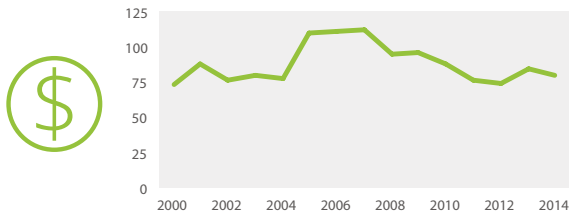


BOTSWANA

Nienke Beintema, Neo Sharon Bodilenyane, and Sandra Perez

AGRICULTURAL RESEARCH SPENDING



Million pula
(2011 constant prices)

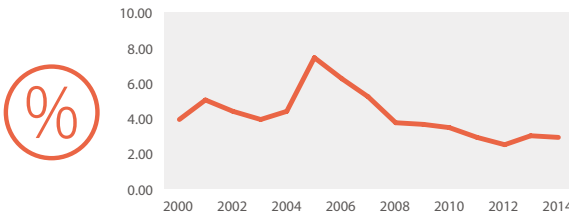
80.3

Million PPP dollars
(2011 constant prices)

21.3

	BOTSWANA	MOZAMBIQUE	ZAMBIA	ZIMBABWE
Million pula (2011 constant prices)	80.3			
Million PPP dollars (2011 constant prices)	21.3	29.3	26.9	43.4

SPENDING INTENSITY

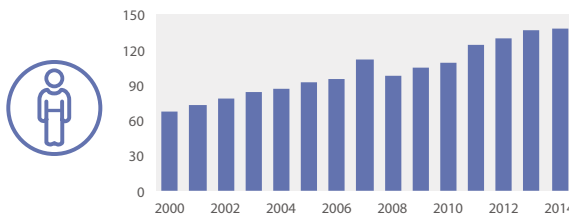


Agricultural research
spending as a share
of AgGDP

2.92%

	BOTSWANA	MOZAMBIQUE	ZAMBIA	ZIMBABWE
Agricultural research spending as a share of AgGDP	2.92%	0.36%	0.51%	1.44%

AGRICULTURAL RESEARCHERS



Full-time
equivalents

137.8

Share of researchers with
MSc and PhD degrees

54%

	BOTSWANA	MOZAMBIQUE	ZAMBIA	ZIMBABWE
Full-time equivalents	137.8	308.4	245.6	208.7
Share of researchers with MSc and PhD degrees	54%	56%	57%	58%

Notes: Data above are for 2014. Research conducted by the private for-profit sector is excluded from this factsheet due to lack of available data. Information on access to further resources, data procedures and methodologies, and acronyms and definitions are provided on Page 4. See www.asti.cgiar.org/Botswana/directory for an overview of Botswana's agricultural R&D agencies.



Declining spending levels

Botswana's ongoing economic depression and spiraling inflation have had a severe, adverse impact on the country's agricultural research spending since 2006. Expenditure levels dropped by 30 percent during 2006–2014, although they rebounded slightly in 2013–2014. The total number of researchers has risen over time, initially due to growth in the number of BSc-qualified researchers but more recently due to the recruitment of researchers qualified to the MSc- and PhD-degree level.



Lack of funding diversity

Agricultural R&D in Botswana is almost entirely funded by the government. Budget cuts in recent years have left the main agency, DAR, with insufficient resources to conduct research or maintain its infrastructure. Competitive regional grants and donor calls for proposals offer a potential new source of funding for DAR; the department would also benefit by being able to keep any revenues generated through the sale of goods and services, which are currently channeled back to the national Treasury.



Capacity strengthening needed

Botswana has a limited number of skilled and experienced agricultural researchers. DAR needs senior PhD-qualified researchers to lead research programs, and train and mentor their younger colleagues. The department needs to take steps to address this situation. The provision of postgraduate training programs at BCA is limited, so most MSc and PhD degrees are obtained abroad. It is important that the government supports BCA in increasing the number and size of its MSc- and BSc- degree programs.

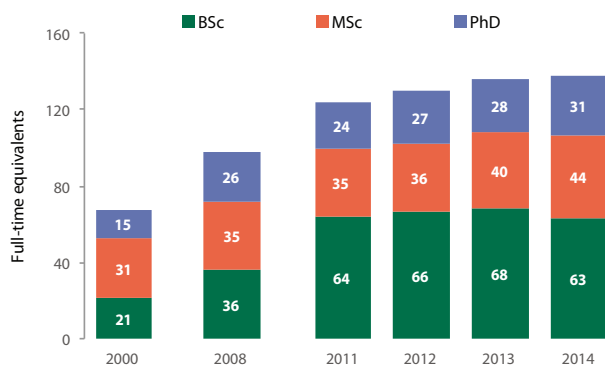


Lack of scale economies

Botswana invests a relatively high share of its AgGDP in agricultural research. The ratio was around 3 percent during 2011–2014—three times the 1 percent minimum level recommended by the African Union and the United Nations. Nevertheless, such a high intensity ratio is not uncommon in countries with small populations and relatively high per capita incomes. Small countries are not able to benefit from economies of scale to the degree that larger countries can, so basic research infrastructure and staffing constitute greater shares of investment.

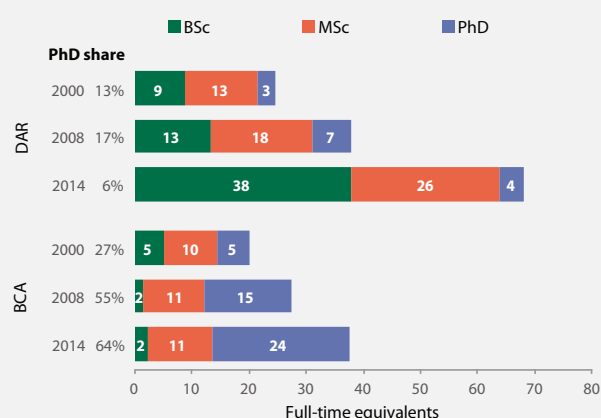
Botswana's agricultural researchers by qualification level

The total number of agricultural researchers in Botswana doubled during 2000–2014. The number of researchers qualified to the BSc-degree level tripled, the number with MSc-degrees increased by about one-third, and the number with PhD degrees doubled.



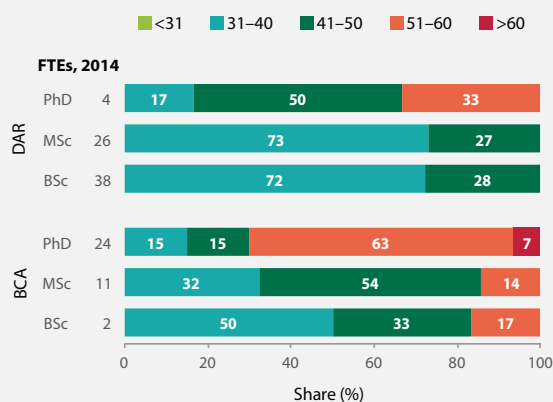
DAR and BCA's agricultural researchers by qualification level

In many African countries, recent growth in agricultural researcher capacity has been driven by the higher education sector. In Botswana, however, DAR was the main source of growth during 2000–2014, primarily due to an influx of BSc-qualified researchers. While growth at BCA was less pronounced, it was largely due to the addition of PhD-qualified researchers.



DAR and BCA's agricultural researchers by age bracket

Most researchers employed at DAR are in their 20s and 30s. The department's PhD-qualified researchers are also unusually young. In contrast, as of 2014, 70 percent of agricultural researchers with PhD degrees at BCA were more than 50 years old, representing a considerable increase over the 2011 level of 44 percent.



Botswana's share of female researchers

Overall, the country's share of female researchers rose slightly, from 31 percent in 2008 to 33 percent in 2014. In general, female researchers were relatively younger and less well-qualified than their male colleagues.



By qualification level, 2014

BSc	37%	MSc	31%	PhD	27%
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By age bracket, 2014

< 41	34%	41-50	35%	> 50	28%
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Government's MSc- and PhD-qualified agricultural researchers by discipline

Livestock is an important agricultural sub-sector in Botswana and, as a result, veterinary medicine and other animal and livestock disciplines are strong in Botswana, accounting for a combined 43 percent of the country's total number of agricultural researchers in 2014. Other important disciplines included food sciences and nutrition (9 percent) and (agro)forestry (7 percent).

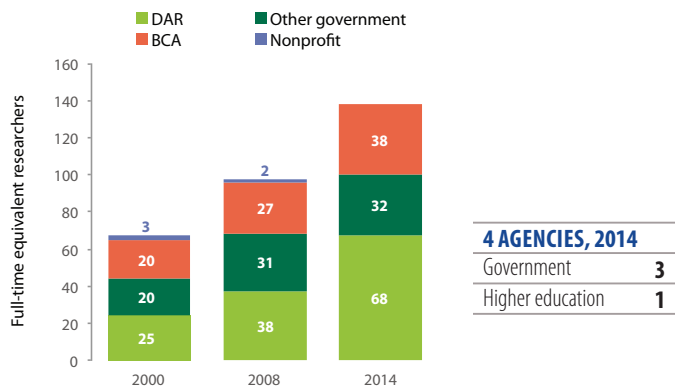
Agricultural researchers, 2014	FTEs		Share (%)	
	MSc	PhD	MSc	PhD
Plant breeding/genetics (incl. biotechnology)	1	1	2	10
Other crop sciences	1	—	4	—
Animal breeding/genetics	2	—	6	—
Animal husbandry	1	—	2	—
Animal nutrition	1	1	4	10
Dairy science	1	—	2	—
Veterinary medicine	2	2	6	30
Zoology/entomology	—	1	—	10
Other animal and livestock	5	1	15	20
Forestry and agroforestry	3	—	9	—
Fisheries and aquatic resources	—	—	—	—
Soil sciences	1	—	4	—

Agricultural researchers, 2014	FTEs		Share (%)	
	MSc	PhD	MSc	PhD
Natural resources management	1	—	4	—
Water and irrigation management	—	—	—	—
Ecology	—	—	—	—
Biodiversity conservation	1	—	4	—
Food sciences and nutrition	3	1	9	10
Socioeconomics (incl. agricultural economics)	—	—	—	—
Extension and education	—	—	—	—
Other sciences	8	1	26	10
Total	32	7	100	100

Note: Due to lack of availability, data exclude the higher education sector.

Institutional composition of Botswana's agricultural research

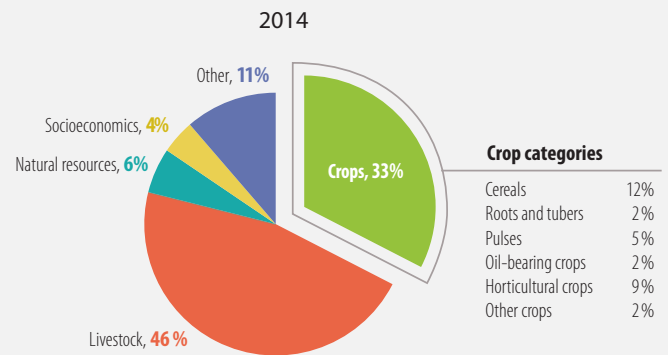
The sectoral composition of agricultural research has changed little in Botswana in recent years, but (with the exception of the nonprofit sector) agricultural researcher numbers grew across all categories. Growth was strongest at DAR, causing its share of the country's agricultural researchers to rise from 36 percent in 2000 to 49 percent in 2014.



Note: Veld Products Research and Development, a nonprofit agency, discontinued its research activities in 2010.

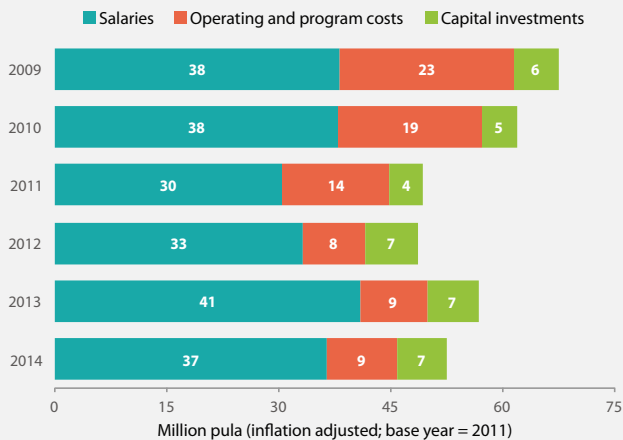
Botswana's agricultural researchers by area of focus

In 2014, 46 percent of the country's FTE researchers conducted livestock research and 33 percent conducted crop research, reflecting the dominance of the livestock sector in Botswana. Major crops under investigation were the cereals maize, sorghum, and millet, along with vegetables, beans, nuts, and fruits.



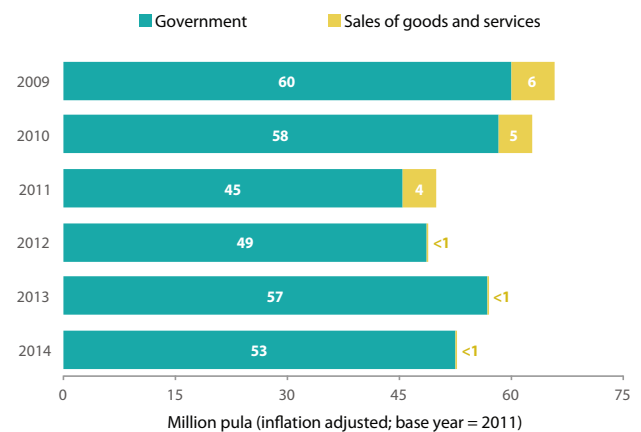
DAR's spending by cost category

On average, salaries and related expenses accounted for about two-thirds of DAR's total spending during 2009–2014. Nonsalary-related spending contracted during this timeframe due to economic depression, which limited DAR's ability to conduct research and maintain its infrastructure.



DAR's funding sources

The national government provides all of DAR's funding. Unlike most African NARs, DAR receives no donor funding. The department raised some revenues through the sale of goods and services during 2009–2011, but this source of funding contracted sharply during 2012–2014. Regardless, such revenues are channeled back to the national Treasury.



DAR's recently released crop varieties

In 2014, DAR released three sorghum varieties, one cowpea variety, and one maize variety. No new varieties were released during 2012 and 2013.

Crop	Number of varieties, 2014
Sorghum	3
Cowpeas	1
Maize	1
Total	5

DAR's recent peer-reviewed publications

Agricultural researchers at DAR publish material infrequently. Only an average of 1 journal article per year was published during 2012–2014. The department's resulting ratio of publications per researcher was very low (0.01).

Type	Number of publications, 2012–2014 annual average	
	DAR	Per FTE researcher
Journal articles		
International	1.0	0.015
Regional	–	–
National	–	–
Books	–	–
Book chapters	–	–
Total	1.0	0.015

Resources for Botswana

This factsheet presents recent data on the performance of agricultural research in Botswana, primarily focusing on key financial, human resource, institutional, and output indicators, while also highlighting relevant trends, challenges, and institutional changes. Additional resources are available at www.asti.cgiar.org and include:



ASTI's **interactive country page** for Botswana features national agricultural research investment and capacity data, a data exploration and download tool, as well as access to a variety of country publications.



ASTI's **benchmarking tool** allows key agricultural research indicators to be ranked and compared across African countries.



ASTI's **data download tool** provides access to more in-depth ASTI datasets and graphs for Botswana and many other countries.



ASTI's **agency directory** provides a view of agencies that conduct agricultural research in Botswana, along with their locations and key agency-level indicators.

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ASTI led by IFPRI

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BOTSWANA

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Key Indicators Financial Resources Human Resources Research Focus Regional comparison

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.
- ▶ **Agricultural research** includes research conducted by the government, higher education, and nonprofit sectors; research conducted by the private for-profit sector is excluded due to lack of available data.
- ▶ 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 2011 local currencies and **2011 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 **decimal rounding** can cause totals to be one point higher or lower than the sum of their parts.



For more information on ASTI's data procedures and methodology, visit www.asti.cgiar.org/methodology.

Acronyms

AgGDP	agricultural gross domestic product
BCA	Botswana College of Agriculture
DAR	Department of Agricultural Research
FTE(s)	full-time equivalent(s)
NARIs	national agricultural research institute(s)
PPP(s)	purchasing power parity (exchange rates)
R&D	research and development

ABOUT ASTI, IFPRI, AND DAR

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 **Department of Agricultural Research (DAR)**, which falls under the Ministry of Agriculture, is Botswana's principal agricultural research agency. In addition to holding a broad mandate covering crop and livestock management research, DAR provides research support services in seed production and certification; soil, plant, and feed analysis; and genetic resource conservation.

ASTI/IFPRI and DAR gratefully acknowledge participating agricultural R&D agencies for their contributions to the data collection and preparation of this factsheet. ASTI also acknowledges the Bill & Melinda Gates Foundation and CGIAR Research Program on Policies, Institutions, and Markets for their 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 DAR.