Evans School of Public Affairs
UNIVERSITY OF WASHINGTON

R&D Finance for Agriculture in Sub-Saharan Africa

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This request provides a general overview of trends in public and private agricultural research and development (R & D) funding and expenditures in Sub-Saharan Africa (SSA). The request is divided into two sections, covering public funding and private funding. Within each section, relevant data is presented on historical funding patterns, the types of research conducted, and which countries within SSA are financing R & D at the highest levels.

Available data shows that:

- The majority of growth in African public agricultural research funding took place in the 1960s, when real public spending on agricultural research increased 6% a year. From 1971 to 2000 annual growth averaged 1.4% a year (Parday and Beintema, 2001).
- Public financing of agricultural R & D experienced a moderate shift in the 1990s from bilateral and multilateral donor funding to domestic government financing. The shift varied by country, but donor funding dropped for all SSA countries an average of 10% (Beintema & Stads, 2006).
- Private research and development funding is heavily concentrated in developed countries with the United States and Japan the two biggest spenders. Within SSA, private R & D expenditures comprise 2% of all R & D spending. The main private actors in SSA are companies based in South Africa and Nigeria. The private sector is focused on research areas that involve marketable inputs, such as chemicals, seeds, and machines (Alston, Pardey & Piggot, 2006).

Data Parameters

The data presented in this report primarily cover research and development expenditures within SSA. The public expenditure data are drawn from the Agricultural Science and Technology Indicators (ASTI) and measure public dollars spent within each sampled country on agricultural R & D between the 1970s and 2000. Additionally, there is some detailed data on the funding sources for domestic expenditures. The list of the countries sampled within each region of Sub-Saharan Africa and their aggregate expenditure totals are listed in Table 2. The ASTI data do not measure aid flows from one region to another. The Organization for Economic Cooperation and Development (OECD) does measure aid flows to SSA (data which is presented in this report) but does not specifically measure the flow for R & D activities. Additionally, the OECD has a biotechnology

statistics database that has numbers and expenditures of biotechnology firms. A chart of other data sources and their limitations is presented at the end of the paper.

Public Funding

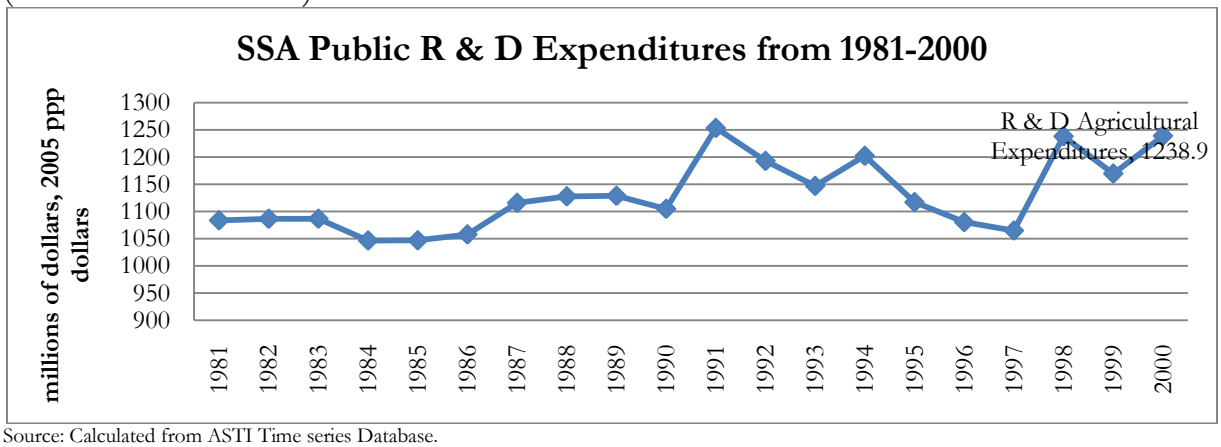
The Agricultural Science and Technology Indicators (ASTI) of IFPRI are generally cited as the most comprehensive sources of agricultural R & D funding data. The ASTI initiative collects and makes available long-term trend data on agricultural R & D investments within developing countries. The data is collected through comprehensive survey work. The site primarily measures research funding and intensity within developing countries. It does not measure individual expenditure flows from one country to another country (such as from the U.S. to Ethiopia).

The general trends in R & D funding, as cited by ASTI (2006) and Parday and Beintema, (2001, 2006) are the following:

- From 1991 to 2000, about half of the countries in Sub-Saharan Africa experienced negative R & D spending growth, generally attributed to political unrest (Burundi, Sudan) or the completion of large donor projects from agencies such as the World Bank (Congo, Madagascar, Niger, Senegal, Zambia).
- Africa's share of worldwide R & D spending compared to other regions decreased over a twenty-year period, from 8% in 1981 to 6% in 2000 (although total spending increased modestly).
- Major international donors such as USAID and the World Bank have trended towards less R & D funding to Sub-Saharan Africa in the 1990s.

ASTI has measured the following for total aggregate expenditure levels (within the sampled countries) for R & D in Sub-Saharan Africa:

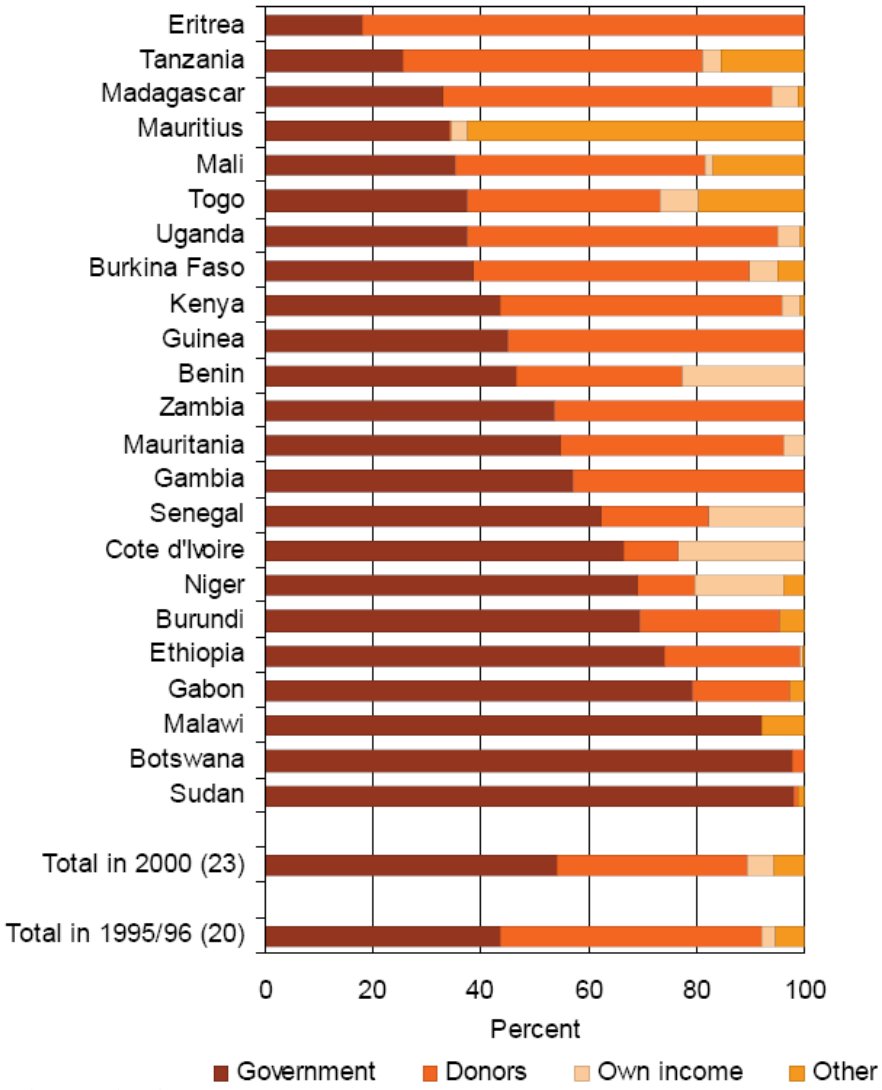
Chart 1. Total domestic spending of Public R & D of countries sampled by ASTI, 1981-2000 (millions of 2005 dollars)



Source: Calculated from ASTI Time series Database.

The landscape of who finances the public R & D in Sub-Saharan Africa has shifted more towards national governments and away from traditional bilateral and multilateral donors (such as the World Bank and USAID). One major example of this is the World Bank, who financed large projects in SSA in the 1990s, making investments that peaked at $120 million in 1991 and dropped to $8 million in 2001. The following chart illustrates this shift away from traditional donor funding during the 1990s (Beintema & Stads, 2006).

Chart 2. Source types of financing for agricultural R & D in SSA countries, 2000 (and regional comparison between 1995 and 2000).



Source: Beintema and Stads (2006)

Growth rates in R & D expenditures for the world as a whole have leveled since the mid 1970s, but the stagnation has occurred more severely in Sub-Saharan Africa, which is the only world region to

show negative growth in the 1990's.[1] West Africa has shown very small amounts of growth in the 1990s. This is illustrated by the following table using data from ASTI:

Table 1. Historical trends in total spending (1993 dollars) and regional growth rates for public agricultural R & D expenditures, 1971-2000 (for countries sampled by ASTI)

	Total spending (million 1993 international dollars)				Annual growth rate (percent)[a]			
Subregion	1971	1981	1991	2000[b]	1971–81	1981–91	1991–2000	1971–2000[b]
East Africa (7)	136.5	185.6	292.7	341.4	2.21	5.07	0.88	3.17
Southern Africa (6)	371.3	370.2	398.2	427.9	–0.19	0.30	1.20	1.25
West Africa (14)	224.0	358.2	345.5	315.3	4.62	0.14	0.06	0.39
Total (27)	731.8	914.0	1,036.4	1,084.7	2.02	1.32	0.77	1.43
Nigeria	62.5	127.9	68.3	106.0	5.64	–6.71	6.27	–1.84
South Africa	287.5	300.3	313.3	365.6	0.11	0.14	1.85	1.65
Total excluding Nigeria and South Africa (25)	381.8	485.8	654.8	613.1	2.46	3.31	–0.30	1.89

Source: Beintema and Stads (2006)

Table 2. Trends in public agricultural research expenditures by country and sub-region, 1971–2000 (millions of 1993 dollars and percentages)

[1] Sub-Saharan Africa accounted for 8% overall of total R&D expenditures in 1981 and 6.3% in 2000 (Parday & Beintema, 2001).

Country	Total expenditures (1993 international dollars)				Annual growth rate[a] (percent)			
	1971	1981	1991	2000[b]	1971–81	1981–91	1991–2000	1971–2000[b]
East Africa								
Burundi	n.a.	n.a.	31.8	7.7	n.a.	n.a.	–16.21	1.01
Eritrea	—	—	—	8.9	—	—	—	—
Ethiopia	12.9	26.9	47.4	80.9	6.21	11.58	7.06	6.13
Kenya	51.6	62.4	101.5	123.6	1.27	4.97	0.57	3.51
Sudan	43.2	49.8	69.2	36.2	0.35	–2.21	–11.03	–1.62
Tanzania	n.a.	n.a.	n.a.	24.5	n.a.	n.a.	9.15	4.40
Uganda	n.a.	n.a.	n.a.	59.6	n.a.	n.a.	7.93	4.41
Subtotal (7)	136.5	185.6	292.7	341.4	2.21	5.07	0.88	3.17
Southern Africa								
Botswana	2.7	9.0	10.5	16.2	12.43	0.11	5.59	5.26
Madagascar	25.4	12.7	16.7	7.4	–4.58	3.03	–7.94	–2.38
Malawi	16.4	17.9	17.1	9.0	1.34	0.67	–5.48	–1.70
Mauritius	8.0	11.0	13.6	21.0	2.49	1.16	6.21	3.34
South Africa	287.5	300.3	313.3	365.6	0.11	0.14	1.85	1.65
Zambia	31.3	19.3	27.0	8.7	–4.70	–0.25	–7.25	–2.86
Subtotal (6)	371.3	370.2	398.2	427.9	–0.19	0.30	1.20	1.25
West Africa								
Benin	6.7	4.2	7.1	8.1	–4.14	5.65	–0.65	1.49
Burkina Faso	3.9	12.5	34.5	21.6	11.65	6.37	–3.16	6.57
Congo	n.a.	n.a.	6.5	2.4	n.a.	n.a.	–12.72	–1.67
Côte d'Ivoire	46.5	60.6	61.6	27.4	2.76	0.10	–3.36	–1.18
Gabon	n.a.	n.a.	1.0	1.6	n.a.	n.a.	4.08	2.33
Gambia	n.a.	n.a.	2.5	1.1	n.a.	n.a.	–7.07	–0.44
Ghana	30.6	21.3	54.3	61.9	–3.51	16.51	1.10	3.04
Guinea	n.a.	n.a.	14.5	7.0	n.a.	n.a.	–2.82	0.75
Mali	n.a.	30.1	23.6	27.5	n.a.	–2.07	1.08	1.65
Mauritania	n.a.	n.a.	6.2	8.9	n.a.	n.a.	3.70	2.86
Niger	6.3	12.0	16.5	6.3	12.86	2.98	–8.42	2.28
Nigeria	62.5	127.9	68.3	106.0	5.64	–6.71	6.27	–1.84
Senegal	27.5	38.0	27.9	21.8	3.58	–3.46	–3.06	–0.36
Togo	8.7	26.1	21.2	13.8	12.33	–0.64	–4.42	–0.31
Subtotal (14)	224.0	358.2	345.5	315.3	4.62	0.14	0.06	0.39
Total (27)	731.8	914.0	1,036.4	1,084.7	2.02	1.32	0.77	1.43
Total – Nigeria and South Africa (25)	381.8	485.8	654.8	613.1	2.46	3.31	–0.30	1.89

Source: Beintema and Stads (2006)

One alternative way of analyzing agricultural R & D flows is through research intensities, which capture R & D funds as a function of national agricultural outputs and populations. As illustrated by Table 3, SSA is actually above the average for all developing countries, particularly relative to their agricultural population. These numbers, however, may primarily be due to very low intensities in China. By all measures, research intensitiesis Sub-Saharan Africa have lagged far behind developed countries and Latin America, and are trending down while research intensities in developing countries in the aggregate are trending upwards.

Table 3. Research Intensities[2] as a share of Agricultural GDP, Per Capita, and Per Economically Active Ag Population, 1976-1995

	As a Share of Ag GDP	**Per Capita**	**Per Economically Active Ag Population**

[2] Research intensities capture the percentage of research and development funds compared to national agricultural outputs and populations

Region	1976	1985	1995	1976	1985	1995	1976	1985	1995
Developing Countries	0.44	0.53	0.62	1.5	2.0	2.5	4.6	6.5	8.5
Sub-Saharan Africa	0.91	0.95	0.85	3.5	3.0	2.4	11.3	10.6	9.4
China	0.41	0.42	0.43	0.7	1.3	1.7	1.8	3.1	4.1
Other Asia	0.31	0.44	0.63	1.1	1.7	2.6	3.8	6.1	10.2
Latin America	0.55	0.72	0.98	3.4	4.0	4.6	26.0	36.0	45.0
Developed Countries	1.53	2.13	2.64	9.6	11.0	12.0	238.5	371.0	594.1
Total	0.83	0.95	1.04	3.3	3.8	4.2	12.9	15.3	17.7

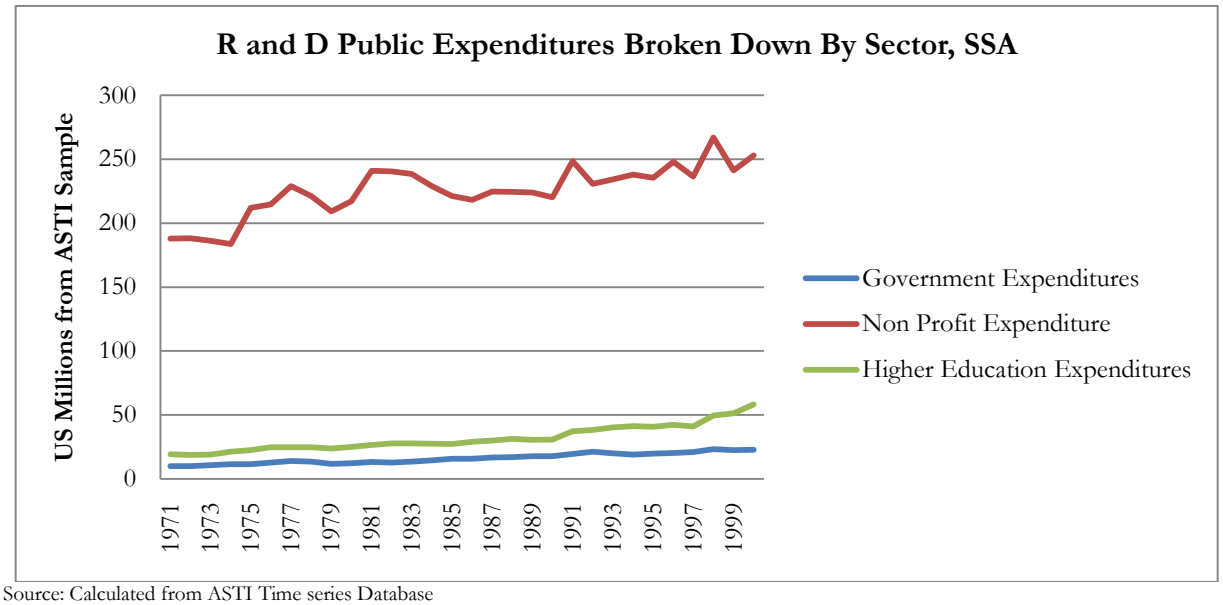
Source: Pardey and Beintema (2008)

Within SSA, the mix of entities that have received and spent public R & D monies for agriculture has shifted over the past 30 years. ASTI collected data on three different categories of public expenditures[3]: non-profit, higher education, and government. They found that government expenditures remained relatively flat while non profits and higher education institutions have increased their expenditures.

The following graph shows time series data from ASTI for public expenditures by each sector within their 27-country survey of Sub-Saharan Africa.

Chart 3. R & D Public Expenditures in SSA Broken Down by Sector, 1971-1999

[3] The three different public expenditures measure total spending within each country sampled. Government expenditures are most often by national Agricultural Research Councils (ARCs). Non-Profits institutions are often linked to producer organizations and receive most of their funding from production or export levies (Beintema & Stads, 2006).



Source: Calculated from ASTI Time series Database

ASTI also reports on how the R & D funding is allocated across focus areas such as crops, livestock, natural resources, etc. The data indicate that the major focus areas in Sub-Saharan Africa in 2000 were crops and livestock (see Table 4). This table breaks down the aggregate data from Table 2, for 2000 (for the countries sampled by ASTI)[4].

Table 4. Percentage of agricultural R & D funding spent within various research areas, SSA, 2000 (for ASTI sampled countries)

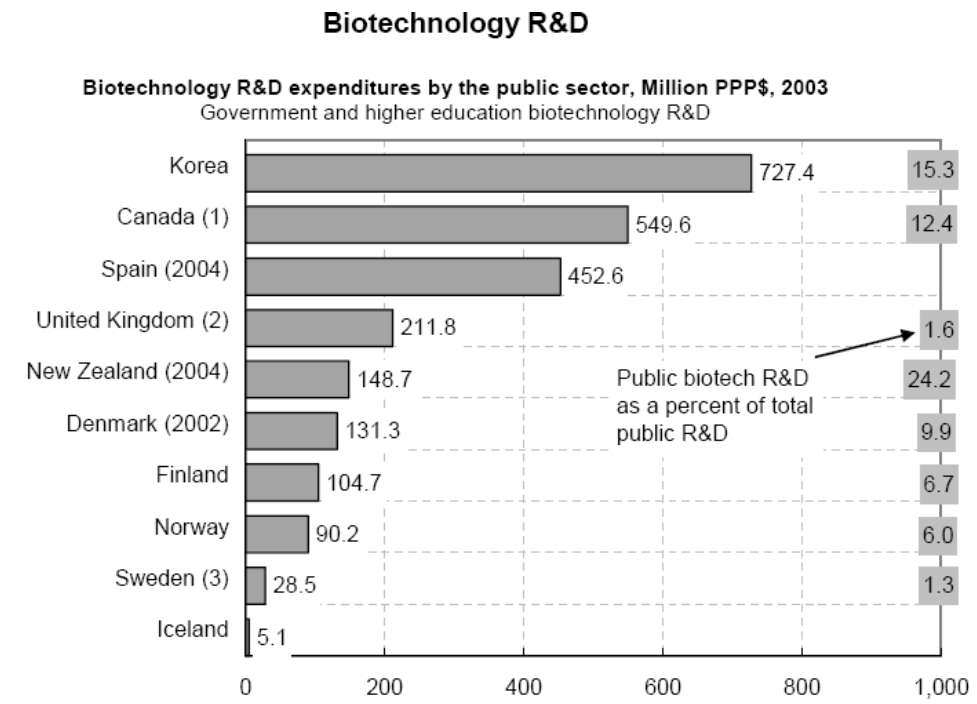
Area of Research	East Africa	Southern Africa	West Africa
Crops	43.0	49.5	45.9
Livestock	22.0	20.7	17.5
Natural Resources	9.5	10.9	7.1
Forestry	7.6	3.2	6.9
Socioeconomics	5.5	2.9	6.9
Fisheries	5.2	3.1	6.6
Off-Farm Post Harvest	2.6	6.4	6.1
Other	4.6	3.3	3.0

Source: Beintema and Stads (2006)

The OECD maintains a database of statistics about public sector spending for biotechnology. This data provides a snapshot of which countries are the primary players in public biotechnology funding (domestic spending). As evidenced by the following graph, Korea, Canada, and Spain spent the most while the United States left biotechnology R & D exclusively to the private sector. This data is not agricultural-specific.

Table 5. Total public expenditures on biotechnology R & D by country (within country), 2003, millions of 2003 dollars

[4] CGIAR is a major research institution with SSA, specific data on their historical funding trends and activities are provided in the appendix.



Source: OECD – Arundel & van-Buezekan (2006)

Private Funding

Private funding is more difficult to measure, especially in SSA. ASTI collected some data from their 27 country sample conducted in 2000, but it is incomplete.[5] Based on their sample, a large majority of private sector funding was spent in Nigeria and South Africa (totaling approximately $26 million). The survey notes that significant barriers exist in measuring private investment, including confidentiality of investments and the relatively small projects that are funded.

The following trends and themes were cited in literature on private R & D funding:

- In general, private shares of total research funding (as a proportion of regional expenditures) are small in Sub-Saharan Africa (2% in 2000) (Beintema & Stads, 2006).
- Private funding is highly concentrated in rich countries and very little of the research is targeted towards the needs of developing countries (Kremer & Zane, 2005).
- Most private spending for agricultural R & D is within the United States and Japan. Within SSA, most private spending is within South Africa[6] and Nigeria (ASTI Database).
- Private firms have been extremely active in biotechnology in crops such as wheat, maize, cotton, and soybeans. Much of the research has been conducted in developed countries. As

[5] ASTI and Adelman (2006) acknowledge that private aid flows are generally understated because of underreporting and the multitude of private aid sources that are generally not compiled comprehensively. Additionally, many private companies outsource their R & D to higher education institutions.

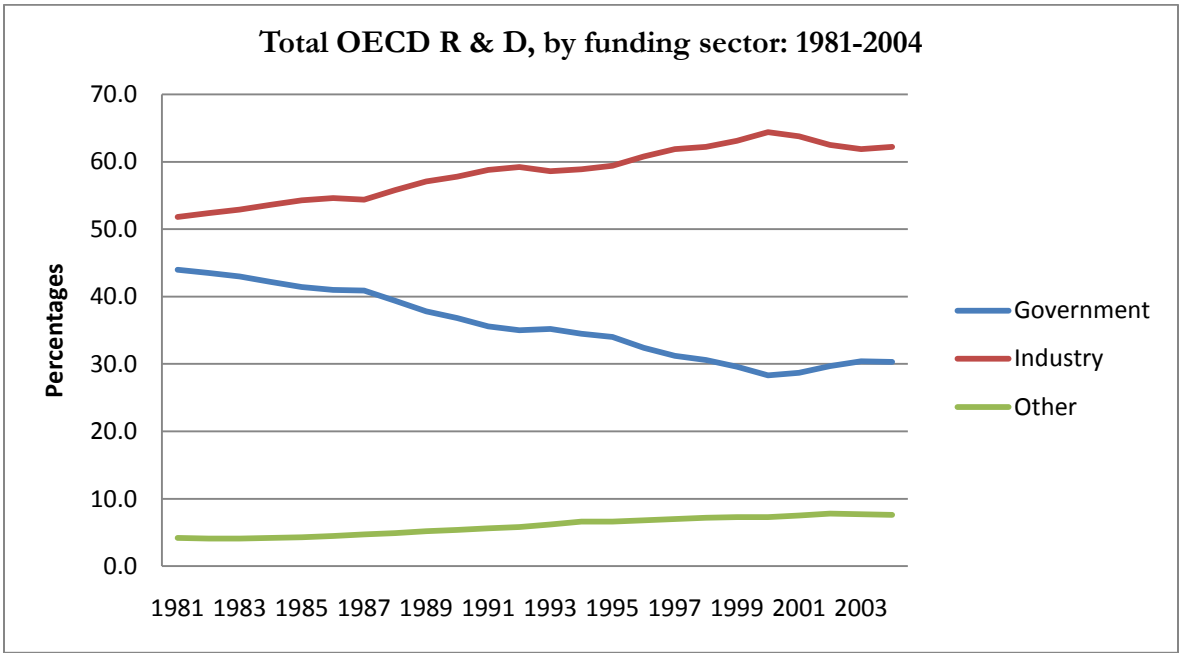
[6] ASTI identified eight companies within South Africa conducting agricultural R & D. The three largest are Capespan, Hortec, and Grain South Africa. Capespan and Hortec conduct research on food processing technology for fruits. Grain South Africa focuses on wheat, barley, corn, sorghum, and barley (including precision farming).

developing countries improve their infrastructure and property rights law, it is theorized that investment should increase (Alston, Pardey & Piggot, 2006).

- Approximately 12% of private research focuses on farm-level technologies while 80% of public research has this focus. Food processing and post harvest research accounts for 30% to 90% of private agricultural R & D (Alston, Pardey & Piggot, 2006).
- Private sector R & D expenditures in the OECD are growing at an annual rate of 5.1% compared to 1.4 % for public sector R & D. (1981 to 1993) (Alston, Pardey & Roseboom, 1998)

Overall, the OECD reports that the proportion of all R & D funding that has come from private industry has trended upwards since 1981, while the proportion of government funding has fallen.

Chart 4. Proportional total R & D funding, by funding sector, from 1981-2003



Source: OECD Main Science and Technology Indicators

According to the OECD, official private aid flows (aid flows from governments to private companies in the developing world), has shown an upwards trend during the 2000s. The United States, Germany, and the United Kingdom are the biggest contributors. This data is not R & D specific.

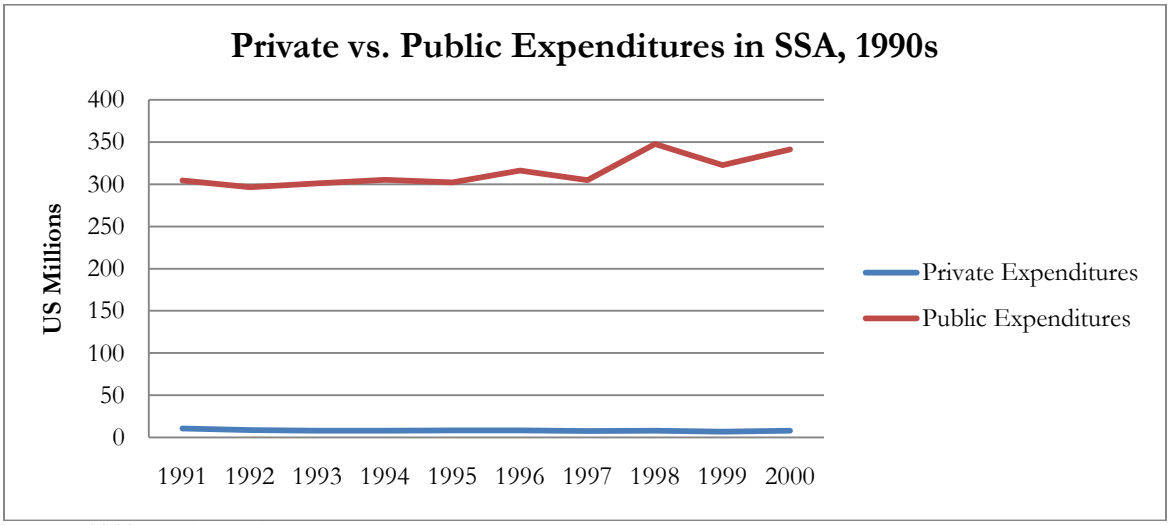
Table 6. SSA Official Private Aid Flows, 2001-2007, U.S. Millions (nominal dollars)

Recipient	Africa - South of Sahara, Total						
Part	1: 1 : Part I - Developing Countries						
Aid type	420: Total Private Net						
Year	2001	2002	2003	2004	2005	2006	2007
Donor							
DAC Countries, Total	3278.31	1243.08	10335.01	16564.25	16694.94	1858.38	20581.37
Australia	-23.95	6.99	..	-44	268.13	-230.92	369.81
Austria	-17.35	-119.55	19.35	3.11	8.23	40.01	..
Belgium	1101.18	-682.23	-1719.21	1690.99	-832.91	-103.21	72.42
Canada	-6.14	-6.91	-5.34	-2.63	0.05	6.79	24.34
Denmark	..	..	..	..	..	..	..
Finland	-45.87	-28.66	-51.48	27.13	-78.23	39.1	47.22
France	1368.41	-800.3	-457.5	194.1	420.24	2760	3998
Germany	114.2	146.71	1061.21	519.74	-1284.87	2193.91	5172.73
Greece	..	1.03	1.13	0.64	2.4	1.9	1.1
Ireland	70	..	..	..	..	..	..
Italy	-87.75	363.68	-95.5	126.29	29.81	240.05	504.61
Japan	-176.71	-19.91	3496.98	-363.02	-196.47	-1611.78	69.45
Netherlands	430.23	270.86	1051.75	1893.35	2224.47	-1444.31	27.71
New Zealand	..	..	..	..	..	..	..
Norway	107.02	114.68	181.24	314.6	528.68	..	941.31
Portugal	247.85	173.27	1182.41	75.05	21.09	237.13	-686.16
Spain	25.33	171.34	38.58	-56.19	-13.39	-71.4	443.99
Sweden	35.66	19.95	60.27	40.07	111.62	42.57	-67.28
Switzerland	6.5	-357.33	-249.82	-344.72	1032.73	50.79	966.42
United Kingdom	282.7	1173.46	4826.2	9788.59	11806.36	-1330.25	3189.24
United States	-153	816	994.74	2701.15	2647	1038	5506.46

Source: OECD ODA Database - Development

The ASTI data do not describe trends in private versus public expenditures in R & D funding in SSA. As previously mentioned, the survey indicated that approximately 2 out of every 100 dollars spent on agricultural research and development came from the private sector during 1991-2000. Chart 5 shows this data broken out by year.

Chart 5. Private and Public Expenditures in Sub-Saharan Africa, 1991-2000 (for ASTI sampled countries)

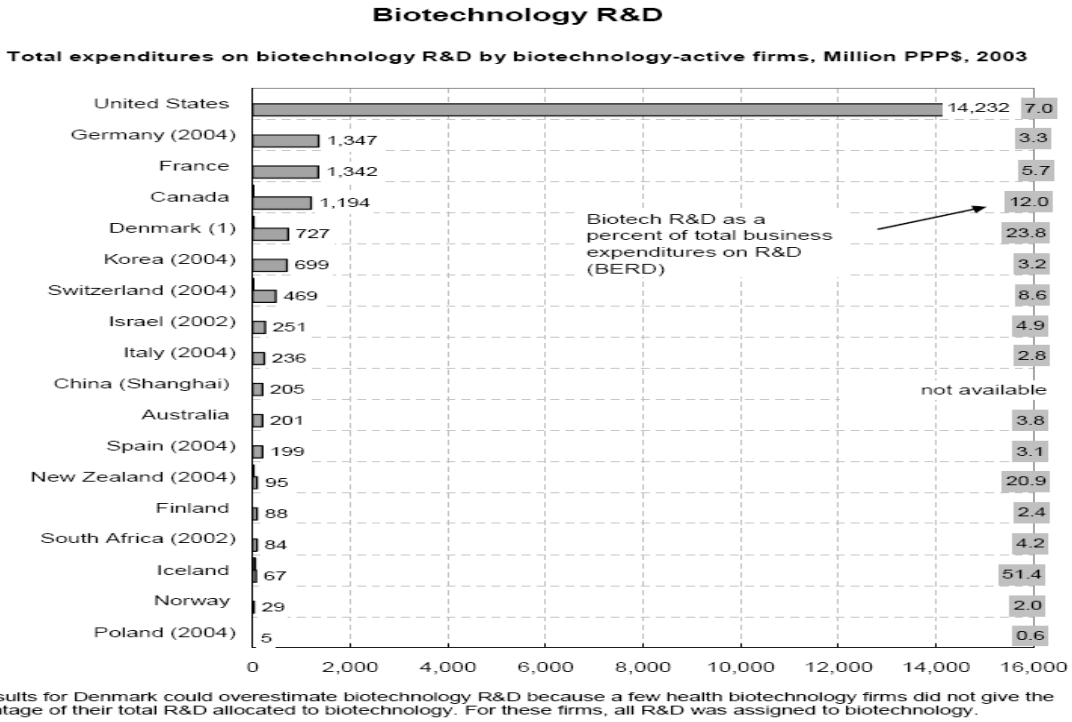


Source: ASTI Time Series Database

The OECD is one source of information about the major players within private funding for agricultural R & D. This data covers only R & D investment by the OECD countries (not including China); however, the vast majority of worldwide R & D funding comes from these countries. Data were collected over a ten-year period and compare business spending on R & D for the category of Agriculture, Hunting, and Forestry. Private companies in the United States spend more than half of all spending among this peer group and have spent increasingly more than companies in other countries throughout the 1990s.

Recently, the private sector has invested a large proportion of its research funding in biotechnology. The OECD's database of key biotech indicators provides a fairly recent snapshot of who the major players are in the biotechnology field. Companies in the United States spend more than the rest of the world combined. Table 7 is a chart from the OECD's 2006 Biotechnology Statistics report:

Table 7: Biotechnology R & D expenditures by biotechnology-active firms (millions PPP, 2003)



Source: OECD – Arundel & van-Buezekan (2006)

Biotechnology R & D is not solely focused on agriculture. Therefore the OECD also has broken out the different types of biotech to get a better sense of what share of the R & D expenditures is spent on agriculture.

Table 8. Firm counts for different applications of biotechnology, by country, 2003

Biotechnology applications: firm counts

Table 1. **Percent of biotechnology firms active in each main application field**

		Health	Agro-food	Industrial-environmental	Other	Total
		Percent				
Australia[1]	2003	47	23	24	6	100
Belgium[3,5]	2003	33	15	..	52	100
Canada[2]	2003	54	28	8	11	100
China (Shanghai)[2]	2003	63	17	15	4	100
Denmark[2,4,9]	2003	58	4	3	35	100
Finland[1]	2003	52	18	25	5	100
France[3,6,10]	2003	41	17	..	41	100
Germany[1,11]	2004	66	21	14	..	100
Iceland[1]	2003	31	25	14	31	100
Ireland[2,4,9]	2003	46	10	17	27	100
Israel[1,7]	2002	49	24	16	11	100
Korea[2]	2004	30	25	41	5	100
New Zealand[1]	2005	19	53	20	9	100
Norway[2,4,9]	2003	53	19	3	25	100
Poland[2]	2004	39	15	31	15	100
South Africa[2]	2002	34	29	21	17	100
Sweden[2,8]	2003	52	8	12	28	100
Switzerland[2,4,9]	2003	49	6	6	39	100
United Kingdom[2,4,9]	2003	53	8	10	30	100
United States[1,12]	2001	65	12	12	11	100

Source: OECD – Arundel & van-Buezekan (2006)

Methodology

Several data sites were searched for research and development information related to Sub-Saharan Africa. The most relevant data found were from the ASTI Initiative from IFPRI. The OECD STAN indicators and Credit Reporting System did not contain specific data on R&D funding in SSA. The following is summary of some of the other data sources explored and a brief description of what data they have, the years the data covers, and what data are missing to understand R & D agricultural funding:

Data Source	Type of Data	Years Covered	Problems
OECD	Official public sector ODA flows by donor, recipient, and sector.	1967-2007	No specific measures of R & D. Closest category is assistance to Agriculture, Fishing, and Forestry.
OECD Stat – STAN Structural Analysis	R & D expenditures for OECD Countries only	1987-2004	Does not include Brazil, China, or India, not Agriculture specific and most relevant category is food, beverages, and tobacco products.
OECD STAN Indicators Database	Measure of R & D Intensity (defined as research dollars as a function of Ag GDP), also measure R & D Expenditures across OECD	1980-2003	Only covers OECD countries and most relevant category is Agriculture, Hunting and Forestry. Data set has distribution across economies and the G12 but does not have total expenditures.
USAID Greenbook	Contains historical data on US overseas loans and grants	1971-2006	Not specific to aid flows for research and development.
WDI Indicators	R & D expenditures and # of researchers in R & D, both at the country level.	1960-2007	R & D categories are general and not broken down by sector or category, data not collected (or inputted for R & D intensity indicators.
UNESCO	R & D expenditures on a country level, number of years varies by country.	1996-2007	R & D is not broken down by sector.
USDA ERS	Collects data on public research spending on R & D, also has a plant breeding database.	1980-2005	Data is U.S.-specific and does not include foreign investments or donor funding.
UNCTAD – FDI STAT	Inward and outward FDI flows from 1990 to 2007, including sector specific	1990-2007	FDI flows are not broken down by R & D investments.
IMF Government	Calculates annual budgets		Unsure if it has R & D Data,

Finance Statistics and International Financial Statistics	and liabilities and assets		specific datasets require a subscription.

A literature search was also conducted to search for relevant data and statistics. Google Scholar, Eldis, and the Web of Science were searched, along with research databases at the OECD, World Bank, and USAID.

The search terms used included the following terms, alone and in combination:

- Research and Development
- Agriculture
- Africa
- Sub-Saharan Africa
- Financing
- Aid
- Nigeria
- South Africa

Possible Further Questions from the Readings:

1. Private and Public Partnerships: Why are they not working together effectively? (Speilman and Grebmer, 2004)
2. What are the conditions that encourage increases in private sector R & D in developing countries? (Pray & Umali-Deminger, 2008)
3. How prevalent is the use of higher institutions by private companies for agricultural R & D? What are the major higher education institutions in SSA and what are they doing? (touched on in Beintema and Stads, 2006)

Further Note:

From correspondence with Nienke Beintema, director of the ASTI (IFPRI/CGIAR), I have learned that they are in the process of conducting an updated research and development survey (primarily funded by the Gates Foundation). The new survey has an additional focus on research themes that are of interest in this request, such as questions on biotech, precision agriculture, market access, etc. Additionally, the new survey has new questions on funding sources. Their website should also be updated in three weeks with more information. This can be found at: http://www.asti.cgiar.org/

Appendix on CGIAR R & D Funding

GGIAR is one of the primary R & D institutions in Sub-Saharan Africa and the World. They are primarily publicly funded. The following is some information on historical financing and Sub-Saharan Africa budget.

Table 5. *Funding support to the CGIAR*

	1972–75	1981–85	1991–94	1995
		(millions of 1993 dollars per year)		
United States	18.3	69.0	57.4	39.1
Japan	0.9	13.3	31.9	36.0
Europe	19.2	53.7	98.6	109.0
Other countries	9.6	20.5	27.7	21.6
Total from developed countries	*48.0*	*156.5*	*215.6*	*205.7*
World Bank	6.7	28.9	41.2	48.2
Foundations	22.8	4.3	6.2	6.4
Others	10.1	54.5	50.6	56.1
Total	*87.6*	*244.2*	*313.5*	*316.5*

Source: taken from Pardey *et al.* (1996) and based on financial reports of the CGIAR Secretariat.

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Appendix Table C.5—*Continued*

CGIAR center	Main areas of focus: Activity	Main areas of focus: Commodity	Location of headquarters	Offices in Sub-Saharan Africa	Budget: Total (million U.S.$)	Budget: Sub-Saharan Africa (million U.S.$)	Budget: Sub-Saharan African Share (percent)
International Food Policy Research Institute (IFPRI)	Identify and analyze national and international strategies and policies for reducing hunger and malnutrition		United States	Ethiopia, Uganda, Senegal	26.5	12.8	48
International Plant Genetic Resources Institute (IPGRI)	Promote activities to further collection, conservation, evolution, and utilization of germplasm		Italy	Benin, Cameroon, Kenya, Uganda	28.3	8.5	30
International Rice Research Institute (IRRI)	Rice-based ecosystems	Rice	Philippines	—	28.8	1.1	4
International Service for National Agricultural Research (ISNAR)[c]	Strengthening national agricultural research systems		The Netherlands	Nigeria, South Africa	12.8	5.0	46
International Water Management Institute (IWMI)	Water and irrigation management		Sri Lanka	Ghana, Kenya, Senegal, South Africa	23.0	4.3	19
WorldFish Center[d]	Sustainable aquatic resource management		Malaysia	Cameroon, Malawi	15.5	4.7	30
Subtotal[d]					393.1	178.3	45

Sources: CGIAR (2004); Roseboom, Beintema, and Mitra (2004); Alston, Dehmer, and Pardey (2006).

[a] Known as the West African Rice Development Association (WARDA) until 2003.

[b] Known as the International Centre for Research in Agroforestry (ICRAF) until 2002.

[c] ISNAR was closed as a stand-alone center in April 2004, and is now a division of the International Food Policy Research Institute based in Addis Ababa, Ethiopia.

[d] Known as the International Centre for Living Aquatic Resource Management (ICLARM) until 2002.