SUDAN

Gert-Jan Stads, Abdalla Ibrahim Elhagwa, and Raed Badwan

KEY INDICATORS, 2000–2012

Total Public Agricultural Research Spending	2000		2008		2012
Sudanese pounds (million constant 2005 prices)	37.3		53.6		32.3
PPP dollars (million constant 2005 prices)	34.6	▲	49.8	▼	30.0
Overall Growth		**44%**		**–40%**	
Total Number of Public Agricultural Researchers					
Full-time equivalents (FTEs)	724.5	▲	962.5	▼	932.8
Overall Growth		**33%**		**–3%**	
Agricultural Research Intensity					
Spending as a share of agricultural GDP	0.19%		0.26%		0.16%
FTE researchers per 100,000 farmers*	11.64		13.95		15.60

Note: Acronyms, definitions, and an overview of agricultural R&D agencies are available on page 4.

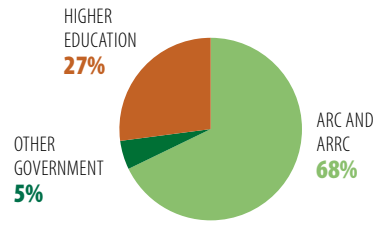
- During 2008–2012, Sudan's total public agricultural R&D spending fell by 40 percent (in inflation-adjusted terms), largely driven by sharp declines at ARC and ARRC.
- In 2011 Sudan invested only 0.19 percent of its agricultural GDP in agricultural R&D, giving it one of the lowest agricultural research intensity ratios in Africa.
- Sudan's key agricultural research challenges in the coming years will be its ability to produce high-quality research and averting the erosion of its agricultural research capacity, given that increasing numbers of experienced senior scientists who were trained abroad begin to retire and are replaced with locally trained junior scientists.

FINANCIAL RESOURCES, 2012

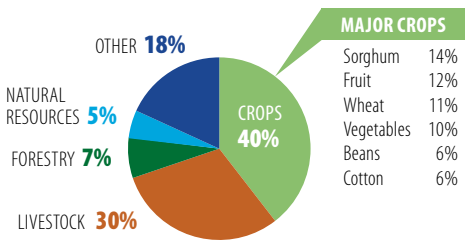
Spending Allocation	
Salaries	80%
Operating and program costs	8%
Capital investments	11%
Funding Sources	
Government, core	90%
Government, other	2%
Donors	6%
Sales of goods/services	2%

Note: Due to availability, financial data only include ARC, ARRC, HRS, and NCR.

INSTITUTIONAL PROFILE, 2012



RESEARCH FOCUS, 2012

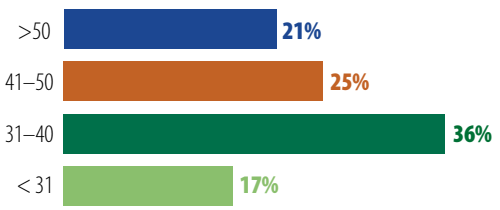


Notes: Major crops include those that are the focus of at least 5 percent of all crop researchers; 42 percent of total crop researchers focused on a wide variety of other crops.

RESEARCHER PROFILE, 2012

Number by qualification (FTEs)

Share by age group (years)



Note: Due to lack of availability, data by age bracket exclude universities other than U of K and U of G.

CHALLENGE

A large number of senior, highly qualified researchers have recently retired or will soon do so, and they are typically being replaced with locally trained, junior staff with only BSc and, in some cases, MSc degrees. This naturally creates knowledge gaps and concerns for the quality of future agricultural research outputs. The need for recruitment and well-targeted training of junior scientists necessarily remains an important strategic objective.

SOLUTION

Raising the retirement age to 65 years for public-sector researchers, as occurred in 2012, is a beneficial first step, giving senior researchers a further five years to train and mentor their younger colleagues. The government's 2013 approval to recruit 100 BSc-qualified researchers at ARC and 170 at ARRC, together with a large number of technicians, is very encouraging. It will be important to secure the necessary funding to maintain and motivate this new generation of researchers and technicians by providing attractive salary packages and training opportunities.

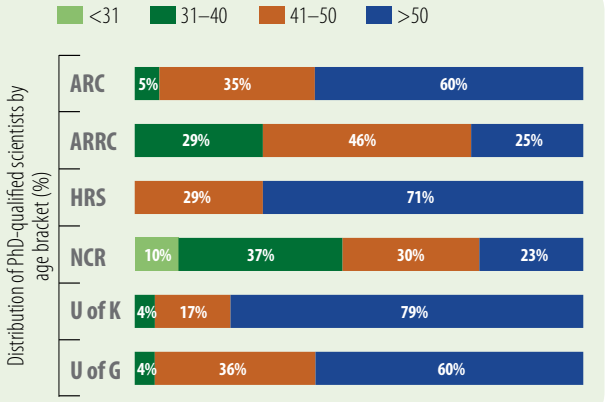
Institutional and age distribution of PhD-qualified agricultural researchers

Number of scientists with PhD degrees

Agency	Headcounts			FTEs
	2005	2008	2012	2012
ARC	196	149	127	127.0
ARRC	81	87	84	58.8
HRS	4	4	7	4.9
NCR	34	66	82	8.2
U of K	na	na	89	20.1
U of G	na	na	67	26.7

Note: na indicates that data were not available.

During 2005–2012, the number of PhD-qualified researchers at ARC fell by nearly 70, and 60 percent of ARC's current researchers with PhD degrees are over 50 years old. The other agencies spend only a proportion of their time on agricultural research (hence the differences in headcounts and FTEs). Like ARC, HRS, U of K, and U of G are severely challenged in that they employ aging pools of PhD-qualified scientists.



DEGREE UPGRADES FOR THE NEXT GENERATION OF SCIENTISTS

Currently, most MSc and PhD training at ARC and ARRC occurs locally. Both corporations predominantly hire young, BSc-qualified research assistants and support their postgraduate training. External training is limited to foreign scholarships sought independently by researchers. An interesting development was the 2004 establishment of SAS as a Federal Union of different research institutes and centers. SAS emphasizes the pooling of human and institutional resources available within the Ministry of Science and Technology so as to provide high-quality training as well as research in various disciplines. SAS is a postgraduate institution, offering masters, doctorate, and professional development programs in the areas of agriculture, animal sciences, energy, environment, engineering, management, and public relations. Despite the recent move back to their original ministries, ARC and ARRC's coordinating councils remain under SAS. Between 2004 and 2013, more than 100 ARC employees attained MSc degrees and 24 attained PhD degrees through SAS. Similarly, 25 ARRC staff obtained PhD degrees and 70 received MSc degrees during the same period.

CROSS-COUNTRY COMPARISONS OF KEY INDICATORS

	Total number of researchers, 2011 (FTEs)	Growth in number of researchers, 2008–2011	Share of PhD researchers, 2011 (FTEs)
Sudan[a]	**932.8**	**–3%**	**37%**
Ethiopia	1,876.6	33%	9%
Kenya	1,150.9	13%	32%
Chad	123.3	32%[b]	17%

[a.] Sudan data refer to 2012 or the 2008–2012 period. [b.] For Chad, this growth is based on the 2009–2011 period.

TREND

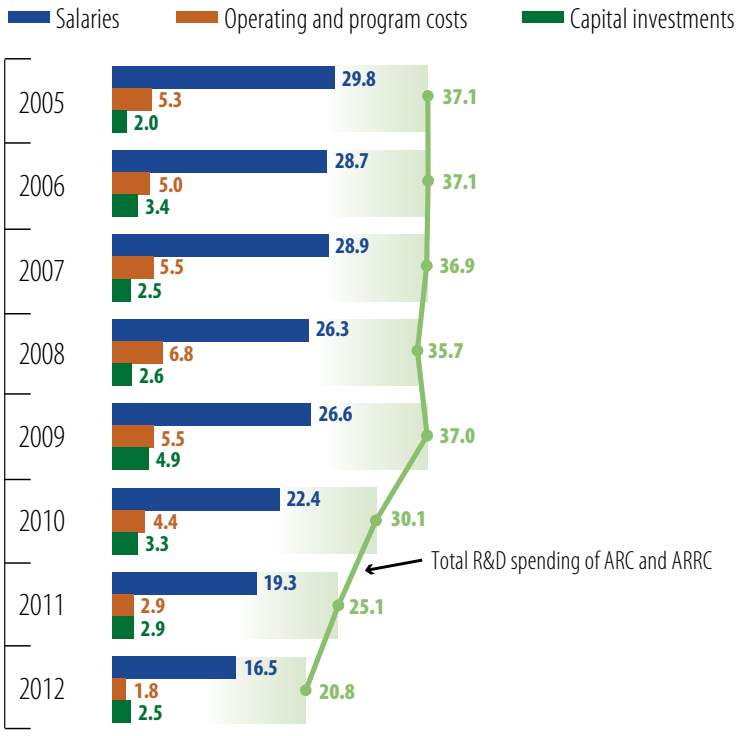
- Agricultural R&D spending has steadily declined in recent years due to a significant decrease in the number of senior, PhD-qualified researchers at ARC, and reduced government support to agriculture stemming from declining oil revenues since the secession of South Sudan in 2011.

OBSERVATION

- Early indications signal the reversal of this negative trend: the government not only began to increase its funding for national agricultural research in 2013, but also pledged US$500,000 per year to CGIAR. Official CGIAR membership is expected to attract new research projects, and funding, over the coming years.

Spending by cost category for ARC and ARRC, 2005–2012

million Sudanese pounds (inflation-adjusted; base year = 2005)



THE IMPACT OF SOUTH SUDAN'S INDEPENDENCE ON AGRICULTURAL R&D IN THE NORTH

Although Sudan's agricultural R&D agencies conducted limited research in the South prior to its July 2011 proclamation of independence, this event still had a significant impact on agricultural R&D in the North. ARC lost 15 scientists to the newly established research, training, and extension service of South Sudan's Ministry of Agriculture and Forestry. In addition, the temporary campus of the University of Juba in Khartoum relocated back to South Sudan. Nevertheless, many scientists (and students) have been reluctant to move to the South because the universities there have yet to meet the standards of the North. South Sudan's independence also had important financial implications based on a 75 percent reduction in the North's oil revenues, which necessitated extensive government budget cuts across all public institutes, including agricultural R&D agencies. Even though the South's independence prompted an alleviation of the (western) donor embargo, the North still largely misses out because the international donor community prioritizes South Sudan in its support to developing agricultural R&D.

Combined total spending at ARC and ARRC fell by nearly half during 2005–2012 (in inflation-adjusted terms), largely driven by reduced salary and operating expenses. In 2012, salaries accounted for 80 percent of the corporations' total expenditures, leaving limited resources for the day-to-day running of research programs or the rehabilitation of infrastructure and equipment.

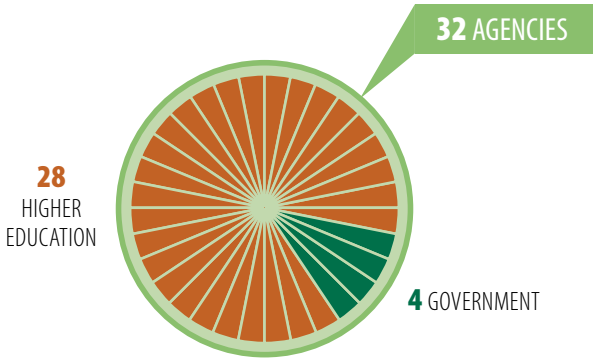
CROSS-COUNTRY COMPARISONS OF KEY INDICATORS *continued*

	Total spending, 2011 (million 2005 PPP dollars)	Overall spending growth, 2008–2011	Spending as a share of AgGDP, 2011
Sudan[c]	**30.0**	**–40%**	**0.19%**
Ethiopia	69.6	8%	0.19%
Kenya	188.1	11%	1.22%
Chad	13.0	9%[d]	0.90%

[c.] Sudan data refer to 2012 or the 2008–2012 period. [d.] For Chad, this growth is based on the 2009–2011 period.

OVERVIEW OF SUDAN'S AGRICULTURAL RESEARCH AGENCIES

Thirty-one public agencies conduct agricultural R&D in Sudan. ARC and ARRC (employing 436 and 197 FTE researchers, respectively, in 2012) are by far the largest; collectively they employ two-thirds of the country's FTE agricultural researchers. ARC is headquartered in Wad Madani in the fertile Gezira region. It operates 24 research stations, 10 research centers, and 3 research units across the country focusing on crop, forestry, agricultural engineering, land management, and socioeconomic research. ARRC's principal mandate involves identifying diseases and epidemics that constrain animal health, production, and export; developing disease control mechanisms; and improving animal production research (including fisheries). Other government agencies involved in agricultural R&D include NCR and HRS. In 2001, ARC, ARRC, and NCR were all transferred to the Ministry of Science and Technology, but a political decision was made in 2010 to return some research agencies to their original supervising ministries in efforts to ensure more effective relationships with relevant departments and stakeholders. Twenty-seven higher education agencies conduct agricultural research in Sudan. The largest include the Faculty of Agriculture and the Faculty of Veterinary Medicine of U of K (41 and 26 FTEs in 2012, respectively), and the Faculty of Agricultural Sciences of U of G (28 FTEs). Agricultural R&D performed by the private sector in Sudan is minimal. Many of the larger companies outsource their research to ARC, ARRC, and the universities.



For a complete list of the agencies included in ASTI's dataset for Sudan, visit **www.asti.cgiar.org/sudan**.

ASTI DATA PROCEDURES AND METHODOLOGIES

- The **data underlying this factsheet** were predominantly derived through primary surveys, although some data were drawn from secondary sources or were estimated.
- **Public agricultural research** includes research conducted by government agencies, higher education agencies, and nonprofit institutions.
- ASTI bases its calculations of human resource and financial data on **full-time equivalent (FTE) researchers**, which take into account the proportion of time staff actually spend on research compared with other activities.
- ASTI presents its financial data in 2005 local currencies and **2005 purchasing power parity (PPP) dollars**. PPPs reflect the relative purchasing power of currencies more effectively than do standard exchange rates because they compare prices of a broader range of local—as opposed to internationally traded—goods and services.
- ASTI estimates the **higher education sector's research expenditures** because it is not possible to isolate them from the sector's other expenditures.
- Note that, due to **decimal rounding**, the percentages presented can sum to more than 100.

For more information on ASTI's data procedures and methodology, visit **www.asti.cgiar.org/methodology**; *for more information on agricultural R&D in Sudan, visit* **www.asti.cgiar.org/sudan**.

ACRONYMS USED IN THIS FACTSHEET

AgGDP	Agricultural gross domestic product
ARC	Agricultural Research Corporation
ARRC	Animal Resources Research Corporation
FTE(s)	Full-time equivalent (researchers)
HRS	Hydrology Research Station
NCR	National Centre for Research
PPP(s)	Purchasing power parity (exchange rates)
R&D	Research and development
SAS	Sudan Academy of Science
U of G	University of Gezira
U of K	University of Khartoum

ABOUT ASTI, IFPRI, AND ARC

Working through collaborative alliances with numerous national and regional R&D agencies and international institutions, **Agricultural Science and Technology Indicators (ASTI)** is a comprehensive and trusted source of information on agricultural R&D systems across the developing world. ASTI is led by the **International Food Policy Research Institute (IFPRI)**, which—as a CGIAR member—provides evidence-based policy solutions to sustainably end hunger and malnutrition and reduce poverty. The **Agricultural Research Corporation (ARC)** is Sudan's principal agricultural research agency; the institute falls under the Ministry of Agriculture and Forestry and focuses on on crop, forestry, agricultural engineering, land management, and socioeconomic research.

ASTI/IFPRI and ARC gratefully acknowledge participating agricultural R&D agencies for their contributions to the data collection and preparation of this country factsheet. ASTI also thanks the Bill and Melinda Gates Foundation for its generous support of ASTI's work in Africa south of the Sahara. This factsheet has been prepared as an ASTI output and has not been peer reviewed; any opinions are those of the authors and do not necessarily reflect the policies or opinions of IFPRI or ARC.

* This December 2013 version reports FTE researchers per 100,000 farmers, which is an adjustment from the November 2013 version (which reported per thousand farmers).