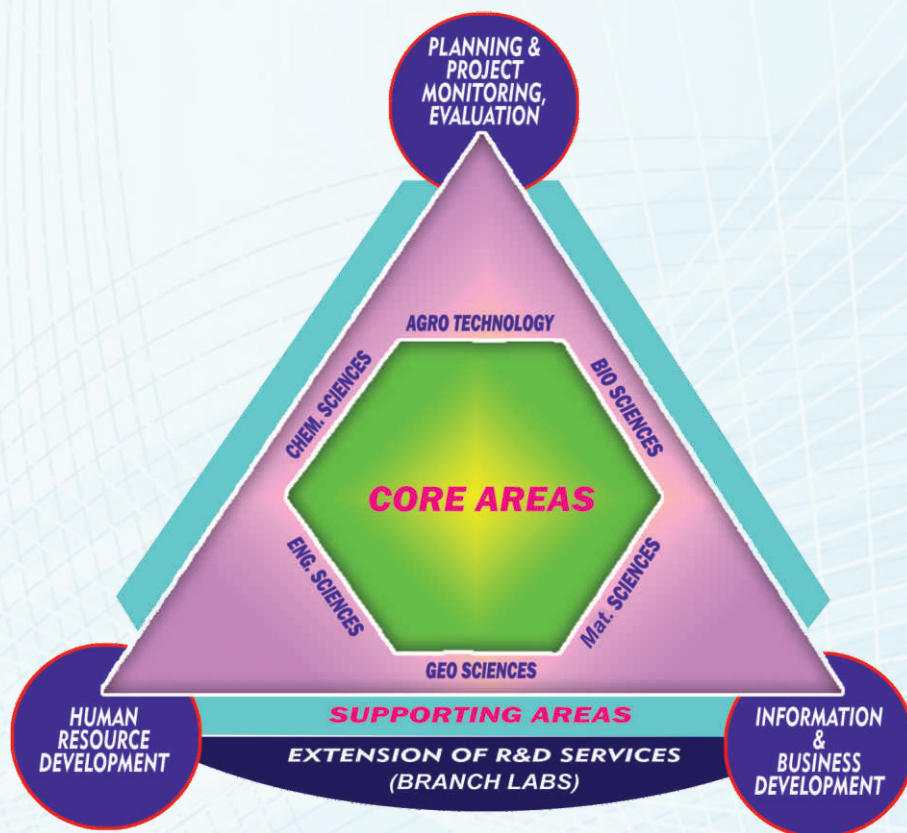


Annual Report

2012-2013



CSIR-North East Institute of Science & Technology : Jorhat



QUALITY POLICY OF CSIR-NEIST

CSIR-North East Institute of Science & Technology, Jorhat is committed to achieve excellence with quality outputs in R&D in frontier areas, professional consultancy and contract services in Chemical, Biological and Allied Sciences to be offered to customers in public and private domains at national and international levels.

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About CSIR-NEIST Jorhat



The governing body of CSIR in its 168th meeting held on 8 December, 2006 decided renaming of five Regional Research Laboratories (RRLs) of CSIR located at five different regions including the one at Jorhat commensurating with their direction, orientation of expertise and excellence developed over the years. Accordingly, the RRL's name was formally changed to North East Institute of Science & Technology (NEIST) with effect from 18 March, 2007, the 46th Foundation Day of the Institute. The NEIST (erstwhile RRL) at Jorhat (Assam) was

established in the year 1961 as one of the multidisciplinary CSIR laboratories. It is worth mentioning here that the constituent laboratories of CSIR have been grouped into five broad areas such as physical sciences, chemical sciences, biological sciences, engineering sciences and information sciences depending upon the type of work, objective and the nature of responsibilities vested on these laboratories. On this basis the NEIST is one among the seven other laboratories under the Chemical Science group. The major thrust of R&D activities of NEIST Jorhat has been to develop indigenous technologies and knowledgebase by utilizing the immense natural wealth of the North Eastern region of India. The North Eastern region of the country being bestowed with an abundance of material resources like petroleum, natural gas, minerals, tea and aromatic & medicinal plants and hence the laboratory was assigned to undertake research for development of expertise and know-how for a wide range of industries and extension works. Over the years, the institute has generated more than 117 technologies in the areas of Agrotechnology, Biotechnology, Chemical Sciences, Engineering Sciences, Environmental Sciences and Petroleum and Oil Field Chemicals of which about 60% were commercial successes culminating in setting up of various industries throughout the country. The Institute also developed expertise in the areas like natural products chemistry, drugs and drug intermediates, VSK cement technology, agro-technologies, petrochemicals, crude-oil transportations, paper and paper products, beneficiation chemicals, ecology and environment studies, geotechnical investigations, foundation design engineering, soil investigation and building materials.

These tasks of the Institute have to be focussed and tuned-up differently at different points of time in accordance with the national commitments and priorities. The Institute also has tie-up with other research and academic institutions for functional and other coordinations for HRD and S&T developments of the region in particular and the country as a whole. Effects have also been made to further evolve the Institute as a lead S&T player in the present global scenario.

From Director's Desk



It gives me immense pleasure to present before you the Annual Report of CSIR-NEIST for the year 2012-2013 highlighting achievements & contributions of the institute in terms of research & development, network projects, processes released, papers published, patent filed, human resource development, societal benefits, seminar, symposium, meetings organized, honour & recognition, awards, etc. The year marked the beginning of the 12th Five year plan.

Like previous years this year had also registered lots of notable progress in almost every front starting with earning a cash flow of Rs 6,78,84,900. A remarkable accomplishment includes development of two new herbal formulations in the field of affordable health care for easy reach of the people at the bottom of the pyramid. The first one is 'Anti-Arthritis', a low cost externally administered purely herbal formulation with no observed side effects observed for treating arthritis, inflammation or any associated problems of arthritis was developed and also released for marketing only. The second one is also a low cost with no anticipated side effects broad spectrum herbal formulation 'Fungi-Destruct' for treatment of dermal infections like onchomycosis, candidiasis, ringworm etc. In addition, during the FY six technologies were transferred to 11 parties from different states of India namely Assam, Manipur, Tripura & West Bengal. The Institute also signed several MoUs and agreements during the period for strengthening research collaboration and development of S&T personnel.

On the IPR front, 4 Patents were granted in India and 4 abroad while 6 patents were filed in India and 16 abroad. On the publication side, the institute published a total of 80 research papers in reputed national and international journals with an average impact factor (IF) of 2.722 and highest IF of 22.462, an improvement over the previous years. During the period three new Consultancy projects and eighteen new grant-in-aid projects were undertaken.

During the period under reporting, the institute organized vital and relevant events like *North East Graduate Congress* jointly with University of Science & Technology, Meghalaya, *Brainstorming Session on Geology, Mining, Coal & Mineral Utilization in NE Region*, *Training Programme on Writing Research Paper*, *National Seminar on Popularization of Coir Technologies in NE States* in collaboration with Central Coir Research Institute, Kerala, *Symposium on Scientific Intervention for Societal*

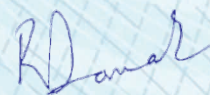


Development, Workshop-cum-Training on IPR Sensitization in NE, Training Programme on Science Communication catalysed & supported by RVPSP, DST, New Delhi, National Training Programme on Chemical Informatics in Biological Research, Conference on Road & Transportation Technologies for North East jointly with CSIR-CRRI, New Delhi and PWD of eight states of North East etc.

On the societal front, CSIR-NEIST conducted numerous training programme on Mushroom cultivation technique under CSIR 800 programme as well as training in banana fibre extraction, liquid deodorant cleaner etc.

In the area of human resource development 13 research scholars were awarded PhDs in various disciplines of science by Gauhati and Dibrugarh University. The Institute also organized three workshops under Faculty Training and Motivation and Adoption of School and Colleges by CSIR labs.

I feel proud to mention that like previous financial year, this year also, the Institute received the prestigious CSIR Technology Award 2012 in the category *Technology Marketing and Business Development* for significantly enhancing the business through consistently increased cash-flow and commercialization of technologies/marketing of knowledgebase. It is worthwhile to mention here that CSIR-NEIST scored a hat trick by receiving the CSIR Technology Award in three consecutive years now. The dedication and hard work of institute has been rewarded in the form of various other awards and recognition bestowed on individual scientists as well as the institute.



(Dr RC Boruah)
Acting Director

CSIR-NEIST AT A GLANCE: 2012-2013

RESOURCE BASE

Infrastructural

R&D Department	13
Branch laboratory	02
Seismic stations	13

HUMAN RESOURCES

Total S&T Staff	288
Scientist(Gr IV)	81
Technical (Gr III)	70
Technical (Gr I + II)	137
Total Administrative Staff	98

FINANCIAL

	(₹ in lakh)
Government Allocation	4530.906
From Contract R&D and Consultancy	653.049
Testing/Analytical services	21.087
Miscellaneous	2.409
Royalty/Premia	2.304

BUDGET

	Sanctioned (₹ in lakh)	Expenditure (₹ in lakh)
General Head		
Recurring	3048.940	3002.608
Capital	545.000	538.661
Network Project		
Non Recurring	498.200	498.200
Recurring	438.766	438.766



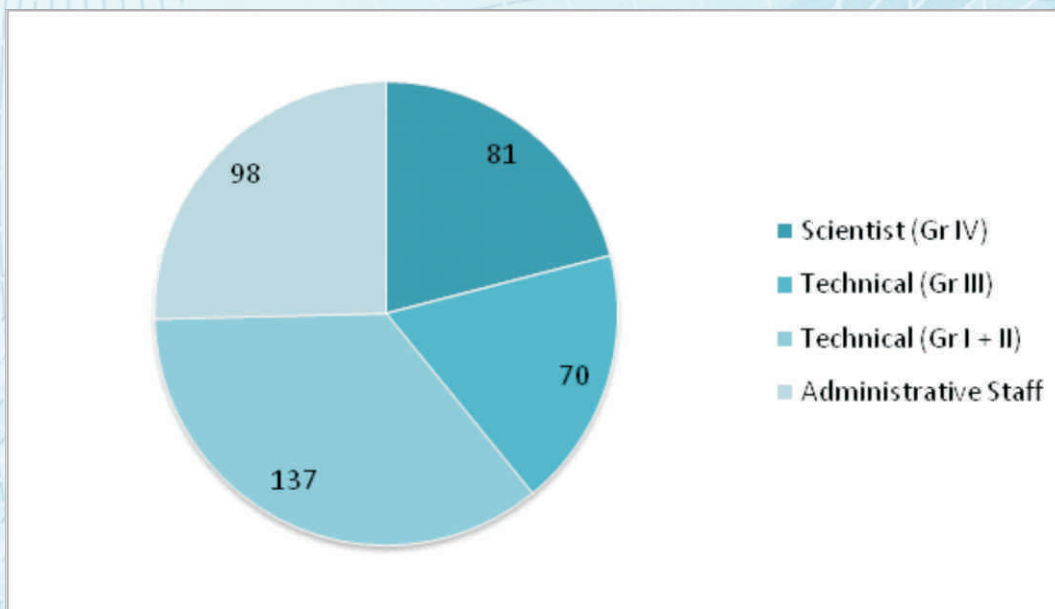
R&D PERFORMANCE: 2012-2013

Contribution to Economy	₹ in crore (Approx.)
Industrial production based on NEIST-Jorhat know-how	>100.00
Science Output	
Total papers published	113
Foreign Journal	71
Indian Journal	10
Chapters in Book	07
Proceedings	25
In peer reviewed Journal	66
Average IF	2.722
Highest IF	22.462
Technological Output	
Process developed	02
Processes released to industry	07
Extramural & Human Resource Development	
Quick Hire Fellow	03
Woman Scientists (DST) as PI	03
Sr Research Fellows	14
Jr Research Fellows	13
CSIR-TWAS Fellows	01
DST Inspire Fellow	03
Teachers Fellow	01
DBT-TWAS Postgraduate Research Fellow and Research Training Fellowship for Developing Country Scientists (RTFDCS)	01
Resource Mobilization	
	(₹ in lakhs)
Government Allocation	4530.906
From Contract R&D and Consultancy	653.049
Testing/Analytical services	21.087
Miscellaneous	2.409
Royalty/Premia	2.304
Patent Filed	
In India	06
Abroad	16
Patent Granted	
In India	04
Abroad	04

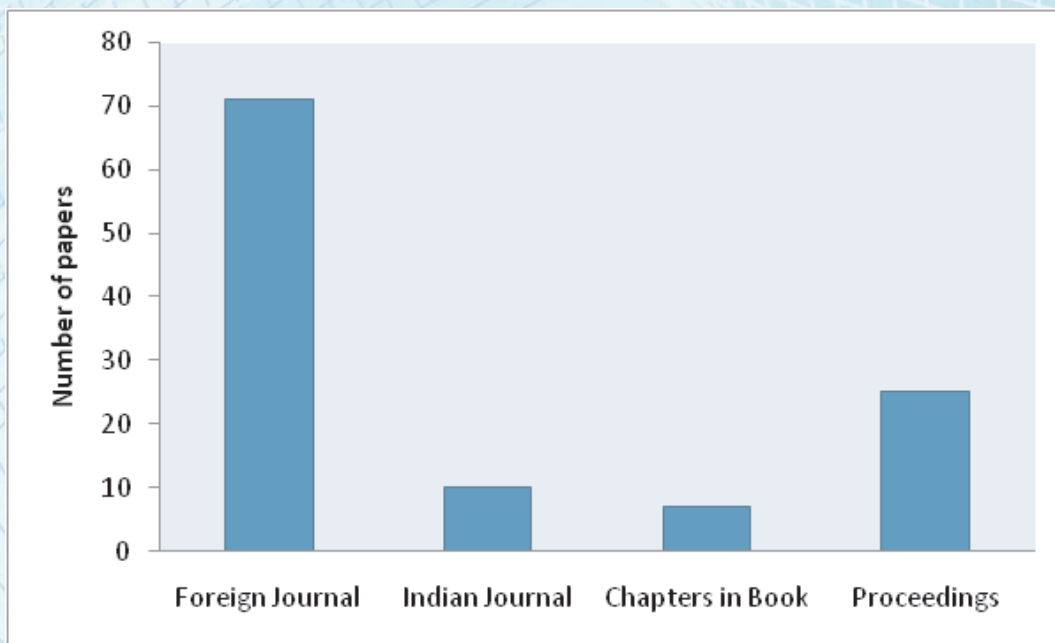


PERFORMANCE INDICATOR

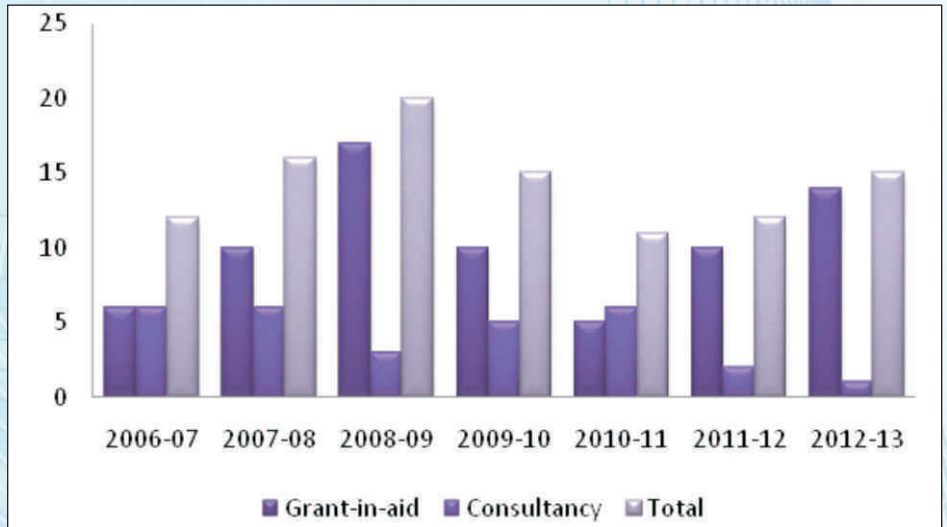
Human Resource: 2012-2013



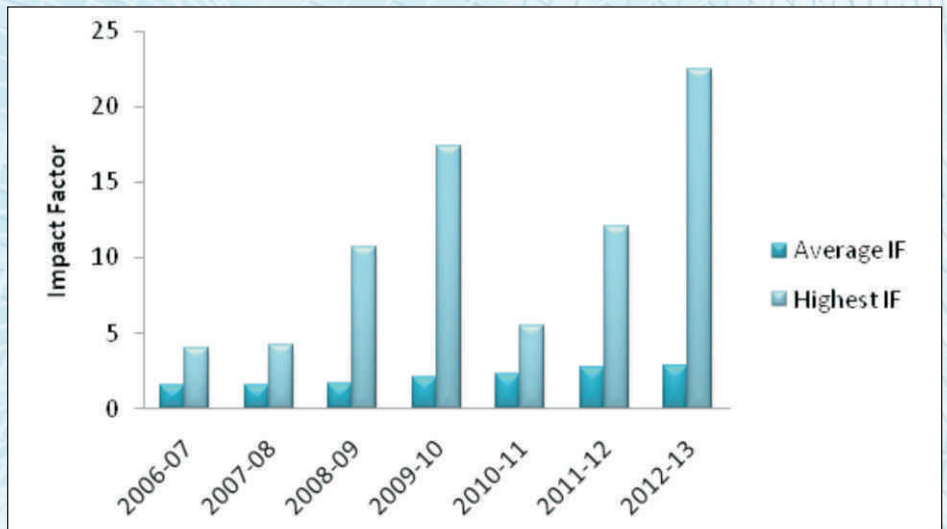
Paper Published: 2012-2013



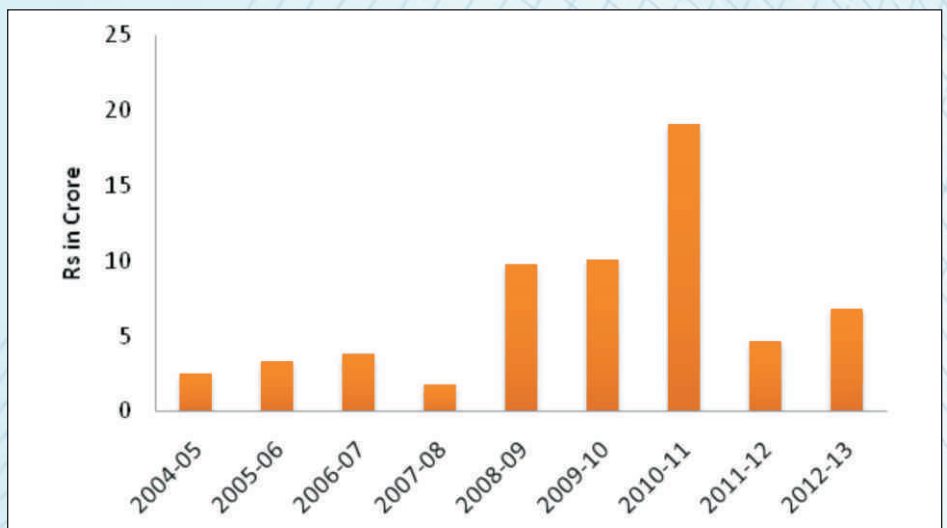
Funded Projects Completed



Impact Factor



External Cash Flow



MEMBERS OF RESEARCH COUNCIL 2010-2013

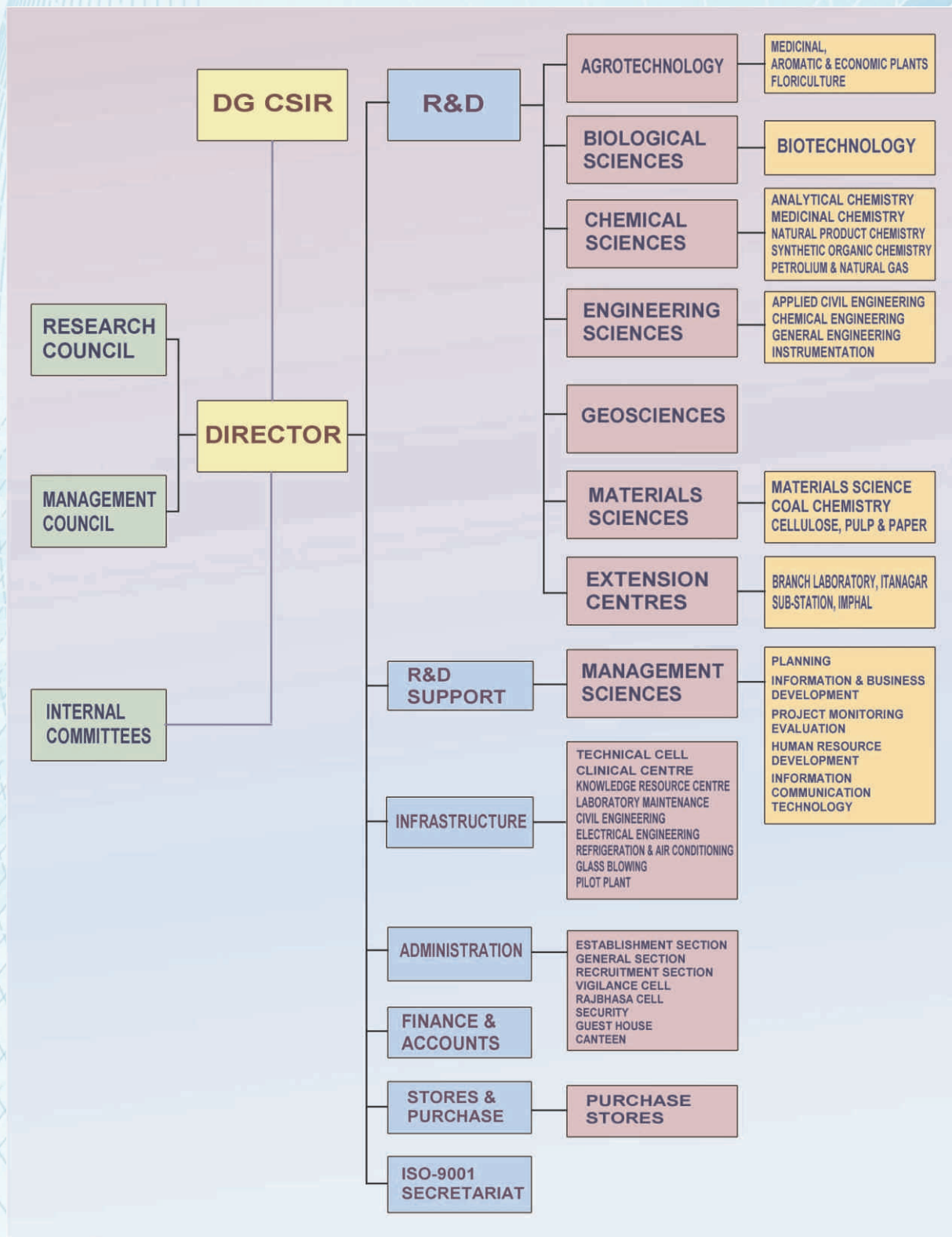
	Prof Harsh K Gupta Former Secretary, DOD Rajaramanna Fellow NGRI, Uppal Road Hyderabad 500 007	Chairman		Shri P P Shrivastav Member, North Eastern Council The North Eastern Council Secretariat Taxation Building Shillong 793 001	Member
	Prof Mihir K Choudhury Vice Chancellor Central University Tezpur 784 028	Member		Dr P K Biswas Former Advisor (S&T) Planning Commission MS-11/905 Kendriya Vihar, Sector 56 Gurgaon 122 003	Member
	Prof Samir Bhattacharya Former Director, IICB-Kolkata Professor & INSA Fellow Department of Life Sciences Visva Bharati Santiniketan 731 235	Member		Prof Ram Rajasekharan Director CSIR-Central Institute of Medicinal and Aromatic Plants Lucknow 226 015	Member
	Prof G D Sharma Pro Vice Chancellor Assam University Silchar 788 011	Member		Dr M O Garg Director CSIR-Indian Institute of Petroleum Dehradun 248 005	Member
	Prof Bharat B Dhar Former Director, CMRI-Dhanbad Vice President, Ritnand Balved Education Foundation D-20, Pamposh Enclave New Delhi 110 048	Member		Dr P G Rao Director CSIR-North East Institute of Science & Technology Jorhat 785 006	Member
	Dr Bakulesh Khamar Executive Director (Research) Cadila Pharmaceuticals "Cadila Corporate Campus" Sarkhej - Dholka Road, Bhat Ahmedabad 382 210	Member		Dr R C Boruah, Outstanding Scientist Acting Director (w.e.f. 01.01.13) CSIR-North East Institute of Science & Technology Jorhat 785 006	Member
	Prof K Krishnaiah Dean (Academic Research) Indian Institute of Technology, Madras Chennai 600 036	Member		Dr L Nath Chief Scientist CSIR-North East Institute of Science & Technology Jorhat 785 006	Secretary



MEMBERS OF MANAGEMENT COUNCIL 2012-2013

Dr P G Rao, Director, CSIR-NEIST	Chairman (upto 31.12.12)
Dr R C Boruah, Outstanding Scientist & Acting Director, CSIR-NEIST	Chairman (w.e.f. 01.01.13)
Dr Amalendu Sinha, Director, CIMFR, Dhanbad	Member
Dr Dipak Kr Dutta, Chief Scientist, CSIR-NEIST	Member
Dr B P Baruah, Principal Scientist, CSIR-NEIST	Member
Dr Ratul Saikia, Sr Scientist, CSIR-NEIST	Member
Dr (Mrs) Swapnali Hazarika, Scientist, CSIR-NEIST	Member
Dr P K Baruah, Medical Officer (Pr Technical Officer), CSIR-NEIST	Member
Dr M C Kakati, Sr Principal Scientist, CSIR-NEIST	Member
Mr Parag Patar, Finance and Accounts Officer, CSIR-NEIST	Member
Mr S K Pal, Administrative Officer, CSIR-NEIST	Member-Secretary
Dr R C Boruah, Outstanding Scientist	Special Invitee (upto 31.12.12)

ORGANIZATION CHART



R&D ACTIVITIES

A) International Collaboration

International Collaboration	Stereoselective multi-component organometallic reactions and synthesis of bioactive molecules using green methodology
<p>PI & Members: Dr Dipak Prajapati PI Dr RomeshChBoruah CoPI</p> <p>Funding Agency: NSFC, China and CSIR, New Delhi</p>	<p>Objectives:</p> <ul style="list-style-type: none"> ✓ To study the reactivity, regioselectivity and stereoselectivity of the organometallic reactions. ✓ To accomplish the synthesis of novel bioactive molecules by a multi-component one-step process and set the pathway for the construction of basic skeletons of natural products. ✓ Naturally, as mentioned above the theme is the development of new knowledge of the finest nature i.e. stereospecificity, regiospecificity and asymmetric synthesis. <p>Significant Achievements: An efficient synthetic method for the construction of 3-hydroxy-3,3'-bioxindoles is developed. To a stirred solution of $Rh_2(OAc)_4$ and N-benzyl isatin in THF was added N-methyl-N-phenyl diazoacetamide in THF for 1 hr via a syringe pump at 25°C or 66°C. After the addition, the reaction mixture was stirred for another 1 hr. Solvents were removed under reduced pressure to give crude products, which were subjected to ¹H NMR spectroscopy analysis for determination of dr. Trapping of in situ generated zwitterionic intermediates by isatins gave the products in moderate to high yields with high diastereoselectivity (up to 95.5) under mild reaction conditions. A wide range of substrate scope is tolerated.</p>
International Collaboration	New Advances in the integrated Management of food processing waste in India and Europe: use of Sustainable Technologies for the Exploitation of by-products into new foods and feeds (NAMASTE)
<p>PI & Members: CSIR-NEIST Dr PK Chowdhury PI & WP3 Leader Dr(Mrs)Aradhana Goswami WP2 Leader</p> <p>Member Mr NC Gogoi Dr Dipul Kalita Dr PJ Saikia Mr Ananta Sharma Mr OP Shahu Mr Tobiu Hussain Ahmed</p> <p>RTD Partners: 1. CSIR-NEIST, Jorhat (Co-ordinating Institute) 2. UAS-Bangalore (Management Partner) 3. EIRC, Bangalore (Industrial Partners)</p>	<p>Objectives:</p> <ul style="list-style-type: none"> ✓ NAMASTE is the first joint project under the coordinated call (FP7) between European Union (EU) and the Department of Biotechnology (DBT), Govt of India, with participants from EU countries and India with a basic aim to develop innovative, comprehensive and industry relevant approaches for the valorization of some specific fruits by-products and cereal brans through the environmentally and economically sustainable conversion of these by-products/wastes into healthy food ingredients, foods and feeds. <p>Significant Achievements: Protocol has been developed for stabilization and preservation of rice bran, Extraction of natural colour (anthocyanin) from pigmented rice bran, Fermented Rice Bran and Dietary fibre from Rice Bran. The muffins (Fig 1) were developed with different incorporation levels of stabilized rice bran and fermented rice bran in value added food products. It was seen that 15 per cent were best acceptable by sensory evaluation. The icing Cake/pastry (Fig 2) incorporated with different per cent levels of Anthocyanin extract in value added food products. It was seen</p>

- 4. Nature Fresh Logistic, Pune
- 5. Vaigai Industries, Madurai

NAMASTE-EU:

- 1. University of Bologna, Italy (Coordinating Institute)
- 2. Instt of Food Research, Norweich, UK
- 3. AZTI, Spain
- 4. Campden & Chorleywood, Hungary
- 5. Agro Technology & Food innovations B.V., Netherlands
- 6. GLP, Spain
- 7. J.Rettenmeier & Soehne GmbH & Co.KG, Germany

Funding Agency:

DBT, New Delhi (Indo-EU International collaborative)

that 2.5 per cent were best acceptable by sensory evaluation. Shelf life of the cake/pastry icing incorporated with natural coloring pigment anthocyanin (extracted from rice bran) was 2 weeks. We also prepared the extruded product (Fig 3) with the incorporation of Stabilized rice bran, fermented rice bran at different incorporation levels. The shelf life of the extruded products is for 3 months stored in food grade high density polythene pouch. Microbial quality control for muffins and icing of cake/pastry and extruded product, after microbial quality control analysis there was no any microbial population on the products. These investigations is an attempt for the preparation of diversified and value added food products from rice bran and anthocyanins, which can be emerge as a new set of products in market. DBT India has recognized NAMASTE-India as its Flagship Programme.



Fig1(a): Fermented Rice Bran 10%



Fig 1(b): Fermented Rice Bran 10%



Fig1(c): Stabilized Rice Bran 15%

Fig (1): Muffins with different incorporation levels of stabilized rice bran and fermented rice bran

Fig (2): Icing Cake/pastry incorporated with different per cent levels of Anthocyanin extract



3(a) MS-Stabilized rice bran 20 %



3(b) MS-Stabilized rice bran 20 %



3 (c) MS-Stabilized rice bran 20 %

Fig (3): extruded product Incorporated with stabilized rice bran

International Collaboration

Eco- friendly management of plant pathogens using natural plant extraction from Northeast India by inducing resistance in plants. (CSIR, India-ASCR, Czeck)

PI & Members :

CSIR-NEIST

- Dr Brijmohan Singh Bhau PI
- Dr Archana Moni Das CoPI
- Dr Raju Khan CoPI

Institute of Experimental botany, ASCR, Prague, Czech Republic

Dr Lenka Burketová

Objectives:

Works involves the extraction of selected medicinal plants of Northeast India using different solvents and the extracts has been sent to foreign collaborator for bio-evaluation against various diseases. Moreover, on the activity report, chemical investigation of some of the plants taken-up for chemical investigation based on their innovativeness activity and the Phytochemical investigation.



Dr Jan Martinec
Vladimír Sasek

Funding Agency:
ASCR, Czech Republic-CSIR

Significant Achievements:

Under Indo Czech joint project, Indian team comprising of Dr. BS Bhau (Principal Investigator), Dr. Raju Khan & Dr. AM Das (Co-PI) of the project visited Institute of Experimental Botany, ASCR, Prague in the month of November 2012. During the visit they met Czech counterparts and discussed about the project. Professor Lenka (PI), Czech team discussed about the mechanism by which they tried for disease control with new, harmless means by inducing resistance in the plants. She along with her team member demonstrated different molecular techniques going to be used in our study. She demonstrated her experiments on Arabidopsis plant. She showed our team how different plant extracts induce resistance in plant against different pathogens by switching on different genes. We also visited Laboratory of Plant Biotechnology and met Professor Jan Rezek. He discussed about the analysis of concentrations of 15 Poly aromatic hydrocarbons (PAHs) in long-term contaminated soil. He also gave the demonstration of extraction from soil samples and how to do analysis of samples. Professor Rezek also discussed about the biodegradation of polycyclic aromatic hydrocarbons in micro-ecosystems containing long-term contaminated soil. Soil contaminated by different chemicals, including PAHs since World War II. Aging of the soil was expected to act as a principal factor limiting biodegradation. The others contained contaminated soil with natural microflora only. PAH extraction was analysed using HPLC (Merck-Hitachi, 655A-12 Liquid Chromatograph, Merck-Hitachi, L-5000 LC Controller, Merck-Hitachi, L-7360 Column Owen) fitted with two Chrompack Chromspher 5 PAH derivatized silica column (particle size 5 µm, C18 covered, length 100 mm, internal diameter 3 mm, pore 120 Å, Chrompack,) and guarded with Chrompack Chromspher guard column packed with the same material. Team also visited to Institute of Chemical Technology, Prague and met to Professor Jana Hajslova. Prof Jana Hajslova is working in the Department of Food Chemistry and Analysis. She worked extensively on comprehensive analysis of a wide range of organic contaminants and toxicants in food, biotic and environmental matrices including (i) modern pesticides; (ii) organohalogen pollutants; (iii) PAHs and their derivatives; (iv) phthalates; (v) natural toxicants, e.g., mycotoxins and plant toxins, using state-of-the-art analytical facilities.

International Collaboration

PI & Members :
Dr SP Saikia
Dr (Mrs) Incononata Galasso

Funding Agency :
CSIR, India/ CNR, Italy

Comparative studies on the Physiological and Biochemical aspects of adaptation and productivity in *Camelina sativa* L. in different biogeographic regions

Objectives:

- ✓ To study the physiological parameters in *Camelina sativa* for adaptation at different biogeography/ecosystems.
- ✓ To study the genotype expression of *Camelina sativa* in two different ecological area in relation of seed and oil yield and quality.

Significant Achievements:

Dr (Mrs) Incononata Galasso, Researcher, CNR-Institute of Agricultural Biology and Biotechnology (CNR-IBBA), Milan, Italy, visited CSIR-NEIST, Jorhat from 12 to 22 November 2012 for carrying out a research stay under the joint project. Under multi-locational trial sowing of the crop was done at Imphal.



International Collaboration	Comparative antimicrobial activity and molecular characterization of <i>Clerodendrum</i> species of Thailand and India
PI & Members : CSIR-NEIST Dr S B Wann PI Dr B S Bhau CoPI Dr T C Bora CoPI Khon Kaen University, Thailand Dr Arunrat Chaveerach PI Dr Runglawan Sudmoon Funding Agency: DST, New Delhi	Objectives: <ul style="list-style-type: none"> ✓ To work on the taxonomy of the germplasm of the plant ✓ To evaluate antimicrobial activity of the plant extract(s) and its various fractions ✓ To assess genetic diversity within species & among species using ISSR & AFLP based molecular markers ✓ To develop good agricultural practices for cultivation, mass production and post harvest processing of the selected plant species

B) National Collaboration

(i) CSIR 800

CSIR 800	Rural development through Aromatic Plant and Mushroom and their processing in North East India.
PI & Members : Dr P R Bhattacharyya PI Dr A K Bordoloi CoPI Funding Agency : CSIR, New Delhi	Objectives: Rural development of NE India. Significant Achievements: <ul style="list-style-type: none"> ✓ Organized various mushroom cultivation training programme and succeeded to train 465 numbers of trainees by organizing 21 no.s of training programme. ✓ Mr Omomowo Israel Olawale, CICS/RTFDCS India PG fellow from Nigeria has been doing his Ph D work under guidance of Dr Ajit Kumar Bordoloi in the Mushroom laboratory. ✓ Attended and participated in the National symposium on Medicinal Mushrooms at Amala Cancer Research centre, Thrissur, Kerela and presented one paper on <i>Ganoderma lucidum-A Potential Medicinal Mushroom It's cultivation and commercial production</i> during 24-25 January,2013 ✓ Participated and delivered presentation at the workshop cum brain storming session at Koraput, Bhubaneswar during 19-20 February 2013. ✓ Composed and compiled the Mushroom Germplasm repository. ✓ Lambert Academic Publishing of Germany has published the Ph D work of Dr A K Bordoloi "<i>Eucalyptus</i> plantation and Ecological Consequences" in the form of a book.

(ii) Empower Project

Empower Project	Study on nutraceuticals, phytochemicals and medicinal properties of a few <i>Piper</i> species of North East India.
PI & Members: Mr Chandan Tamuly PI Funding Agency: CSIR, New Delhi	Objectives: <ul style="list-style-type: none"> ✓ To evaluate nutraceuticals from different parts of selective <i>Piper</i> species of North East India. ✓ Chemical profiling of secondary metabolites like alkaloids terpenoids, flavonoids etc of different parts of the selective species. ✓ To evaluate the antioxidant properties, polyphenols & flavonoids content of the selective <i>Piper</i> species.



Significant Achievements:

- ✓ Collection and identification of ten *Piper* species from NE India was done.
- ✓ Evaluation of nutraceuticals of ten nos. of *Piper* species from North East India
- ✓ Minerals i.e. Na, K Ca, Mg, Fe, Cu etc evaluated for the ten pier species from NE India.
- ✓ The work on phytochemical analysis, medicinal properties in on progress.
- ✓ A paper entitled "Study on Antioxidant Activity and Minerals of a Certain Ethno medicinal Plants of Arunachal Pradesh, India" authored by Chandan Tamuly, Bipul Saikia, Moushumi Hazarika, Jayanta Bora & M.J. Bordoloi was published in the proceedings (ISBN: 978-983-2641-90-2) on International Conference on Food Science and Nutrition (ICFSN). Traditional Resources: Scientific Approaches towards Quality Foods, Chye F.Y., Lee, J.S., Siew, C.K., Noorakmar, A.W and Ramlah M. R. (eds). 2-4 April 2012, pp: 33-52.
- ✓ In-situ biosynthesis of Ag, Au and bimetallic nanoparticles using *Piper pedicellatum* C.DC: Green chemistry approach" authored by Chandan Tamuly, Moushumi Hazarika, Sarat Ch. Borah, Manash R. Das, M. P. Boruah". *Colloids and Surfaces B: Biointerfaces*. 102, 2013, 627-634 (IF= 3.456).
- ✓ A paper entitled "Synthesis of Ag and Au nanoparticles using *Piper pedicellatum* C.DC: A green chemistry approach" authored by Chandan Tamuly, Moushumi Hazarika, Sarat Borah & Manash R. Das was presented in a national symposium on "Recent trends in Chemical Science and Technology" held at Dept.of Chemistry, IIT Patna. The abstract of the paper was published in the book of the abstract pp: 34.

Empower Project

"Molecular Recognition Stimuli Responsive Smart Polymeric Gel Microcapsule Membrane for Control Release Application: Probing Role of Diffusion Limitation in Gel Microstructure"

PI & Members:

Dr(Mrs) Swapnali Hazarika PI

Objectives :

- ✓ The main objectives of the project is to formulate a microcapsule membrane system comprising a "Core-Shell" configuration with polymeric gel prepared by insitu polymerization of poly(N-isopropylacrylamide-co-benzo-18-crown-acrylamide) through a suitable approach and environment and characterize the membrane system (by instrumental techniques) in terms of microcapsule size, "core-shell" pattern, gel microstructure (with emphasis on porous network) and deduce the role of critical parameters of polymerization.
- ✓ To perform experimental study on substrate release into confined media simulating a real system environment, generate transient concentration profile under various plausible conditions.
- ✓ To make a formal mathematical model representing the physicochemical phenomena, validate with experimental results and simulate to extract the diffusion parameters.
- ✓ A process intensification based alternate approach of insitu polymerization has to be studied with characterization of the polymer and conducting control release experiment.



Significant Achievements:

Benzo-18-crown-6-acrylamide monomer from acryloyl chloride and Benzo-18-crown-6 has been synthesized and characterized. Hydrogel from N-isopropyl-acrylamide (NIPAM) and Benzo-18-crown-6-acrylamide has been prepared and characterized by FTIR, SEM and TEM analysis. The synthesized hydrogel has been applied for control release of vitamin B, vitamin H and drugs. Swelling and deswelling kinetics of the hydrogel have been studied by addition of polyethylene glycol in the hydrogel and established the swelling and deswelling behavior. Control release of vitamin as well as drug has also been studied and established the diffusion kinetics where Diffusion coefficient has been calculated. The role of diffusion has been studied in control release of vitamin B, vitamin H and drugs and established that diffusion plays an important role in control release.

(iii) Network Projects

Network Projects	Membrane and adsorbent technology platform for effective separation of gases and liquids (Nodal Laboratory: CSIR-CSMCRI)
<p>CSIR-NEIST: Membrane Separation Processes for Liquids and Gases</p> <p>PI & Members : Dr(Mrs) S Hazarika PI</p> <p>Member Dr P Barkakati Mr NC Gogoi Dr (Mrs) Aradhana Goswami Dr MM Bora Mr S Borthakur</p> <p>Funding Agency: CSIR, New Delhi</p>	<p>Objectives:</p> <ul style="list-style-type: none"> ✓ The major objectives of the project are to development Nanofiltration membrane for Extraction and separation of value added products from Natural feedstock of North East region. In this regard enzymatic conversion in Membrane reactor will be studied for naturally occurring substrates in bio-resource based chemical platform. As a work of gas separation 'Molecular Gate' membrane technology will be used for separation of CO₂, CH₄ etc. for biogas up-gradation. <p>Significant Achievements:</p> <p>About 10 nos. of species of plant samples have been identified and collected from different parts of Assam including Jorhat district. The plant samples have been collected in kinds of their leaves, flower, fruit, peel of the fruits, depending upon the information available from the local peoples and literature. Collected samples have been identified with their local and scientific names and screened for viability and eco-friendliness properties for extraction and separation of value added product. The main objective of the project is separation of value added products from natural feedstock of NE region by membrane separation process. For this work, membrane materials have been selected and experimental protocols have been developed for preparation of membranes. Independent membrane from polysulfone and composite membrane using cyclodextrine and chitosan have been prepared in different experimental conditions.</p>
<p>CSIR-NEIST : Nano Oxidic Membrane Reactors by Green Chemical Approach</p> <p>PI & Members: Dr R L Goswamee PI</p> <p>Member Dr (Mrs) A Goswami</p> <p>Funding Agency: CSIR, New Delhi</p>	<p>Objectives:</p> <ul style="list-style-type: none"> ✓ Design of mixed metal oxide nano sheet based Inorganic Membrane Reactors. ✓ Preparation of supported dispersible mixed metal oxide nano sheet based catalyst by different conventional, green-chemical routes involving steps like sol-gel synthesis, hybrid multifunctional gel synthesis, supercritical drying, microwave assisted synthesis, ionic liquid solvent etc.



- ✓ Study of N₂O decomposition and CH₄ conversion ability of supported dispersible mixed metal oxide nano sheet based catalyst powders (e.g. Ni-Al, Co-Al etc. for N₂O decomposition and Ni-Al, Cu-Zn-Al etc. for CH₄ conversion etc).
- ✓ Preparation of crack free thin films of nano oxides over ceramic supports by dip & spin coating to obtain asymmetric membranes.

Network Project

Biocatalysts for industrial application & greener organic synthesis (BIAGOS) (Nodal Laboratory: CSIR-IICT)

CSIR-NEIST : Functionalization, glycosylation and acylation using transferase (AATs) of Artemisinin and related phytochemicals for value addition.

PI & Members :
 Dr TC Bora, Nodal Scientist
 Member
 Dr PG Rao
 Dr NC Barua
 Dr RL Bezbaruah
 Dr Ratul Saikia
 Mr AC Kakoty
 Mrs Archana Yadav

Funding Agency:
 CSIR, New Delhi

Objectives :

- ✓ **Collection and screening of microbial strains from NE gene pool & their maintenance as stock cultures.**
- ✓ Screening for targeted and desired functionalization of Artemisinin.
- ✓ Screening for targeted and desired glycosylation of phytochemicals.
- ✓ Screening for Acylation using acyl transferase (AATs) and related catalysts to achieve the desired goal.
- ✓ Optimization and improvement of the strains and their molecular characterization. Process parameters will be completed. Patents will be filed. Reports will be submitted to the nodal institute.

Network Projects

Inherently safer practices for industrial risk reduction (INSPIRE) (Nodal Laboratory: CSIR-IICT)

PI & Members :
 Mr NC Gogoi PI
 Member
 Dr (Mrs) A Goswami
 Dr (Mrs) S Hazarika
 Dr Pranjali Gogoi
 Dr Sanjeev Gogoi
 Dr Pallab Pahari
 Dr T Hussain

Funding Agency:
 CSIR, New Delhi

Network Projects

Organic reactions in generating innovative and natural scaffolds, ORIGIN

PI & Members:
 Dr Dipak Prajapati PI
 Member
 Dr Romesh Ch Boruah
 Dr PJ Bhuyan
 Dr Pranjali Gogoi
 Dr Sanjeev Gogoi

Funding Agency :
 CSIR, New Delhi

Objectives:

- ✓ Design and synthesis of small molecules (Mol.wt <600 Dalton) as potential therapeutic agents in human health care.
- ✓ Asymmetric total synthesis of natural products having proven biological activity with special relevance to cancer, CNS, arthritis and cardiovascular disorders.
- ✓ Library synthesis around scaffolds identified from natural and synthetic molecules using automation including Fragment based synthesis.
- ✓ Development of new methods towards C-C and C-X bond forming reactions and application to scaffold synthesis taking into account the green chemistry principles.

