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## **Asian Biotechnology, Innovation and Development Initiative (ABIDI)\***

During the Third Asian Conference on Biotechnology and Development at Manila on 9-10 November, 2006, it was that Asian countries should launch an initiative to evolve an analytical framework for policy makers in the area of biotechnology. The idea is to collect policy relevant statistics for analysing trends in investment, public allocation, availability of manpower and activities of the private sector. This should be done in the context of overall socio-economic requirements in the region.

Adoption of biotechnology in industrial and other activities is a relatively recent phenomenon even in many developed countries. It is expected that the statistics would provide clarity about the governance of biotechnology. It is, therefore, important to outline a statistical framework that allows the measurement of these industrial and developmental activities so that the policy makers may evolve adequate responses. Since in a globalized world innovation is influenced by several interdependent regional systems hence, it would be useful to launch this initiative at the Asian level.

In this note, we first give a brief account of the ABIDI initiative followed by a definition of biotechnology and then of the data collection system in the OECD. We also try to evolve a modified biotechnology statistics framework mainly in terms of commercialization of GMOs, R&D allocations and industry statistics. The last section gives an outline of a possible plan for adoption of statistical indicators for data collection.

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\* Background Note prepared for ABIDI meeting on 25 January, 2007 at New Delhi.

## **The ABIDI Initiative**

Asia has seen a sharp rise in the biotechnology industry in the last decade. The wide-ranging applications of biotechnology in the spheres of pharmaceuticals and agriculture have made this not only an instrument for addressing certain key development issues like food security and health care but it has also emerged as a catalyst for economic growth. No wonder the developing countries have shown great interest in the new technology and the biotechnology industry today has a growing presence in the industrial sector of these countries, particularly in those from Asia.

However, there have been no systematic efforts to put together quantitative details of these advancements. The quantification of various initiatives, at an internationally comparable level could have provided a precise estimation of complementarities that exist in the Asian region for cooperation and also for supplementing national efforts for optimum utilization of available resources. Similarly, there are several issues that deserve the attention of policy makers and researchers for understanding the direction of the S&T policy and its impact on society at large. It is against this background that the ABIDI initiative is being launched.

The idea is to bring together policy community, academics and interested institutions for facilitating greater understanding on the policy aspects related to the innovation and development of biotechnology. The issues related to ABIDI that we wish to discuss in this meeting may be summarized as follows:

- (a) Organizational structure or nature of agencies to be encouraged for collection of biotechnology statistics at the national level,
- (b) How convergence would be achieved in the methods of collection, authentication and curing of data across countries,
- (c) The publication of comparable results at the Asia level would require some resources and an international institutional support not only for financial resources but also for analytical inputs. It is also to be seen whether ABIDI would remain web based or would publish these statistics,
- (d) Another important issue is to see the focus of the survey, that is, to see which among these indicators would be incorporated and what would be the frequency of these surveys, and

- (e) Selecting of a modalities for the initiative for its smooth working.

### **Definition of Biotechnology and International Initiatives for Collection of Biotechnology Statistics**

To maximize comparability of both public and business sector biotechnology statistics, a definition of biotechnology was developed by OECD with the help of an expert group. There are two definitions the OECD came out with. These were updates that were consequent to the field- based experience in some countries.

The first defines biotechnology as *“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.”*

Although the single definition defines the purpose of biotechnology, the list-based definition is essential for identifying modern biotechnology. In the *Biotechnology Statistics 2006* report, the OECD includes data for a few countries that used a different definition of biotechnology, as long as the definition was limited to ‘modern’ biotechnology. This option will still be available in 2008, although we encourage countries to adopt the OECD definition.

#### **OECD list-based definition of biotechnology techniques**

**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.

**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, biodesulphurization, bioremediation, biofiltration and phytoremediation.

**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.

The Working Party of National Experts on Science and Technology Indicators (NESTI) of the Committee for Science and Technology Policy of the OECD has initiated an exercise in data collection in biotechnology for Member countries.<sup>1</sup> In its various meetings, NESTI decided to initiate the exercise after finalizing the definition of biotechnology for statistical purposes. An inventory of policy issues and related indicators has also been prepared. Different working groups have come out with guidelines for the compilation of these indicators along with model questions and surveys. These working groups are also identifying links with other existing manuals like the Oslo Manual and the Frascati Manual. Some of the Member countries have already launched data collection exercise, which we discuss briefly herewith.

Canada is one of the major economies following the OECD definition of biotechnology. Statistics Canada is currently running its fourth dedicated survey on biotechnology covering almost 12,000 firms, with a revenue of \$ 250,000 (Can \$) and using 22 different categories of biotechnology, as per the list-based definition of biotechnology prepared by OECD. Canada has come out with an exhaustive model survey with almost 30 questions spread over several pages.<sup>2</sup>

In France, two surveys have already been conducted for the years 1999 and 2000, while the third survey is all set to be launched in the middle of 2002.<sup>3</sup> This survey is to cover 1500 firms engaged in biotechnology. Plans are also being worked out to incorporate the results of these surveys in the Annual R&D survey of France. There are two

major government departments in France, viz. the Bioengineering Department and the Bureau of R&D Statistics, which together conduct the biotechnology surveys, since 2001. Before this, the Bioengineering Department was managing its own database of firms entering incubators, awarded by the annual national contest by the firms' creation and voluntary registrations in the national database, while the Bureau of R&D statistics relies on their own surveys. The first in the series was launched in 2000.

In the United States, the National Science Foundation (NSF) of the Department of Commerce has launched a limited data collection exercise of biotechnology statistics.<sup>4</sup> Since 2001, data about biotechnology was being collected as part of the Survey of Industrial Research and Development, as was being done for other technologies like information technology and material synthesis. However, realizing the importance of biotechnology in the economic growth, it has been decided to make Bureau of Industry and Security (BIS) as the lead agency to collect statistics on biotechnology from 2002 onwards. In order to facilitate this exercise, an inter-agency working group has been constituted. This survey would be mandatory in nature.

Similarly, Japan and Australia have also conducted their first limited surveys in the years 2000 and 2001, respectively. Australia has developed the Australian FoS classifications that are relevant to biotechnology.<sup>5</sup> Australia will shortly include FoS in their next R&D survey. The results are expected in twelve months time. Australia will report the results of this survey back to the Ad Hoc group in 2003, which will serve to guide the group as to the final levels of FoS in the future.

Actually, OECD is facilitating the evolution of a common approach towards biotechnology data collection so that international comparison becomes easier. At this point, there are significant differences in terms of approach towards data collection, definition of biotechnology and variables being covered among different OECD Member countries.<sup>6</sup> However, the core 6 issue remains centred around the financial cost, lack of expertise and regulations and finally, the market uncertainty. Canada and New Zealand distinguish four major areas for biotechnology processes namely: (a) DNA-based processes; (b)

Biochemistry and immunochemistry; (c) Bioprocessing, and (d) Environment. The French survey does not distinguish major categories. Within these major categories, several sub groupings are distinguished. These are fairly similar for Canada and New Zealand, and differ somewhat with those identified in France. Similarly, these country surveys approach the question of barriers in adoption of biotechnology in different ways. The Canadian survey requests information on barriers to biotechnology use, whereas the New Zealand survey requests information on barriers to R&D in biotechnology while the French survey does not ask for barriers.

In the *Biotechnology Statistics 2006* report, the OECD includes data for a few countries that used a different definition of biotechnology, as long as the definition was limited to 'modern' biotechnology. This option will still be available in 2008, although we encourage countries to adopt the OECD definition.

### **Proposed Plan for Asia**

In case of Asia, we are beginning the biotechnology statistics collection exercise with the following template.

1. Please list the publicly-funded biotechnology R&D programmes that exist in your country in the table below. For each programme, please provide as much of the information below as possible. Please use another sheet if you have more than three biotechnology R&D programmes.
  1. Name of the key funding agency (ies) dealing with biotechnology
  2. Year of launching of first biotech initiative (both research and commercial)
  3. Generic areas of funding (e.g. Agriculture, Medical, Animal, etc.)
  4. Implementing Agencies
  5. Amount of funding total and approximate funding (US \$) during last 5 years
  6. Primary recipients of funding (e.g. private sector, higher education, government research organizations)
  7. Cost-sharing between funding agencies and R&D performers (if any)
  8. Web address (URL) of key government agency dealing with biotechnology.

2. Please provide available official statistics on biotechnology R&D performed or funded by the government. Where possible, please break out funding by type of performer (government, business, higher education, other), by type of application (e.g. health, agriculture, environmental, industry) and by type of instrument used (e.g., institutional funding, contracts or grants).
3. Please provide available official statistics on the estimated number of researchers (or science and technology personnel) in the biotechnology sector. If possible, please distinguish among researchers in the business, higher education and government sectors.
4. Please provide number of private sector companies (if possible sectors-wise distribution and their turnover).

### **First Meeting of ABIDI**

At the informal meeting organized by RIS and Department of Biotechnology (DBT), Government of India, the Asian Biotechnology Innovation and Development Initiative (ABIDI) was launched in New Delhi. The meeting was inaugurated by Dr. Nagesh Kumar, Director General, RIS. The perspectives on ABIDI were discussed by Dr. S. R. Rao, Adviser, DBT. Professor Anthony Arundel of OECD, Paris set the tone for discussion by focusing his presentation on 'Biotechnology Indicators for Public Policy'. Professor Anthony and Ms. Brigitte Vanbeuzekom of OECD also gave an overview on biotechnology statistics collection plan of OECD for 2008-09.

The meeting was attended by Dr Nina Gloriani, The Philippines, Dr Virginia G. Novenario-Enriquez, The Philippines; Dr Prasartporn Smitamana, Thailand, Ms Watcharin Meerod, Thailand; Dr Karim Maredia, MSU; Prof Dongsoon Lim, South Korea; Dr Ann Jinhui, China; Dr Bambang Purwantara, Indonesia; Dr Durga Datta Dhakal, Nepal; Prof Phua Kai Hong, Singapore; and Dr Anil Jayasekera, Sri Lanka.

The Indian participants included Dr K. K. Tripathi, DBT, Dr A. K. Harit, DBT, Dr K. Satyanarayana, DDG, ICMR; Dr V. S. Reddy, ICGEB; Dr Vibha Dhawan, TERI; Mr N. Srinivasan, UNAPCTT while the private sector was represented by Dr A. S. Kataria, Seed Association of India; Dr R. K. Sinha, All India Crop Biotechnology Association and Ms Rolly Duhera, BioSpectrum.

## Endnotes

- <sup>1</sup> Some non-Member countries like India and Israel have also been involved recently.
- <sup>2</sup> Rose (2002). 'Update on the Biotechnology Statistics Programme in Canada'. A paper submitted at the working party of National Experts on Science and Technology Indicators, Finland, 13-15 May 2002.
- <sup>3</sup> Francoz, Dominique (2002). 'The State of Biotechnology Statistics in France'. A paper submitted at the working party of National Experts on Science and Technology Indicators, Finland, 13-15 May 2002.
- <sup>4</sup> Beuzekom, Brigitte van (2002). 'Update on Biotechnology Statistics in the United States'. A paper submitted at the working party of National Experts on Science and Technology Indicators, Finland, 13-15 May 2002.
- <sup>5</sup> Byars, Derek (2002). 'Australia: Identification of Fields of Science Relevant to Biotechnology R&D'. A paper submitted at the working party of National Experts on Science and Technology Indicators, Finland, 13-15 May 2002.
- <sup>6</sup> Pilat, Dirk (2002). 'Detail on some key survey questions in biotechnology use surveys'. A paper submitted at the working party of National Experts on Science and Technology Indicators, Finland, 13-15 May 2002.