

ANNEX 3

BIOTECHNOLOGY STATISTICS: METHODOLOGY

Biotechnology consists of a group of related technologies with applications in many different economic sectors – agriculture, forestry, aquaculture, mining, petroleum refining, environmental remediation, human and animal health, food processing, chemicals, security systems – and in many industrial processes. It is the range of current and potential applications, together with their economic, environmental and social impacts, that creates policy interest in obtaining high-quality economic and innovation indicators for biotechnology.

However, unlike information and communication technology or other technologies, biotechnology lacks a core “sector” that can be quickly identified and surveyed. This has created major challenges for developing comparable biotechnology indicators. These include national differences in the definition of biotechnology and the fields of application of biotechnology, and of a biotechnology firm. To address these issues, over the past seven years the OECD co-ordinated work by national experts to improve definitions and survey methodologies. This resulted in the “OECD” definition of biotechnology and the *Framework for Biotechnology Statistics*, which provides guidance for collecting data on biotechnology.

OECD Biotechnology Statistics 2006 presents some results of this international effort to improve the comparability of biotechnology indicators. Most countries now use the OECD list-based definition of biotechnology or similar definitions that focus on modern biotechnologies. However, full comparability has not yet been reached, owing to different methods of constructing sample frames and dealing with survey non-responses. Methodological similarities and differences in national biotechnology surveys are summarised in the table.

Although every effort has been made to maximise comparability across countries, caution must be used when comparing biotechnology activities across countries when the data are obtained from studies with different methodologies. This applies particularly to differences between studies limited to firms whose main economic activity is biotechnology (dedicated biotechnology firms) and studies of all firms with some biotechnology activity (biotechnology-active firms). Other factors, such as differences in the definition of biotechnology, whether or not firms must innovate, and low response rates in some countries, will also reduce comparability.

As a final caution, some of the results for specific countries vary, depending on the data source. For example, the 2001 Department of Commerce survey estimates total biotechnology R&D at USD 16 834 million current PPP, while the 2003 National Science Foundation (NSF) R&D survey for the United States estimates total biotechnology R&D at USD 14 232 million in current purchasing power parity (PPP). The estimated decline in biotechnology R&D between 2001 and 2003 could be an artefact due to different survey methodologies. The 2003 results are likely to be more accurate, owing to the use of the R&D sample frame and a higher response rate. However, the 2003 survey did not provide results by field of application. Consequently, the 2001 results were used to estimate the distribution of biotechnology R&D expenditures by application.

The biotechnology data presented in section F are official data collected by national statistical offices. This is only a small selection of the data presented in *OECD Biotechnology Statistics 2006*.

Source

- OECD (2006), *OECD Biotechnology Statistics 2006*, OECD, Paris, available at: www.oecd.org/dataoecd/51/59/36760212.pdf.

For further reading

- OECD (2005), *A Framework for Biotechnology Statistics*, OECD, Paris, available at: www.oecd.org/dataoecd/5/48/34935605.pdf.
- Arundel, A. (2003), *Biotechnology Indicators and Public Policy*, STI Working Paper 2003/5, OECD, Paris.

Methodological information for national biotechnology surveys

	Year	Biotech definition ¹	Biotech firm type ²	All firms innovate?	Sample frame ³	Source ⁴	Response rate	Extrapolation ⁵
Australia	2003-04	OECD	R&D	Yes	R&D	GOV	86%	Partial
Belgium	2003	OECD	All	..	Secondary	NP-GOV	31%	No
Canada	2003	OECD	All	Yes	Secondary	GOV	80%	Yes
China (Shanghai)	2003	Modern	All	..	Secondary	GOV	39%	No
Denmark	2003	None	R&D	Yes	R&D	NP-GOV	63%	Yes
Finland	2003	OECD	R&D	Yes	R&D	GOV	83%	Yes
Finland	2003	Modern	Dedicated	..	Secondary	NP-GOV	71%	Partial
France	2003	OECD	R&D	Yes	R&D	GOV	72%	Yes
Germany	2004	OECD	All	No	Secondary	GOV	65%	Yes
Iceland	2003	OECD	R&D	Yes	R&D	NP-GOV	100%	Not relevant
Israel	2002	OECD	All	No	Secondary	GOV	96%	Yes
Italy	2004	OECD	R&D	Yes	R&D	GOV	50%	No
Japan	2003	Mixed ⁶	All	No	Secondary	JBA-GOV	76%	No
Korea	2004	Modern ⁶	All	..	Secondary	GOV	100%	Not relevant
Korea	2004	..	R&D	Yes	R&D	GOV	76%	..
New Zealand	2004	OECD	All	No	Secondary	GOV	94%	No
New Zealand	2004	OECD	R&D	Yes	R&D	GOV	84%	Yes
New Zealand	2005	OECD	All	No	Secondary	GOV	93%	No
Norway	2003	OECD	R&D	Yes	R&D	GOV	95%	Yes
Poland	2004	OECD	..	Yes	..	GOV	34%	No
South Africa ⁷	2002-03	Mixed	All	No	Secondary	EgoliBio-GOV	72%	No
Spain	2004	OECD	R&D	Yes	R&D	GOV	86%	Yes
Sweden	2003	None	R&D	Yes	R&D	GOV	94%	Yes
Sweden	2003	..	Dedicated	..	Secondary	NP-GOV
Switzerland	2004	OECD	R&D	Yes	R&D	GOV	81%	Yes
United States ⁸	2001	OECD	All	No	Secondary	GOV	61%	No
United States	2003	OECD	R&D	Yes	R&D	GOV	81%	Partial

1. What definition of biotechnology was used in the survey? Categories are: OECD (list-based definition), Modern (similar to the OECD list-based definition), Mixed (includes both modern and traditional biotechnologies, but it is possible to separate modern from traditional biotechnologies), All (modern and traditional combined), and None (no definition given in the survey).
2. OECD defined three types of firms for this data collection: All (all firms with some activities in biotechnology or "biotechnology-active" firms), Dedicated biotechnology firms (the firm's main economic activity is biotechnology), and R&D (all firms that perform some biotechnology R&D). Typically, the information on biotechnology-active firms and dedicated biotechnology firms is collected by surveys of firms believed to be active in biotechnology, whereas the information on biotechnology R&D firms is obtained from R&D surveys of the business enterprise sector.
3. What sample frame was used in the survey? Two main methods of constructing the frame are in common use: R&D survey (all respondents to the business R&D survey are asked if they have expenditures for biotechnology R&D); and secondary sources (a list of biotech firms is constructed from a diverse set of sources, such as biotechnology industry associations, searching patent data to identify firms that have applied for a biotechnology patent, results of previous R&D surveys, applicants to government support programmes for biotechnology R&D, etc.).
4. Who conducted the survey? GOV (survey or study conducted by a government agency), and NP-GOV (conducted by a non-profit organisation at the request of a government agency).
5. Are survey non-respondents accounted for by the use of extrapolation techniques such as weighting, imputation or other methods to estimate the full population of biotechnology firms? Categories are Yes, No, and Partial. "Partial" was used in cases where extrapolation was limited to selected firms or limited to some of the survey questions or indicators.
6. Wherever possible, the results are limited to "modern" biotechnology, but this could still include some second-generation or traditional biotechnology activity.
7. Large firms in traditional biotechnology (fermented food products) were excluded, but some traditional and second-generation biotechnology firms are in the sample.
8. The definition of biotechnology used in the R&D survey was similar but not identical to the OECD definition.