes.

8. The IITA campus houses the regional offices of a number of the CGIAR centers.

9. Data are calculated as least squares growth rates.

REFERENCES

ACU (Association of Commonwealth Universities). Various years. *Commonwealth universities yearbook: A directory to the universities of the British Commonwealth and the handbook of their organisation*. London: ACU.

Adetunji, S. A. 1994. Nigerian agricultural research management and administration. In *Towards strengthening the Nigerian agricultural research system*, eds. B. Shaib, O. Adedipe, O. A. Odegbaro, and A. Aliyu. Abuja: National Agricultural Research Project.

Beintema, N. M. 2003. Presentation given at the 25th Meeting of the ASARECA Committee of Directors, Inter-Continental Hotel, Nairobi, January 27–31.

FAO (Food and Agriculture Organization of the United Nations). 2003. FAOSTAT. <http://faostat.fao.org/default.htm> (accessed July 12, 2003).

Herz, K. O. 1996. Funding agricultural research in selected countries in Sub-Saharan Africa. SD Dimensions. <http://www.fao.org/sd/RTdirect/RTre0002.htm> (accessed 26 June 2003).

Idachaba, F. S. 1998. *Instability of national agricultural research systems in Sub-Saharan Africa: Lessons from Nigeria*. Research Report No. 13. The Hague: ISNAR.

IFPRI–ISNAR–ASARECA (International Food Policy Research Institute, International Service for National Agricultural Research, and Association for Strengthening Agricultural Research in Eastern and Central Africa). 2001–02. Agricultural Science & Technology Indicators survey for East Africa. Unpublished surveys. IFPRI and ISNAR, Washington, D.C.

Ikpi, A. E. 1995. Policy relevance of research for sustainable development in Nigeria's agriculture. Chapter 1 in *Sustainable agriculture and economic development in Nigeria*, eds. A. E. Ikpi and J. K. Olayemi. *Proceedings of a workshop on Nigeria's agricultural research, policy planning, and plan implementation experience and relevance to development held at the University of Ibadan Conference Centre, Ibadan, Nigeria, May 31 and June 1, 1994*. Nigeria: Winrock International.

OECD (Organisation for Economic Co-operation and Development). 1994. *The measurement of scientific and technical activities 1993: Standard practice for surveys of research and experimental development¾Frascati Manual*. Paris: OECD.

Okoro, D. E., and J. N. Onuoha. 1985. The impact of the collaboration between the International agricultural research system and the national agricultural research system in Nigeria. CGIAR, Washington, D.C. Mimeo.

Okunmadewa, F., and J. K. Olayemi. 2002. Globalization, internal policy reforms, and public agricultural research in Nigeria. Chapter 13 in *Globalization and the developing countries: Emerging strategies for rural development and poverty alleviation*, ed. D. Bigman. Wallingford, U.K.: CABI Publishing.

Roseboom, J., N. M. Beintema, P. G. Pardey, and E. O. Oyedipe. 1994. The national agricultural research system of Nigeria. Statistical Brief No. 15. The Hague: ISNAR.

Shaib, B., A. Aliyu, and J. S. Bakshi. 1997. Nigeria: National agricultural research strategy plan 1996–2010. Abuja: Department of Agricultural Sciences, Federal Ministry of Agriculture and Natural Resources.

UNESCO (United Nations Educational, Scientific and Cultural Organization), Division of Statistics on Science and Technology. 1984. Manual for statistics on scientific and technological activities. UNESCO, Paris. Mimeo.

Terry, E. 2004. Personal communication. January.

Voh, J. P. 1999. Recent and prospective changes in national research systems in Nigeria as an effect of globalization. Paper prepared for the ISNAR Workshop on Globalization, The Hague, September 8–9.

World Bank and FMARD (Ministry of Agriculture and Rural Development). 2000. The Nigerian agricultural and rural technology system: Key elements of a strategy. World Bank, Washington, D.C. Mimeo

World Bank. 2000. *Implementation Completion Report (22610) on a Credit in the Amount of US78 Million to the Federal Republic of Nigeria for an National Agricultural Research Project*. Report No. 20501. Washington, D.C.

World Bank, Washington, D.C. Mimeo. World Bank. 2003. World development indicators 2003. Washington, D.C. CD-ROM.

METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI and ISNAR 2001-02) and ACU (various years).

- The dat a 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 Nigerian GDP deflator of base year 1993 and then converting to U.S. dollars with a 1993 purchasing power parity (ppp) index, both taken from World Bank (2003). Ppp's are synthetic exchange rates used to reflect the purchasing power of currencies, typically comparing prices among a broader range of goods and services than conventional exchange rates.

- The salaries and living expenses of many expatriate researchers working on donor-supported projects are paid directly by the donor agency and are often excluded in the financial reports of the agricultural R&D agencies. These *implicit* costs have been estimated using the average cost per researcher in 1985 to be $160,000 1993 international dollars and backcasting this figure using the rate of change in real personnel costs per fte researcher in the US state agricultural experiment station system. This extrapolation procedure has the assumption that the personnel-cost trend for US researchers is a reasonable proxy of the trend in real costs of internationally recruited staff in the agricultural R&D agencies.

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

ABOUT THE AUTHORS

Nienke Beintema < n.beintema@cgiar.org > is coordinator of the joint IFPRI–ISNAR Agricultural Science & Technology Indicators (ASTI) initiative.
Gbolagade Ayoola < gbayoola@yahoo.com > is an associate professor at the Department of Agricultural Economics of the University of Agriculture, Makurdi.

CONTACT ASTI INITIATIVE   http://www.asti.cgiar.org

Nienke Beintema, Project Coordinator < ASTI@cgiar.org >

International Food Policy Research Institute (IFPRI)	**International Service for National Agricultural Research (ISNAR)**
2033 K Street, N.W.	P.O. Box 93375
Washington, D. C. 20006 U.S.A.	2509 AJ The Hague, The Netherlands
Phone +1 (202) 862-5600	Phone +31 (70) 349-6100
Fax +1 (202) 467-4439	Fax +31 (70) 381-9677
http://www.ifpri.cgiar.org	http://www.isnar.cgiar.org