Department of Biotechnology (DBT)
Ministry of Science & Technology
Government of India

Report on DBT's effort in Promoting Biotechnology Activities in NER:

OVERVIEW:

In order to give focused attention for the North Eastern Region, the department has made 10% allocation to North Eastern States of India & this comes to about Rs.150.00 Crores per Annum. A North Eastern Region Biotechnology Programme Management Cell (NER-BPMC) which was established by DBT in the year 2009 is helping to evolve and implement various new programmes in the area of biotechnology for the benefit of NER states. The Twinning R&D programme has made a huge impact in NE states for implementing hard core biotechnology in association with rest of India institutions. So for more than 400 twining projects have been implemented as collaborative projects between North East institutions and the rest of India Institutions. To create an environment of training and research in Medical Biotechnology, the department provided support to 11 medical colleges in NER. 126 Biotech Hubs have been established at various institutions, universities & colleges to promote education, training & research in biological sciences including biotechnology. 18 institutions of NER are part of DBT e-Library consortium (DeLCON) which provides access to more than 900 high impact e-journals. Biotech infrastructural facilities have been created at NRC Yak; NRC Mithun and NEIGRIHMS. 15 colleges have been recognized so far as Star Colleges in NER. 130 Scientists of NER were supported through a special scheme of DBT's Overseas Associateship and more than 75 scientists have already availed such fellowships. Through yet another program of similar nature, 11 Scientists were provided National Associateship for advanced training at leading institutions in India. 88 Senior Secondary Schools from NER have been selected for setting up of Biotechnology Labs under "Biotechnology Labs in Senior Secondary schools (BLiSS)" Scheme. During this year, 15 Scientists/Faculty have been selected for bringing advancement in the Biotechnology and Life Science related activities in various institutions of research and higher learning in the NER under "DBT-NER Visiting Research Professorship (VRP) Scheme".

A COE on Agriculture Biotechnology named DBT-AAU Centre and another on Fisheries & Aquaculture Biotechnology (FAB) have been supported to Assam Agricultural University, Jorhat and College of Fisheries, CAU, Tripura respectively. A regional level Animal House facility is being established at RMRC, Dibrugarh (Assam), which will be accessible to entire biomedical research community of NER for carrying out critical animal experiments in disease biology, molecular medicine, vaccinology and pharmacology.

SECTORAL PRIORITIES FOR NER

In line with the National Biotechnology Development Strategy of DBT, the sectoral priorities of NER-BPMC are:

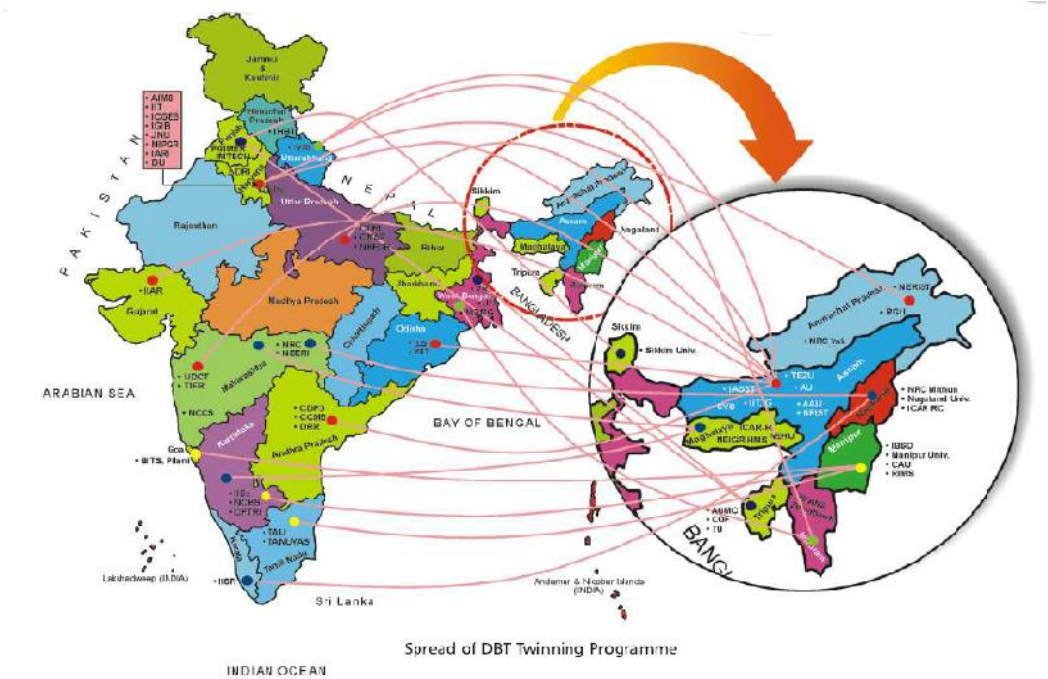
- Competence in innovative R&D
- Agriculture and Food Productivity
- Human Resource Development and Capacity Building
- Human and Animal Healthcare
- Clean Environment, Sustainable Utilization and Conservation of Biodiversity
- Intellectual Property Management, Technology Transfer, Biotech Incubators, Entrepreneurship
- Bioinformatics, Specialized Databases
- Societal Development

Competence in innovative R&D

❖ Twinning Programme

The goal of this programme is to strengthen R&D activity in the North East India through joint collaborations. Financial assistance is provided to competitive R&D projects from scientists in the North Eastern States in collaboration with Scientists from National Institutions from other parts of the country.

The programme has supported nearly 350 R&D projects, leading to more than 200 papers published in peer reviewed journals, and more than 450 young scientists of NER trained in advamced biotechnology.



Spread of DBT Twinning Programme

The following major facilities were established to strengthen competence in innovative R & D:

- **DBT- AAU Centre for Agriculture Biotechnology in NER**

DBT has established the above centre at Assam Agricultural University, Jorhat for strengthening agri-biotechnology research in NER. The centre has the mandate to undertake/strengthen research in the areas of Gene technology for crop improvement; Gene mining and Molecular breeding; Microbial gene prospecting; Biofertilizer and Biopesticide. It will also be engaged in developing skilled/trained human resource, generating bioputs to assist eco-farming in NER, and documentation and genetic cataloguing of bioresources for IP mamangement.

The Centre has successfully generated transgenic chickpeas and blackgram lines using Bt genes to confer protection against pod borers; 750 rice germplasm are genotyped using 120 SSR markers; Development of drought tolerant rice variety (Ranjit) is in progress; Seven acid tolerance genes are found to be up-regulated in Bacillus megatarium;, Biofertilizers and biopesticides generated at headquarter and at satellite centres are being distributed to the farmers. Nine PhD students enrolled in Agri-biotechnology at Assam Agricultural University are awarded with fellowships. Centre has also funded 9 innovative projects to the PIs from various organizations at N E India and conducted 6 scientific workshops on biotechnology and several training workshops on bioinput production involving researchers of N E India as well as other parts of the country.

A view of DBT – AAU Building Constructed at AAU, Jorhat

- **Establishment of a "DBT Animal House Facility for Biotechnology Research in North-Eastern Region"**

  In order to give a strong fillip to research in experimental medical sciences and in herbal medicine, DBT has initiated establishment of a state-of-the-art, Regional Animal House Facility at Regional Medical Research Centre (RMRC), Dibrugarh.

  It will provide well-equipped and fully-functional lab space to the researchers from entire NER for carrying out critical experiments in disease biology, molecular medicine, immunology/vaccinology, drug development and molecular pharmacology. This facility will facilitate availability of specific-pathogen free (SPF) and genetically defined lab animals. Imparting training to the biomedical research staff in standard procedures in animal experimentation will be yet another important activity of this facility.

- **DBT-NER Centre for Advanced Animal Diagnostics and Services on Animal Health and Diseases (ADSAHD).**

  The North Eastern Region of India, owing to its unique geographical location sharing five international borders, bears constant threat of exotic trans-boundary diseases of our valuable livestock. This programme is aimed at strengthening regional infrastructure and capabilities for developing latest diagnostics and organizing rigorous surveillance for the highly contagious and ravaging diseases so that forecasting model on disease outbreaks in the region can be developed for a formidable defense to guard the territories.

  The programme envisages establishing three core laboratories across the NER for carrying out research and training activities in trans-boundary and endemic animal diseases. It aims to impart training to the State veterinary personnel in disease reporting, sample collection techniques and fostering public-public partnership module for effectively handling the animal-man-environment continuum chain. In February 2015, this programme was launched by Dr. Harsh Vardhan, Hon'ble Union Minister of Science & Technology and Earth Sciences, Government of India.

(Launching of ADSAHD Programme)

❖ **Establishment of Biotech Hubs**

In order to inculcate interest for biotechnology among budding scientists at the formative stage of science education (UG/PG level) and research career (PhD level), DBT has launched a programme on establishing a network of Biotech Hubs across NER. The programme is aimed at providing necessary infrastructure in universities/ colleges/ institutions as well as to impart necessary training in sophisticated technologies so as to support and promote biotechnology education and research.

At this juncture, there are 6 State-Level and 120 Institutional Level vibrantly active Biotech Hubs spread across all the eight states of NER. Together these hubs have conducted more than 300 training programmes and supported more than 300 PG and PhD students. More 250 research papers published in peer reviewed journals underline the quality of research being undertaken at some of the Biotech Hubs.

❖ **Establishment of Unit of Excellence in Biotechnology (U-Excel)**

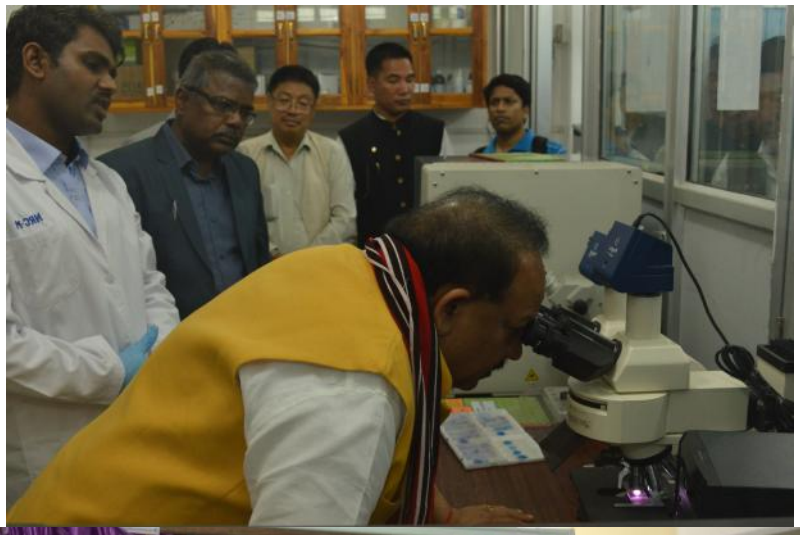
With a view to recognize promising mid-career scientists in NER, a programme of awarding Unit of Excellence grant to them has been initiated so as to enable them to pursue their innovative research in frontier areas of biotechnology. So far, 12 Units of Excellence have been established.

❖ **Development of Biotech Infrastructural Facilities at National Research Centre on Yak (NRC on Yak), Dirang, Arunachal Pradesh.**

These high-end facilities in Arunachal Pradesh will improve the research dynamics for desirable gain in the yak husbandry in North East India.

❖ **Development of Biotech Infrastructure Facilities at National Research Centre (NRC) Mithun (ICAR), Nagaland.**

DBT has come forward to support & create biotech infrastructure facilities in Nagaland for better research/ academic programmes on Mithun husbandry, genomics and conservation.



❖ Eco-Friendly Farming Using Bio-inputs

This programme has emphasized upon the application of bio-inputs (biopesticides, biofertilizers) for organic farming of key high value crops (HVCs) of NER, mass multiplication of required bio-inputs and evaluation of their efficacy. The programme is being implemented by ICAR-Research Complex for NE Region (ICAR-RC), Umiam, Meghalaya; 14 Krishi Vigyan Kendra's (KVKs) of ICAR under Zone III in NER, and Institute of Bioresources and Sustainable Development (IBSD), Imphal, Manipur. The programme covers 14 districts in 8 NE states, has trained 1400 farmers in organic farming in the use of bio inputs and promoted organic farming of 9 crops (5 spices, 2 fruits and 2 vegetable crops). An area of 156 hectare has been developed and certified for organic farming.

The programme has shown success of technology in field demonstrations with some target crops, *viz.*, Tomato, Chilli, French Bean, Turmeric and Ginger. The promising results from these field demonstrations have indicated high possibility of substituting chemical fertilizers and synthetic pesticides with safe and effective bioinputs.


❖ Value addition in Jackfruit & commercialization of its processed products:

Major objectives of this programme comprise identification of superior genotypes of jackfruit and their molecular characterization on one hand, and validation and commercialization of technologies for value added products from Jackfruit, on the other.

It is a multicentric programme involving involving University of Agricultural Sciences (UAS) GKVK, Bangalore; College of Home Science, Central Agricultural University (CAU), Tura, Meghalaya; Department of Horticulture, AAU, Jorhat; NGOs GRAMA (NGO),Kerala; Parivarthan (Women SHG), Karnataka; Kadamba Marketing Society, Karnataka; KVK, Tripura (Under ICAR-RC, Tripura Centre); KVK, Kamrup, Assam, (Under AAU, Jorhat).

The programme has identified more than 40 elite jackfruit genotypes from Karnataka, Assam and Tripura for culinary or table purposes, organized training

workshops for farmers for existing jackfruit technologies, and produced value added products like pickle, curry, bhaji, tikki, chips, squash, wine, jam, papad, etc. Marketing and supply chain is being developed through involvement of farmers and entrepreneurs.

❖ **Augmenting clean pork production and value addition**

Being implemented at the National Research Centre for Pig (ICAR), Guwahati, Assam**,** this project has been designed to develop shelf stable pork products (namely nuggets and bites, sausages, patties, kebabs, samosa, momo, slices etc.) and to refine & standardize the technologies for producing a wide range of value added pork products to provide variety to the pork consumers. Production of pork sausages has already been initiated. With more than 75% non-vegetarian population (with special attraction towards pork and pork products) in the North-Eastern Region, the technologies developed herein could be taken up at commercial scale with possible turnover of about 150-200 tonnes of pork products per annum in the coming years.

❖ **Value chain development in Citrus**

This programme aims at using modern technologies for mass production of citrus plants and value-added citrus products. This collaborative DBT programme is being implemented by ICAR-RC, Nagaland; ICAR-RC for NEH Region, Shillong, Meghalaya; NRC for Citrus (ICAR), Nagpur, IIT, Kharagpur, West Bengal.

So far, more than 2000 seedlings of rough lemon have been raised, Khasi mandarin and sweet orange successful grafted, and processing of citrus juice standardized. A Poly-house for multiplication of citrus rootstocks has also been constructed.

Value added products from Citrus

❖ **Network Programme on Chemical Ecology of North Eastern Region**

A collaborative research programme on Chemical Ecology of North Eastern Region has been launched, with scientists from reputed national institutions (National Centre for Biological Sciences (NCBS), Indian Institute of Science (IISc), University of Agricultural Sciences) and those from NER institutions [IBSD, Imphal, (Manipur), Regional Centre of IBSD, Gangtok (Sikkim), NEHU, Shillong (Meghalaya), Nagaland S&T Council, Kohima (Nagaland), Rajiv Gandhi University, Itanagar, (Arunachal Pradesh)], being the partners in this programme. The programme will focus on identification of the origins and compositions of plant, insect and vertebrate pheromones and semio-chemicals; analysis and (re) engineering of chemical communication mechanisms; molecular and structural mechanisms; behavioral and neural mechanisms; biochemical, genetic and physiological mechanisms, governing interactions between flora and fauna of NER.

❖ Overseas Associateship for NER Scientists

This scheme aims to promote capacity building in cutting edge areas of biotechnology and life sciences. The Award promotes and supports scientists of merit in their pursuit of skill enhancement in scientific research/training in Overseas laboratories for short term as well as long term.

So far, 130 scientists have been awarded the Associate-ship. As of now more than 120 scientists have availed this Assocaiteship. This overseas associateship has resulted in more than 15 research papers in peer reviewed journals and has also enabled more than 10 laureates in getting extra-mural funding for their R&D projects besieging training inhouse scientific human resource of NER.

Major Overseas Institutions where NER Scientists Trained

- **Boston Children Hospital, Harvard Medical School**
- **Cornell University**
- **Washington State University**
- **University of Texas**
- **United States Department of Agriculture (USDA)**
- **University of California**
- **Universitv of Wisconsin**

USA 50 %

UK 18.5%

- **University of Glasgow**
- **University of Strathclyde Science**
- **The Food and Environment Research Agency**
- **University of Aberdeen**

EU 17.1%

- **Uppsala University, Sweden**
- **Gent University, Belgium**
- **University of Regensburg, Germany**
- **Institute of farm Animal Genetics, Germany**
- **IFAPA Centre, Alameda del Obispo, Spain**
- **Labratorire Interactions Plantes Microbes,**
- **CNRS-INRA. France**

CANADA 5.71%

- **Lakehead University**
- **Concordia University**
- **University of British Columbia**

Others* 8.75%

- **National Institute of Biomedical Innovation, Japan**
- **CSIRO,Canberra, Australia**
- **Yat-sen University Cancer Centre,China**
- **Universitv of Southern Queensland. Australia**

❖ **Biotechnology National Associateship**

A special National Associateship Programme for short term and long term training was launched in 2012-2013 to enable promising scientists from NER to conduct research or training in National Institutions/research laboratories in different areas of biotechnology such as (i) agriculture, food and feed biotechnology; (ii) animal biotechnology; (iii) aquaculture and marine biotechnology; (iv) food and nutrition; (v) environmental biotechnology (vi) industrial biotechnology: materials biotechnology, reaction and process design; (vii) medical biotechnology; (viii) nano -biotechnology and bioengineering; (ix) bioinformatics and IT-enabled biotechnology; (x) intellectual property and patent law.

The fellowship has been awarded to 11 candidates (2 for long term training and 9 for short term training). Out of 11 scientists, 8 have availed the Associateship in reputed institutions in various parts of India.

❖ **Setting up of Biotech Labs at Senior Secondary Schools (BLiSS) in NER.**

An unprecedented growth in the field of biotechnology has resulted in break through developments. To harness this potential, it is important to create awareness at an early stage by imparting good biotechnology education at school level and also to create an environment of access to a well equipped laboratory. Recognizing this need, the Department of Biotechnology (DBT), has initiated a scheme for establishing "Biotechnology Labs in Senior Secondary schools (BLiSS)" across the North Eastern States of India. During this financial year, 88 Senior Secondary Schools from NER have been selected by DBT for support under BLiSS with financial support of upto Rs. 18.00 lakhs in 3 years. A basis set of laboratory equipment alongwith recurring support is being provided under this scheme. 88 schools from NER have been selected by DBT under BLiSS programme.

❖ **DBT-NER Visiting Research Professorship (VRP) Scheme for NER**

The Department of Biotechnology (DBT) to achieve excellence in promotion of biotechnology & related areas in the North Eastern Region (NER) of India, has initiated "DBT-NER Visiting Research Professorship (VRP) Scheme" to utilize the expertise and expertise of outstanding biotechnology professionals for bringing advancement in the Biotechnology and Life Science related activities in various institutions of research and higher learning in the NER States of India. Scientists/faculty from reputed institutions in India shown their interest in sharing their domain expertise to NER institutions through this scheme. Recently, 15 scientists/faculty have been selected by DBT under VRP for NER during this financial year. 4 have already joined NER institutions.

❖ **Training on recent technique in infectious disease diagnosis.**

Two short-term (2-week), hands-on training on “Recent Technique in Infectious Disease Diagnostic for Mid-career Scientists from NER” were organized by All India Institute of Medical Science (AIIMS) and Biotech Consortium India Limited (BCIL) at AIIMS, New Delhi. Sixteen Scientists from NER were trained in new sophisticated technology platforms and biotechnological tools used in diagnosis of infectious diseases.

❖ **Research methodology workshop for North East**

DBT provided support for three "learning by doing" Research Methodology Training Workshops for the medical research fraternity in the North Eastern Region. Each workshop was of three days duration.

These workshops imparted knowledge about basic concepts in Medical Research, Study Design, Regulatory aspects, Data Analysis and about essentials of research protocol/ proposal writing. More than 200 participants comprising MD/MS students, PhD students, and their mentors benefitted from these workshops.

❖ **Centre for empowerment of human resources at NEHU**

DBT has established this centre for conducting trainings/workshops for faculty/research students of the region in niche areas of Biotechnology for undertaking R&D activities. Distinguished faculty with national/international credentials are invited to impart advanced training to the participants. The topics on which hands on training programmes were conducted included (i) Real Time PCR, (ii) DNA cloning, sequencing and sequence Analysis, (iii) Proteomics and its applications, (iv) Techniques in Genomics and their applications in Biotechnology and (v) NGS and its applications.

The centre also organized an Autumn School in Plant Sciences for the benefit of graduate students of the region. An important contribution of the centre has been a greater inquisitiveness in the students of this region to take up science as a career. This is reflected in substantial increase in the number of students from NER qualifying various national examinations like NET, GATE, BINC, etc.

Students of school of Meghalaya being explained the functioning of different equipment

A hands on Training workshop in progress

- **DBT Biotechnology/Bioinformatics training centre for NER Researchers at ACTREC, Mumbai**

  Recently DBT has established a “DBT Biotechnology/Bioinformatics training centre for teachers & research scholars from the North Eastern Region of India” at Advanced Centre for Treatment, Research and Education in Cancer (ACTREC), Mumbai. This centre is providing high end hands on training to NER researchers on cancer biology. 30 researchers (in 2 batches) from NER have been trained at ACTRECT between June 2015 to July 2015.

- **Training Programme for “Enhancing Capacity building in genomics –driven research in human health & disease in NER at NIBMG, Kalyani**

  DBT has recently initiated a training programme through NIBMG, Kalyani, to provide comprehensive training to scientists, research students and clinicians belonging to the North Eastern Region (NER) of India, who are engaged in “Biomedical Research”, to better equip them to undertake focused research leading towards understanding the molecular basis of diseases prevalent in NER of India. The first training programme has been organized at Assam University Silchar and further trainings are going on.

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❖ **Development/Upgradation of Infrastructure in Medical Colleges**

The DBT program on Development of Infrastructure in Medical Colleges in the NER was initiated in the year 2009. The program is now operational in 11 medical colleges/ institutions in four states of the Region, namely Assam, Nagaland, Tripura and Manipur. Labs of 21 Principal Investigators have been renovated/upgraded for providing quality diagnostic services as well as for carrying out research on various health problems prevalent in the region using modern biotechnology tools and technologies.

High end equipment including flow cytometer, Real-Time PCR machine, Hi-speed centrifuges, Deep freezers etc. installed.

In addition, a total of 157 medical students have been supported for biotechnology-based MD/MS research in various subjects.

DBT Healthcare Lab, Naga Hospital Authority, Kohima, Nagaland

Inauguration of DBT Healthcare laboratory & Research Centre

❖ **Establishment of a Comprehensive Facility for Diagnosis and Management of Genetic Disorders.**

A centre dedicated to molecular diagnosis and management of genetic disorders has been established at Assam Medical College & Hospital, Dibrugarh. It will provide state of the art services for diagnosis of genetic disorders through specially created units, namely, Cytogenetics Unit, Molecular Genetics Unit, Biochemical Genetics Unit, and Genetic Counselling Unit; in addition, a Bio-Bank will help create a repository/cohort of well characterized clinical samples for future studies.

This facility will provide timely and accurate diagnosis of genetic diseases due to chromosomal aberrations, single gene mutations, haemoglobinopathies, etc. Hopefully, this facility will create a nucleus for the emergence of a centre of excellence for quality education and research in Medical Genetics in NER.

- **Creation of Improved Diagnostic Services Infrastructure at NEIGRIHMS**

  DBT has provided support for establishing sophisticated infrastructure for improved diagnostic services in pathology, hematology and genetics departments at the North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences (NEIGRIHMS), Shillong (Meghalaya).

  The support is expected to significantly improve the efficiency of the diagnostic services of the institute, and help generate credible statistics about various diseases as well.

  These facilities will specifically help in establishing viral etiology of nasopharyngeal carcinoma (EBV), and oral squamous cell carcinoma (HPV); in unraveling pattern of neoplastic renal diseases and hematolymphoid neoplasma, and in molecular typing of minor blood group antigens in NER.

- **Establishment of Molecular Diagnostic Laboratory for Cancer**

  DBT has taken the initiative towards establishing a molecular diagnostic laboratory at the Mizoram State Cancer Institute (MSCI), Aizawl (Mizoram). Mizoram has a total population of about 11 lakhs and a literacy rate of 91.58%. Regrettably, Mizoram also has the dubious distinction of having the highest incidence of cancer in India.

  Recognizing that accurate and precise diagnosis is the cornerstone of any successful cancer treatment, DBT has established this molecular laboratory which will not only enhance the quality of comprehensive cancer care but will enable quality research to understand the factors underlying high incidence of cancer in the State.

  The initial focus of the research project would be on three cancer types commonly encountered in Mizoram: 1. Chronic myeloid leukemia (BCR-ABL translocation); 2. Breast cancer (HER2/neu), and 3. Lung cancer (EGFR).

- **Biotech facilitated utilization and conservation of selected Medicinal & Aromatic Plants (MAP)**

  This programme focuses on molecular taxonomic characterization of important medicinal and aromatic plant (MAP) species, isolation and pharmacological evaluation of their bioactive extracts/ ingredients for specific medicinal value. The programme also promotes Good Agricultural Practices (GAP), and large scale production of planting material and post harvesting technologies. The programme is being implemented by Assam Agricultural University (AAU), Jorhat; College of Veterinary Sciences, AAU, Khanapara, Guwahati and North East Institute of Science and Technology (NEIST), Jorhat, Assam.

  Under this programme, four plant species (*Homalomena aromatica*, *Clerodendrum indicum*, *Acorus calamus*, and *Piper longum*) have been selected for taxonomical studies, development of GAP, mass multiplication and post-harvest management.

  The contents of alkaloid, Tannin, Flavonoid and Riboflavin amongst the germplasm of *H. aromatica* have been determined. Distinct RAPD DNA sequences for 22 genotypes of the targeted plant species from different areas of NE states have been assigned distinct Accession numbers by the GenBank.

- **Impact Assessment of Jhumming on plant and soil microbiota and restoration of sustainable Jhum agro-ecosystem**

  This network programme is aimed at amelioration and eco-restoration of Jhum lands in North East India. Its specific objectives include estimating the genetic & biochemical diversity of untapped microbial pool, screening for heat and acidity tolerant microbes, bio-prospecting studies for stress tolerant genes and Allele mining, defining roles of hardy native plant spp. resilient to slash & burn practices in Jhum system, developing rapid multiplication technique for eco-restoration during fallow periods, and exploring the possibility of establishing symbiotic relationship between native plant species and potential microbes.

  This network programme is being implemented by North-Eastern Hill University (NEHU), Shillong Meghalaya;Central Agriculture University (CAU),UMIAM, ; Mizoram University, Aizawl, Mizoram; Nagaland University, Medziphema, Nagaland; AAU-RARS, Diphu, (DBT) ; AAU Jorhat, Assam; Institute of Bioresources and Sustainable Development (IBSD), Imphal, Manipur.

  So far, impact of jhumming has been assessed on the soil microbiota and soil chemical/biochemical compositions at the experimental plots. Soil samples collected from jhum fallow under burned and unburned situations have been analyzed.

Altogether, 150 bacterial isolates have been obtained and studied for growth promoting properties.

- **Centre of Excellence on Fisheries and Aquaculture Biotechnology (FAB-COE)**

For strengthening the Fisheries and Aquaculture Biotechnology related R&D activity in the NER region, a FAB-COE has been established by DBT at College of Fisheries, Central Agricultural University, Lembucherra, Tripura. Its main objectives are to improve the yield of fish production in NER, to explore the fish biodiversity of the eight North Eastern States, understand the lineage of species diversity, ddevelopment of protocol for breeding, seed production and faming of economically viable species, fish resource management education and capacity building, and R&D on feed development

In ongoing fish diversity exploration in eight North-Eastern states, so far a total of 180 fish species belonging to 13 orders, 34 families and 78 genera have been collected and identified using morphological taxonomic tools, and cataloged and inventorized. Using molecular tools so far sixty (60) species have been DNA-barcoded, one of which is a new submission. The FAB-COE has succeeded in brood stock development and seed production of C. reba and O. belangeri at College of Fisheries farm and acclimation of B. dario, a truly riverine species, in aquaria. The centre has also started capacity building programme for farmers in Tripura, Manipur, Sikkim and Meghalaya.

Molecular Biology Lab at FAB-COE

Referral Museum

(Inauguration of Wet Laboratory set up under Centre of Excellence on Fisheries and Aquaculture Biotechnology by the Hon'ble Union Minister for Science & Technology and Earth Sciences)

Bioinformatics, Specialized Databases

- **North Eastern Bioinformatics Network (NEBINet)**

  Twenty nine bioinformatics centers have been established in all the 8 states of the NER and are networked as the North Eastern Bioinformatics Network (NEBINet). These Bioinformatics centres are provided with latest IT equipment to support the research activities of the host institutions in NER. Two new bioinformatics centres were established during the current year at College of Fisheries, Central Agricultural University, Lembucherra, Tripura and National Research Centre on Mithun (ICAR), Nagaland

- **DBT's e-Library Consortia (DeLCON)**

  DBT's e-Library Consortia for North Eastern Region (NER-DeLCON) was established in the year 2010 through which access to more than 900 High Impact e-journals were subscribed by DBT. The facility is being offered to 18 selected NER institutions free of cost; it is being extensively used by scientists, faculty and students of these 18 institutions. A separate website www.delcon.gov.in has been created for DeLCON.

- **Biotechnology and Bioinformatics Resources of North East India (BABRONE).**

  An online human resource repository of Biotechnology and Bioinformatics Resources of North East India (BABRONE) has been created and located at College of Veterinary Sciences (AAU), Khanapara, Guwahati (Assam). It is a freely

accessible e-learning server developed as a common platform for uploading learning materials, sharing of information and as an online discussion forum.

❖ **Network Program on Development of Digital Database of Bio resources of NE India**

A digital database of bio-resources of North East India is under development. From the secondary data source, 309 species of plants having medicinal (290), food (12), arts and culture (02), fiber (02), spices (02) and beverage (01) values along with 31 species of animals having food (27) and medicinal (04) importance were recorded. For supporting the data collected from the different published papers, a total of 650 photographs have been collected to feed into the database.

From the field survey of East, West and North district of Sikkim, 143 species of plants were recorded as having medicinal (119 spp.), food (20 spp.), wild edible fruits (03spp.), beverage (01sp) value, and 13 species of animals were documented as being used by the locals mostly as food which included 11 species of fish and 02 species of insects.

Biotech Incubators and Entrepreneurship

❖ **Setting up of Guwahati Biotech Park**

DBT has established a Biotech Park at Guwahati, Assam, as a meeting point of technological innovation for knowledge-based biotechnology enterprises and to provide sustainable linkages between the industry, research institutions and academia to boost the region's competitiveness.

Its main objectives are to encourage and support the start up, incubation and development of innovation led, high growth knowledge based business in the multidisciplinary area of biotechnology. It provides state-of-the-art infrastructure facilities and single window services for setting up biotechnology ventures in NER,

acting as an engine for the growth of the biotechnology, chemical and biological industry and as a facilitator and a catalyst in the process of industry's development.

The park will promote formal and operational links between centers of knowledge creation such as national R&D laboratories, Universities, Medical Institutions and research organizations in India and abroad and create a strong network.

- **Feasibility Report for setting up of Bioincubator in Sikkim**

  DBT has got prepared a feasibility report for setting up of Bioincubator in Gangtok, Sikkim through Biotech Consortium India Limited (BCIL), New Delhi.

- **Entrepreneurship Development Programmes (EDPs)**

  Comprehensive Entrepreneurship Development Programme (EDP) in Biotechnology has been initiated by DBT through Biotech Consortium India Limited (BCIL), with the objective to assist budding entrepreneurs with guidance and technical support from concept to commissioning of their enterprises. Through this initiative, 2 entrepreneurs have setup their commercial ventures successfully.

- **Entrepreneurship Development Programme in Plant Tissue Culture**

  15 days training programme on entrepreneurship development for production of superior quality planting material using in vitro technology was organized by The Energy & Resources Institute (TERI), New Delhi.

  The programme aimed at enhancing the technical capability of entrepreneurs engaged in mass production of tissue cultured plants and appraising them about the current development in this field.

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