

## **The OECD experience with biotechnology measurement**

**WPN: Statistics and Measurement  
November 14<sup>th</sup>, 2007**

[brigitte.vanbeuzekom@oecd.org](mailto:brigitte.vanbeuzekom@oecd.org)



## OECD efforts to collect biotechnology statistics

---

- In 2000, the OECD held its first *ad hoc* Biotechnology Statistics meeting
- What was the situation concerning biotechnology statistics in 2000?



## OECD efforts to collect biotechnology statistics

---

- very little official data available
- most countries had future plans of including questions in national surveys
- there were many different definitions of biotechnology in use
- studies used other sources to give indication of biotech ‘industry’



# OECD efforts to collect biotechnology statistics

---

What are these other sources?

- Consulting firms (E&Y etc)
- Patent data
- Citations
- Budget data



# OECD efforts to collect biotechnology statistics

---

What are these other sources?

(continued)

- Venture capital
- Trade data
- Data on Alliances
- Biotech Associations



# OECD efforts to collect biotechnology statistics

---

What's the problem with different sources?

## Biotechnology in Canada in 1997 (Canadian \$)

	<b>E&amp;Y</b>	<b>Contact Canada</b>	<b>StatsCan</b>
<b>Companies</b>	224	746	282
<b>Employees</b>	11 000	26 800	9 823
<b>Sales</b>	\$ 979 M	\$4.1 B	\$1.13 B
<b>R&amp;D</b>	\$403 M	\$1.73 B	\$585 M

Source: BIOTECCanada, *Canadian Biotechnology '98*, 1998.



## **OECD efforts to collect biotechnology statistics**

---

This is just one example of how different definitions can lead to different answers. This is a problem when trying to compare data internationally.



## **OECD efforts to collect biotechnology statistics**

---

2001: Agreeing on a definition of biotechnology – the premises

- There are various potential definitions
- Biotechnology is an activity that uses or transforms material of living origin
- Definition is for statistical purposes
- Value judgments should be avoided



## OECD efforts to collect biotechnology statistics

---

2001: Agreeing on a definition of biotech – the premises for a list-based definitions

- Built on same principles
- Comments on existing lists (Canada, France and New Zealand)
- A list of items that corresponds to recognized activities, techniques, fields or domains
- Several lists are possible
- Grouping the items



## OECD efforts to collect biotechnology statistics

---

2001: Statistical definition of biotechnology

- Background: two types of definitions were needed -- a single definition and a list based definition
- A provisional single definition and a list based definition were adopted
- OECD recommends they be used together

## OECD efforts to collect biotechnology statistics

---

The single definition of biotechnology is deliberately broad. It covers all modern biotechnology but also many traditional or borderline activities. For this reason, the single definition should **always** be accompanied by the list-based definition. The single definition is:

- *The application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.*

## OECD efforts to collect biotechnology statistics

---

The OECD list-based definition of biotechnology includes **seven** categories, and respondents are usually given a write-in option for new biotechnologies that do not fit any of the categories. A firm that reports activity in one or more of the categories is defined as a biotechnology firm. This list of biotechnology techniques is **indicative** rather than exhaustive. It is expected to change over time as biotechnology activities evolve. The seven categories include:

## OECD efforts to collect biotechnology statistics

---

- **DNA/RNA:** Genomics, pharmacogenomics, gene probes, genetic engineering, DNA/RNA sequencing/synthesis/amplification, gene expression profiling, and use of antisense technology.
- **Proteins and other molecules:** Sequencing/synthesis/engineering of proteins and peptides (including large molecule hormones); improved delivery methods for large molecule drugs; proteomics, protein isolation and purification, signaling, identification of cell receptors.



## OECD efforts to collect biotechnology statistics

---

- **Cell and tissue culture and engineering:** Cell/tissue culture, tissue engineering (including tissue scaffolds and biomedical engineering), cellular fusion, vaccine/immune stimulants, embryo manipulation.
- **Process biotechnology techniques:** Fermentation using bioreactors, bioprocessing, bioleaching, biopulping, biobleaching, biodesulphurisation, bioremediation, biofiltration and phytoremediation.



## OECD efforts to collect biotechnology statistics

---

- **Gene and RNA vectors:** Gene therapy, viral vectors.
- **Bioinformatics:** Construction of databases on genomes, protein sequences; modelling complex biological processes, including systems biology.
- **Nanobiotechnology:** Applies the tools and processes of nano/microfabrication to build devices for studying biosystems and applications in drug delivery, diagnostics, etc.
- **Other:** *Please specify...*

## OECD efforts to collect biotechnology statistics

---

The **definitions** were then **tested** in several countries.

- In Finland, for example, a questionnaire was elaborated by Statistics Finland
- The questionnaire was sent to 15 Finnish firms known to act in the field of biotechnology
- The purpose was to determine the usefulness of both statistical definitions
- Response rate 12/15
- Result: All firms were able to identify themselves as "biotechnology firms" based on the definitions
- The definitions were also tested in Australia, Canada and Italy.



## **How to collect data on biotechnology:**

There are two ways in which data on biotechnology can be collected :

- By adding a question(s) to an existing survey(s); this approach doesn't increase the response burden too much and still allows for the production of internationally comparable data. (13 member countries chose this method)
- Or by conducting a dedicated biotechnology survey; this is the ideal method but can be costly and time-consuming. (9 MC chose this method)



## **How to collect data on biotechnology:**

At the OECD we explored adding a question to existing R&D surveys.

- The development of biotechnology techniques and resulting products and processes generally involves R&D. As most OECD countries have R&D surveys it was a logical step to consider adding a question to the R&D survey.
- At the 2002, NESTI meeting delegates recommended adding an optional biotech-related question to national R&D surveys of the business enterprise sector.



## **How to collect data on biotechnology:**

The recommended question, which was included in the sixth edition of the *Frascati Manual* (OECD, 2002), is presented hereafter:

- Did the R&D reported above include any biotechnology R&D (include OECD definition of biotech) ----- Yes/No
- If yes, please provide an estimate of the share of the total intramural R&D expenditure reported earlier that is attributable to biotechnology. \_\_\_\_\_%
- 13 OECD countries chose this method



## **How to collect data on biotechnology:**

The OECD also developed a model survey for a dedicated biotechnology collections

- The model survey provides a small set of questions that form a basis for compilation of internationally comparable data. This doesn't preclude having other questions.

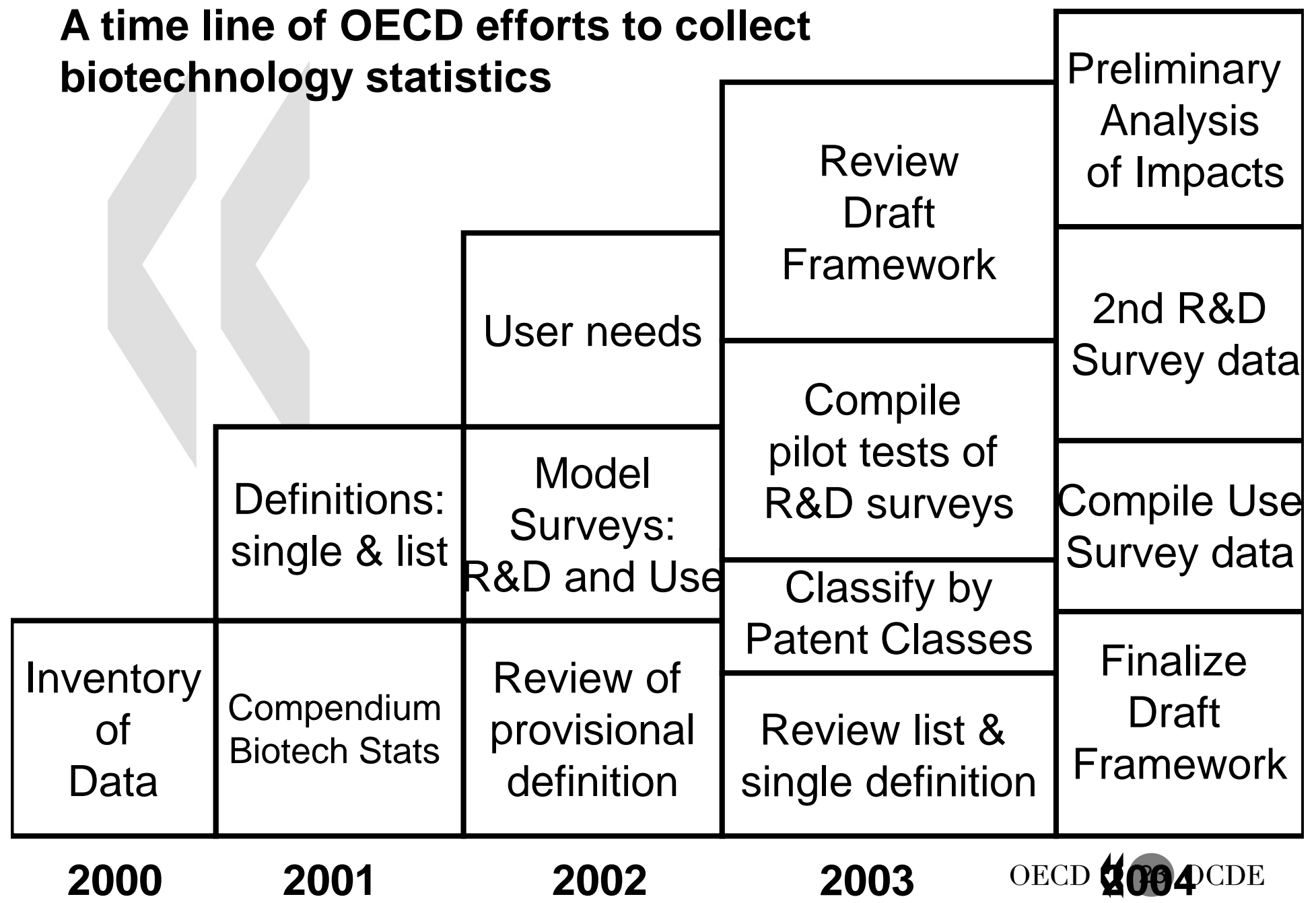


## **How to collect data on biotechnology:**

The OECD model survey for a dedicated biotechnology collections includes:

- The high priority indicators identified are: the number and characteristics of biotechnology firms (including by firm size and industry if possible), revenue generated from sales of biotechnology products, biotechnology R&D expenditures, sources of capital finance, human resources employed, and barriers to biotechnology R&D or commercialisation.

# A time line of OECD efforts to collect biotechnology statistics





# OECD efforts to collect biotechnology statistics

---

The statistical framework is divided into the following chapters:

- Basic definitions to be used for statistical purposes;
- User needs: policy issues to be addressed and indicators to address the above;
- Collection guidelines on how to best compile the above – model survey;
- Set of classifications that can be used;
- Links to other statistical frameworks.

# OECD efforts to collect biotechnology statistics

---

## Links:

- Biotechnology Statistics Inventory is available online  
<http://www.oecd.org/sti/biotechnology/inventory>.
- *Framework for biotechnology statistics*  
<http://www.oecd.org/sti/biotechnology/framework>
- *OECD Biotechnology Statistics 2006*  
<http://www.oecd.org/dataoecd/51/59/36760212.pdf>



# OECD efforts to collect biotechnology statistics

---

Thank you!

[brigitte.vanbeuzekom@oecd.org](mailto:brigitte.vanbeuzekom@oecd.org)