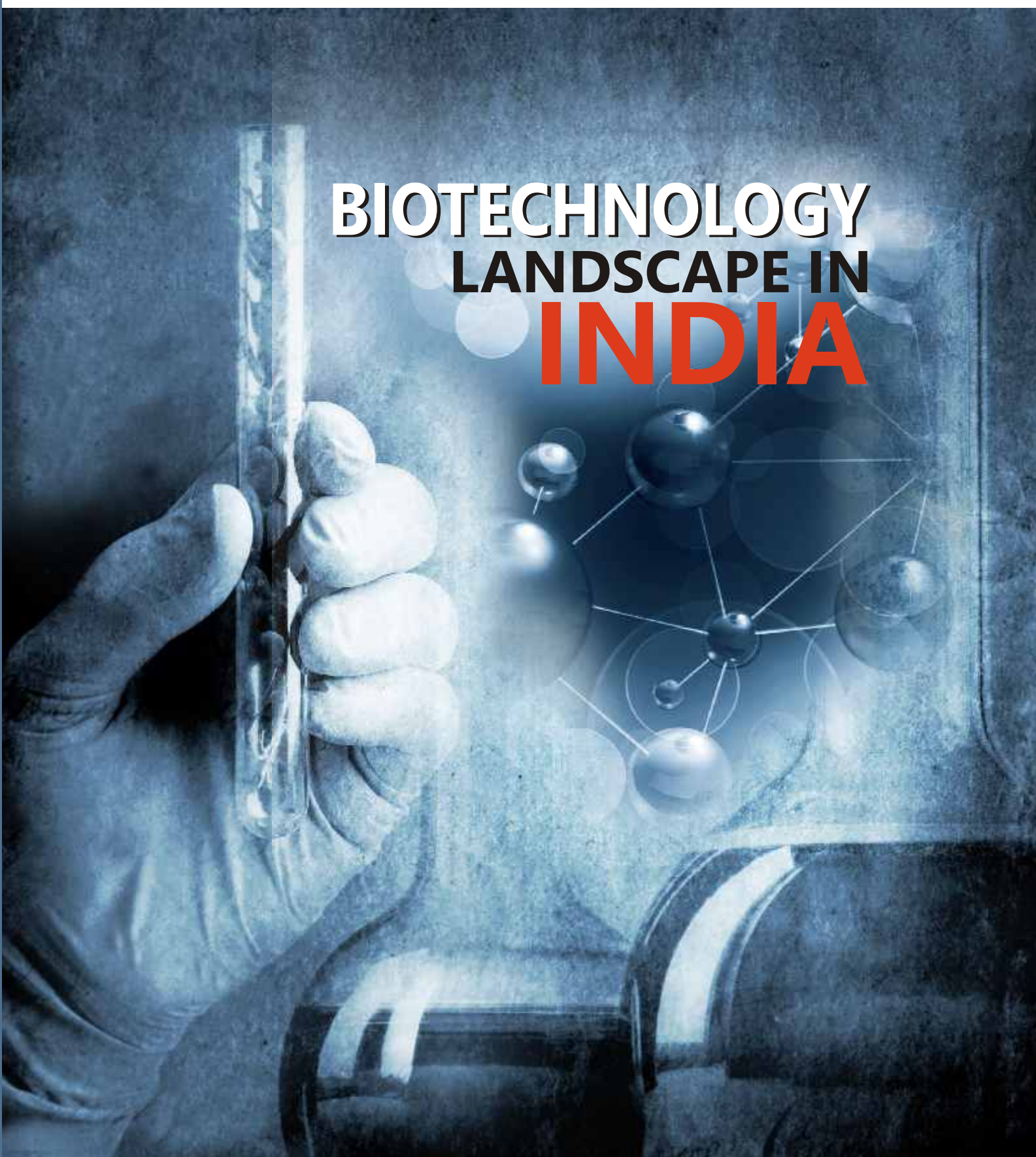
सत्यमेव जयते

Department of Biotechnology
Government of India

FICCI



BIOTECHNOLOGY LANDSCAPE IN INDIA

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ANNEXURE 35

Biotechnology Sector in India

1. Overview

The booming Indian biotech industry grew at a CAGR of 18.5 % in FY 20011-12 and generated total revenues of Rs 20440.7 crore (US$ 3766 million). Indian biotech industry has been growing at a double-digit rate over the last five years (CAGR 19.2%, 2007-2012). The year-on-year growth of the biotech market is expected to accelerate driven by high demand for vaccines, biopesticides, biofertilizers, biodiesel, biotherapeutics and medical devices in India as well as at the global level. Exports revenue for 2011-12 was estimated to be Rs. 9841.5 crore (US$ 1813 million) and registered a growth of 11% over FY 2010-11.

- According to the "India in Business", Ministry of External Affairs, Govt of India the forecast for 2015 is that the Indian biotech industry would have annual revenues in excess of US$13 billion.
- According to Global Industry Analysis-The Biotechnology industry in India is expected to reach US$11.6 billion by 2017.

India is already ranked among the top 12 biotech destinations worldwide and third largest in the Asia-Pacific region. The field of Biotechnology in the last decade has already made a significant impact in agricultural, industrial, pharmaceutical and medical sectors. For achieving these goals, trained human resource is required. This was visualized in 1982 by the then National Biotechnology Board (NBTB) and initiated an "Integrated Programme of Human Resource Development". The Department of Biotechnology was the first government body in the country to start Human Resource Development in Biotechnology program in a big way. DBT has covered general biotechnology, agricultural biotechnology, medical biotechnology, marine biotechnology, bioinformatics, Industrial biotechnology, Pharmaceutical biotechnology and biochemical engineering and Biotechnology subject areas for the human resource development.

Several states in India have taken their own initiatives in terms of defining their own biotech policies to give an impetus to the industry in this sector and to biotechnology in India as a whole. They are encouraging research activities, establishing links between their research institutions and industry. Several concessions are being offered to the industry in terms of single window clearance, speedy customs clearance, exemption from tax, creation of funds to be used for the incubation of new project. The industry is concentrated around major Bioclusters: Maharashtra, Karnataka, Uttar Pradesh, Andhra Pradesh, NCR & Gujarat.

Bengaluru is the home to the biggest bio cluster in India with 137 Biotechnology companies, making it 40% of the total 340 such units in the country as per Government of India-Ministry of MSME report August 2012.

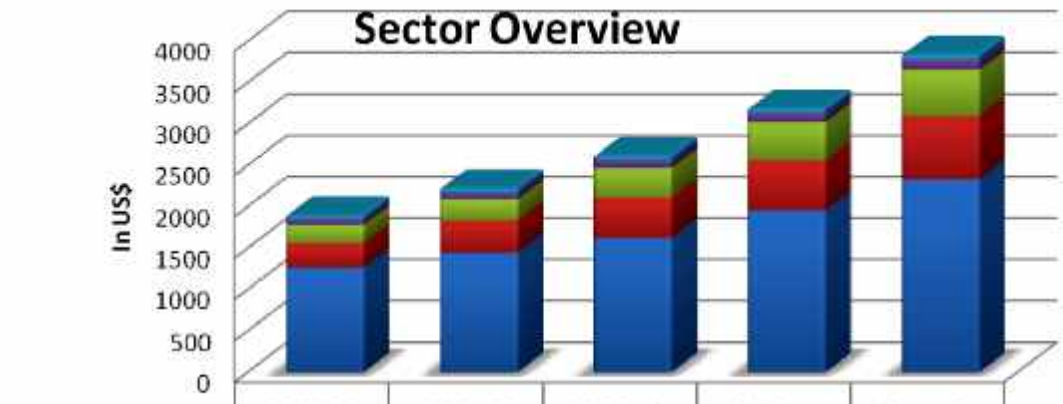
Highlights during FY 2011-12

- Industry recorded growth at 18.5%
- BioAgri grew at 23%
- BioServices registered 15.50% growth
- Exports accounted for 48% share of total revenue

The Indian Biotech sector may be seen to comprise of

1. BioPharma
2. BioServices
3. BioAgriculture
4. BioIndustrial
5. BioInformatics

Figure 1-Biotech Industry Statistics (2007-12)[1]



	2007-08	2008-09	2009-10	2010-11	2011-12
BIOINFORMATICS	35.01	40.54	42.56	44.59	54.91
BIOINDUSTRY	75.54	88.08	103.92	115.33	128.43
BIOAGRI	221.3	260.36	356.73	465.97	556.99
BIOSERVICES	289.66	379.95	486.27	597.94	764.88
BIOPHARMA	1271.23	1452.55	1626.86	1963.33	2336.28

[1] *$1 =Rs. 54.35*

Table 1 -Top 5 Indian Biotech firms by Revenue (2011-12)

REVENUE RANK	COMPANY	WEBSITE	LOCATION	2011-12 REVENUE (Rs Cr)
1	Serum Institute of India	www.seruminstitute.com/	Pune	1708.001
2	Biocon	www.biocon.com/	Bangalore	1676.401
3	Nuziveedu Seeds	www.nuziveeduseeds.com/	Secundrabad	745
4	Reliance Life Sciences	www.rellife.com/	Mumbai	693
5	NovoNordisk	www.novonordisk.co.in/	Bangalore	647.28

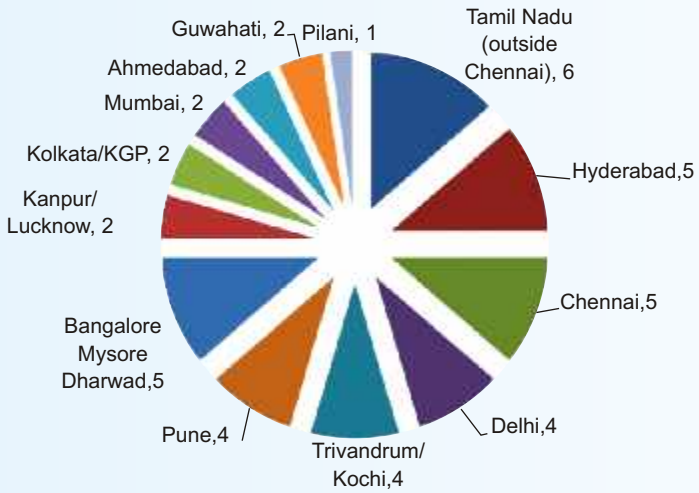
Source- Biospectrum, June 2012, List of Biotech companies in term of revenue.

2. Review of Industry segments

The biotechnology sector is among the fastest growing knowledge-based ones in India.

* Human health biotech products account for 60% of the country's total biotech market.
* Agri-biotech and veterinary products account for another 25% market share while medical devices, contract R&D, reagents and supplies constitute the remaining 15% share.
* R&D development in India mainly nurtured by various government funding agencies.
* Biotech industry grew at 18.5% annual rate with total worth of Rs 20440.7 crore in 2011-12.
* India has 26 operational biotech parks, 46% are in the western parts of the country.

Figure 2-Biotech Industry Sector Composition (2012)[2]

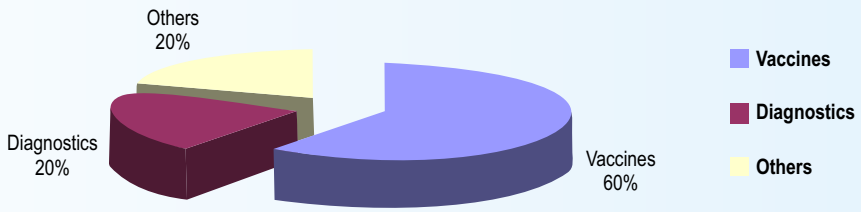


[2] *$1 =Rs. 54.35*

2.1 Biopharma

The Indian BioPharma segment is the largest segment of the Biotech Industry in India and continued to grab the largest share of the total biotech industry revenues in 2010-11. It accounts for approx 62% of the total market share. BioPharma segment grew at a CAGR of 12.94 % in 2011-12. It contributed Rs 12,679 crore (US$ 2336 million), accounting for 60 percent market share. The large majority of biopharmaceutical products are pharmaceuticals that are derived from life forms. Small molecule drugs are not typically regarded as biopharmaceutical in nature by the industry. The Indian BioPharma market comprise mainly of vaccines, diagnostics, therapeutic drugs, insulin, animal biologics and statins. Therapeutics, vaccines and diagnostics formed the backbone of the growth story, each contributing significantly to the revenue. It is estimated that by 2016, 10 of the top selling 20 drugs will be biologics, according to the Datamonitor Report Pharmaceutical Key trends 2011-Prescription Pharmaceutical Sales 2011. India's biopharmaceutical sector is well differentiated as it has gained recognition of the global biotechnology and therefore referred to as the bio-economy. The Indian market for both therapeutic and diagnostic antibodies is expected to grow exponentially in the coming years.

Figure 3-Biopharma segment breakup



Vaccines contributed largest share to the total Biopharma sales with estimated sales of Rs 3269 crore (US$ 602 million). in FY 2011-12 over last year's figure of Rs 2,266 (US$ 417.5 million). The private sector vaccines market has recorded a growth of about 25 percent. 60 percent of the total volume of vaccines manufactured in India is exported.

The domestic biopharmaceuticals business saw a significant rise in its revenues to $1.3 billion during 2011-12, accounting for 51 percent share of the total revenue. Revenues made from export of biopharmaceuticals were to the tune of $1.2 billion, comprising mainly of statins and vaccines. The private sector vaccines market has recorded a growth of about 25 percent. Government procurement for immunization programs has seen an increase during 2011-12.

The diagnostics market revenue in 2011-12 touched US$ 600 million as against US$ 510 million in 2010-11. The diagnostics market in India is witnessing a 20 percent growth which is the faster than any country in the world. Molecular diagnostics accounts for about 30-40% of total market. Cancer

therapeutics is a lucrative business for many Indian companies because of high unmet needs, high prices of innovator drugs, increase of awareness and affordability.

Biogenerics segment in the near term will be a key growth driver for Indian players especially with the US set to establish a biogenerics (biosimilars) pathway by 2013.

Table 2-Top 20 BioPharma Companies by Revenue (2011-12)

RANK	COMPANY	WEBSITE	REVENUE IN $ MILLION 2011-12	REVENUE IN $ MILLION 2010-11
1	Serum Institute of India	www.seruminstitute.com/	346	216
2	Biocon	www.biocon.com/	341	301
3	Reliance Life Sciences	www.rellife.com/	141	103
4	NovoNordisk	www.novonordisk.co.in/	132	97
5	Panacea Biotech	www.panaceabiotec.com/	78	194
6	Bharat Biotech	www.bharatbiotech.com/	66	55
7	Bharat Serums & Vaccines	www.bharatserums.com/	61	47
8	Eli Lily	www.lilly.com/	59	43
9	Indian Immunologicals	www.indimmune.com/	57	55
10	Sanofi Pasteur India	www.sanofipasteur.in/	53	34
11	GlaxoSimthKline	www.gsk-india.com/	52	37
12	Haffkine Bio-Pharmaceutical	vaccinehaffkine.com/	36	18
13	Sanofi India (Formerly Aventis Pharma)	www.sanofi.in/	34	19
14	Concord Biotech	www.concorindia.com/	30	26
15	Pfizer(Wyeth India)	www.pfizerindia.com/	21	15
16	Biological E	www.biologicale.com/	20	52
17	Novatris Vaccines	www.novartis.in/	20	19
18	Dr. Reddy's Laboratories	www.drreddys.com/india/	18	14
19	Cadila Healthcare	www.zyduscadila.com/	12	11
20	Bharat Immunologicals & Biologicals	www.bibcol.com/	10	-

Source- Biospectrum, August 2012, List of Top 20 BioPharma companies

2.2 Bioservices

The bioservices sector witnessed a growth of 15.5 % in 2011-12. The sector touched a revenue of Rs. 4152 crore (US$765 million) as against last year's revenue of Rs. 2876 crore (US$530 million). India's leading players in contract research area maintained a good customer base that helped them to maintain a decent growth during last year. Many companies have set up contract research and clinical research services operations in India during the past few years and the number is expected to grow faster considering the potential opportunity as Global companies are viewing India as a favorite destination for outsourcing services.

Clinical Trials

The global clinical research industry is moving toward emerging markets in Asia, Latin America and Eastern Europe, for clinical research. There are over 115 clinical trial and contract research companies operating in India which have been offering all kinds of services to sponsors. India follows the international guidelines and all the stakeholders are working towards making the process stringent to avoid earning a bad name. Over 80 hospitals are currently equipped to conduct the trials according to global standards.

Figure 4-Share of India in Global Patient Enrolment

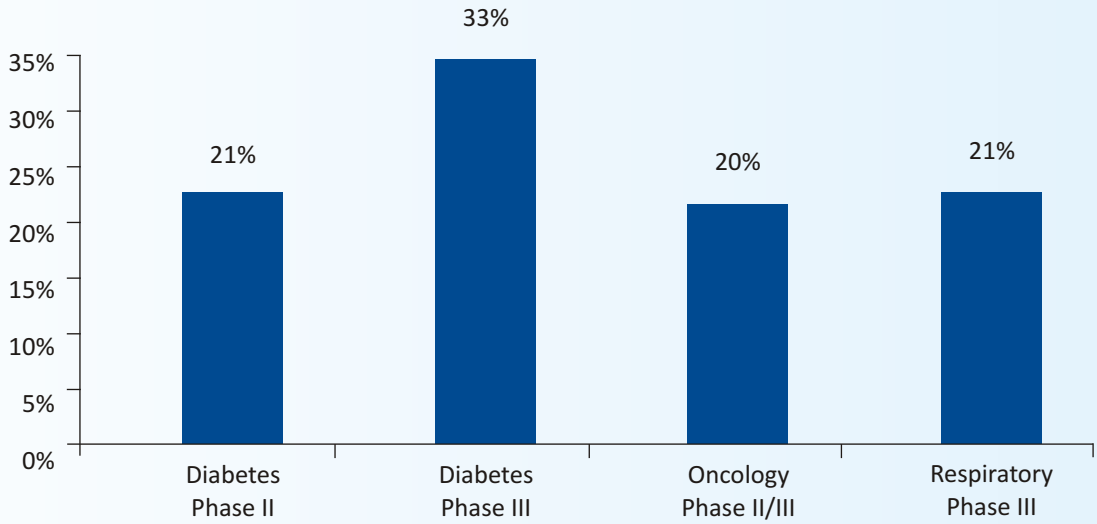
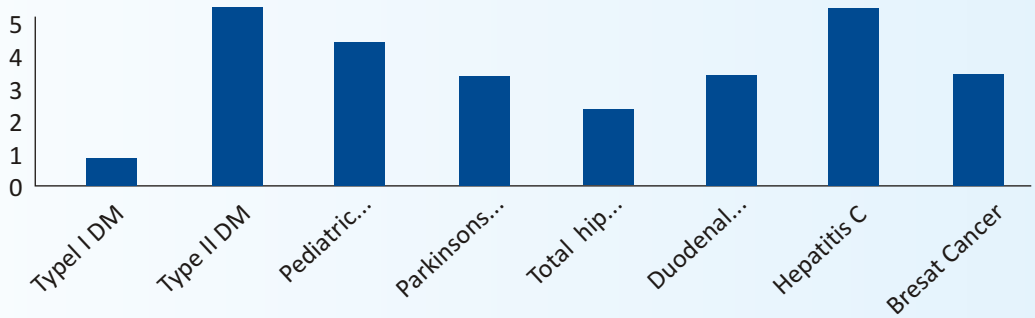


Figure 5- Recruitment rate - Patients/ per month/ per site



Stem Cells

The global market for stem cell therapies was expected to be Rs 92,593 crore ($22 bn) by 2011. Adult stem cell therapy currently dominates the global stem cells market with a share of almost 60%. The current stem cell therapy market in India is approximately $540 million and it is expected to grow rapidly. The growth of the stem cell industry worldwide According to one published report, the growth potential of stem cell industry is expected to hit over US$60 billion by 2015 from an estimated value of US$20 billion that was projected in 2011.

Recent approval of clinical trials of stem cell-based drugs by the Drug Controller General of India (DCGI) is seen as an important step forward towards development of stem cell therapy.

ICMR and the Department of Biotechnology (DBT) have laid down the fundamental guidelines for stem cell research and therapy and are holding nationwide consultation on the draft guidelines to streamline it with global standards and regulations.

Availability of skilled manpower and initiatives taken by the government in creating appropriate infrastructure for stem cell research are attracting collaborative research projects. The initiative taken by the DBT in creating a world-class stem cell research center in Bangalore is another positive step in nurturing value-added stem cell research in India. India has the opportunity to be a global force in biotechnology and stem cell research can be an important constituent of this aspect of global leadership in this frontier technology area.

Medical Devices

Healthcare sector is one of the large & fast growing sectors in India with an annual turnover of $ 40 Bn with a 10-12% annual growth rate. 72% of the healthcare sector is dominated by the Healthcare services i.e. hospitals, labs, physicians & other services. Medical Device & Equipments sector contributes only 6% of the total healthcare sector at $ 3 Bn and is growing at 15%. As per the Global Medical Device Nomenclature (GMDN) there are > 14,000 different products types (Ranging from wound closure pads to stents to IVD machines) of medical devices. Medical Device sector helps reducing disease burden to patients, families, society & India's health system. Some of the leading medical devices companies in India are:

Table 3: List of Medical Devices Companies In India

Sl No.	COMPANY	WEBSITE	LOCATION
1	3 M India Ltd	http://www.3m.com/	Bangalore
2	India Medtronic Pvt Ltd	www.medtronic.co.in/	Mumbai
3	Johnson & Johnson Ltd.	www.jnjindia.com/	New Delhi
4	Becton Dickinson Abbott Vascular	www.bd.com/india/	Haryana
5	Bausch & Lomb	www.bausch.in/	Haryana
6	Sushrut Surgicals Pvt Ltd	www.sushrut.com/	New Delhi
7	Zimmer India Pvt. Ltd.	http://www.zimmer.com/en-IN/index.jspx	Haryana
8	Edwards Life Sciences	www.edwards.com/	Mumbai
9	Trivitron Diagnostics Pvt Ltd	www.trivitron.com/	Chennai
10	Stryker	www.stryker.com/	Haryana

2.3 BioAgri

Agricultural biotechnology is now the third largest sector in the domestic biotech industry, with total revenues of Rs. 24.8 billion ($557 million) in FY 2010-11, a 28% growth over the previous year. Current estimate of benefit to India with a single biotech crops is about US$ 15 billion. The revenue share of agricultural in the total biotechnology industry revenue has grown over the past five years from less than five percent to over 14 percent in 2010-11. There are more than 30 companies marketing Bt cotton seeds in India. India has almost 8.4 million hectares of area under Bt cotton cultivation.

Table 4-Top 10 BioAgri Companies by Revenue (2011-12)

RANK	COMPANY	Website	REVENUE IN $ MILLION 2011-12	REVENUE IN $ MILLION 2010-11
1	Nuziveedu Seeds	www.nuziveeduseeds.com/	152	128
2	Rasi Seeds	www.rasiseeds.com/	80	78
3	Ankur Seeds	www.ankurseeds.com/	66	52
4	Mahyco	www.mahyco.com/	64	75
5	Krishidhan Seeds	www.krishidhanseeds.com/	35	58
6	Nath Seeds	http://www.nathseeds.com	18	6
7	JK Agri Genetics	jkseeds.net/	10	7
8	Mavens Biotech	www.mavensbiotech.com/	9	12
9	Excel Industries	www.excelind.co.in/	2	3
10	Metahelix	www.meta-helix.com/	1	-

Source- Biospectrum, August 2012, List of Top 10 BioAgri companies

2.4 BioIndustrial

BioIndustrial Sector, also known as White Biotechnology, uses cells or components of cells like enzyme, organic amino acids and yeast to produce industrially useful products. Enzymes, which constitute a major segment of this sector, are used in industrial processing of starch, distilleries, alcohol, textile & garments, leather processing as well as for supplementing healthcare products. The BioIndustrial market primarily comprise of Industrial enzymes The Indian bioindustrial sector registered a 11.2 percent growth in its revenues with total sales of Rs. 697 crore (US$128 million. The multinationals contribute about 65 percent of the market while the rest is met by the local players. However, the share of local players has been increasing over the last three-to-four years as these companies realize the huge potential. The companies are enhancing their R&D facilities and staff, establishing manufacturing plants, and a comprehensive distribution network. In addition to importing enzymes for different purposes, India also exports enzymes. The domestic consumption of enzymes for 2011-12 stood at about US$110 million, while the exports raked US$32 million in revenues during the period. Analysts commonly classify bioindustry firms under the following five headings based on their end markets:

- **Therapeutics**: products that cure or reduce the incidence of disease.
- **Diagnostics:** products that test for the presence of various health or disease states.
- **Bioremediation and new high technology applications:** bioremediation involves using biotechnology-designed organisms to clean up oil or other spills. Researchers are creating new sources of energy and linking biotechnology with microelectronics, nanotechnology and other high technology industries.
- **Bioindustry suppliers:** specialized materials, equipment or services for other bioindustry firms. Such products include reagents (substances used in chemical reactions), specialized software, and technical instruments for gene splicing.

Table 5-Top 5 BioIndustries by Revenue (2011-12)

RANK	COMPANY	WEBSITE	REVENUE IN $ MILLION 2011-12	REVENUE IN $ MILLION 2010-11
1	Novozymes South Asia	www.novozymes.com/	297.66	242
2	Advanced Enzymes	www.enzymeindia.com/	180	154
3	Rossari Biotech	www.rossari.com/index.html	79.2	72
4	Maps(India)	www.mapsenzymes.com/	58	48
5	Titan Biotech	www.titanbiotechltd.com/	22.52	18.69

Source- Biospectrum, June 2012, List of Top 5 BioIndustrial companies

The enzymes sector in India has been growing at about 11.47 percent in the last 10 years and is expected to see a growth of 11.17 percent in 2012-13. In recent years, enzymes have also found numerous applications in the food, pharmaceutical, diagnostic and chemical processing industries. The Indian market is spearheaded by global leaders such as Novozymes South Asia, Danisco (India), DSM Nutritional Products India, and Chr. Hansen (India). Besides, there are many domestic enzyme

manufacturers, such as Advanced Enzymes, Lumis, Maps and Anthem. The pharmaceutical enzymes segment is relatively nascent and is the focus of a small group of specialized manufacturers. Meanwhile, the textile and leather enzyme segments are mature, while the detergent enzymes segment is in the growth stage.

2.5 BioInformatics

In 2011-12, the sector recorded a growth of seven percent clocking. The department of biotechnology (DBT) initiated the program on bioinformatics way back in 1986-87. The Biotechnology Information System Network (BTIS), a division of DBT, has covered the entire country by connecting to the 57 key research centers. The sector had witnessed an increase in the domestic revenue during last year. This rise was attributed to factors such as increase in public funding towards research and development (R&D) from the Government of India, decline in costs of human genome sequencing, increase in R&D investments by companies, and increase in the number of orders for contract research activities. In 2011-12 the sector recorded a growth of 9.6 percent clocking Rs 265.7 crore in 2011-12.

The Indian bioinformatics market, which is the smallest of biotech industry segments constituting barely 2% of the market share in overall revenue, grew by 11.5% in FY 2010-11 to reach US$ 58 Million. Tata Consultancy Services (TCS) and Council of Scientific and Industrial Research (CSIR) have launched 'Bio Suite', the country's first comprehensive software for bioinformatics which caters to the needs of fields such as biology, post-genomic drug discovery and other related areas. Bio Suite was developed under the New Millennium Indian Technology Leadership Initiative programme (NMITLI). Indian bioinformatics market is focused on biological database creation and management; data analysis and visualization tools; and services and IT infrastructure. Companies from IT and life science sector are gradually gaining traction in bioinformatics industry by developing innovative products and services. Rising R&D activities coupled with the favorable government activities is primarily driving the market. Further, the continual increment in the healthcare expenditure amongst Indians is fueling growth in the market.

Table 6-Top 5 Bioinformatics Companies by Revenue (2011-12)

RANK	COMPANY	WEBSITE	REVENUE IN $ MILLION 2011-12	REVENUE IN $ MILLION 2010-11
1	Strand Life Sciences	www.strandls.com/	49.14	42
2	Ocimum Biosolutions	www.ocimumbio.com/	49	65
3	Molecular Connections	www.molecularconnections.com/	48.9	-
4	Geschickten	geschickten.com/	0.45	0.65
5	NovoInformatics	www.novoinformatics.com/	0.2	-

Source- Biospectrum, June 2012, List of Top 5 Bioinformatics companies

3. Biotech Parks and Incubators in India

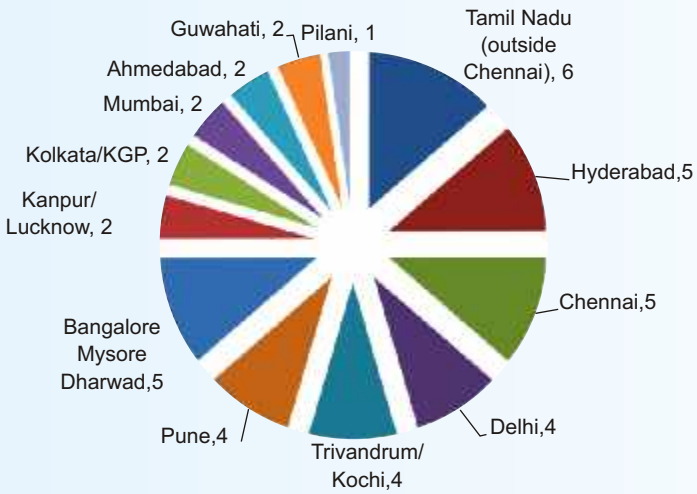
Both, the Central and State governments are setting up biotech parks, incubators as well as pilot projects to promote and encourage entrepreneurial ventures in biotech and provide a template for promotion of biotech startup companies. The Indian government is additionally establishing several biotech parks and incubators. Some existing biotech parks/incubation centers area unit in Uttar Pradesh, Hyderabad, Kerala, Himachal Pradesh, and urban center. Around 150 Incubators and Science & Technology Parks are currently functional in India.

Table 7: List of Biotechnology Parks In India

PARKS	WEBSITE	CITY
Alexandria Centre for Science and Innovation		Hyderabad
ICICI Knowledge Park	http://www.ikpknowledgepark.com/	Hyderabad
International Biotech Park	www.ibpl.net/	Pune
Lucknow Biotech Park	www.biotechpark.org.in/index1.htm	Lucknow
Golden Jubilee Biotech Park	www.biotechpark.co.in/	Chennai
Ticel Bio Park	www.ticelbiopark.com/	Chennai

Source- IBEF Report, November 2011

Figure 2-Biotech Parks & Incubators Distribution



Source- BCIL-July 2012 PPT report.

4. Central Government Initiatives

Indian Government plays a vital role in promotion of Biotech Sector in India. Various Ministries under Govt. of India have set up scientific research institutes and also through its various schemes offers technical and financial assistance to the individuals and research institutes.

The Ministry of Science and Technology has three Departments under its aegis: (i) Department of Biotechnology (DBT); (ii) Department of Science and Technology (DST) and Department of Scientific and Industrial Research (DSIR) under which the Council of Scientific and Industrial Research (CSIR) operates.

4.1 Department of Biotechnology

Department of Biotechnology (DBT) is the nodal agency under the Ministry of Science & Technology, Government of India for the promotion of research, development and innovation in the field of biotechnology. DBT funds and supports all Indian universities, research organisations, non-governmental organisations and companies / industry working in the area of biotechnology. These will include institutes under CSIR, Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), Defence Research and Development Organisation (DRDO) etc.

DBT is mandated to achieve excellence in the field of biotechnology for the benefit of society, environment, entrepreneurs, trade and industry who are partners in growth.

The Department provides support for the promotion of research, establishment of infrastructure, generation of human resource, popularization of biotechnology, encouragement of industry (company) participation in research, creation of centers of excellence, bio-clusters and biotechnology parks, implementation of biosafety guidelines for genetically modified organisms and recombinant DNA products and biotechnology based programs for societal benefits.

DBT has structured programmes aimed at bridging technology gap, training of scientific manpower in state of art technologies and creating environment for the development of cost effective innovative technologies.

The Department has achieved significant growth in the application of biotechnology in the area of agriculture, health care, animal health, animal sciences and environment.

DBT has entered into bi/multi-lateral strategic alliance with a focus on global challenges. Vision behind these alliances is to promote scientific excellence & capacity building, triggering of innovation environment amongst industry and academia alike. Successful collaborations have been established with strategic partners like Australia, Canada, Denmark, Finland, Germany, Japan, Norway, Netherlands, Spain, Sweden, Switzerland, UK, USA and EU.

DBT also works with international non-governmental organizations such as Wellcome Trust and Gates Foundation.

Mandate include:

- Central coordinating and policy making organization in biotechnology
- Funds research and development in biotechnology
- Developing critical mass of skilled human resource
- Establishment of state-of-the-art infrastructure facilities
- Establishment of centres of excellence
- Provide framework and guidelines for regulatory policies

The details of DBT and its institutes is available in the website: dbtindia.nic.in/index.asp

4.1.1 MAJOR INSTITUTES IN INDIA SUPPORTED AND FUNDED BY DBT INCLUDE:

National Institute Of Immunology, New Delhi: NII is an autonomous institution supported by the Department of Biotechnology, Government of India with a commitment to advanced research in basic mechanisms involved in body's defense, host-pathogen interactions and related areas for potential use in health care. The institute has developed, validated and technology transferred to the industry, e.g. technique by which it may be possible for patients to take a shot of insulin just once every four to five months. The following diagnostic kits for the following have been developed: pregnancy, typhoid, hepatitis B, amoebic liver abscess and intestinal amoebiasis. The Institute has developed an ELISA test to detect the presence of HIV- 1 and HIV-2 Antibodies in serum with high specificity to the local strains.

Website: http://www.nii.res.in/

National Brain Research Center, Manesar: NBRC is a major neuroscience research group, situated in Haryana, India. It is an Autonomous Government Institute accredited with a deemed university status and is a nodal center under Department of Biotechnology of the Ministry of Science and Technology, Government of India. The center is dedicated to provide infrastructural facilities and a coordinated multidisciplinary team to work at the frontiers of neuroscience research and network the existing groups and whenever required, create satellite units to catalyze the overall growth of this discipline in the country. Research carried out at NBRC encompasses breadth of neuroscience from Cellular and Molecular Neuroscience, Developmental Neuroscience, Systems and Cognitive Neuroscience to Computational Neuroscience and Brain Imaging

Internationally, NBRC has collaborations with RIKEN Brain Science Institute, Japan, National Institute of Mental Health (NIMH), USA, Pavlov Institute, Russia, Institute National de la Santé et de la Recherché Médicale (INSERM), and France.

Website: http://www.nbrc.ac.in/

DNA Fingerprinting & Diagnostics, Hyderabad- CDFD is an autonomous organization funded by the Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India. The centre is equipped with world class state-of-the-art instrumentation and computing infrastructure to

facilitate working in frontier areas of research in Life Sciences. There are around fifteen groups working on diverse research areas and the centre continues to attract leaders in related disciplines. CDFD is supported with a strong Bioinformatics facility.

Website: http://www.cdfd.org.in/

Institute of Bioresources and Sustainable Development, Imphal: IBSD was established in the year 2001 to carry out research and development work in basic and applied areas of bioresources conservation, management and utilization of the mega biodiversity of the region. Presently Institute carries out research work in Plant, Microbial, and Bioresources database development of the North Eastern region. The key objectives of the Institute are to study and document the unique biodiversity of bio-geographic junction of the Indian and oriental landmasses, to develop biotechnological interventions for sustainable development and utilization of bioresources and undertake capacity building in bioresources conservation and management.

Website: http://www.ibsd-imphal.nic.in/

Institute of Life Sciences, Bhubaneswar: ILS has a research programme that strategically plans to address issues on infectious disease biology in experimental as well as human models. The mission is to use cutting edge technology in modern biology to acquire insights into pathogen biology, immune-regulation and protective immunity and inflammatory processes at cellular and molecular levels. The research interests of the faculty are in three major areas: (a) Infectious Disease Biology, (b) Gene Function and Regulation and (c) Translation Research and Technology Development. In addition, new collaborations with industry have been established to tap commercial potential of laboratory science.

Website: http://www.ils.res.in/

National Institute of Plant Genome Research, New Delhi: NIPGR is an autonomous institution supported by the Department of Biotechnology, Government of India. The research programme of the institute aims to contribute to the understanding of the structure, expression and function of genes along with arrangement of genes on plant genomes and manipulation of plant genes/genomes to breed improved varieties of food and industrial crops for high yields and of better quality products. NIPGR aims to contribute in the achievement of such hopes arising out of current pace of genomics research.

Website: http://www.nipgr.res.in/

National Center for Cell Sciences, Pune: NCCS took birth as National Tissue Culture Facility in March 11, 1986 with a mandate of basic research, teaching & training, and as a national repository for cell lines/hybridomas etc. The centre has expanded its scientific charter to strengthen basic research in the areas of cancer biology, cell biology, immunology, genomics and proteomics. The vision of NCCS is to accelerate research in modern biology to create new knowledge and technologies for human welfare.

Website: http://www.nccs.res.in/

Rajiv Gandhi Center for Biotechnology, Trivandrum: RGCB is an autonomous National Institute under the Department of Biotechnology, Ministry of Science & Technology. The institute aims to be an international hub of biotechnology with a major emphasis on research programs in disease biology and molecular medicine. RGCB also has take up development of advanced diagnostics for assessing diagnosis, prognosis and disease course for cardiac disease, cancer and infectious diseases.

Website: http://rgcb.res.in/

National Agri - Food Biotechnology Institute, Mohali: NABI is an autonomous institute of the Department of Biotechnology, Ministry of Science and Technology, Government of India, located in Mohali, Punjab. The institute aims at catalyzing the transformation of agri-food sector in India and to be a nodal organization for knowledge generation and translational science leading to value added products based on agri-food biotech innovations. A translation unit is being planned to be set up in NABI to establish linkages in the region among relevant R&D units, Management Institute and Small & Medium industries. The unit will support, strengthen, and promote innovation through several initiatives, support R&D research resource units in the State and region, integrate S&T development through bottom up science & horizontal technology acquisition & development and will facilitate traversing the complete path from discovery to market.

Website: http://www.nabi.res.in/

International Centre for Genetic Engineering and Biotechnology (ICGEB): The ICGEB is an international, nonprofit research organization. Established as a special project of UNIDO, it became fully autonomous in 1994 and now counts over 60 Member States.

The International Centre for Genetic Engineering and Biotechnology provides a scientific and educational environment of the highest standard and conducts innovative research in life sciences for the benefit of developing countries. It strengthens the research capability of its Members through training and funding programmes and advisory services and represents a comprehensive approach to promoting biotechnology internationally.

The Centre is dedicated to advanced research and training in molecular biology and biotechnology and holds out the prospect of advancing knowledge and applying the latest techniques in the fields of: - biomedicine; - crop improvement; - environmental; protection/remediation; biopharmaceuticals and biopesticide production

With Components in Trieste, Italy, New Delhi, India and Cape Town, South Africa, the Centre forms an interactive network with Affiliated Centres in ICGEB Member States. ICGEB is part of the United Nations System.

Website: www.icgeb.org

Complete List of other Institutes under DBT is given in Annexure.

4.2 Department of Science and Technology (DST)

The Department of Science and Technology (DST) is a department within the Ministry of Science and Technology in India. It was established in May 1971, with the objective of promoting new areas of Science and Technology and to play the role of a nodal department for organising, coordinating and promoting Scientific and Technological activities in the country. It give funds to various approved scientific projects in India. It also supports various researchers in India to attend conferences abroad and to go for experimental works.

Few objectives of DST include:

- Formulation of policy statements and guidelines
- Co-ordination of areas of Science & Technology in which a number of Institutions & Departments have interests and capabilities
- Support to basic and applied research in National Institutions
- Support minimum Infrastructural facilities for Testing & Instrumentation

The details of DST and its institutes is available in the website: http://www.dst.gov.in/

List of Institutes under ICAR is given in Annexure.

The Indian biotech industry has been growing at a fast pace since the last three decades both in terms of expansion of business conducted by contract service providers, research and innovation. The Indian biotechnology sector is one of the fastest growing knowledge-based sectors in India and is expected to play a key role in shaping India's rapidly developing economy. With numerous comparative advantages in terms of research and development (R&D) facilities, knowledge, skills, and cost effectiveness, the biotechnology industry in India has immense potential to emerge as a global key player. Major research in India is supported by government through institutes like - Indian Council of Agricultural Research., Indian Council of Medical Research, Council of scientific & Industrial Research, Department of Biotechnology under the Ministry of Science & Technology. Various ministries and its departments have set up various research institutes and centres for betterment of biotechnology in India. Some major departments and organizations in india primarily focusing on biotechnology development include:

- Ministry of Science & Technology
  - o Department of Science & Technology
  - o Department of Biotechnology
  - o Council of Industrial & Scientific Research
- Ministry of Health & Family Welfare
  - o Indian Council Of Medical Research

- Ministry of Agriculture
  - o Indian Council of Agricultural Research

In addition to these there are several other ministries and some departments with many organizations and institutes for biotechnology research. Details of few are mentioned in the fore coming sections.

4.3 Council of Scientific & Industrial Research (CSIR)

Council of Scientific and Industrial Research (CSIR) established in 1942 is an autonomous body and India's largest Research and Development (R&D) organization, with 37 laboratories and 39 field stations or extension centres spread across the nation. Although CSIR is mainly funded by the Ministry of Science and Technology, it operates as an autonomous body. The research and development activities of CSIR includes various fields such as aerospace engineering, Structural engineering, ocean sciences, Life Sciences, metallurgy, chemicals, mining, food, petroleum, leather, and environment. The Council has also helped the creation of new schools of research and in enlarging facilities for research by means of grants, training of research personnel, etc.

The main functions of the Council are:

- Promotion, guidance and coordination of scientific and industrial research in India including other institutions and financing the specific research activities.
- Scientific study of problems affecting industries and trade.
- Award of Research Fellowships.
- Utilization of the results of researches conducted under the Council towards the development of industries in India.
- The establishment, maintenance and management of laboratories, workshops and organizations to further scientific and industrial research.
- The collection and dissemination of information in regard not only to research but also to industrial matters generally.
- Publication of scientific papers.

The details of CSIR and its institutes are available in the website:

http://rdpp.csir.res.in/csir_acsir/Home.aspx

Major research institutes under CSIR are:

Central Drug Research Institute, Lucknow: CDRI is considered to be a pioneer research organization with relevant infrastructure and expertise for drug development. The Institute's manpower has been grouped into 17 R & D divisions and few divisions provide technical and scientific support. Two data centers and one field station is located outside CDRI further offer operational support. The Institute has the following charter of activities

- Development of new drugs and diagnostics
- Cellular and molecular studies to understand disease processes and reproductive physiology
- Development of contraceptive agents and devices
- Systematic evaluation of medicinal properties of natural products
- Development of technology for drugs, intermediates and biologicals
- Dissemination of information in the field of drug research, development and production
- Consultancy and development of technical manpower

Website: http://www.cdriindia.org/

Center for Cellular and Molecular Biology, Hyderabad: CCMB is a premier research organization in frontier areas of modern biology. The objectives of the Centre are to conduct high quality basic research and training in frontier areas of modern biology, and promote centralized national facilities for new and modern techniques in the inter-disciplinary areas of biology. Established in 1977 for the advancement of biotechnology, it has spawned a number of industry collaborations and technology spin-offs. It worked with private institutions to produce India's first recombinant DNA vaccine for Hepatitis B.

Website: http://www.ccmb.res.in/

Institute of Genomics & Integrative Biology, Delhi: Institute of Genomics & Integrative Biology (IGIB), one of the premier constituent establishments of Council of Scientific and Industrial Research (CSIR), is carrying out research and development in the areas of genomics, molecular medicines, bioinformatics and environmental biotechnology. The Institute has played pivotal role in genomics and integrative biology through R & D partnerships and in collaboration with medical institutes, universities and the industry. IGIB has made many significant contributions to the Indian Science, and is globally acknowledged, in certain areas of specialization.

Website: http://www.igib.res.in/

List of Institutes under CSIR is given in Annexure.

4.4 Other major departments of the Government of India funding biotechnology:

Indian Council of Agricultural Research (ICAR)

The Indian Council of Agricultural Research (ICAR) is an autonomous organisation under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture, Government of India. Formerly known as Imperial Council of Agricultural Research, it was established on 16 July 1929. The ICAR has its headquarters at New Delhi. With 99 ICAR institutes and 53 agricultural universities spread across the country this is one of the largest national agricultural systems in the

world. The ICAR has played a pioneering role in ushering Green Revolution and subsequent developments in agriculture in India through its research and technology development. ICAR is committed to bring a demand-driven and technology-led revolution in the country to meet challenges of the rising demand for food, improving livelihood opportunities of farmers, and for ensuring sustainable farming and agricultural growth. Objectives of ICAR include:

- To plan, undertake, aid, promote and co-ordinate education, research and its application in agriculture, agroforestry, animal husbandry, fisheries, home science and allied sciences.
- To act as clearing house of research and general information relating to agriculture, animal husbandry, home science and fisheries through its publications and information system, and instituting and promoting transfer of technology programmes.
- To provide, undertake and promote consultancy services in the fields of education, research, training and dissemination of information in agriculture, agroforestry, animal husbandry, fisheries, home science and allied sciences.
- To look into problems relating to broader areas of rural development concerning agriculture, including post-harvest technology, by developing co-operative programmes with other organizations such as the Indian Council of Social Sciences Research, Council of Scientific and Industrial Research, Bhabha Atomic Research Centre, and universities.

The major deemed universities under ICAR are:

1. Indian Agricultural Research Institute, New Delhi
2. National Dairy Research Institute, Karnal
3. Indian Veterinary Research Institute, Izatnagar
4. Central Institute on Fisheries Education, Mumbai

ICAR also comprises of: Institutions (47), National Research Centres(17), National Bureaux(6) and Directorates/Project Directorates(25)

The details of ICAR and its institutes is available in the website: http://www.icar.org.in/

List of Institutes under ICAR is given in Annexure.

Indian Council of Medical Research (ICMR)

The Indian Council of Medical Research (ICMR), New Delhi is an apex body in India for the formulation, coordination and promotion of biomedical research. The ICMR is funded by the Government of India through the Department of Health Research, Ministry of Health & Family Welfare. In 1911, the Government of India set up the Indian Research Fund Association (IRFA) with the specific objective of sponsoring and coordinating medical research in the country. After independence, several important changes were made in the organisation and the activities of the IRFA. It was redesignated the Indian Council of Medical Research (ICMR) in 1949, with considerably expanded scope of functions. The Council promotes biomedical research in the country through intramural as well as extramural research. Over the decades, the base of extramural research and

also its strategies have been expanded by the Council. The Council's research priorities coincide with National health priorities such as control and management of communicable diseases, fertility control, maternal and child health, control of nutritional disorders, developing alternative strategies for health care delivery, containment within safety limits of environmental and occupational health problems; research on major non-communicable diseases like cancer, cardiovascular diseases, blindness, diabetes and other metabolic and haematological disorders; mental health research and drug research (including traditional remedies). These efforts are undertaken with a view to reduce the total burden of disease and to promote health and well-being of the population. The Indian Journal of Medical Research is published under the auspices of the Council.

The details of ICMR and its institutes is available in the website: http://www.icmr.nic.in/

List of Institutes under ICMR is given in Annexure.

Defence Research and Development Organisation (DRDO)

Defence Research & Development Organisation (DRDO) works under Department of Defence Research and Development of Ministry of Defence. It was formed in 1958 by the merger of the Technical Development Establishment and the Directorate of Technical Development and Production with the Defence Science Organisation. DRDO has a network of 52 laboratories and is dedicatedly working towards enhancing self-reliance in Defence Systems and undertakes design & development leading to production of world class weapon systems and equipment in accordance with the expressed needs and the qualitative requirements laid down by the three services. Dept. of Defence Research and Development (R&D) are working for indigenous development of weapons, sensors & platforms required by the three wings of the Armed Forces. To fulfil this mandate, Dept of Defence Research and Development (R&D), is closely working with academic institutions, Research and Development (R&D) Centres and production agencies of Science and Technology (S&T) Ministries/Dept in Public & Civil Sector including Defence Public Sector Undertakings & Ordnance Factories. DRDO is working in various areas of military technology which include aeronautics, armaments, combat vehicles, electronics, instrumentation engineering systems, missiles, materials, naval systems, advanced computing, simulation and life sciences. Life Science Research Board, Objectives are:

- Expanding and deepening the knowledge-base of life sciences in the country through strengthening and use of national resources including know-how and expertise.
- Catalysing cross-fertilization of ideas and expertise between research scientists for providing support to the soldiers in operations
- Enhancing core competence in the field of knowledge germane to development, manufacture and use biomedical and biotechnological products
- Create conditions suitable for attracting talent and expertise from overseas locations through collaborations and other academic exchanges.

The details of DRDO and its institutes is available in the website: www.drdo.gov.in

List of Institutes under DRDO is given in Annexure.

5. Other Institutes & Universities

To promote Biotechnology in Educational and research sector, several Universities and Institutes have been set up both under the government and by private owners which provide wide exposure and possibilities for students in India.

Indian Institute of Science, Bangalore: IISc is a Premier public institution for scientific and technological research and higher education located in Bangalore, India. It was established in 1909. Departments and centres in the Institute are broadly assigned to two categories: science and engineering. IISc collaborates with various government organizations like DRDO, ISRO, Bharat Electronics Limited, Aeronautical Development Agency, National Aerospace Laboratories, CSIR, Department of IT (Government of India). IISc also works in collaboration with private industry and research labs. Few organizations have been incubated by Society for Innovation and Development (SID) in the campus. IISc actively promotes and supports ventures by faculty, students and alumni.

Website: http://www.iisc.ernet.in/

National Centre for Biological Sciences, Bangalore

NCBS is a research centre specializing in biological research. It is a part of the Tata Institute of Fundamental Research (TIFR) under the Department of Atomic Energy of the Government of India. The mandate of NCBS is basic research in the frontier areas of biology. The research interests range from the study of single molecules to ecology and evolution. In addition NCBS is engaged in a number of collaborative initiatives, such as inStem and the iBio; and also helps to develop cutting edge instrumentation and software via C-CAMP.

Website: http://www.ncbs.res.in/

5.2 Other Centres:

In addition there are several Universities and Institutions who are involved in Biotech Research and Development.

Tata Institute of Fundamental Research (TIFR)

The Tata Institute of Fundamental Research (TIFR) is a research institution in India dedicated to basic research in mathematics and the sciences. It is a Deemed University and works under the Department of Atomic Energy of the Government of India. It is located at Navy Nagar, Colaba and Mumbai. TIFR conducts research primarily in natural sciences, mathematics, biological sciences and theoretical computer science and is considered one of the outstanding research centres in India.[1] TIFR has a graduate program leading to a PhD in all the major fields of study.

TIFR also includes institutes outside its main campus in Colaba and Mumbai:

- Homi Bhabha Centre for Science Education at Deonar, Mumbai

- National Centre for Radio Astrophysics at Pune
- National Centre for Biological Sciences at Bangalore\
- TIFR Centre, Bangalore for Mathematics
- International Centre for Theoretical Sciences at Bangalore
- National Balloon Facility at Hyderabad
- TIFR Hyderabad

Website: www.tifr.res.in/

Indian Institutes of Science Education and Research (IISERs)

The Indian Institutes of Science Education and Research (IISERs), and the related National Institute of Science Education and Research (NISER) are a group of science education and research institutes in India. The institutes were created by the Government of India, through the Ministry of Human Resource Development (MHRD), under The National Institutes of Technology (Amendment) Bill, 2010 (an amendment of the National Institutes of Technology Act, 2007), which was passed by the Rajya Sabha on 30 April 2012. Five IISERs have been established across the country, namely IISER Kolkata in West Bengal, IISER Pune in Maharashtra, IISER Mohali in Punjab, IISER Bhopal in Madhya Pradesh and IISER Thiruvananthapuram in Kerala. NISER is being set up in Bhubaneswar. Each IISER is an autonomous institution awarding its own Master's and Doctoral degrees. Students are encouraged to carry out research projects during the vacation periods in the first four years of their Masters programme in various research institutes outside IISER. IISERs are a unique initiative in science education in India in which teaching and education will be totally integrated with the state-of-the-art research nurturing both curiosity and creativity in an intellectually vibrant atmosphere of research. IISERs are destined to become Science Institutes of the highest caliber and reach the prestigious position in the global setting that IISc, IIMs and IITs presently enjoy.

Objectives of IISER:

- To create an excellent research institute for the development of undergraduate and postgraduate education in science with an intellectually alive atmosphere of research.
- To create a unique research institution in the country in which education will be totally integrated with state-of-the-art research.
- To create a cadre of high caliber internationally well-known faculty members devoted to teaching as well as research in science.

Website: http://www.iiser-admissions.in

Indian Institutes of Technology (IITs)

The Indian Institutes of Technology (IITs) is a group of autonomous public engineering institutes of India. The IITs are governed by the Institutes of Technology Act, 1961 which has declared them as

"institutions of national importance", and lays down their powers, duties, framework for governance etc. The IITs receive comparatively higher grants than other engineering colleges in India.[54] While the total government funding to most other engineering colleges is around Rs. 100-200 million (USD 2-4 million) per year, the amount varies between Rs. 900-1,300 million (USD 18-26 million) per year for each IIT. The sixteen institutes in India are located at Bhubaneswar, Chennai, Delhi, Gandhinagar, Guwahati, Hyderabad, Indore, Jodhpur, Kanpur, Kharagpur, Mandi, Mumbai, Patna, Ropar, Roorkee and Varanasi. Each IIT is an autonomous institution, linked to the others through a common IIT Council, which oversees their administration.

Website: www.iit.org/

Indian Institute of Technology (IIT-Kharagpur) website:- www.iitkgp.ernet.in/

Indian Institute of Technology (IIT-Kanpur) website:-www.iitk.ac.in/

Indian Institute of Technology (IIT-Bombay) website:- www.iitb.ac.in/

Indian Institute of Technology (IIT-Delhi) website:- www.iitd.ac.in/

Indian Institute of Technology (IIT-Madras) website:- www.iitm.ac.in/

Indian Institute of Technology (IIT-Guwahati) website:- www.iitg.ernet.in/

Indian Institute of Technology (IIT-Roorkee) website:- www.iitr.ac.in/

Indian Institute of Technology (IIT-Hyderabad) website:- www.iith.ac.in/

Indian Institute of Technology (IIT-Patna) website:- www.iitp.ac.in/

Indian Institute of Technology (IIT-Bhubneshvar) website:- www.iitbbs.ac.in/

Indian Institute of Technology (IIT-Gandhinagar) website:- www.iitgn.ac.in/

Indian Institute of Technology (IIT-Indore) website:- www.iiti.ac.in/

Indian Institute of Technology (IIT-Jodhpur) website:- www.iitj.ac.in/

Indian Institute of Technology (IIT-Mandi) website:- www.iitmandi.ac.in/

Indian Institute of Technology (IIT-Ropar) website:- www.iitrpr.ac.in/

Indian Institute of Technology (IIT-Varanasi) website:- www.iitbhu.ac.in/

MAJOR UNIVERSITIES IN INDIA WITH STRONG EDUCATION AND RESEARCH IN BIOTECHNOLOGY:

Delhi University

The University of Delhi is the premier university of the country and is known for its high standards in teaching and research and attracts eminent scholars to its faculty. It was established in 1922 as a unitary, teaching and residential university by an Act of the then Central Legislative Assembly.

i) Ambedkar Centre for Biomedical Research (ACBR)

The Government of India established this Institute at the University of Delhi. The mandate of the Centre is high quality postgraduate education and research in Biomedical Sciences. The Institute

also has provision for doctoral and postdoctoral training to young scientists at the start of their research career to gain the skills and insights in frontier areas of biomedical sciences.

Website: www.du.ac.in

ii) Department of Biochemistry

The faculty at the Department of Biochemistry has a number of research projects with both basic and applied aspects in different areas of human diseases with its focus on macromolecular delivery, vaccine development and diagnostics.

iii) Department of Plant Molecular Biology

The Department offers a Masters course in Plant Molecular Biology and Biotechnology designed to encompass areas such as plant physiology and biochemistry, molecular cell biology, prokaryotic genetics, eukaryotic gene regulation, advanced molecular biology, biotechnology, genomics, bio informatics and IPR related issues. Students are specially trained to give seminars and improve their research and writing ability by way of M Sc dissertation.

iv) Department of Microbiology

The Masters course in Microbiology was started to impart knowledge about the importance of micro-organisms as experimental tools in basic research, biochemical and genetical studies; their role in the maintenance of environmental quality, agriculture and medicine and in the pharmaceutical, dairy, detergent, leather, starch, food and feed, fermentation and pulp and paper industries. There is an increasing demand for trained microbiologists in pollution control organizations, food processing, pharmaceutical and fermentation industries, industrial effluent treatment plants and in various national and international research institutes.

iv) Department of Genetics

The research interests of the Department are in the area of heavy metal resistance in soil bacteria, and fungi, microbial strain improvement for the production of some useful biomolecules, biochemical genetics of bacteria and fungi, molecular genetic improvement of plant growth promoting rhizobacteria, and biocontrol bacteria, peptide antibiotic production by lactic acid bacteria, metagenomics of soil; multigene engineering in tomato and brinjal for stress tolerance; RNAi approach for developing transgenic tomato, brinjal and cotton resistant to disease and pests; analyzing gene-regulatory mechanisms for optimizing transgene expression in plants; Identification of susceptibility genes for complex traits such as schizophrenia, Parkinson's, Rheumatoid arthritis, Ulcerative colitis etc;

Website: www.south.du.ac.in

Jawaharlal Nehru University

JNU was established in 1969 by an act of parliament. It was named after Jawaharlal Nehru, India's first prime minister and was founded by Indira Gandhi, (Nehru's daughter), and G. Parthasarathy was the first vice-chancellor

The objective of the founders was to make the university a premier institution of higher learning and to promote research and teaching leading to the increasing engagement of its students and teachers in higher level academic work and national and international policy making.

i) School of Biotechnology

Jawaharlal Nehru University (JNU), New Delhi was one of the first six Universities in India to initiate a Postgraduate teaching and research programme in the field of Biotechnology in 1985. Since 1985, it was running as the Special Centre for Biotechnology (CBT) under the joint sponsorship of the University Grants Commission (UGC) and the Department of Biotechnology (DBT), Ministry of Science & Technology, Govt. of India. To begin with, it was started to initiate Biotechnology education programme with an impetus to generate a workforce that could turn into a substantially trained pool to meet the country's demands.

ii) School of Life Sciences

The School of Life Sciences (SLS) was established on the basis of a report prepared by a working group headed by Prof. M.S. Swaminathan in the year 1970 The uniqueness of the School essentially lies in the fact that within the School's faculty there are experts and active researchers representing almost all areas of modern biology.

Website: www.jnu.ac.in

University of Pune
Department of Biotechnology

i) **The Department of Biotechnology,** University of Pune (University with potential for excellence) established in 1994 offers a two year M.Sc. Biotechnology Course fully supported by the Department of Biotechnology(DBT), Government of India. It also offers M.Phil. and Ph.D. programmes in Biotechnology and related areas.

ii) Department of Biology

The Department of Botany, established in 1952, is one of the leading Departments of India in the field of teaching and research in plant sciences. department is concentrating its research programs in the area of biodiversity assessment conservation, and bioprospecting of the plant health located in the Western Ghats of Maharashtra.

iii) **The Department of Chemistry** is one of the first department to be established by the University of Pune in April 1950. Department of Chemistry, situated in the picturesque surroundings on the University Campus, offers programs leading to M. Sc., M. Phil. and Ph.D. degrees.

Website: www.unipune.ac.in

University of Hyderabad

The University of Hyderabad also known as Hyderabad Central University is an Indian public university, largely devoted to postgraduate and doctoral studies.

School of Life Sciences

- Department of Biochemistry
- Department of Plant Sciences
- Department of Animal Sciences
- Department of Biotechnology and Bioinformatics

Each department offers M.Sc. and Ph.D. programmes of study. Under the Distance Education Programme, the school participates in two postgraduate Diplomas in Environmental Management and in Medicinal Botany. In addition, Department of Biotechnology also offers Integrated Ph. D Programme

Website: www.uohyd.ac.in

Madurai Kamraj University

Madurai Kamaraj University, established in 1966, has 18 Schools comprising 73 Departments.

i) School of Biotechnology

School of Biotechnology has some departments like Department of Genetic Engineering, Department of Plant Biotechnology and Department of Molecular Biology.

ii) School of Chemistry

School of Chemistry comprises four departments - Organic, Inorganic, Physical and Natural Products.

iii) School of Biological Sciences

It has following departments like Department of Biochemistry, Department of Plant Sciences, Department of Molecular Biology, Department of Genetics, Department of Microbial Technology.

Website: www.mkuniversity.org

PGIMER

i) The Postgraduate Institute of Medical Education and Research (PGIMER) Chandigarh was conceived in 1960 as a center of excellence which would endeavour to develop patterns of teaching in postgraduate medical education in as many branches as possible and attempt to produce specialists in several disciplines of medicine.

ii) Department of Biochemistry

The discipline of Biochemistry occupies a pivotal position in biomedical sciences. The Department of Biochemistry was set along with the inception of this Institute. The Department is involved in teaching, research and patient care.

iii) Department of Experimental Medicine & Biotechnology

The department has proved its excellence at both national and international level in teaching as well as research directed to understand the molecular basis of several diseases especially cardiovascular diseases, leukemia, diarrhoeal diseases, tuberculosis and AIDS etc. In the year 1983, the department acquired the expertise in the area of Molecular Biology recognized widely as the heart of modern medicine.

Website: pgimer.nic.in

JIPMER

Jawaharlal Institute of Postgraduate Medical Education and Research originated as École de Médicine de Pondichérry established by the French Government in the year 1823.This Medical College was later upgraded into Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER).

i) Department of Biochemistry

Department of Biochemistry, JIPMER was established in the year 1957. Investigations in the clinical biochemistry laboratory were started in 1965. Several special investigations were done by the department including RIA of insulin, ALP and LDH isoenzymes, hormonal assays, lipid profile, ceruloplasmin, 17-hydroxy steroids, hemoglobin electrophoresis and lipoprotein electrophoresis.

ii) Department of Microbiology

The Department of Microbiology, JIPMER underwent a rapid increase in patient care services. molecular diagnosis of TB meningitis & other extrapulmonary tuberculosis, leptospirosis, amoebiasis, neurocysticercosis and HSV encephalitis is carried out by PCR. The facilities for real-time PCR for influenza virus as well as for HIV have been established.

Website: jipmer.edu.in

BITS Pilani, Rajasthan

The Birla Institute of Technology & Science, BITS Pilani is an all-India Institute for higher education. The primary motive of BITS is to "train young men and women able and eager to create and put into action such ideas, methods, techniques and information". Research is an integral and important part of any higher education system. BITS Pilani, actively promotes research among its staff and students. In addition to basic research, which is the backbone of any applied research, the Institute also gives adequate importance and support to applied research.

Website: www.bits-pilani.ac.in

Birla Institute of Technology, Mesra

BIT, Mesra is a "Deemed University" under Sec. 3 of the U.G.C. Act 1956. The Board of Governors is responsible for the main functions and overall supervision of activities.

i) Department of Biotechnology

The Department of Biotechnology was established in 2002 with financial support from the Department of Agriculture, Government of Jharkhand, with objectives like providing education and training facilities, carrying out application oriented research, developing in-house technologies and promoting consultancy services in various areas of Biotechnology.

ii) Department of Pharmaceutical Sciences

The Department of Pharmaceutical Sciences was established in 1972 at BIT Mesra. It is well equipped for both teaching and research activities, which are undertaken across the whole spectrum of Pharmaceutical Sciences. The Department encourages and supports studies involving a range of research strategies and has particular expertise and experience in both quantitative and qualitative research methods including studies of innovation.

Guru Nanak Dev University

i) Department of Biotechnology

The Department of Biotechnology at Guru Nanak Dev University, Amritsar was established in 1991 by the Department of Biotechnology, Government of India and is a constituent of National Network of thirty plus centers imparting job-oriented training to the students in Biotechnology.

ii) Department of Human Genetics

The department of Human Genetics was established in 1988 as part of School of Life Sciences under specific recommendations of the UGC.

iii) Department of Zoology

The thrust areas of research in the department include: Insect Physiology and Biochemistry, Fish and Fisheries, Aquatic Biology, Insect plant interactions, Parasitology and Nematology, Insect Bionomics, Solid waste management and Cytogenetics.

Website: www.gndu.ac.in

Other universities which offer biotechnology education and research programs are:

UNIVERSITIES	LOCATION	WEBSITE
Banaras Hindu University	Varanasi	www.bhu.ac.in/
University of Mumbai	Mumbai	www.mu.ac.in/
M.S.University of Baroda	Vadodara	www.msubaroda.ac.in
Osmania University	Hyderabad	www.osmania.ac.in/
University of Mysore	Karnataka	www.uni-mysore.ac.in
Punjab Agricultural University	Ludhiana	www.pau.edu/
Maharaja Sayajirao University	Baroda	www.msubaroda.ac.in/
Kurukshetra University	Haryana	www.kuk.ac.in/
Central University of Rajasthan	Rajasthan	www.curaj.ac.in/
Aligarh Muslim University	Aligarh	www.amu.ac.in/
SRM University	Tamil Nadu	www.srmuniv.ac.in/
VIT University	Tamil Nadu	www.vit.ac.in/
Amity Institute of Biotechnology	Uttar Pradesh	www.amity.edu/aib/
Uttar Pradesh Technical University	Uttar Pradesh	www.uptu.ac.in
University of Nagpur	Maharashtra	www.nagpuruniversity.org/
Anna University	Tamil Nadu	www.annauniv.edu/

Biotechnology Industry Research Assistance Council (BIRAC):

Department of Biotechnology established BIRAC as a 'Not-for-Profit' Section 25 Company, as its inter-face agency for supporting industry-academia interaction, and will serve as a single window for the emerging biotech industry in the country.

A unique initiative of the government to promote the growth of biotechnology industry in India, the BIRAC will also help establish connectivity with professional and institutional networks and provide financial support for mid-level, quality innovation targeted at affordable solutions and product development. BIRAC as an organisation nurturing and promoting innovation lead research would play an important role of "Connector and Catalyser". BIRAC is also mandated to encourage knowledge networking among biotech entrepreneurs at national and international level to maintain the technological and scientific edge. BIRAC is guided by an Independent Board of Directors comprising senior professionals, academicians, policy makers and industrialists. Major initiatives by BIRAC include:

1. **Biotech Ignition Grant schemes (BIG):** Igniting new ideas
2. **Small Business Innovation Research Initiative (SBIRI):** Supporting early stage research for proof of concept, validation

3. **Biotechnology Industry Partnership Programme (BIPP):** Partnership with industry for high risk discovery led innovation research

4. **Contract Research Scheme (CRS):** Facilitating technology validation and development

5. **Bio-incubator Support Scheme (BISS):** Strengthening and Up-gradation of Bio-incubators

1. Biotech Ignition Grant Schemes

BIRAC offers Biotechnology Ignition Grant (BIG) to scientist entrepreneurs from research institutes, academic private sector and start ups, who have an exciting idea which may be in the nascent and planning stage. This scheme is designed to stimulate commercialization of research discoveries by providing very early stage grants for the development and maturation of those discoveries into marketable product or intellectual property (IP), in particular to help bridge the gap between discovery and invention.

The purpose of the BIG Scheme is to:

a. Foster generation of ideas with commercialisation potential

b. Upscale and validate of proof of concept

c. Encourage researchers to take technology closer to market through a start up

d. Stimulate enterprise formation

2. Small Business Innovation Research Initiative (SBIRI)

The Small Business Innovation Research Initiative (SBIRI), a scheme launched in September, 2005 by the Department of Biotechnology (DBT), aims to encourage small and medium scale industries to take up risk in innovative R&D in biotech sector. The main focus is on supporting proof of concept and early stage research in startups and SMEs. Launching of SBIRI has worked as an enabling platform for the target organizations to realize their potential in terms of product and process development and taking them to the market. It has facilitated innovation, risk taking by small and medium companies and bringing together the private industry, public institutions and the government under one roof to promote the research and innovation in the Indian Biotech Sector.

The SBIRI aims to:

a. Strengthen those existing private industrial units whose product development is based on in-house innovative R&D

b. Encourage other smaller businesses to increase their R&D capabilities and capacity

c. Create opportunities for starting new technology-based or knowledge-based businesses by science entrepreneurs

d. Stimulate technological innovation

e. Increase private sector commercialization derived from Government funded R&D

The SBIRI objectives:

a. To provide support for early stage, pre-proof-of-concept research in biotechnology by industry

b. To support new indigenous technologies particularly those related to societal needs in the healthcare, food and nutrition, agriculture and other sectors

c. To nurture and mentor innovative and emerging technologies/entrepreneurs, to assist new enterprises to forge appropriate linkages with academia and government.

3. Biotech Industry Partnership Programme (BIPP)

Biotechnology Industry Partnership Programme (BIPP) is a government partnership with Industries for support on a cost sharing basis for path-breaking research in frontier futuristic technology areas having major economic potential and making the Indian industry globally competitive. It is focused on IP creation with ownership retained by Indian industry and wherever relevant, by collaborating scientists. BIPP supports the development of appropriate technologies in the context of recognized national priorities in the area of agriculture, health, bio-energy, green manufacturing, when the scale of the problem has serious consequences for social and economic development. (BIPP) is a government partnership program with Industries for public support on a cost sharing basis for:

a. Path-breaking research in frontier futuristic technology areas having major economic potential and making Indian industry globally competitive and focused on IP creation with ownerships by Indian industry and where relevant, collaborating scientists.

b. Development of appropriate technologies in the context of recognized national priorities in the area of agriculture, health, bio-energy, green manufacturing for social and economic development.

4. Contract Research Scheme (CRS)

The CRS scheme supports the academia-industry interaction between research institutes, universities, public funded research laboratories, governmental organizations, research foundations and companies / industries under the Public-Private Partnership (PPP) mode. The funding is in the form of grant which is given to both the academic as well as the industrial partner. While the industry performs its role as a 'validation partner' and engages on a contractual basis, the IP rights reside solely with the academic partner(s). The Objective of the Scheme is to:

a. To encourage Public and/or Private Universities to validate their translational research that has commercialisation potential

b. Engage with the contract research and manufacturing (CRAMS) industry to carry out the validation of a process or a prototype.

5. Bio-incubator Support Scheme (BISS)

BIRAC has initiated a scheme for Strengthening and Up-gradation of the existing Bio-incubators and also to establish New World Class Bio-incubators in certain strategic locations. These Bio incubators will provide the incubation space and other required services to start-up companies for their initial growth. The BIRAC Bio-incubator strengthening support is provided to those existing Incubators which have proven experience and competence to run successful incubators, have an existing network for mentoring and handholding of incubators, and also can provide the enabling services to promote innovation research. Seven existing Bio-incubators across the country have been strengthened and approximately 55,000 sq ft of Bio-incubator space has been created to support start up.

State Biotech Policies

Andhra Pradesh

Government of Andhra Pradesh, in collaboration with the ICICI Limited, has set up a knowledge Park near Hyderabad. Hyderabad, the capital of Andhra Pradesh has emerged as the destination of first choice for corporate and entrepreneurs desiring to enter the exciting world of Bio-tech. Andhra Pradesh is the leading centre for Biotechnology and is known as Vaccine Capital of India. Hub of the Genome Valley is being developed an area covering 600 sq. km.

Tamil Nadu

The Government of Tamil Nadu is facilitating in the setting up of the biotechnology enterprise zones (biovalleys) along the lines of Silicon Valley to exploit the bio resources of the state. Four biotech parks, a bioinformatics and genome center will be established, each of which would be leveraging the bioresources of the agro-ecological zones of Tamil Nadu. Tamil Nadu has taken positive steps in devising biotechnology friendly policies, and creating a BT park in Taramini. These five entities will be the hub of the biotechnology enterprise zones.

Madhya Pradesh

The Government of Madhya Pradesh has displayed a strong commitment for the socio-economic development of the citizens of the state. The setting up of the country's first state level Biodiversity Board under the chairmanship of the Chief Minister on 21st October 1999 was the first concrete step in this direction. Madhya Pradesh has been the largest user of bio-fertilizers amongst all the states. The state is rich in genetically diverse livestock resources. The state government has initiated a concerted effort to promote the cultivation of medicinal and aromatic plants.

Gujrat

The State intends to promote biotechnology sector by building appropriate image, encouraging entrepreneurship, strengthening organizational colorations and forecasting business partnerships. For facilitating the development of biotechnology in the State, Government of Gujarat has constituted Gujarat State Biotechnology Mission, under the aegis of Department of Science and

Technology. Total Investment Intentions for 17,719 projects, including 12,886 in SME sector, promising jobs to 0.37 million were announced at the sixth version of Vibrant Gujarat, Gujarat Government's flagship mega event 2013.

Uttar Pradesh

The state government has introduced its biotech policy in 2004 with an aim to develop knowledge based economy, assuring benefits to all sections of the society and promoting entrepreneurship in biotechnology related industries. Lucknow is known as the biotechnology city of India and has established Biotechnology Research Park. Single window facility and relaxation of taxes on biotechnology based products. 100% relaxation on the registration fee and stamp duty for biotech units is initiated. Uninterrupted power supply for biotech units was implemented.

Maharashtra

The State has an excellent intellectual infrastructure. The Govt. is promoting "Centers of Excellence", which will cover all aspects of cutting edge research and development in emerging areas of technology. Through nearly 1000 institutions, it produces around 163,000 trained technical personnel each year. Some of the best Centers of excellence in India are present in Maharashtra.

The government is also promoting biotech parks, R&D centers, and pilot plant facilities for underway contract research by putting equity stakes in such projects.

Karnataka

Karnataka is the Biotech Capital of India, with over 60% of all biotechnology companies in India having a base in Bangalore and driving 50% of the total revenues in the national biotechnology sector. The Karnataka government has announced a biotech policy to promote this sector and is setting up an institute for bioinformatics in Bangalore. Three 'biotech parks' are emerging in the state, namely 'University of Agricultural Sciences, Bangalore; 'Institute of Agri-biotech in Dharwad ; and 'Institute of Biotechnology in Karwar. The state has the first mover advantage, with strong research capabilities, resource base, skilled manpower and government support creating an enabling environment for high growth.

Uttarakhand

The Uttarakhand biotechnology department has decided to set up a biotech park in the hill state in order to promote industries based on the technology. Uttarakhand is a store house of rich variety herbs, medicinal and aromatic plant species. Rare species of plants and animals found in the State, add to its natural advantage in this sector. The programme also promotes agro-farming and encourage cultivation of medicinal and aromatic plants in the state. A Biotechnology Park is planned that is expected to house modern biotechnological facility, including bio-incubator and basic infrastructure and common facilities like modern equipment, green house, animal house, business centre and laboratories.

Goa

Recognizing the potential of biotech sector, the government of Goa is keen to facilitate accelerated development of biotechnology utilizing the natural, scientific, human and other resources in the state and the region by providing the required policy support keeping in view the unique requirements of the sector. The biotech policy aims at integrating the existing achievements in research & industry and strengthening & expanding its existing base.

The setting up of the biotech incubator facility in Goa is in an advanced stage of approval and a memorandum of understanding will shortly be signed between the government, GU and GSIA.

Himachal Pradesh

Himachal Pradesh has prepared a blue print for promotion of biotechnology industries in the state. With the view to explore the potential of biotechnology in the state, the government has proposed to set up Biotechnology Park at Solan district under PPP. The state of Himachal Pradesh had announced 100% tax holidays for all biotechnology products up to the year 2012. It is also proposed to provide research based support to the private companies in form of providing for instance, access to a data base of bioresources which is being developed along with separate entries of endangered medicinal plants.

ANNEXURE

DBT- Research Institutes and Centres

Autonomous Institutes

1. Centre for DNA Fingerprinting & Diagnostics, Hyderabad- www.cdfd.org.in/
2. Institute of Bioresources and Sustainable Development (IBSD), Imphal, Manipur- www.ibsd-imphal.nic.in/
3. Translational Health Science and Technology Institute (THSTI)- www.thsti.res.in/
4. National Institute of Biomedical Genomics (NIBMG)- www.nibmg.ac.in/
5. National Institute of Animal Biotechnology, Hyderabad- www.niab.org.in/
6. National Centre for Cell Science, Pune- www.nccs.res.in/
7. National Brain Research Centre, Manesar- www.nbrc.ac.in/
8. Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram- rgcb.res.in/
9. National Institute of Immunology Delhi- www.nii.res.in/
10. Institute of Plant Genome Research(NIPGR) Delhi- www.nipgr.res.in/
11. Institute of Life Sciences, Bhubaneswar- www.ils.res.in/
12. Institute of Bioresources and Sustainable Development Imphal- www.ibsd-imphal.nic.in/
13. National Agri-Food Biotechnology Institution (NABI)- www.nabi.res.in/
14. Regional Centre for Biotechnology (RCB)- www.nii.res.in/rcb.htm

Public Sector Undertakings

15. Bharat Immunologicals and Biologicals Corporation Limited, Bulandshahar
16. Indian Vaccine Corporation Limited Delhi

    Biotech Consortium India Limited, New Delhi

ICAR Research Institutes and Centres (http://www.icar.org.in/en/node/325)

ICAR Institute

1. Indian Agricultural Research Institute, New Delhi- www.iari.res.in/
2. Indian Agricultural Statistics Research Institute, New Delhi- www.iasri.res.in/

3. National Academy of Agricultural Research Management, Hyderabad, Andhra Pradesh- www.naarm.ernet.in/
4. Central Research Institute for Dryland Agriculture, Hyderabad, Andhra Pradesh- www.crida.in/
5. Central Soil Salinity Research Institute, Karnal, Haryana- cssri.nic.in/
6. National Dairy Research Institute, Karnal, Haryana- www.ndri.res.in/
7. Central Avian Research Institute, Bareilly, Uttar Pradesh- cari.res.in/
8. Indian Veterinary Research Institute, Bareilly, Uttar Pradesh- www.ivri.nic.in/
9. Central Institute for Cotton Research, Nagpur, Maharashtra- www.cicr.org.in/
10. Central Institute for Research on Buffalo (CIRB), Hisar- www.cirb.res.in/
11. Central Institute for Research on Cotton Technology, Mumbai, Maharashtra- www.circot.res.in/
12. Central Institute of Fisheries Education, Mumbai- www.cife.edu.in/
13. Central Institute for Research on Goats, Mathura, U.P.- www.cirg.res.in/
14. Indian Institute of Sugarcane Research, Lucknow, U.P.- www.iisr.nic.in/
15. Central Institute for Subtropical Horticulture, Lucknow, U.P.- www.cishlko.org/
16. Central Institute of Agricultural Engineering, Bhopal, M.P.- www.ciae.nic.in/
17. Indian Institute of Soil Science, Bhopal, Madhaya Pradesh- www.iiss.nic.in/
18. Central Institute of Arid Horticulture, Bikaner, Rajasthan- www.ciah.ernet.in/
19. Central Institute of Brackish water Aquaculture, Chennai- www.ciba.res.in/
20. Central Institute of Post Harvest Engineering & Technology, Ludhiana, Punjab- www.ciphet.in/
21. Central Institute of Temperate Horticulture, Srinagar, J&K- www.cith.ernet.in/
22. Central Marine Fisheries Research Institute, Cochin- www.cmfri.org.in/
23. Central Institute of Fisheries Technology, Cochin- www.cift.res.in/
24. Central Plantation Crops Research Institute, Kasaragod- www.cpcri.gov.in/
25. Central Arid Zone Research Institute, Jodhpur, Rajasthan- www.cazri.res.in/
26. Central Potato Research Institute, Shimla, H.P.- cpri.ernet.in/
27. Central Research Institute for Jute and Allied Fibres, Barrackpore, West Bengal- www.crijaf.org.in/

28. Central Inland Fisheries Research Institute, Barrackpore, West Bengal- www.cifri.ernet.in/
29. Central Rice Research Institute, Cuttack, Orissa- www.crri.nic.in/
30. Central Sheep and Wool Research Institute, Avikanagar- www.cswri.res.in/
31. Central Soil and Water Conservation Research and Training Institute, Dehradun, Uttarakhand- www.cswcrtiweb.org/
32. Central Tobacco Research Institute, Rajamundry- www.ctri.nic.in/
33. Central Tuber Crops Research Institute, Thiruvananthapuram, Kerala- www.ctcri.org/
34. ICAR Research Complex for Eastern Region, Patna, Bihar-
35. ICAR Research Complex for Goa, Goa
36. ICAR Research Complex for NEH Region, Ri Bhoi,
37. Central Agricultural Research Institute, Port Blair- cari.res.in/
38. Indian Grassland & Fodder Research Institute, Jhansi, U.P.- www.igfri.res.in/
39. Indian Institute of Horticultural Research, Bengaluru- www.iihr.ernet.in/
40. National Institute of Animal Nutrition and Physiology, Bengaluru, Karnataka- www.nianp.res.in/
41. Indian Institute of Natural Resins and Gums, Ranchi- ilri.ernet.in/
42. Indian Institute of Pulses Research, Kanpur, U.P.- www.iipr.res.in/
43. Indian Institute of Spices Research, Marikunnu, Kerala- www.spices.res.in/
44. Indian Institute of Vegetable Research, Varanasi, U.P.- www.iivr.org.in/
45. Sugarcane Breeding Institute, Coimbatore, Tamil Nadu- www.sugarcane.res.in/
46. Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand- www.vpkas.nic.in/
47. Central Institute of Freshwater Aquaculture, Bhubaneshwar, Orissa- www.cifa.in/

Bureau

1. National Bureau of Agriculturally Important Micro Organisms, Mau Nath Bhanjan, Uttar Pradesh- www.nbaim.org.in/
2. National Bureau of Animal Genetic Resources, Karnal, Haryana- www.nbagr.res.in/
3. National Bureau of Fish Genetic Resources, Lucknow, Uttar Pradesh- www.nbfgr.res.in/
4. National Bureau of Plant Genetic Resources, New Delhi- www.nbpgr.ernet.in/

5. National Bureau of Soil Survey & Land Use Planning, Nagpur, Maharashtra- www.nbsslup.in/
6. National Bureau of Agriculturally Important Insects, Bangalore- www.nbaii.res.in/

Project Directorate

1. Directorate of Groundnut Research, Junagarh, Gujarat
2. Directorate of Maize Research, New Delhi
3. Directorate of Rice Research, Hyderabad
4. Directorate of Wheat Research, Karnal
5. Directorate of Oilseed Research, Hyderabad
6. Directorate of Seed Research, Mau
7. Directorate of Sorghum Research, Hyderabad
8. Directorate of Soybean Research, Indore
9. Directorate of Rapeseed & Mustard Research, Bharatpur
10. Directorate of Mushroom Research, Solan
11. Directorate on Onion and Garlic Research, Pune
12. Directorate of Cashew Research, Puttur
13. Directorate of Oil Palm Research, Pedavegi, West Godawari
14. Directorate of Medicinal and Aromatic Plants Research, Anand
15. Directorate of Floriculture Research, Pusa, New Delhi
16. Project Directorate for Farming Systems Research, Modipuram
17. Directorate of Water Management Research, Bhubaneshwar
18. Directorate of Weed Science Research, Jabalpur
19. Project Directorate on Cattle, Meerut
20. Project Directorate on Foot & Mouth Disease, Mukteshwar
21. Project Directorate on Poultry, Hyderabad
22. Project Directorate on Animal Disease Monitoring and Surveillance, Hebbal, Bangalore
23. Directorate of Knowledge Management in Agriculture (DKMA), New Delhi
24. Directorate of Cold Water Fisheries Research, Bhimtal, Nainital
25. Directorate of Research on Women in Agriculture, Bhubaneshwar

National Research Centre

1. National Centre for Agril. Economics & Policy Research, New Delhi
2. National Centre for Integrated Pest Management, New Delhi
3. National Research Centre for Agroforestry, Jhansi
4. National Research Centre for Banana, Trichi
5. National Research Centre for Citrus, Nagpur
6. National Research Centre for Grapes, Pune
7. National Research Centre for Litchi, Muzaffarpur
8. National Research Centre for Pomegranate, Solapur
9. National Research Centre on Camel, Bikaner
10. National Research Centre on Equines, Hisar
11. National Research Centre on Meat, Hyderabad
12. National Research Centre on Mithun, Medziphema, Nagaland
13. National Research Centre on Orchids, Pakyong, Sikkim
14. National Research Centre on Pig, Guwahati
15. National Research Centre on Plant Biotechnology, New Delhi
16. National Research Centre Seed Spices, Ajmer
17. National Research Centre on Yak, West Kemang

Others

1. Krishi Vigyan Kendra - Mahabaleshwar, Maharashtra
2. All India Coordinated Project of Micro and Secondary Nutrients and Pollutant Elements in Soils & Plants

DRDO Research Institutes and Centres
(http://drdo.gov.in/drdo/English/index.jsp?pg=techclus.jsp)

Life Sciences

1. Defence Bio-Engineering & Electro Medical Laboratory (DEBEL), Bangalore
2. Defence Institute of Bio-Energy Research (DIBER), Haldwani
3. Defence Food Research Laboratory (DFRL), Mysore

4. Defence Institute of High Altitude Research (DIHAR),Leh
5. Defence Institute of Physiology & Allied Sciences (DIPAS), Delhi
6. Defence Institute of Psychological Research (DIPR), Delhi
7. Defence Research Laboratory (DRL), Tejpur
8. Institute of Nuclear Medicine & Allied Sciences (INMAS), Delhi
9. Defence Research & Development Establishment (DRDE), Gwalior

MED

1. Advanced Numerical Research & Analysis Group (ANURAG), Hyderabad
2. Defence Scientific Information & Documentation Centre (DESIDOC), Delhi
3. Microwave Tube Research & Development Center (MTRDC), Bangalore
4. Solid State Physics Laboratory (SSPL), Delhi

ICMR Research Institutes and Centres (http://www.icmr.nic.in/institute.htm#Permanent Institutes/Centres)

1. National Institute of Virology (NIV), Pune- www.niv.co.in/
2. National Institute of Nutrition, Hyderabad (NIN)- www.ninindia.org/
3. National Centre for Laboratory Animal Science, (NCLAS) Hyderabad- www.ninindia.org/nclas.htm
4. Food and Drug Toxicology Research Centre, (FDTRC) Hyderabad- www.ninindia.org/fdtrc.htm
5. National Animal Resource Facility for Biomedical Research. Hyderabad-
6. National Institute of Malaria Research (NIMR), Delhi- www.mrcindia.org/
7. Rajendra Memorial Research Institute of Medical Sciences, Patna- www.rmrims.org.in/
8. National Institute for Research in Reproductive Health (NIRRH), Mumbai- www.nirrh.res.in/
9. National Jalma institute for Leprosy & Other Mycobacterial Diseases (NCJILOMD),Agra
10. National Institute of Occupational Health(NIOH), Ahmedabad- www.nioh.org/
11. Tuberculosis Research Centre (TRC), Chennai- www.trc-chennai.org/
12. National Institute of Epidemiology (NIE), Chennai- www.trc-chennai.org/
13. National Institute of Medical Statistics (NIMS), Delhi- nims-icmr.nic.in/
14. National Institute of Cholera and Enteric Diseases (NICED), Kolkata- www.niced.org.in/

15. Centre for Research in Medical Entomology (CRME), Madurai
16. National Institute of Immunohaemotology (NIIH), Mumbai- www.niih.org.in/
17. Enterovirus Research Centre (ERC), Mumbai
18. Genetic Research Centre, Mumbai
19. Institute of Cytology and Preventive Oncology (ICPO), Noida- www.icpo.org.in/
20. Vector Control Research Centre (VCRC), Pondicherry- www.vcrc.res.in/
21. Microbial Containment Complex (MCC), Pune
22. National AIDS Research Institute (NARI), Pune- www.nari-icmr.res.in/
23. Desert Medicine Research Centre (DMRC), Jodhpur
24. Institute of Pathology (IOP), Delhi
25. Regional Medical Research Center, Bhubaneswar
26. Regional Medical Research Center, Belgaum

CSIR- Research Institutes and Centres

1. CBRI - CSIR-Central Building Research Institute, Roorkee (Visit www.cbri.res.in)
2. CCMB- Centre for Cellular and Molecular Biology, Hyderabad- www.ccmb.res.in/
3. CDRI - Central Drug Research Institute, Lucknow- www.cdriindia.org/
4. CFTRI - Central Food Technological Research Institute, Mysore- www.cftri.com/
5. CIMAP - Central Institute of Medicinal and Aromatic Plants, Lucknow- www.cimap.res.in/
6. CSIO - Central Scientific Instruments Organisation, Chandigarh- www.csio.res.in/
7. IGIB - Institute of Genomics and Integrative Biology, Delhi
8. IICB - Indian Institute of Chemical Biology, Kolkata- www.iicb.res.in/
9. IICT - Indian Institute of Chemical Technology, Hyderabad- www.iictindia.org/
10. IIIM, Jammu - Indian Institute of Integrative Medicine, Jammu- www.iiim.res.in/
11. IMTECH - Institute of Microbial Technology, Chandigarh- www.imtech.res.in/
12. IITR - Indian Institute of Toxicology Research, Lucknow (Formerly known as Industrial Toxicology Research Centre)- www.iitrindia.org/
13. NBRI - National Botanical Research Institute, Lucknow- www.nbri.res.in/
14. NCL - National Chemical Laboratory, Pune- www.ncl-india.org/

15. NEERI - National Environmental Engineering Research Institute, Nagpur- www.neeri.res.in/
16. NISCAIR - National Institute of Science Communication and Information Resources, New Delhi- www.niscair.res.in/
17. NISTADS - National Institute of Science, Technology and Development Studies, New Delhi- www.nistads.res.in/

DST Institutes and Centres (http://www.dst.gov.in/contact/dst-sites.htm)

Scientific Programmes

1. Science and Engineering Research Council (SERC)- www.serc-dst.org
2. Kishore Vaigyanik Protsahan Yojana (KVPY)- www.iisc.ernet.in/kvpy
3. Intensification of Research in High Priority Areas (IRHPA)- www.serc-dst.org/irpha.htm
4. National Science & Technology Management Information System(NSTMIS)- www.nstmis-dst.org

S&T and Socio Economic Development

1. National Council for Science & Technology Communication (NCSTC)- www.vichar.nic.in/
2. National Science & Technology Entrepreneurship Development Board (NSTEDB)- www.scienceandsociety-dst.org/
3. Science and Society Division- www.nstedb.com/ www.techno-preneur.net/
4. State Councils for Science & Technology- www.nrdms.gov.in/
5. International S&T Cooperation- www.stic-dst.org

Professional Bodies

1. Indian Academy of Sciences, Bangalore- www.ias.ac.in
2. Indian National Academy of Engineering, New Delhi- www.inae.org
3. The National Academy of Sciences, Allahabad- www.nasi.nic.in
4. The Indian Science Congress Association, Kolkata- www.sciencecongress.org/

Autonomous S&T Institutions

1. Agharkar Research Institute, Pune
2. Aryabhatta Research Institute of Observational-Sciences (ARIES), Nainital
3. Birbal Sahni Institute of Palaeobotany, Lucknow
4. Bose Institute, Kolkata

5. Centre for Liquid Crystal Research, Jalahalli, Bangalore
6. Indian Association for the Cultivation of Science, Kolkata
7. Indian Institute of Astrophysics, Bangalore
8. Indian Institute of Geomagnetism, Mumbai
9. Indian Institute of Tropical Meteorology, Pune
10. International Advanced Research Centre for Powder Metallurgy and New Materials, Hyderabad
11. The Institute of Advanced Study in Science & Technology, ASSAM
12. Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
13. National Accreditation Board for Testing & Calibration Laboratories, New Delhi
14. Raman Research Institute, Bangalore
15. S.N. Bose National Centre for Basic Sciences, Kolkata
16. Sreechitra Tirunal Institute for Medical Sciences & Technology, Thiruvananthapuram
17. Technology Information, Forecasting & Assessment Council (TIFAC), New Delhi
18. Vigyan Prasar, New Delhi
19. Wadia Institute of Himalayan Geology, Dehradun