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Amrit Mahotsav



NATIONAL CONFERENCE ON  
**DISSEMINATION OF  
INNOVATIONS IN  
BAMBOO SECTOR FOR  
IMPROVING THE  
RURAL ECONOMY**

3<sup>RD</sup> & 4<sup>TH</sup> MARCH 2022

## **ADIVSORY TEAM:**

- **Dr. G Narendra Kumar, IAS**, Director General, NIRD&PR
- **Shri C Achalender Reddy, IFS (Retd)**, Director, CIPS
- **Dr. G V Raju**, Professor, NIRDPR
- **Dr. Partha Pratim Sahu**, Associate Professor, NIRD&PR
- **Dr. R Ramesh**, Associate Professor, NIRD&PR

## **ORGANISING TEAM:**

- **Dr. C Kathiresan**, Associate Professor, NIRD&PR
- **Dr. Fareed Ahmed**, Adivsor, CIPS
- **Shri Mohammad Khan**, Sr. Consultant, NIRD&PR
- **Shri. D. Balakishan**, Advisor, CIPS
- **Ms. P Sri Vidya**, Manager (Administration), CIPS



# **NATIONAL INSTITUTE OF RURAL DEVELOPMENT AND PANCHAYATI RAJ**

(AN AUTONOMOUS ORGANISATION UNDER THE MINISTRY OF RURAL  
DEVELOPMENT)

AND

## **CENTRE FOR INNOVATIONS IN PUBLIC SYSTEMS**

(AN AUTONOMOUS CENTRE OF ADMINISTRATIVE STAFF COLLEGE OF INDIA  
ESTABLISHED BY THE GOVERNMENT OF INDIA)

JOINTLY ORGANIZING  
NATIONAL CONFERENCE ON  
**DISSEMINATION OF INNOVATIONS IN  
BAMBOO SECTOR FOR IMPROVING THE  
RURAL ECONOMY**

**3<sup>RD</sup> & 4<sup>TH</sup> MARCH 2022**

VENUE:

VIKAS AUDITORIUM, NATIONAL INSTITUTE OF RURAL DEVELOPMENT AND  
PANCHAYATI RAJ, RAJENDRANAGAR, HYDERABAD.



## PREFACE

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Bamboo has a rich history and promising future as a part of the solution to 21st-century challenges. A giant, fast-growing woody grass and one of Earth's oldest and most precious plant materials, it has benefited human societies since times before recorded history. Bamboo is the major source of income generation for selective communities in many states of India which are engaged primarily in making bamboo products. Many tribal communities are dependent on bamboo products for their domestic needs. Bamboo creates economic value and employment for farmers, traders, artisans, small and medium enterprises, and large-scale bamboo-based industries. The potential for bamboo to provide income generation opportunities, especially to the woman in rural India is well known. Bamboo is adding great value to the rural agricultural economy and acts as an effective tool for poverty alleviation. Today, it helps more than two billion people living in many countries to meet their basic needs, and as a widespread, renewable, productive, versatile, low-or no-cost, easily accessed, environment enhancing resource, it has great potential to improve life even more in the years ahead, especially in the villages and countryside of the developing world where the resources are found.

India is the second richest country in the world after China in terms of bamboo's genetic resources. According to the literature available, there are 125 indigenous and 11 exotic species of bamboo belonging to 23 genera in India. The major bamboo genera found in India are *Arundinaria*, *Bambusa*, *Chimonobambusa*, *Dendrocalamus*, *Dinochloa*, *Gigantochloa*, etc. More than 50% of the bamboo species occur in the North East Region of India. The North Eastern States and West Bengal account for more than 50% of the bamboo resources of the country. Other bamboo-rich areas of the country are the Madhya Pradesh, Chhattisgarh and the Western Ghats.

The total bamboo bearing area of the country has been estimated to be 15.0 million ha. Madhya Pradesh has maximum bamboo bearing area of 1.84 m ha followed by Arunachal Pradesh (1.57 million ha), Maharashtra (1.35 million ha) and Odisha (1.12 million ha).

In view of promoting the plantation of bamboo on a large scale to meet various needs in the country, the Government of India has launched the "Restructured National Bamboo Mission" in 2018-19 which is being implemented in 23 States including the Northeast States.

Recognizing the potential of India becoming a world leader in Bamboo technology, given the dynamism that the country is showing today, the enormity of its bamboo resources, its professional expertise, and innovation as well as skilled labor and entrepreneurship, a two-day National Conference on "Dissemination of Innovations in Bamboo Sector for Improving the Rural Economy" is being jointly organized by the National Institute of Rural Development and Panchayati Raj (NIRD&PR) and Centre for Innovations in Public Systems (CIPS) at NIRD&PR campus, Hyderabad on 03-04 March 2022.

This conference serves as a platform to

- Promote cultivation of commercial species of bamboo by farmers
- Support start-ups towards sector rejuvenation and connect them to stakeholders associated with bamboo
- Facilitate experience-sharing and knowledge exchange, bringing informed ideas, inputs, and insights on bamboo production technologies and techniques in bamboo treatment



- Showcase innovations of utilizing bamboo in construction, bamboo charcoal, activated carbon, fibers, furniture, etc.
- Highlight new schemes – under National Bamboo Mission
- Explore possible solutions to address various issues and challenges in Bamboo marketing and its value addition for improving the rural economy
- Create a zeal in bringing innovations towards self-reliant India
- Introduce Bamboo as a viable component in Agroforestry models

Various government departments, captains of the industry, officials belonging to National Bamboo Mission, State Bamboo Missions, State Forest Departments, States Forest Development Corporations, Ministry of Tribal Development, Tribal Co-operative Marketing Federation of India (TRIFED), Machinery Makers, Handicrafts Corporations, North East Cane and Bamboo Development Council, besides Research institutions and NGOs will exchange their views, issues, and challenges related to Bamboo Sector for improving the rural economy. It shall witness discussions on innovations and all subjects related to the end-to-end progression of the bamboo industry from planting material to high-end engineered products and marketing.

The conference will be of two days duration and will include sessions on selected themes and other related activities. The focal theme for this year's conference is **“Dissemination of Innovations in Bamboo Sector for Improving the Rural Economy”**.

This conference will focus on the following **sub-themes**:

- Why Bamboo?
- Bamboo for construction & furniture
- Innovative products of bamboo
- Prospects and Challenges
- Bamboo: A versatile product
- Way Forward

Renowned Speakers from the Central and State Government and Public and Private sectors from pan India, the most recent innovative practices, developments, and success stories are hallmarks of this conference. The profiles and abstracts of topics are in the following pages.



## PROFILE

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**Shri. Nagendra Nath Sinha, IAS (JH-1987)** took charge as Secretary, Ministry of Rural Development, Government of India, New Delhi on May 27th, 2020. Shri Sinha holds Bachelor's degree in Electrical Engineering from IIT, Kanpur (1985) and Masters in Health Sciences from Johns Hopkins University, Baltimore, USA (2004). His previous assignments include Secretary (Border Management), Ministry of Home Affairs; Chairman, NHAI; Managing Director, National Highways & Infrastructure Development Corporation Ltd., New Delhi; Additional Chief Secretary, Rural Development, Govt. of Jharkhand, besides Secretary/Principal Secretary in Departments of IT, Road, Construction, Industry, Mines among others in the state of Jharkhand.



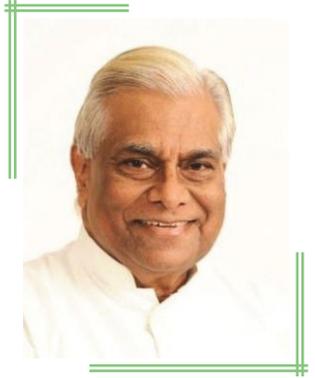
He has to his credit several landmark projects in Govt. of India viz. Delhi-Mumbai Expressway, Zojilla Tunnel, Dhubri Phulbari Bridge, universal electronic tolling; Sports Complex & Games Village at Ranchi, Ranchi Ring Road, State Data Center in Jharkhand.

As Secretary, Rural Development, he is responsible for formulation, coordination and implementation of policies and programmes that addresses the development needs of the rural areas, focusing especially on eradication of poverty, creation of sustainable employment and livelihood opportunities and enabling infrastructure and institutions.



## PROFILE

**Shri. K. Padmanabhaiah, IAS (Retd.),** served Court of Governors of Administrative Staff College of India as a member since September 2012, took charge as its Chairman from November 2015. He is associated with member of NGOs involved with development and empowerment. He is also an educator and commentator on matters relating to public policy, administration and governance.



He was born on 6th Oct, 1938 in a village in Krishna District, Andhra Pradesh. He obtained a Masters degree in Science from Andhra University and a Masters degree in Financial Management, from the prestigious Jamnalal Bajaj Institute of Management, Mumbai. In 1961, he joined the Indian Administrative Service (IAS) in Maharashtra cadre. He served Government of Maharashtra in a variety of important positions like Director of Sugar Co-operatives; District Collector, Nashik; Principal Secretary, Planning; Principal Secretary, Finance and Municipal Commissioner of Greater Bombay. His tenure as Director of Sugar Co-Operatives (1970-74) saw the most spectacular growth of Sugar Industry in the State and it received national and international recognition. He was invited by various State Governments to advise them on development of co-operative sugar factories. During his tenure as Collector (1975-77), Nashik district was adjudged as one of the best districts in the country in performance of the 20-point program of the Prime Minister and his initiatives were widely appreciated by the National press.

He performed a stellar role as Municipal Commissioner, Greater Bombay (1990-91) and he was awarded the prestigious Gaints International's Award for excellence in Civic Administration. He served Government of India as Joint Secretary, Petroleum (1982-84); Joint Secretary, Power (1984-86); Minister Economic in Indian High Commission in London (1986-1989) and Secretary, Urban Development and Housing (1993). In 1993, Maharashtra and Karnataka States were struck by a devastating earthquake.

The Government invited him to chair an 'Advisory Committee of International Experts' on reconstruction and rehabilitation of the earthquake affected areas. The Committee's report served as a blue-print for the entire rehabilitation and reconstruction work with aid from the World Bank. Subsequently he worked as Secretary Civil Aviation; Chairman of both 'Air India' and 'Indian Airlines' (1994) and as Union Home Secretary and Secretary, Jammu & Kashmir Affairs (1994-1997). By 1994 the entire civil administration and political process in the Kashmir valley was in disarray, and insurgency was at its peak. As Union Home Secretary, he played an extremely crucial role in reviving the political process in Jammu & Kashmir State during 1994-1997, and in holding the very first elections in the insurgency ridden State after a gap of nine years. His work received nation-wide recognition and he was awarded the 'Shiromani Award' for National Development and Integration (1996) and the 'Priyadarshini Award' for outstanding Public Service (1996). After retirement in 1997 he was appointed as the Government of India Representative for Naga Peace talks. He persuaded the Naga rebel leadership who were based abroad for decades, to come back to India, persuaded them to move away from their rigid stand of sovereignty, continued the dialogue with patience & perseverance, and persuaded them to continue the ceasefire which led to peace in Nagaland and Naga-inhabited areas of the North East. He relinquished this post on 31st August 2009 on completion of the tenure. In 2008, he was awarded 'Padma Bhushan' by the President of India for outstanding contributions to the Nation in the field of Civil Service.

## PROFILE

**Dr. G. Narendra Kumar, IAS** (1989 batch) is the Director-General of the National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad. He is functioning as the Chief Executive of the Institute, acting as a think-tank for the Ministries of Rural Development and Panchayati Raj. He is guiding and monitoring innovative research and capacity building of state government functionaries to enable effective implementation of programs under the ministries of Rural Development and Panchayat Raj.



In the last one year, he was instrumental for re-structuring the NIRDPR to be a research driven capacity-building organization, accomplishing the seamless merger of CAPART with NIRDPR, restructuring the governance framework for improved implementation of RURBAN program, launching of 250 Model GP clusters project for strengthening Panchayat Governance, developing a Rural Housing Knowledge Network with support from MoRD, developing service contract modules for WASH services in rural areas and capacity building for these modules; and also, launching of Kaushal Apthi- a Skills-Aptitude assessment app, developed and implemented a system for services based Citizen Charter at Panchayat level.

He served as Principal Secretary, Government of the NCT of Delhi during 2018–2020, where he looked after: i) Land and Building Department ii) Technical Education iii) Cooperation and iv) Welfare of SC, ST, and OBCs, etc.

Prior to this, He served as the Development Commissioner for the Government of Puducherry (during 2016-17); Director, Country Relations and Business Affairs, ICRISAT (2012-16), and Joint Secretary to the Government of India in the Cabinet Secretariat, Govt. of India (2009-12);

He is a doctorate in Chemistry from Osmania University (1995); Masters in Biochemical Engineering & Bio-Technology from IIT Delhi (1988); Master's Degree in Public Administration from the Maxwell School of Public Affairs, USA (2003). A Certificate of Advanced Study in Information Systems and Telecommunication Management from Syracuse University, USA. He has published a number of research articles in national and international journals and contributed many policy documents on diversified subjects.

He had setup four (4) specialized Universities in Delhi substantially increased the opportunities for technical and higher education, besides increasing the number of seats in exciting institutions at popularized job fairs for vocational trainees. Got ITIs of Delhi and India's National Authority CWC, ISO 9001 certified, while working as Secretary Technical Education and as joint secretary. Operationalized Delhi's Real Estate Regulatory Authority (RERA).

He has notable academic distinctions, which includes- topper in Masters Program in Public Administration- at Syracuse University, USA; British Chevening Fellow in Environmental Management, University of Bradford and Manchester, UK; Research Fellow of CSIR at the Osmania University; UGC Fellowship- India; State Merit Scholarship during his bachelor's degree.

He is recipient of "Golden Icon Award" for exemplary leadership and ICT achievement in e-Governance in education.



## PROFILE

**Shri. C. Achalender Reddy**, a 1986 Batch, IFS (Indian Forest Service) officer, retired at the level of PCCF, Arunachal Pradesh has been appointed in February 2021 as Director, Centre for Innovations in Public Systems, (an autonomous centre of Administrative Staff College of India) established by Government of India on the recommendations of 13th Finance Commission. He took over the charge of Director, CIPS on 15th February, 2021. Mr. Reddy hails from a farming family of the nondescript village called Yerragollapahad of Jangoan district, Telangana and a product of Agricultural University, Rajendranagar.



Earlier, held the positions of Managing Director, Goa Forest Development Corporation and Served in various capacities for about 34 years in AGMUT Cadre, i.e,- Arunachal Pradesh, Goa, Mizoram, Andaman & Nicobar Islands; OSD- Buddha Purnima Project under the then HUDA & Additional Secretary, Tourism in erstwhile undivided Andhra Pradesh: Director - National Bamboo Mission – Goa and as Secretary, National Biodiversity Authority, Govt. of India.

During his more than three decades of service, credited with Awards and Commendation letters from Chief Secretary, Central and State level Ministers for his outstanding work and professionalism. Mr Reddy is a popular guest speaker at various Universities, Institutions and Academies imparting training to All India Service and Group ‘A’ Officers. He was given “Wildlife Service Award” by the Sanctuary Asia Magazine for his outstanding contribution to wildlife conservation in general and particularly for Sea Turtle protection in Goa. Ecotourism Wing was opened for the first time by Goa state government in the year 1999 based on his Approach Paper.

As Secretary, National Biodiversity Authority (NBA), played a key role in assisting MoEFCC in successfully organizing a mega international event – Eleventh Conference of Parties (CoP-11) to Convention on Biological Diversity in Oct, 2012 at Hyderabad. Based on his Concept Note, A “Biodiversity Park” was established at Hi-Tech City, Hyderabad which has become an iconic spot now.

In NBA, he played a vital role in establishing the “Centre for Biodiversity Policy and Law” in collaboration with Norwegian agencies. He was the Chairman of a National Level Expert Committee on Digital Sequence Information (DSI) on Genetic resources; a Member of Inter-Ministerial Working Group on Amendments to BD Act constituted by MoEFCC and Member of Ad-hoc Technical Expert Group on DSI constituted by the Secretariat of Convention on Biological Diversity, Montreal. While in service and after retirement also, he represented India in several international meetings and dialogues pertaining to Biodiversity. He has some publications to his credit on Biodiversity, Innovations in Governance etc. Recently, appointed as Member of National Biodiversity Authority (not a full-time position) a statutory regulatory body of Government of India.

# PROGRAMME SCHEDULE

Date: 03rd March 2022

Time	Topic	Speaker
<b>INAUGURAL SESSION</b>		
<b>10:00 - 11:10 hrs</b> <i>(70 minutes)</i>	<b>Welcoming the dignitaries</b> <i>(10 minutes)</i>	
	<b>Welcome Address</b>	<b>Shri. C. Achalender Reddy, IFS (Retd.)</b> <i>Director</i> <i>Centre for Innovations in Public Systems (CIPS)</i> <i>Hyderabad</i>
	<b>Opening Remarks</b>	<b>Dr. G. Narendra Kumar, IAS</b> <i>Director General</i> <i>National Institute of Rural Development and Panchayati Raj (NIRD&amp;PR)</i> <i>Hyderabad</i>
	<b>Special Address by Guest of Honour</b>	<b>Shri. K. Padmanabhaiah, IAS (Retd.)</b> <i>Chairman</i> <i>Court of Governors (CoG)</i> <i>Administrative Staff College of India (ASCI)</i> <i>Former Home Secretary, Government of India</i> <i>Hyderabad</i>
	<b>Inaugural Address by Chief Guest</b>	<b>Shri. Nagendra Nath Sinha, IAS</b> <i>Secretary</i> <i>Department of Rural Development</i> <i>Ministry of Rural Development</i> <i>Government of India, New Delhi</i>
<b>11:10 - 11:25 hrs</b> <i>(15 minutes)</i>	<b>Vote of Thanks</b>	<b>Dr. C. Kathiresan</b> <i>Associate Professor and Head</i> <i>Centre for Innovations and Appropriate Technologies</i> <i>National Institute of Rural Development and Panchayati Raj (NIRD&amp;PR)</i> <i>Hyderabad</i>
	<b>Tea Break</b>	



Time	Speaker	Topic
<b>Session - I: WHY BAMBOO?</b>		
<b>11:25 - 13:05 hrs</b> <i>(100 minutes)</i>	<b>Session Chair: Shri. G. Chandra Sekhar Reddy, IFS</b> <i>Addl. PCCF &amp; Vice Chairman and Managing Director</i> <i>Telangana State Forest Development Corporation Limited</i>	
	<b>Shri. Punati Sridhar, IFS (Retd.)</b> <i>Ex-PCCF &amp; HoFF, Karnataka</i> <i>Chairman, Bamboo Society of India (BSI)</i> <b>(20 minutes)</b>	<b>Bamboo - a versatile grass with great potential for rural economy</b>
	<b>Dr. Amit J. Agrawal</b> <i>Asstt. Professor</i> <i>Department of Petrochemical Technology</i> <i>Laximnarayan Institute of Technology, RTM</i> <i>Nagpur University, Nagpur</i> <b>(20 minutes)</b>	<b>Indigenous Technologies simplified for commercial &amp; sustainable application of Bamboo to support Rural Economy</b>
	<b>Ar. Nilam Kumari Manjunatha</b> <i>Principal Architect</i> <i>Manasaram Architects</i> <b>(20 minutes)</b>	<b>Human Resources Development for Bamboo Sector</b>
	<b>Shri. Pasha Patel</b> <i>Chairman, Phoenix Foundation</i> <b>(20 minutes)</b>	<b>Promotion of Bamboo in India</b>
<b>Interactive Session &amp; Summing Up - by Chair</b>		
<b>13:05 - 13:50 hrs</b> <i>(45 minutes)</i>	<b>Lunch Break</b>	

Time	Speaker	Topic
<b>Session - II: BAMBOO FOR CONSTRUCTION &amp; FURNITURE</b>		
13:50 - 15:10 hrs (80 minutes)	<b>Session Chair: Dr. R. Hampayya</b> <i>Ex-Chairman, Andhra Pradesh Biodiversity Board</i>	
	<b>Shri. Sanjeev Karpe</b> <i>Managing Director</i> <i>Native Konbac Bamboo Products Pvt. Ltd.</i> <i>Maharashtra</i>	<b>Bamboo based construction and Furniture</b>
	<b>Dr. Soham Pandya</b> <i>Chairman</i> <i>Centre for Environmental Development (CED)</i> <i>Maharashtra</i>	<b>Versatile and innovative uses of bamboo</b>
	<b>Prof. Charuchandra Arun Korde</b> <i>Assistant Professor</i> <i>Indian Institute of Technology, Bombay</i>	<b>Bamboo construction for Rural and agricultural infrastructure</b>
<b>Interactive Session &amp; Summing Up - by Chair</b>		
15:10 - 15:25 hrs (15 minutes)	<b>Tea Break</b>	
<b>Session - III: INNOVATIVE PRODUCTS OF BAMBOO</b>		
15:25 - 16:45 hrs (80 minutes)	<b>Session Chair: Dr. (Smt.) C. Suvarna, IFS</b> <i>Chief Executive, National Fisheries Development Board</i> <i>Ministry of Fisheries, Animal Husbandry &amp; Dairying, GoI</i>	
	<b>Dr. Braja Narayan Mohanty, IFS (Retd.)</b> <i>Ex-PCCF &amp; HoFF, Manipur</i> <i>Ex-Director IPIRTI</i>	<b>Innovations in Bamboo value addition for Rural economy and entrepreneurship</b>
	<b>Shri. Prasada Rao Vaddarapu, IFS</b> <i>Director, Livelihood &amp; Capacity Development</i> <i>- JICA Project</i>	<b>Innovations in Bamboo utility products to improve Rural economy in Tripura</b>
	<b>Shri. Rajeev Valasala Kumaran</b> <i>Wind Craft, Bamboo Crafts</i>	<b>Innovations and Modernization of Bamboo Craft Sector</b>
<b>Interactive Session &amp; Summing Up - by Chair</b>		
<b>Session - IV: Panel Discussion</b>		
16:45 - 17:30 hrs (45 minutes)	<b>Moderator: Shri. C. Muralidhar Rao, IFS (Retd.)</b> <i>Ex-Principal Secretary, Environment and Forests, &amp; PCCF, Govt of Mizoram</i>	
	<b>Panelists</b>	<ul style="list-style-type: none"> <li>• All Chairs</li> <li>• Other Experts / Professionals</li> </ul>



Date: 04th March 2022

Time	Speaker	Topic
<b>Session - V: PROSPECTS AND CHALLENGES</b>		
<b>09:45 - 11:25 hrs</b> <i>(100 minutes)</i>	<b>Session Chair: Dr. Ravi Shankar Thupalli</b> <i>International Expert – Conservation</i> <i>Review Specialist - FAO</i>	
	<b>Dr. Sandeep Chopde</b> <i>Associate Professor</i> <i>MET Institute of Management</i> <b>(20 minutes)</b>	<b>Bamboo farming for sustainable agriculture</b>
	<b>Shri. RSC Jayaraj, IFS</b> <i>PCCF &amp; Director</i> <i>Rain Forest Research Institute</i> <b>(20 minutes)</b>	<b>Bamboo Sector in North-East India - Prospects and challenges</b>
	<b>Shri. Anand Banthia</b> <i>Head - Marketing</i> <i>Garnet India, Madhya Pradesh</i> <b>(20 minutes)</b>	<b>Innovations in Bamboo Processing and Product Manufacturing</b>
	<b>Shri. Ranganath Krishnan</b> <i>Secretary cum Treasurer, Bamboo Society of India</i> <i>CEO, Goldensands Agrotech India Pvt. Ltd.</i> <b>(20 minutes)</b>	<b>Developing Bamboo Market Linkages</b>
<b>Interactive Session &amp; Summing Up - by Chair</b>		
<b>11:25 - 11:40 hrs</b> <i>(15 minutes)</i>	<b>Tea Break</b>	

Time	Speaker	Topic
<b>Session - VI: BAMBOO - A VERSATILE PRODUCT</b>		
11:40 - 13:00 hrs (80 minutes)	<b>Session Chair: Shri. Binod Anand</b> <i>Secretary General, Confederation of NGOs of Rural India</i>	
	<b>Shri. T.S.K. Reddy, IFS (Retd.)</b> <i>Ex-MD, Bamboo Development Corporation Maharashtra Bamboo Development Corporation</i> (20 minutes)	<b>Bamboo-Green Gold of 21st Century</b>
	<b>Ms. Daya Patki</b> <i>Bamboo Entrepreneur, Pune</i> (20 minutes)	<b>Bamboo plantations to value addition</b>
	<b>Ms. Neera Sarmah</b> <i>The Bamboo Lady of India</i> (20 minutes)	<b>Help Nature and Community</b>
<b>Interactive Session &amp; Summing Up - by Chair</b>		
13:00 - 13:45 hrs (45 minutes)	<b>Lunch Break</b>	
<b>Session - VII: WAY FORWARD</b>		
13:45 - 15:05 hrs (80 minutes)	<b>Session Chair: Shri. Ranganath Krishnan</b> <i>Secretary cum Treasurer, Bamboo Society of India CEO of Goldensands Agrotech India Pvt. Ltd.</i>	
	<b>Shri. S.T.S. Lepcha, IFS (Retd.)</b> <i>Ex-PCCF, Uttarakhand</i> (20 minutes)	<b>Think beyond Bamboo National Mission</b>
	<b>Dr. P. Sudhakar</b> <i>Former Prof. IIT Delhi</i> (20 minutes)	<b>Innovations &amp; Demos in Bamboo and Bamboo use</b>
	<b>Shri. Parmeswaran K Iyer</b> <i>Bamboo Entrepreneur &amp; Specialist Director, Bamboopecker Lifestyle Crafts Pvt. Ltd. &amp; NGC Member BSI</i> (20 minutes)	<b>Policies and entrepreneurship in bamboo</b>
<b>Interactive Session &amp; Summing Up - by Chair</b>		
15:05 - 15:20 hrs (15 minutes)	<b>Tea Break</b>	
<b>Session - VIII: Panel Discussion on Way Forward</b>		
15:20 - 16:05 hrs (45 minutes)	<b>Moderator: Dr. G. Narendra Kumar, IAS</b> <i>Director General, NIRD&amp;PR</i>	
	<b>Panelists</b>	<ul style="list-style-type: none"> <li>• All Chairs</li> <li>• Other Experts / Professionals</li> </ul>



Time	Topic	Speaker
<b>VALEDICTORY SESSION</b>		
<b>16:15 - 17:25 hrs (70 minutes)</b>	<b>Welcoming the dignitaries</b>	
	<b>Special Address by Guest of Honour</b>	
	<b>Highlights of the Conference</b>	<b>Shri. C. Achalender Reddy, IFS (Retd.)</b> <i>Director            Centre for Innovations in Public Systems (CIPS)            Hyderabad</i>
	<b>Take Aways &amp; Way Forward</b>	<b>Dr. G. Narendra Kumar, IAS</b> <i>Director General            National Institute of Rural Development and            Panchayati Raj (NIRD&amp;PR)            Hyderabad</i>
	<b>Address by Chief Guest</b>	<b>Smt. Shanti Kumari, IAS</b> <i>Special Chief Secretary (Forestry)            Department of Environment, Forest, Science &amp;            Technology            Govt. of Telangana, Hyderabad</i>
	<b>Vote of Thanks</b>	<b>Dr. Fareed Ahmed</b> <i>Advisor            Centre for Innovations in Public Systems (CIPS)            Former Executive Director            Punjab &amp; Sindh Bank and            Former General Manager, Corporation Bank</i>



# Session - I

## Why Bamboo?





## SESSION CHAIR

### PROFILE

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**Dr. G. Chandrasekhar Reddy, IFS (1991)** is currently working as Additional Principal Chief Conservator of Forests & Vice Chairman & Managing Director, Telangana State Forest Development Corporation Ltd., Hyderabad. He is a native of Adilabad District. He is a graduate of B.Sc. Forestry and a post-graduate in Life Sciences from JNU, New Delhi. He did his masters in management and public policy at IIM, Bangalore and Syracuse University, USA. He also holds a PG Diploma in Environmental Education and Management from HCU, Hyderabad. He was awarded a doctoral degree in Environmental Sciences from Kakatiya University. He has many publications to his credit.



He has 30 years of rich experience in natural resources management and has worked in the areas of forest management, watershed based livelihoods management, drought and flood mitigation, water conservation and water use efficiency, forestry education and training, urban forest parks development, Yadadri Model High density planting, eco-friendly coal mining, bio-diesel, environment education, wildlife management etc.

He worked as Project Director for DFID, JICA, and World Bank Aided Livelihoods & Water Sector Projects in the State. He served as Course Coordinator for the 86th and 87th foundation courses for IFS officers and Indian Civil Services officer trainees at Dr. MCR HRD Institute, conducted under the aegis of Lal Bahadur Shastri National Academy of Administration (LBSNAA) Mussoorie. He is the founding Dean of Forest College & Research Institute (FCRI) in Telangana and served for five years. He is currently taking up Eco-Tourism and working on Eucalyptus alternatives for commercial plantations in the State of Telangana.

*eMail: [vcmd.tsfdcl@gmail.com](mailto:vcmd.tsfdcl@gmail.com)*



## PROFILE

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**Shri. Prasanta Kumar Swain, IPoS** (1987) presently Additional Secretary, National Bamboo Mission (INM, Policy, RFS, NRM, RTI, O&M, PG, DM, EA, Farmers Welfare, Investment & Price Support, PDC). Prior to taking charge as Additional Secretary, he was Joint Secretary, Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare.



## NATIONAL BAMBOO MISSION AND NEW SCHEMES

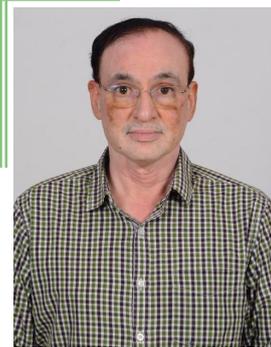
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## PROFILE

**Shri. Punati Sridhar, IFS (Retd.)** is currently working as the Chairman of the Bamboo Society of India which is a pan India NGO. He was a former Principal Chief Conservator of Forests (Wildlife) and HoFF, Karnataka. Mr. Sridhar did his Post Graduation in Agriculture plant breeding and genetics and joined Indian Forest Service and put in 36 years of service.

Mr. Sridhar as the Project Director of the Kalyanakere Mavatgur Kere watershed project in Bangalore and Tumkur districts, won the National Productivity Award for his and his teams's tireless efforts. When he was Conservator of Forests of Forests Gulbarga Circle as DCF SF Bijapur and as DCF Gulbarga under his guidance 6-10 feet tall seedlings were raised and planted, which helped in making the areas green.



He as DCF Karwar, with the planning and involvement of the local public and the Sharanabasaveshwara temple authorities, could successfully stop the age-old tradition of the cutting of thousands of Memecylon eduli trees during the Sankranthi temple festival in the pristine evergreen Westernghats in Anshi near the temple. Efforts made by the department for decades to stop this practise were not fruitful earlier. As the Chairman of the Bidar Forest Development Agency under his guidance excellent forest plantations in Bidar district with people's participation through the Village Forest Committees was taken up and for which the Bidar FDA was awarded "the Indira Priyadarshini Vriksha Mitra Award".

As the Director, Environment, Karnataka, he could successfully prevent iron ore mining in the Baba Budangiri hill ranges of the western ghats which ultimately was also upheld by the High Court and the area stands saved even today. As the head of the JSYS he could help rejuvenation and use of 3700 lakes in the state through community participation.

When he was in MGIRED, Mr. Punati Sridhar initiated remote village individual house solar electrification in deep interior Tiger Reserves for the dwellers by raising funds from friends and family. He also initiated community participation for making the MGIRED neighbouring Rachenahalli lake being maintained and develop to make it accessible for public use. From a defecation site it was transformed into a good lake open for public use. The digitisation of forest lands was initiated and 80% completed by the time he retired which helps even Forest Guard to verify forest boundaries.

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## BAMBOO, A VERSATILE SPECIES WITH GREAT POTENTIAL FOR RURAL LIVELIHOOD

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Bamboo is a woody tree like grass belonging to the family Poaceae (Graminea). New shoots that emerge from the soil during the growing season reach their full length within a couple of months. The maximum-recorded growth of Moso bamboo in China is up to 1 meter per day, which makes bamboo the fastest growing plant in the world. It's life span varies from 30-100 years and yields continuously from 5th year if planting every year till it dies after flowering. Current estimations are that more than 1250 species exist and covers more than 50 million hectares of land. Bamboos occur naturally in most parts of the world. India, China and Brazil have most of the global bamboo cover.

Globally Bamboo has about Millions of people across the world make a living through bamboo. India is blessed with 148 species of bamboo with 29 genera covering 15.69 million hectares of land. Most of the bamboo is distributed in forest areas. Studies show that because of its fast growth bamboo groves sequester 40% more carbon and release 39% more oxygen than trees. No part of the bamboo plant is wasted. Shoots are harvested for food; branches for poles; main bamboo pole for fibres, pulp or charcoal production. Lower trunk for construction uses or flooring and engineered bamboo products.

Traditional uses - scaffolding and basketry, food, musical instruments

Present uses - furniture, decor, beverages, engineered bamboo products, activated bamboo charcoal, cosmetics, chemicals, bamboo textiles, organic pesticides / fungicide, paper, ornaments, toys, bio-plastic granules, replacement for plastic, construction including schools, resorts, hotels, houses, architecture, interior decoration, etc. In post-disaster housing earthquake areas, coastal areas

Innovative uses -heavy duty drainage pipes and wind turbines, for decoration in Cars, aeroplanes, etc

Ecology environment: combat climate change, phytoremediation

Agro forestry, live fencing, dry bamboo fencing, leaf compost

Bamboo market worldwide is about \$ 72 bn (2019). China has 70% share of this whereas India contributes to only 5% share. Major Exporters of bamboo products are China, Thailand, Vietnam. Whereas major importers are India, US, The Netherlands, Spain. Over 2.2 billion people the world over are dependent on bamboo and its related industries for bamboo products, income, food, and housing. China has over 8 million and India over 2 million people working in bamboo sector. Thus, potential for increasing India's bamboo economy several folds is fairly good if we have the right policy, inventory information and support. This can create livelihood for millions of people especially women and youth as the sector mostly employs them. Also, with increase in demand for bamboo products, the area under agroforestry would increase considerably providing livelihood for farmers.



## PROFILE

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**Dr. Amit Jugalkishorji Agrawal** is currently working as an Assistant Professor in the Petrochemical Technology Department at the Laxminarayan Institute of Technology, Nagpur. He was with Bharati Vidyapeeth College of Engineering, Navi Mumbai as Assistant Professor (Adhoc) from January 2011 to October 2013 and the Government Polytechnic, as Assistant Professor (Contract Basis) from November 2009 to December 2010.



He did his B. Tech. in Chemical Technology (Petrochemical Technology) in first division from the University Department of Chemical Technology, Amravati in 2007 and his M. Tech. in Chemical Technology (Petrochemical Technology) in first division from L.I.T. Nagpur in 2009. He submitted work for a Ph. D. in Chemical Technology from L.I.T. Nagpur in 2021.

He successfully completed five research and consultancy projects funded by Maharashtra Bamboo Development Board, Nagpur, Forest Department, TATR Region, Chandrapur, Private Industries and R. T. M. Nagpur University, Nagpur. He published a number of research articles in national and international journals.

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# INDIGENOUS TECHNOLOGIES SIMPLIFIED FOR COMMERCIAL AND SUSTAINABLE APPLICATIONS OF BAMBOO TO SUPPORT RURAL ECONOMY

## Introduction

Bamboo is a group of woody perennial grasses in the true grass family Poaceae, which is a large family with over 10,000 species. The size of bamboo varies from small annuals to giant timber bamboo. Bamboo is the fastest-growing woody plant in the world. Looking towards the versatility of bamboo and to promote its farming, some research projects as mentioned below were undertaken in association with the Maharashtra Bamboo Development Board, Nagpur (MBDB) to improve the applicability of bamboo in several areas.

### 1. Activated Carbon (AC):

Carbon biomass with an iodine number between 600 and 1450 mg/gm is considered activated carbon (ASTM 2011). The most well-known applications of AC are water and air purification, food and pharmaceutical industries, electronic industries, etc. AC is obtained from the controlled pyrolysis of a raw material (bamboo), where temperatures vary from 400 to 1200 °C, and consequent physical and chemical activation.

Activated Carbon Synthesis from Bamboo was one of the major projects carried out in the laboratory. In this project, activated carbon was synthesised from about 35 different species of bamboo and its various properties, namely iodine number, calorific value, and ash content, were determined. Beyond this, the carbonization capabilities of all these species were optimised according to the age and moisture content of bamboo. Moreover, statistical data was generated according to soil quality and time of harvesting bamboo so as to get a better quality of bamboo carbon.

Furthermore, three different product prototypes were developed based on Bamboo AC. Finally, a large-scale commercial carbonization furnace with a processing capacity of approximately 1100 kg of bamboo per day was designed, and TWO such furnaces were installed in separate locations to synthesize Bamboo AC. The furnaces are running efficiently to produce bamboo AC.

### 2. Bamboo Fibers:

Generally, fibre extraction of bamboo is done through mechanical (enzymatic) or chemical methods. Along with these methods, fibre extraction from bamboo is also done through a new technique of sonication. In this method, promising results are obtained at initial stages, and the added advantage of the processing possibility of any species of bamboo was also observed. Depending on the strength, the fibres may find applications from fabric making to the manufacturing of reinforced structures.



**3. Disposables & Pencil Body:**

Agarbatti Sticks manufacturing and artisan-making industries generate about 60-80% of bamboo dust as a waste. This dust is effectively utilised to convert it into value-added products like pencil bodies and disposable cups and plates, which are completely biodegradable in nature. The technology is so simplified that a layman can also be trained to produce these products of national interest on a commercial basis, and that too, with very low investments.

**4. Food Grade Silica from Bamboo Leaves:**

Bamboo leaves are often considered garbage by the public and receive less attention. Bamboo leaves are a very good source of silicon dioxide, or silica, and it has a wide utility, from medical to agriculture. In the initial studies, thermal and chemical extraction of silica from bamboo leaves was practiced in the laboratory.

**5. Fire Retardant Coatings and Anti-Bacterial Coatings for Bamboo Structures:**

Bamboo structures and bamboo-based furniture are easily attacked by a special mold and bacteria, which reduces their life. Moreover, bamboo structures are easily prone to fire. Keeping these problems in mind, some specific and environmentally friendly paints and coatings have been developed in the lab for counteracting mold attacks on bamboo structures and fire retardant paints to reduce the possible fire hazards of bamboo structures to a greater extent. The major advantage of these paints and coatings is that they retain the originality of bamboo without making it look old.



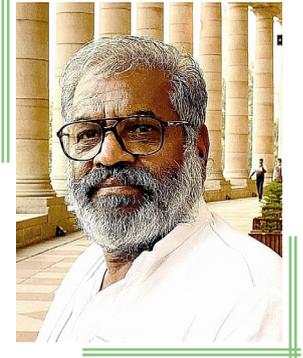
## PROFILE

**Shri. Pasha Patel**, hails from Ausa in Latur district of Maharashtra and was involved in farming. He is the founder member of India Bamboo Forum.

He relates to farmers at the ground level and understands their problems. Patel carried out most farmer agitations in the country during the 1980s and 1990s. Pasha Patel is a former member of the Maharashtra Legislative Council and also former Chairman of Maharashtra Commission for Agricultural Costs and Prices (CACP).

He has been associated with various educational institutions. He started a diploma Engineering course in Bamboo Technology, a Tissue culture lab for Bamboo Plants and started Soil Testing Lab at Lodga, Latur District to promote and spread Bamboo farming & Bamboo processing industry. He also started Bamboo Furniture factory in collaboration with KONBAC (Kokan Bamboo & Cane Development Centre), Sindhudurg Maharashtra.

Presently he is Governing Council Member of Bureau of Indian Standard (BIS), Government of India, and a Member, General Council of National Institute of Rural Development & Panchayati Raj, Hyderabad



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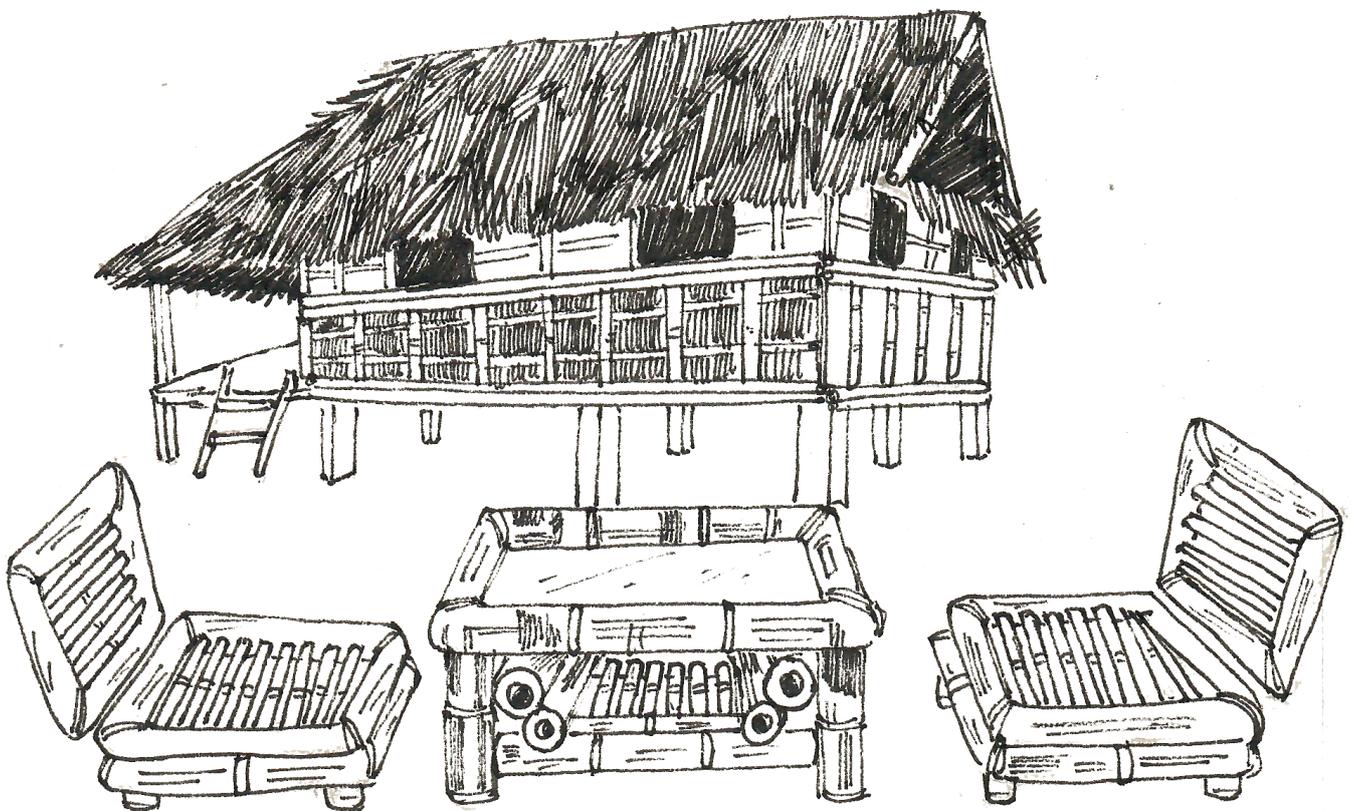
## PROMOTION OF BAMBOO IN INDIA





## Session - II

# Bamboo for Construction and Furniture





## SESSION CHAIR

### PROFILE

**Dr. R. Hampayya**, did his graduation in B.Sc. (Agriculture) and completed his Ph.D from Indian Agricultural Research Institute (IARI), New Delhi. Later he joined Agricultural Research Service.

He held the following positions :-

1. Department of Agriculture as Agricultural Officer
2. Cane Superintendent in Kothari Sugars
3. Research Director in Pioneer Seeds, USA.
4. Chief General Manager in E.C.L. Agrotech, Bangalore
5. Consultant – Ukrainian Seed Company, MAIS
6. Chairman, A.P. Biodiversity Board 2005-2014
7. Chief Scientist – Hitachi Agro Project
8. Director, Rainbow Seeds (P) Ltd, Hyderabad – Present



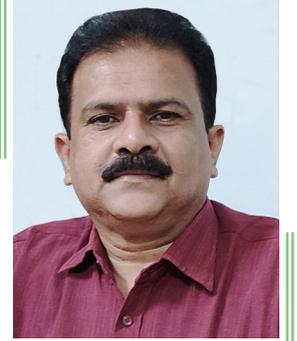
He held the position of Chairman, A.P. Biodiversity Board for about 8 years in the united Andhra Pradesh state during which he played a key role in organizing COP-11 to Convention on Biological Diversity (CBD) at Hyderabad in 2012. He also represented India during COP-12 to CBD held at South Korea in 2014.

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## PROFILE

**Shri. Sanjeev Shashikant Karpe** is the Founder Managing Director of Konkan Bamboo & Cane Development Centre (KONBAC), Sindhudurg, Maharashtra, a Sankalp Award winning social enterprise and an organization working for sustainable development through the use of bamboo as a resource & implementing various bamboo projects successfully for the last 17 years.



Mr. Sanjeev, a qualified electrical engineer, has been associated with the bamboo industry for the last eighteen years and has pioneered the work in setting up bamboo-based enterprises in rural India. He is a fellow of IIM Lucknow. He is also an expert member on the steering committee of the “INBAR Task Force – Bamboo Construction”. The International Network for Bamboo & Rattan (INBAR) is an intergovernmental body having 48 member countries and is headquartered in Beijing, China.

He is a Director of Jans Bamboo Products Pvt. Ltd., a social enterprise which is presently doing construction of one of the largest bamboo construction projects in the world - 80000 sq. ft.

Mr. Sanjeev SK., was also a Director with the Centre for Indian Bamboo Resources & Technology (CIBART), which had implemented the “Bamboo Livelihood Business Enterprise Project” for the development of Primitive Tribal Groups of South Gujarat for the Govt. of Gujarat. He was a “Bamboo Expert” on a project to “Promote Bamboo MSME Clusters for Sustainable Development” in 9 states in India, implemented by FMC and funded by the European Union. He was also the Chairman of the “Modular Bamboo Furniture Cluster, Sindhudurg”, a project supported by the Directorate of Industries, Government of Maharashtra.

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## BAMBOO BASED CONSTRUCTION AND FURNITURE BY KONBAC

The global bamboo industry is worth \$36 billion. China is the global market leader, controlling more than 50% (USD 19.5 billion) of this industry. In fact, India is ranked 15th globally (with a market size of USD 4.35 billion) in spite of having the largest natural bamboo cover of around 10 million hectares, double that of China. The primary reason for this disparity is that the Indian bamboo industry is confined to low-value-added products such as handicrafts, stick making, and other products made from unprocessed bamboo, whereas China has firmly established itself in the high-value-added products market. These high-value products are furniture, flooring, and other bamboo products, which are mostly made out of engineered bamboo boards. It is high time that India also ventures beyond the basic low-value bamboo product portfolio into making high-value-added products to make the best use of one of the most rapidly renewable natural resources the country is endowed with.

Konbac Bamboo & Cane Development Center (KONBAC) has evolved over the years in the township of Kudal in the district of Sindhudurg, Maharashtra, as a market leader in bamboo products. Established in 2004 as a Section 25 company set up by the Centre for Indian Bamboo Resource and Technology (CIBART) and over a period of a decade, developed the expertise and experience in producing niche quality bamboo furniture and structures while promoting the better practice of the poor farmers growing bamboo, which is the most environmentally friendly plant on this planet.

Konbac, with its present portfolio of bamboo-based construction and furniture products, has excelled in serving the demand across public and private sectors, boasting of a client base comprising of Taj Hotels, Mahindra Resorts, LAVASA, and Orissa Tourism Development Corporation, among others. To overcome the quality issues of bamboo as a raw material for construction and furniture, Konbac is using pressure-treated and aged bamboo for specific uses. Due to the nonavailability of traditional bamboo species, which can be used for construction, Konbac diverted its expertise from the use of larger diameter bamboo for major construction projects and developed appropriate designs for the bamboo locally available. This involved developing a new technique of joining small-diameter bamboos together using metal plates with the help of nuts and bolts to make aesthetically pleasing constructions for the high-end market. The construction is in line with the INBAR-developed ISO bamboo building codes.

Also, Konbac is developing its new innovative designs of bamboo board-based furniture considering the demands of customers. Bamboo board-based furniture as an option for wood attracts people and will boost the furniture market in the future. Encouraged by the enhanced movement of the public towards eco-friendly products, Konbac is ambitious and expects to add a few more locations and develop a product line of pre-fabricated and affordable housing components.

At present, KONBAC has made considerable progress in developing into a self-sustaining institutional ecosystem and has fully developed facilities for designing, prototyping, and product ionizing marketable bamboo products for Indian markets. It has also put in place mechanisms to link poor bamboo producers to larger, more lucrative markets and has already emerged as a model that is being emulated elsewhere in India and abroad.



The furniture-manufacturing unit is oriented to creating a viable instrument to kick-start and makes the market for bamboo a dynamic process. It adds value by adhering to quality criteria in all links of the value chain for bamboo, generating new business opportunities, motivating investment among producers, defining clear rules for both purchasers and sellers, and promoting the articulation among enterprises and institutions to develop enterprises that strengthen the sector.

One of the key strategies developed by Konbac was to work towards positioning bamboo as a credible alternative to wood from trees, and develop and provide the means to enable the rural poor and smallholders to participate in and benefit from the US \$100+ billion wood products market, something they are unable to do with timber, making bamboo a true pro-poor wood. This would provide them with the needed income stability, buffer the uncertainties of agriculture, make viable the environmental services of bamboo, and create a very large number of new jobs in rural areas. A second important strategy developed was to leverage bamboo's off-farm economic value and opportunities to realize the considerable environmental benefits it offers.

The Bamboo Furniture Production Unit is designed to operate as a center of business for bamboo, bringing in the needed technologies, building human capacity, and formalizing the sector with agreements and standards. On the one hand, it enabled the resource production sector to derive a better understanding of and benefit from the economic potential of bamboo. Existing growers and new interested farmers started to learn about possible opportunities, started getting involved in commercial plantations, in the supplying of raw materials under agreed quality standards, and started receiving technical advice to further develop their production activities. On the other hand, the enterprise sector will be able to count on this unit to supply them with the needed quantities of quality and standardized raw materials for their products, thereby ensuring that they are also of good quality according to the standards that the market demands.



## PROFILE

**Dr. Soham Pandya** is currently the Chairman of a voluntary organization, “Centre for Environmental Development,” in Wardha and actively engaged in research, field trials, field extension, training, entrepreneurship development, and policy interventions. He is a student of biotechnology. He did his M.Sc. from M.S. University, Baroda, and his Ph.D. from Sardar Patel University, Vallabh-Vidyanagar, Anand, Gujarat. He completed a British Council-sponsored Certificate Course for “Natural Resource Managers” at the Center for Developmental Studies, Swansea, Wales, U.K. He attended a Certificate Course in “Basic Computer Application for Managing Natural Resources” at Wye College, London, U.K. He worked as a faculty in different colleges affiliated with Pune University, Nagpur University, and Amravati University. He worked as Chairman and Executive Director of a voluntary organisation called “Centre of Science for Villages” (CSV), Dattapur, Wardha. This organisation works in entrepreneurship development, housing, sanitation, renewable energy, village industries, agriculture, and forestry.



Dr. Soham Pandya has introduced a range of appropriate technologies (AT) and methodologies ecologically sound, economically viable, and socially just. These technologies are associated with i) Organic Farming, ii) Land Cover Management, iii) Watershed Management, iv) Forest Resource Management, v) Habitation Creation Using Locally Available Construction Materials, i.e., Mud and Bamboo, vi) Total Sanitation for Solid and Liquid Waste Management, vii) Renewable Energy, viii) Village Industries, and ix) Entrepreneurship Development. As Principal Investigator, Dr. Soham Pandya has implemented more than a dozen scientific projects funded by the Ministry of Science and Technology, Women and Child Development, CAPART, etc. He transferred a range of AT in 220 villages of Vidarbha, Maharashtra, as the Mother NGO of the Maharashtra Government (Ministry of Agriculture) and the Program Implementing Agency (PIA) of the Watershed Management Program.

Dr. Soham Pandya has written a Draft Proposal on Land Cover Management for the Science and Society Division, Department of Science and Technology (DST), Ministry of Science and Technology, Government of India, New Delhi.

The Honourable Supreme Court of India appointed him to a committee to provide a report on tree felling in West Bengal. He has published many scientific papers, books, reports, and popular articles. He is a fellow of Leadership in Environment and Development (LEAD) – International and a member of many organisations.

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## VERSATILE AND INNOVATIVE USE OF BAMBOO

Bamboo is a prominent plant species in the natural vegetation of many forests located in the world's tropical, subtropical, and mild temperate regions, from sea level to altitudes of more than 12,000 feet (or 4,000 meters). About 76 genera account for some 1200 species of bamboo throughout the world. Of this genetic wealth of bamboo, 186 species occur in India. Most bamboo grows in the forest and propagates through natural regeneration. Some important Indian species of bamboo are: 1) *Bambusa arundinacea*; 2) *Bambusa polymorpha*; 3) *Bambusa tulda*; 4) *Dendrocalamus hamiltonii*; 5) *Dendrocalamus strictus*; 6) *Melocannabambusoides*; 7) *Ochlandra travancorica*. Among these, the most abundant and important species is *Dendrocalamus strictus*, which has received due attention from researchers. Bamboo is divided into five distinct parts: 1) Rhizome; 2) Culms; 3) Sheaths; 4) Leaves, and 5) Roots. Bamboo has been used in various ways, and one cannot make a list of all of the uses. We are trying to list some of the important uses of bamboo in different fields.

Artisanal Products: 1) Topys for Children, 2) Animal Sheds 3) Cups 4) Blow Gun 5) Baskets of different kinds 6) Bullock Cart 7) Candle holder 8) Chicken cage 9) Pig Cage 10) Cutlery 11) Char Coal for vanity of uses 12) Hand Holding Fans 13) Artistic wall hangings 14) Fencing (Live and from dry Culms) 15) Flute 16) Fishing Nets 17) Furniture of hundreds of kinds for indoor and outdoor use 18) Swings of different kinds 19) Storage Baskets 20) Containers for transportation 21) Hats / Caps 22) Fruit Harvesters 23) Kanvar 24) Ladders 25) Support to Trees Bearing Huge amount of Fruits 26) looms for Weaving 27) Musical Instruments 28) Bow and Arrows 29) Trays 30) Water lifting device 31) Winnower

Modern Products: 1) Bicycle; 2) tricycle 3) Brief Case 4) Suit Case 5) Bags with hangers 6) Hanger 7) Brushes 8) Manure from leaf litter 9) Mulching Pads from Leaf litter 10) Paper 11) Racks 12) Rayon 13) Strainers 14) Windmill 15) Fabric making

Edible Products: Young and soft bamboo shoots are an important ingredient in the food of North East India and Odisha. 1) Bamboo Picklee 2) Bamboo Chips 3) Bamboo Drink (Fermented)

Health: 1) Bone Setting 2) Vanshlochan

Construction Industry: 1) Bridges 2) Tree Houses of dozens of Kinds 3) Bamboo Reinforced walls and roofs are plastered on both sides with cement and sand mortar. 4) Bamboo Houses are seen in almost all parts of India (Assam Houses, Mizo Houses; Chhattisgarh Houses). 5) Doors 6) Windows 7) Ply Sheets 8) Wardrobe 9) Furniture 10) Sliding Shutters 10) Room Divider 11) Roofing Tiles 12) Parda (Window Screens)



## PROFILE

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**Dr. Chaaruchandra Arun Korde**, a structural engineer with broad exposure to basic and strategic research, high-end construction projects, and entrepreneurship for the past decade. In his limited career, he has dealt with conventional and non-conventional construction materials for structural design and executed constructions using the same. He has done his bachelor's in civil engineering from MSU, Vadodara; Master's in structural engineering and Ph.D. in Bamboo Concrete Composite Structures from IIT Delhi; Post Doctorate Research from Trinity College Dublin, Ireland on Precast Structures; and worked in the industry for five years with Structural Design Consultancy as well as contractor companies in various positions ranging from Structural Engg, Manager (Structural Design & Planning), Senior Manager (Structural Design & Planning) and as Design Director (EPC Project, NHAI). He has joined the Centre for Technology Alternatives for Rural Areas at the Indian Institute of Technology Bombay, Mumbai.



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## BAMBOO CONSTRUCTIONS FOR RURAL & AGRICULTURAL INFRASTRUCTURE

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India has set out on a path towards decentralized economic growth, which is evident from the significant infrastructure development in terms of quality roads reaching the villages, the e-highway through BharatNet, improvements in communication infrastructure, energy infrastructure, as well as policy efforts toward improving health infrastructure, housing, providing cooking gas, and new policy measures towards providing clean drinking water to all. These efforts will significantly increase the demand right at the village level, resulting in livelihood generation and employment opportunities. However, it will also increase the reliance on ecologically intensive materials like steel, cement, concrete, and bricks, as these are the fundamental building blocks of infrastructure development. Also, significant dependence on these will create sustainability challenges, i.e., social inclusivity, ecological diversity, and economic viability. Hence, it is an equally challenging time to promote alternative materials that can complement the sustainability challenges.

One such material is Bamboo, which in recent times is gaining traction both amongst farmers and the government due to its rapid growth potential. However, the focus has been mostly towards industrial product development and the furniture and handicraft sectors, which, on the one hand, are material-intensive but require a specific type of bamboo and consume the limited volume of bamboo with low market traction. Furthermore, the most fundamental issue that policymakers are constantly overlooking is what to do with the existing bamboo stock, which is producing millions of tons of bamboo.

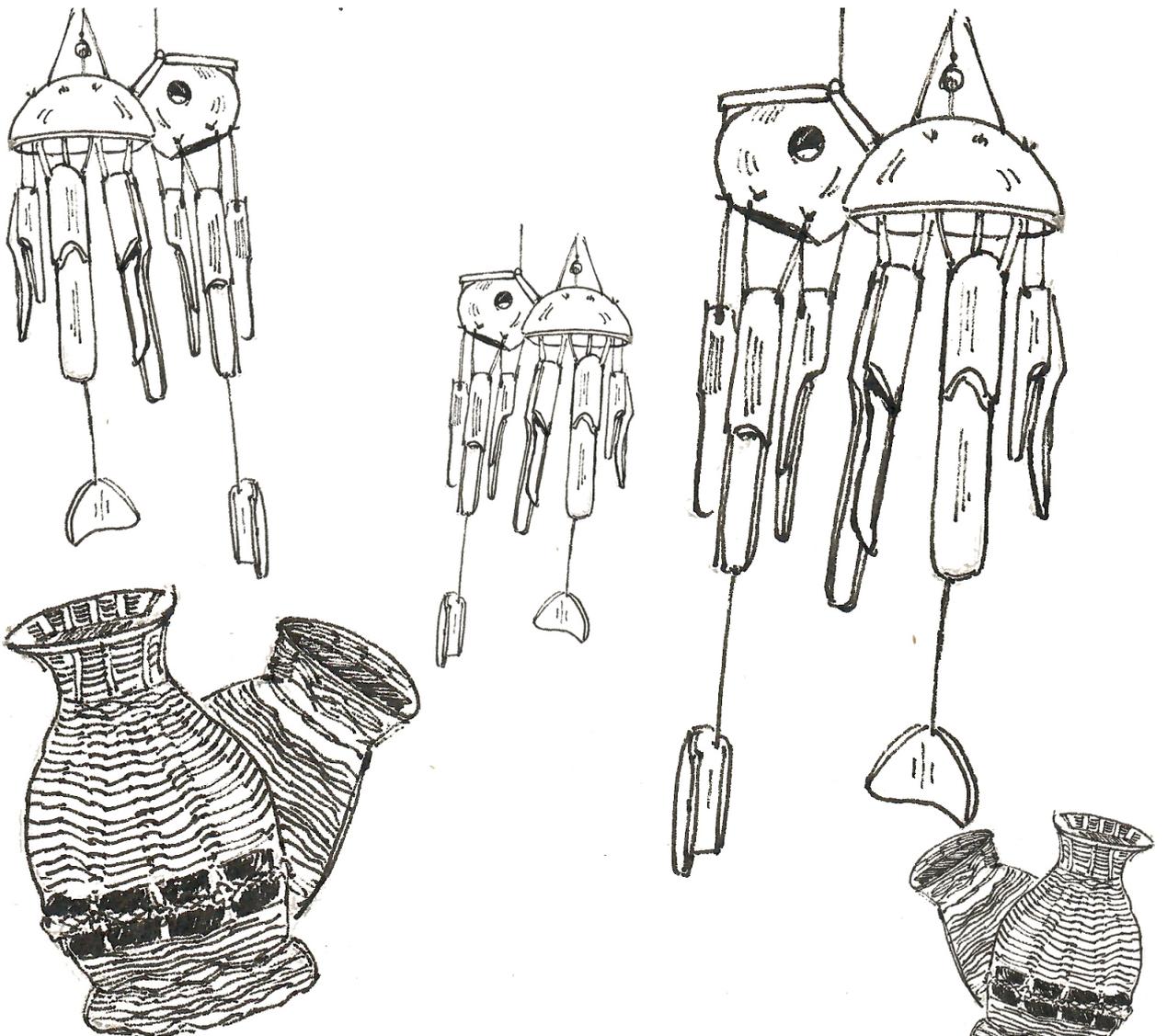
Bamboo in construction is the only sector that can consume these existing stocks of bamboo and that too at a rate that ensures returns to the farmers and forest communities. There is significant potential for the application of bamboo in the development of various infrastructure like Rural, Agricultural, Irrigation, Forest, Coastal, Tourism, Energy, and Urban areas ranging from Housing, Animal Husbandry Shelters, Silos, Warehouses, Schools, Hospitals, Water Tanks, Bridges, etc. When planned systematically, they will usher in, in a true sense, an all-inclusive development of villages and lead toward Gram Swaraj.





## Session - III

# Innovative Products of Bamboo





## SESSION CHAIR

### PROFILE

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**Dr. Suvarna Chandrappagari, IFS**, joined the Indian Forest Service in 1991 and was allocated the Andhra Pradesh cadre and later the Telangana cadre in 2014, after the bifurcation of Andhra Pradesh state. She did her post graduation degree from Acharya N. G. Ranga Agricultural University, Andhra Pradesh, and after joining the service, she earned her Doctorate Degree (Ph.D.) in Rural Development (Women and Forestry).

She has held several key positions under the State Governments, including Commissioner of Fisheries for the Government of Telangana, Member Secretary of the Telangana State Biodiversity Board (TSBB), Special Commissioner (Watersheds) for the Government of Andhra Pradesh, Director of the Andhra Pradesh Forest Academy, and Director Self-Help Groups (SHG) for the Government of Andhra Pradesh.

She was awarded the Hubert Humphrey Fellowship (awarded by the Institute of International Education, Govt. of USA), which she pursued at Cornell University, USA. She was awarded the highest-level State Excellency Award for the services rendered by the Govt. of Telangana. Furthermore, she played a key role in winning national level awards for the Department of Rural Development, State Bio-diversity Board (UNDP award) and Fisheries Department (E-Governance award).

She has several publications in national-level and international-level journals/forums to her credit, on subjects like forest management, watershed management, gender, training & capacity building, and fisheries, and she has published a book as well.

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## PROFILE

**Dr. Braja Narayan Mohanty, IFS (R)**, is currently working as an advisor and an independent consultant to many industrial houses and government organisations to optimize panel products made out of bamboo and other ligno-cellulosic materials.

He joined the Indian Forest Service in 1986 (Manipur cadre) and was awarded a Ph. D in Forestry. He was the Director of the Indian Plywood Industries Research and Training Institute (IPIRTI), Bengaluru and also worked as the Group Coordinator Research at IWST in Bengaluru and as Head of Biodiversity at the Institute of Forest Tree Breeding and Genetics (IFGTB) in Coimbatore. He had undergone training at China's National Bamboo Research Centre, Hangzhou, on the processing and marketing of high-end products.



He was also chosen by the Ministry of Development of the North Eastern Region (NER), Government of India as a Bamboo Expert to carry forward the ongoing task of setting up bamboo industries in all eight states of NER. Besides, he has worked as Deputy Director-General of the Ministry of Environment and Forest & Climate Change, Government of India in the Bhopal Regional Office, where he was, inter alia, looking after the semi-arid regions of Gujarat in Kutch and surrounding areas from a land-use change point of view. He has worked in various capacities in the government of Manipur (India), including that of the Principal Chief Conservator of Forests (Apex Scale) for looking after the biodiversity hotspots.

He was associated for many years as an ex-officio executive body member of the International Organization-Asia Pacific Association of Forest Research Institutes (APAFRI) with headquarters in Kuala Lumpur. He has worked as a resource person with INBAR and the World Bamboo Organization during the Bamboo and Rattan Congress (BARC), 2018, in Beijing and the 11th World Bamboo Congress in Xalapa, Mexico. He worked with a high-level technical committee to advise the restructured National Bamboo Mission, Government of India. British Columbia University in Vancouver (Canada) selected him to act as an expert in selecting a bamboo professor. He published 55 research and popular papers in reputed journals and presented his research papers at many national and international conferences. He has authored a few books and contributed chapters to edited works by eminent authors. Recently, he has co-authored a book entitled "Advances in Synthetic Resin Adhesives for Panel Products," which focuses on in-depth information on environmentally friendly resin-making technologies for panel products made out of plantation timbers, agro-residues, and bamboo.

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## INNOVATIONS IN BAMBOO VALUE ADDITION FOR RURAL ECONOMY AND ENTREPRENEURSHIP

The multiple usage potential of bamboo bears the promise of integrating various socio-economic sectors, starting from the most traditional to the next generation of bamboo activities. Traditional uses of bamboo (for example, making handicrafts) are not financially rewarding for artisans because, on the surface, such works do not involve high-value additions. Hence, it is currently trending to mechanically process bamboo into high-end wood, plastic, or steel alternatives. Making this a reality necessitates the establishment of bamboo-based post-harvest processing and production lines, which are the primary sources of remunerative employment for poor artisans who comprise society's disadvantaged mass population. Introducing innovative processes and products will help enrich their income and employability potential. This would further lead to a sustainable process of rural industrialization, ushering in inclusive growth and livelihood optimization. (as in Hindi, "Jan hai to Jahan bhi hai").

Bamboo as a construction material has many favourable technical properties, viz., high strength to weight ratio, high modulus of elasticity, high modulus of rupture, etc., making it ideal for housing in areas prone to natural calamities such as earthquakes and hurricanes. The tensile strength of bamboo is greater than that of mild steel. Both modified Assam-type and prefab bamboo houses hold the key to immense growth and employment potential for daily wage earners. In India, with its huge bamboo resources and a potentially large national market, various stakeholders have spearheaded innovations in bamboo composites such as bamboo mat board (BMB), bamboo mat veneer composite (BMVC), bamboo mat corrugated sheets (BMCS), bamboo mat ridge cap (BMRC) for roofing and bamboo scrimbers for flooring and panelling. These value-addition technologies have immense employment generation potential, mainly for the rural and tribal poor, who can earn money at each step of the value chain.

The processing technologies mentioned above are pro-poor and cost-effective, easy to adopt, durable, high-in-finish, and sustainable in the long run. Before embarking on large-scale industrial production, the primary processing of bamboo at the harvest site is a must, which meets the immediate monetary requirements of rural poor people. Primary processing involves cross-cutting, knot removal, strip making, sliver preparation, mat-weaving, and round stick making and involves seasoning and preservative treatments. In one study in Angamaly, Kerala, it was found that the average cutting cost of each bamboo was Rs. 11/-and that, in addition, there was a 17.5% annual incentive on the total number of bamboos cut. In such a situation, on average, a tribal cutter earns up to Rs 2.70 lakh per head annually. Once bamboo mats, strips, round sticks, etc. are prepared in workshops, further industrial processing with the use of resins, glues, temperature-pressure treatments, drying, finishing, etc., transforms bamboo into high-value timber substitutes such as BMB, BMVC, BMCS, BMRC, Bamboo Laminates, Scrimbers (Flooring Tiles and Furniture), Bamboo Blinds, etc. The study in Kerala found that the mat weaver gets an amount of Rs 166 per mat (of size 8.25' X 4.25'), and she can make about three mats per day. Even after deducting the cost of bamboo, she earns Rs 500/-per day and, taking 220 person-days per year, she can earn up to Rs 1.10 lakh/annum. On a long-term basis, the products can sustainably cater to the growing markets of India as well as the rest of the globe and have the potential to not only meet the livelihood requirements of poor communities but also play the stellar role of kick-starting economic growth of marginalised and tribal populations in bamboo-rich areas, especially in the backward and rural hinterlands of India.



## PROFILE

**Shri. Prasada Rao Vaddarapu** is an IFS officer from the Tripura cadre from the 2010 batch, and he is currently the Director, Livelihood & Capacity Development, in the Tripura JICA Project. He did his M.Sc., in Agriculture Sciences (Agronomy) from Haryana Agricultural University, Hisar, Haryana, and his Diploma in Forestry from IGNFA, Dehradun.



He is the mastermind behind making the bamboo growers and artisans of Tripura independent and self-sufficient. He gained a thorough understanding and knowledge of the region, the growers, the artisans, and the vast bamboo forests that contribute to almost 30 percent of India's annual growth.

He has come up with the unique Tree Bank project, which is cost-effective and convenient and eliminates the risk of plants getting damaged. Tree Banks are similar to nurseries. They are spaces where pole-sized trees are readily available to be transported for plantation activities. This facilitates the effective and quick generation of green belts at a very low cost along roadsides and on barren lands. This innovative technique of raising Trees Banks mitigates the adverse impact of climate change and global warming. Tree Banks- a technique of raising pole size trees in poly bags to create green belts overnight was developed by him and is also used in Tripura and adopted to raise roadside plantations with a 100% success rate without plant guards.

He received the Chief Minister's Civil Services Award for Excellence in Public Administration for 2021, in the Best Officer Category. A few remarkable contributions by Mr. Prasad Rao are:

1. The wild cardamom was discovered and reported in Tripura's forests, and the state-designated it as an NTFP.
2. Developed the Tree Bank Concept to raise pole size trees in large polybags for social forestry, which was shortlisted for the PM Award for excellence in Public Administration in 2020 and is published in the E-Journal of DoPT, Govt of India.
3. Developed Bamboo Bottles, Brooms and other utility products, which were appreciated by the Honourable PM Sri. Narendra Modi Ji in the Man ki Bath Program.

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## INNOVATIONS IN BAMBOO UTILITY PRODUCTS TO IMPROVE THE RURAL ECONOMY OF TRIPURA

The development of eco-friendly brooms with bamboo handles, bamboo bottles, and other bamboo utility products has created a lot of opportunity for the state's bamboo artisans, the majority of whom are poor forest-dwelling tribal communities. These products have brought a lot of value to the abundantly available bamboo resources of the state and thereby promoted the bamboo-based economy. These innovations have promoted bamboo as an alternative to plastic and facilitated environmental conservation by replacing plastic with bamboo.

Before these interventions, most of the hill broom grass resources collected in the state were exported as grass, without value addition. The scope to generate employment in the state through value addition was limited as broomsticks were missing. With this intervention, we started value addition and were able to employ the grass collecting people in the lean season when there is no alternative employment for the forest gatherers, particularly during the corona pandemic crisis. TRPC Ltd. supplies the raw materials to every household or at the community facilities where the tribal bamboo artisans, mostly women, are involved in making the brooms and can earn Rs. 350 per day. Total 85,000 no of brooms are manufactured at nine locations in the state, which includes, Dasda, Kanchanpur, Noagang in the North District, Pan Bagan in Unakoti district, Chamanu and Gandacherra in Dhalai district, Rishyabari and Karbook in Gomati District, and Thikumba in the South districts which are very remote and far-flung areas, where these resources are available and created about 5000 mandays @Rs. 350/manday and pumped Rs. 17,50,000 in these areas during the corona pandemic crisis. Though the magnitude of impact is low, it is significant and provides scope to expand its impact in the coming years with a proper marketing strategy. We have completely sold out of these brooms successfully in different markets throughout the country and even exported them to neighbouring Bangladesh. The public's response to promoting these brooms is very good, and they are getting repeated orders. We have procured 85 MT of hill broom grass under the MFP-MSP scheme at Rs. 50 per kg in the last two years and pumped about Rs. 42,00,000 into the rural economy during the corona pandemic crisis.

Similarly, through the innovation of bamboo bottles and other utility products like bamboo boards, bamboo wall and ceiling panels, bamboo clocks, bamboo trays, bamboo cutlery, bamboo desktop souvenirs, etc., unique utility products were created, which attracted the attention of the entire country, including the attention of our Honourable Prime Minister, Sri. Narendra Modi ji, Bollywood celebrities like, Raveena Tandon ji, Manoj Bajpai ji, and brought a lot of recognition to the bamboo artisans of the state. The Honourable Prime Minister, Sri. Narendra Modi ji, has well appreciated this initiative during one of his Man ki Bath programs, praising the unique Atmanirbhar Bharat and Vocal for Local initiative.

TRPC Ltd. has produced and marketed 8000 bamboo bottles and generated about Rs. 1,05,00,000 in economic activity through this product alone in the last one year. This turnover was distributed proportionately among different stakeholders, from bamboo growers, processing workers on treatment, bamboo artisans, engraving, packing, logistic agencies, local trade promoters, etc. This innovation has created 5000 man-days @ Rs.500/man-day in the last year during the corona pandemic. Because of this activity, the bamboo clusters promoted under TBM were activated at Kalibazar, Simna, and Nalchar clusters and provided significant employment during the crisis period.



TRPC Ltd, with the assistance of TBM funding and VDVK schemes, TRPC Ltd. successfully trained 1000 bamboo artisans in the state in these innovative trades and facilitated the marketing of these artisans' products through the VDVK schemes. Through the innovations of these bamboo-based products, a new dimension is added to the bamboo sector in the state with high utility and eco-friendly branding, which can create a lot of demand for the product from different corners of the country and world on a recurring basis, which in turn will create stable employment opportunities for the bamboo artisans of the state.

LBSNAA, IGNEA, ONGC, TRIFED, SIPARD, Fab India, and other reputed corporate gifting companies are our clients to take delivery of these products. For these innovative initiatives, the undersigned was awarded as the best civil servant of the state on the occasion of the Golden Jubilee celebrations of the statehood of Tripura.



## PROFILE

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**Shri. Rajeev Valasala Kumaran**, is a Freelance artist and Designer-master craftsman and a Certified Bamboo craft trainer from BCDI -Tripura with 19 years experience in Bamboo and related training. He is associated with National institute of Design as a master craftsman and State Bamboo mission KSBM Kerala Forest Research Institute 'KFRI' as an official Trainer. He is an empanelled Master craftsman by the Handicraft Development Commissioner office, Ministry of Textile (Chennai- Region) and has been deputed as Master trainer for many training programmes organised by Government/ private sectors. He won IICD special mention award for innovative designs in craft in the year 2021. Imparted as master craftsman for international open Elective Bamboo workshop 2019, at National institute of Design Bengaluru in February 2020 He was speaker (hands on creativity) at India global tech forum-3, international bamboo day festival, Taiwan in 2020, on skill development-session in National bamboo mission conference February 2021 and he was member in the jury for international bamboo designs 2020 (TIGBTF-3). He was mentioned three times in 2019 & 2020 by International Bamboo organization 'INBAR'



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## INNOVATIONS AND MODERNIZATION OF BAMBOO CRAFT SECTOR

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## SESSION - IV: PANEL DISCUSSION - MODERATOR

### PROFILE

**Dr. C. Muralidhar Rao, IFS (Retd.)** has superannuated from Indian Forest Service in 2020 as PCCF and Principal Secretary, Environment and Forests, Govt of Mizoram. He belonged to the 1985 batch of IFS, Union Territories cadre. He was born and brought up in Nalgonda District, AP, and did his Master's in Botany at Osmania University. After training in IGNTA at Dehradun and the L. B. Sastri National Academy of Administration at Mussoorie, he joined Mizoram State. He worked in various capacities in the Department of Forests for about six years.



He joined AP forest Department for a two-year stint, and later, he joined Andaman Forest Development Corporation and served there for three years. Later, he was deputed to the Government of India and worked for five years in various capacities in the Indian Council of Forest Research and Education (ICFRE) Institute of Forest Genetics and Tree Breeding (IFGTB, Coimbatore) and the newly formed Forest Research Centre at Hyderabad. He was instrumental in implementing the World Bank Forestry Project (FREEP). Later he joined the Arunachal Pradesh Forest Department and handled many jobs, including Member Secretary, State Pollution Control Board; Director Environment; Director State Forest Research Institute, Itanagar.

He has vast experience in involving local communities in participatory forest management. He was a conservator of Forests, Southern Circle, Central Circle and successfully implemented the Medicinal Plants Programme in the remote districts of Arunachal Pradesh viz; Tirap, Changlang Siangs, and Subansiris. Afterward, he joined Govt of India, Ministry of Environment and Forests as Director and handled the Cadre management of IFS and Human resource management of Various Forest establishments in the country. Later he joined the Department of Atomic Energy, Atomic Minerals Directorate of Exploration and Research (AMD) in Hyderabad as an Officer on Special Duty, helping the AMD in Environmental Management. He held the post of CVO in ECIL on two short tenures.

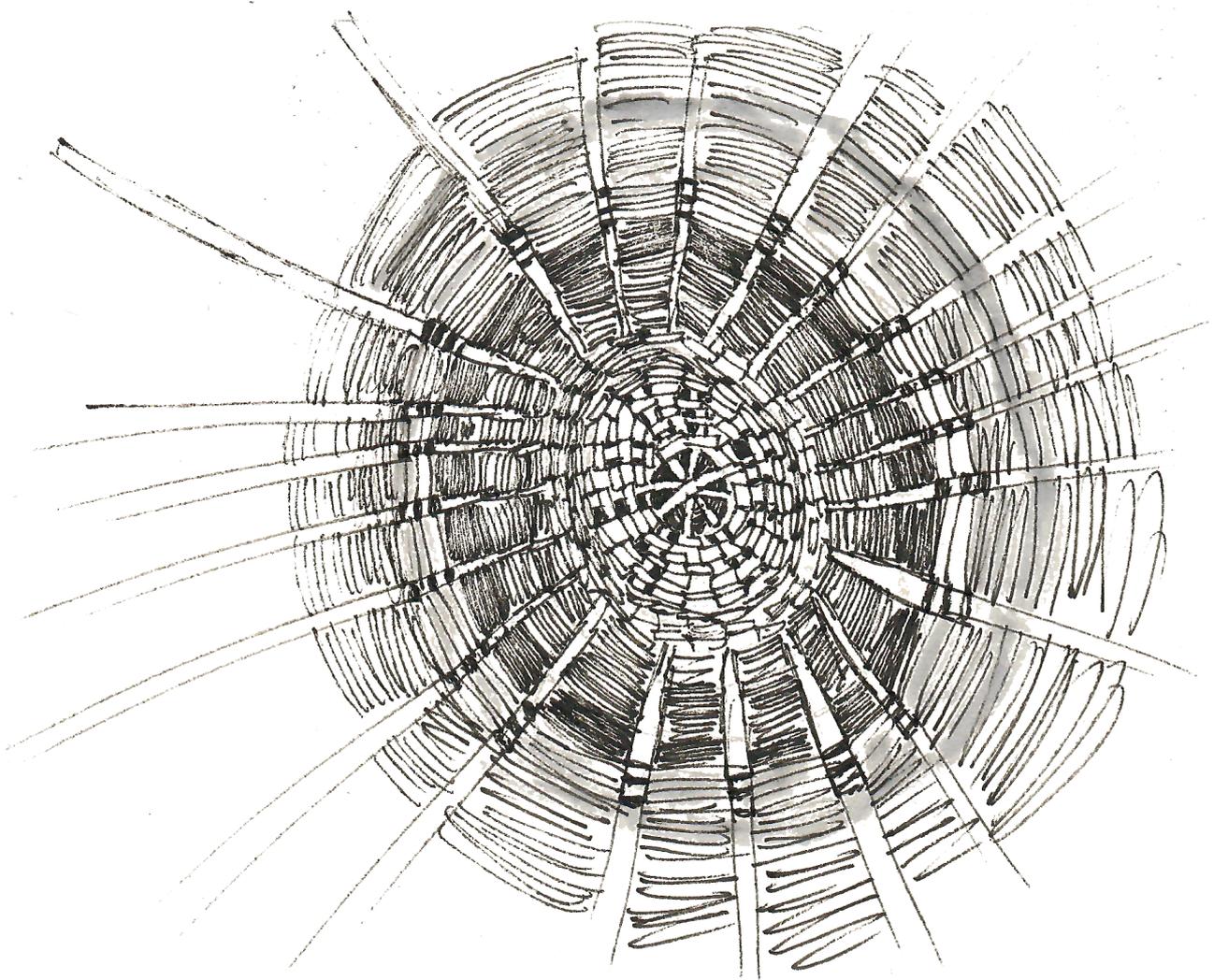
He underwent three months of training in "bioremediation of pollutants" at the University of Toronto, Canada, in 2000. Also, He obtained a Ph.D. from JNTUH, Hyderabad, on the bioremediation of uranium mining waste in India. Dr. Rao later joined the Government of Arunachal as ADL PCCF and worked in various capacities for four years before going to Mizoram on promotion as PCCF. In Mizoram, he was PCCF (HOD) and Principal Secretary, Environment and Forests, for about two years before his superannuation in July 2020. He held full additional charge of Chairman, State Pollution Control Board, besides heading the National Bamboo Mission project in the State. He is presently settled in Hyderabad with his family.

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## Session - V

# Prospects and Challenges





## SESSION CHAIR

### PROFILE

**Dr. Ravishankar Thupalli** is an international expert in community-involved conservation and sustainable management of forests, including mangroves. He is an expert in developing resilient climate livelihoods through climate smart agriculture (CSA) and climate resilient fisheries (CRF). Experienced in identifying issues, developing grants proposals for National and International agencies, and monitoring and evaluation. Dr. Ravishankar has worked for livelihood enhancement and poverty reduction of tribal and fishermen communities through research, training, and capacity building of stakeholders in the Asia Pacific region. He has provided expert inputs on the project outcomes with verifiable success in optimizing resources. He has been working closely with grassroots organizations, NGOs, Govt. agencies in the Asia and Pacific region, and UN organizations.



He has worked with various multinational organizations, including FAO, UNDP, UNEP, GEF, GCF, ADB, WB, JICA, KfW, CFC, FIDA, Livelihoods Venture, France, Nippon Koei India, and with forest and revenue departments of states and Union Territories in India. He has worked as an Expert and Team Leader in Post Disaster Needs Assessment (PDNA) of coastal areas, forests, and mangroves altered by cyclonic storms and tsunamis. He has worked for FAO in the Maldives, Bangladesh, Sri Lanka, Myanmar, Solomon Islands, Vanuatu, Samoa, Fiji, Indonesia, and Thailand and UNDP in the Philippines and for other organizations in Nepal, Bhutan, and Malaysia. Dr. Ravishankar is a recognized GEF and GCF Project Development Specialist and has developed projects for the Maldives, Sri Lanka, Vanuatu, Solomon Islands, Philippines, and India for UNDP, UNEP, and FAO. He holds a Ph.D. in Ethnobotany of Adilabad and Karimnagar districts of Andhra Pradesh, now Telangana. Dr. Ravishankar was recently awarded Biodiversity Conserver Award by Andhra Pradesh Biodiversity Board. He was also awarded a young scientist award and is a member of several national and international committees. He has published around 100 papers, books, and book chapters. Presently, Dr. Thupalli is working as Team Leader and senior mid-term review specialist for FAO GEF Bangladesh.

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## PROFILE

**Dr. Sandeep Chopde** is working as an Associate Professor with MET's Institute of Management, Mumbai. His core area is Finance and has done his Phd in Behavioural Finance. He has also co-authored books in Finance for courses of University of Mumbai. With keen interest towards agriculture and love for nature, he is also doing Bamboo farming from 2011 on his farm at village Rangav, Taluka Sangameshwar, District Ratnagiri, Maharashtra. He is successfully managing his bamboo farm and earning income from it since last 5 years. In 2011 he planted one hectare of Bambusa Balcoa and now has expanded the plantation to 9 acres consisting of bambusa tulda, dendrocalamus stocksii, dendrocalamus brandisii and Oliveri.



He is awarded by Vasantao Naik Prathisthan “Krishi Gaurav Puraskar” at Pusad in 2019 for unique contribution in field of agriculture through Bamboo Plantation.

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### **BAMBOO FARMING FOR SUSTAINABLE AGRICULTURE - A CASE OF BAMBUSA BALCOA PLANTATION AT RANGAV, RATNAGIRI DISTRICT, MAHARASHTRA**

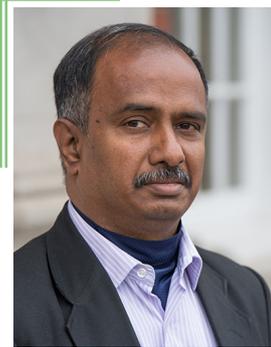
The topic covers how the selection of bamboo species was done in 2011 for planting after doing lot of research. It emphasizes on the difficulties faced after plantation and how the plantation is managed over the years. It also focuses on the financials involved and profitability from plantation.



## PROFILE

**Shri. R.S.C. Jayaraj, IFS** (1987) is currently working as the Director of the Rain Forest Research Institute (ICFRE), Jorhat. He received environmental management training in Kagoshima Prefecture, Japan, and landscape management training at Kasetsart University in Bangkok.

Mr. Jayaraj did his M.Sc., in Botany from Bharathidasan University, Tiruchirapalli, his AIGNFA (Forestry) from Indira Gandhi National Forest Academy, Dehra Dun and his Ph.D in Forest Ecology and Environment from the Forest Research Institute University. Mr. R.S.C. Jayaraj was an FAO Fellow in Planting Stock Improvement at the University of Minnesota, U.S.A. He published 58 papers in journals, 12 books, 17 book chapters, and 28 papers in proceedings.



Mr. Jayaraj is a member of the Indian Agroforestry Society, the Andaman Science Association and is associated with many other national and international organizations. He is also actively involved in the following:

- Biodiversity Management Committees of the National Biodiversity Authority
- Expert Committee on Normally Traded Commodities of the National Biodiversity Authority
- NITI Forum for Northeast India of the NITI Aayog
- Drafting Committee of the Arunachal Pradesh Forest Act
- State Action Plan on Climate Change (SAPCC) for Andaman and Nicobar Islands
- State Action Plan on Climate Change (SAPCC) for Kerala and
- Expert Committee for the preparation of Working Plans of Andaman and Nicobar Islands.

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## BAMBOO SECTOR IN NORTHEAST INDIA- PROSPECTS AND CHALLENGES

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Bamboo is an integral part of life in Northeast India, which holds one-third of the country's bamboo resources and a rich diversity of 99 species. Nine out of the ten prioritised bamboos of the Restructured National Bamboo Mission are found naturally in this area, with a high degree of variability, providing scope for selection and improvement. Though the predominant use is for domestic purposes, industrial use is picking up, and new ventures are emerging. There is an urgent need to attend to the supply side while expanding the demand for bamboo, which is often lost sight of. The paper discusses the various domestic and industrial uses, raw material availability, strategy to be adopted for a bamboo-based economy in the region, and a roadmap for future production, utilization, and research on bamboo.

The total bamboo bearing area in the region has shown a steady decline over the past decade, reducing from 55,991 sq. km in 2011 to 53,485 sq. km in 2021, as per the State of Forest Reports, due to various land-use changes and developmental activities. However, as indicated in the 2021 report of the Forest Survey of India, the growing stock has shown an increase over the 2019 assessment, to the extent of 65%, which is quite phenomenal. This growing stock comprises 99 species of bamboo and is spread over the entire region, mostly in Arunachal Pradesh, which is relatively inaccessible with steep slopes. Therefore, there is a need to differentiate between what is physically available on the ground and what is accessible for use. Further, out of 99 species, only about 15 species are commercially useful, and their distribution is limited to tropical and subtropical areas. Only species-wise resource mapping can give the real picture of the availability of usable bamboos. Thus, there is always the danger of overestimating the availability of bamboo while planning large-scale industrial use. Nearly 85% of bamboo is available in forest areas and is naturally grown, mostly scattered as undergrowth among trees. These have low productivity due to biotic interference, only on the order of 2-3 MT/ha.

Therefore, there is an urgent need to expand the cultivated bamboo, especially in the Brahmaputra valley, Barak valley, and the plains of Tripura, which have a great potential for cultivation. While going for cultivation, it is necessary to use the fast-growing high-yielding genotypes available with research organizations, as they yield at least 15-20% more than the routine stock. One major bottleneck is the availability of quality planting material. There is a need to establish more nurseries that can macro-proliferate micro propagated elite material. The use of routine seed-based materials needs to be discouraged, replacing them with selected, high yielding genotypes multiplied clonally. Intensive silviculture combined with appropriate planting stock can boost the plantation's productivity by up to 50 MT/ha.

On the utilization aspect, there is a need to introduce primary processing to avoid wastage and optimize the use of bamboo. Wherever bamboo is used as a structural material or for furniture, there is a need for preservative treatment to prolong the life of bamboo and reduce the need for extraction. While most of the bamboo goes for domestic use in housing, fencing, and production of household articles, the industrial use is picking up, especially for the production of agarbatti sticks, bamboo wood and bamboo boards. Bamboo-based ecotourism structures are also on the rise. There is a need for investment in industries engaged in the production of novel products of low volume and high value, besides having an export market.



One neglected sector is the use of bamboo shoots. Most of the shoots harvested are consumed locally, and value addition is restricted to preservation for a limited period. If exclusive plantations for shoot harvest are raised, the production can be increased, and facilities for canning and export can be introduced.

Both the production of raw materials and the utilisation of those materials, particularly on an industrial scale, require solid research support. Bamboo related research in the region needs strengthening, especially in the aspects of productivity enhancement, nursery and plantation silviculture, scientific harvesting, post-harvest management, mechanization of operations, preservative treatment, use of engineered bamboo, bamboo reinforcement in construction, use of bamboo in carbon capture and bamboo-based ecotourism. If appropriate steps are taken, bamboo can transform the economy of the Northeast India region.



## PROFILE

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**Shri. Anand Banthia**, a Bachelor of Engineering specialising in Industrial & Production Engineering from S.G.S.I.T.S., Indore, and is also having Certification course in Family Managed Business from S.P. Jain Institute of Management & Research, is presently Marketing head and Main Lead in New Product Development Division and Member of Technical Support Division at M/s Garnet Tools, Manufacturer of Bamboo processing, woodworking machines, cutting tools and special purpose machines Conference.



He has been speaker at many national and international level conferences and made presentations in the field of Bamboo, Electrical, Wood, Composite products. Speaker at World Bamboo Congress at Belgium, 2012 at World Bamboo Congress at Bangkok, 2009, at XIMB, Bhubaneshwar for Bamboo based project and processes and INBAR on Bamboo Processing Methods and Machines in 2020 (Webinar). He has trained and implemented machines at BHEL, Multinationals like TOSHIBA, Prime Meiden and many more companies in India and abroad. He has good experience of implementation and had lot of interactions about bamboo with UNIDO, Indian and Foreign Research Companies, Private and government enterprises in India and abroad.

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## INNOVATIONS IN BAMBOO PROCESSING AND PRODUCT MANUFACTURING

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## PROFILE

**Shri. Ranganath Krishnan** is an agripreneur based in Bangalore, India with strong ambition to lead India's Bamboo cause. Presently he is a National Governing Council Member, Secretary, and Treasurer of Bamboo Society of India. Also, he is the CEO of Goldensands Agrotech India Private Ltd. focused on contract farming and value addition of Bamboo. He is an MDP alumnus of IIM Ahmedabad.

Visionary leader with broad business knowledge across multiple verticals spanning over 30+ years of expertise in the field of Information Technology, Market Data, Agriculture, Horticulture, Project Management, Ecommerce and Skill Development.

Apart from this, he is also a Certified Blockchain Expert and Certified Ethereum Expert, Six Sigma Green Belt Certified, and having attended over 100 courses (both technical and self development) in his professional life.

Being part of the executive team of the Bamboo Society of India, he is currently focused on contributing towards building a sustainable climate through Bamboo cultivation, developing bamboo market linkages, and contribute in developing bamboo value addition ecosystem while helping India achieve the target of net-zero by 2070.

He is goal-oriented with excellent rapport-building ability across all levels, with a pleasant personality, and has strong interpersonal skills.

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## DEVELOPING BAMBOO MARKET LINKAGES

Identification of market gaps, Strength, Weakness, Opportunities and Threats (SWOT) and way forward in developing bamboo market.

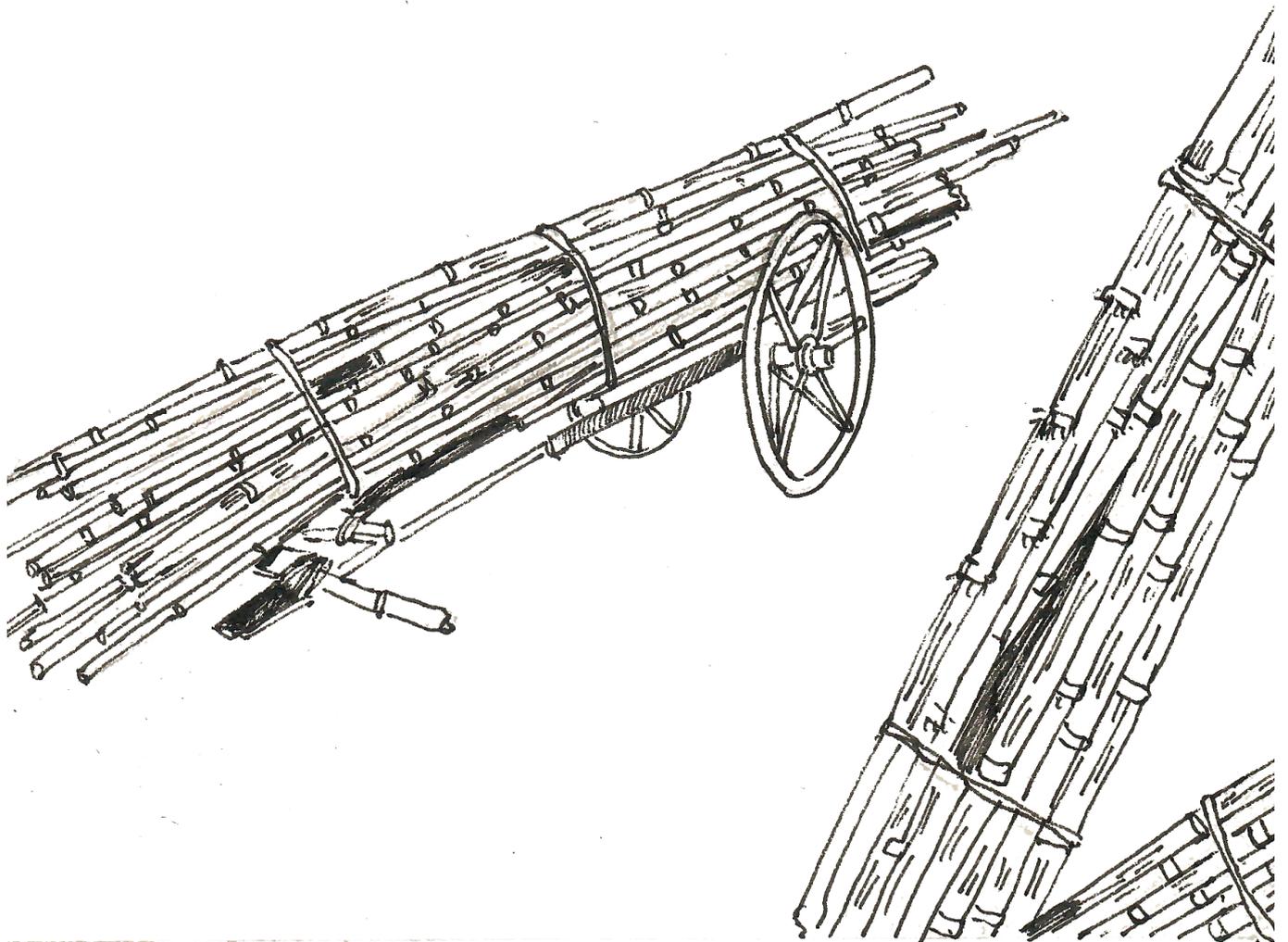






## Session - VI

# Bamboo - A Versatile Product





## SESSION CHAIR

### PROFILE

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**Shri. Binod Anand** is a member of the International Network of Financial Education anchored by the OECD, leads the CNRI Centre for Agricultural Transformation through Science & Sustainability (CCATSS), and heads the CNRI Leadership Team, which collaborates with key partners to suggest solutions to help them find innovation in work culture and expand their sustainability efforts. Binod is passionate about developing sustainable livelihood solutions for smallholders, particularly tribal and other marginalized groups, and creating a more sustainable global agri-food system for the future. Before this role, he served with MORD (Govt. of India) in a senior capacity. He has been instrumental in bringing NAREGA into practice (now MANAREGA), TV Today (AAJ Tak News Channel), Power HR Forum (an Association of Power Sector PSEs of the Government of India), Lupin Foundation, Money Life, and ABLE. He previously worked for LIC, Unilever, PFRDA, DST, NABARD, and Project Swalamban (now Atal Pension Yojna) before working on different projects for CNRI. Binod has also advised several large corporations on bringing technology and marketing to the grassroots, and he has conducted extensive research on rural marketing. At CNRI, he is working with governments and companies to tackle global hunger and malnutrition, improve the lives of smallholder farmers, and address the challenges of sustainable development goals in a G-Local way. Binod also co-founded other non-profits and co-led WETRI (We Think for Rural India), an organization of youths working towards national integration. He is frequently quoted by the national media and is a faculty member of the Centre for the Study of Democratic Administration. Outside of work, he can be found hiking, listening to audiobooks, and reflecting on various learnings from Bhagwat Geeta and other Vedic philosophical aspects.



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## PROFILE

**Shri. T. Sai Kumar Reddy, IFS (Retd.)** was the Managing Director of Maharashtra Bamboo Development Board. After successfully completing his Indian Forest Service probation at Indira Gandhi National Forest Academy (IGNFA), Dehradun, he served the country in many capacities. He was Chief Conservator of Forests at Gadchiroli, Regional Manager, FDCM (South) at Chandrapur and Conservator of Forests at Dhule, in the Dhule District. He was also the Deputy Conservator of Forests for the Pandharkawada Forest Division in the Yavatmal Circle and the Deputy Director of the Forest Survey of India in Nagpur, Maharashtra. He was also Project Officer, Integrated Tribal Development Project (ITDP) at Dahanu, Thana District and Deputy Conservator of Forests at Taloda, Dhule District of Maharashtra State. He earned his B.Tech in Civil Engineering from Sri Venkateshwara University and his M.Tech. in Building Technology from IIT, Madras. He has a Diploma in Forestry from the Indira Gandhi National Forest Academy (IGNFA), Dehra Dun.



His contributions include i) involved in the Sardar Sarovar Project (SSP) Rehabilitation Program and Catchment Area Treatment (CAT) of the Narmada River Catchment, in addition to other forest activities such as forest protection and plantation work, ii) involved in the project area's tribal schools and other tribal development activities. iii) involved in Tendu leaf collection in the entire division, and controlled local disturbances created by contractors and local anti-social elements. Also successfully implemented Forest Development Agency (FDA) project by conducting medical camps, electrifying tribal villages with bio-fuel generators, and initiating income-generating activities such as gum collection, lac collection, and so on among the tribals. iv) Completed two working plans in the circle (Yawal forest division and Jalgaon forest division) worked on Geographic Information Systems and developed Digital maps for all five divisions of the circle. Hard copies of the digital maps have been supplied to Beat guards, Round Officers, range officers. Range officers are supplied with location maps, vegetation maps and forest boundaries, all printed on flex water proof material. acquired Digital village maps from MRSAC and compiled area statements for the Jalgaon division.

Besides the above, he also worked for i) regular forestry works, initiated collection of non-timber forest produce (NTFP) by declaring MSP for 13 items, collected and marketed the produce, helping tribals to get better revenue. Started herbal processing centre called GONDWANA HERBS; ii) conducted 4 vaidya sammelans and declared MSP for 175 herbs collected and marketed under the brand name Gondwana Herbs; iii) started 47 agarbatti making units in 47 villages, providing a year long livelihood to 1400 women. Cycle pure Agarbatti brand was the marketing partner; iv) Started Vocational Skill Training program for tribal girls and boys in hotel management, construction, and automobiles in association with NGO Pratham and provided training and placement to 5500 boys and girls;

He secured the Prime Minister's Award for Excellence in Civil Administration for the year 2013-14 for the initiatives in "Skill Development and Vocational Training Program".

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## BAMBOO – GREEN GOLD OF 21ST CENTURY

Bamboo is the “The Green Gold” of the 21st century. It has multiple uses and is a gift of mother nature. Bamboo, for ages, has played an efficient role in shaping our environment and society. It raises the standard of living of forest dwellers and tribal communities through strengthened ecosystems and enhanced livelihoods. In the last few decades, bamboo lost its importance as a daily life use article to modernisation and new age materials, but now with a renewed vigour, bamboo is set to bounce back on centre stage to bolster the rural economy owing to its multiple uses in products such as engineered bamboo wood, bamboo ply boards, flooring, wall cladding, furniture, ethanol, charcoal and many other uses. Bamboo plants store more carbon than certain species of trees, as their composites are bio-compostable. Bamboo is nature’s engineering material. It is an excellent raw material for manufacturing re-engineered, environmentally and people-friendly products. It alternates between traditional wood products and their substitutes made from metals and plastics.

The promotion of the bamboo sector has many opportunities and perspectives for supporting the livelihoods of rural people. Bamboo is the country’s vast genetic resource and has a great potential to produce higher biomass for the benefit of society. Plantations outside the forest are viable alternatives to meet the growing demand. However, there is a need for improved planting material of bamboo for higher productivity and a large-scale plantation programme. Based on their properties and assessment of inherent characteristics matching with end uses National Mission on Bamboo Applications (NMBA) has identified for commercial cultivation of bamboo, the species are found in national forests and cultivated areas; the 16 species selected by NMBA are *Bambusa balcooa*, *Bambusa bambos*, *Bambusa nutans*, *Bambusa pallita*, *Bambusa polymorpha*, *Bambusa tulda*, *Bambusa vulgaris* green, *Dendrocalamus brandisii*, *Dendrocalamus giganteus*, *Dendrocalamus strictus*, *Oxytenanthera stocksii*, *Melocanna bambusoides*, *Ochlandra tranvancorica*, *Schizostachyum dullooa*, *Thyrostachys oliveri*.

The future is very bright for this species as the felling and transit permissions (TP) required for Government of India has removed this species by amending the Indian Forest Act IFA 1927 and omitting bamboo from the definition of tree/timber. This step is great encouragement for the farmers to plant bamboo in their fields.

**Traditional uses of bamboo:** Bamboo utilisation continues to be an integral part of the culture and the socio-economic scenario in many parts of the country. The traditional uses of bamboo in different regions of the country due to its lightweight, good tensile strength, straightness, smoothness, and durability are favoured in rural housing, scaffolding in urban constructions, handicrafts, for agriculture implements like ploughs, storage of grain, baskets, supports in vegetable growing areas, etc. Bamboo shoots are low in calories and fat but have high nutritional value and are rich in vitamins, cellulose, and amino acids. It is a good source of food in many parts of the country.

**New utilisation of bamboo:** In the wake of reducing timber supplies, several environmentally and people-friendly technologies have been developed to manufacture innovative bamboo products. These products are wood-substitutes (engineered bamboo), bamboo mat boards, laminated bamboo, and corrugated bamboo sheets. Bamboo charcoal has a very high calorific value, and certain species of bamboo give a very high carbon activation number from just the burning of bamboo. Bamboo charcoal can be used in cosmetology, pharmaceuticals, water and air filtration units. From the pyrolysis process, bamboo charcoal and bamboo oil can be derived. This oil can be



utilised as bio fuel. Bamboo mats and split bamboo can replace geo textiles (plastic) while laying the roads. Bamboo is anti-bacterial in nature and will make excellent rayon fabric, which has high potential in the market.

For the fullest utilisation of bamboo as a naturally renewable resource and to unlock its potential to contribute to national growth, it is necessary that all parts of bamboo be utilised following the circular economy concept. It is necessary that various parts of bamboo culms be put to optimal use with the required economy of scale to maximize economic gains.



## PROFILE

**Ms. Daya Anand Patki** is the founder of Bamboo Tantra, an organisation well known across the country. The goal of Bamboo Tantra is to promote the use of bamboo products, support the growth of bamboo artisans, and encourage the movement towards natural and climate-friendly materials. Bamboo Tantra provides the best range of portable cabins, bamboo saplings, bamboo jewellery, coconut shell peelers, and mango harvester with effective and timely delivery. She has around 12 acres of land under bamboo cultivation and nursery practices.



She was born in Chinchwad, Pune, Maharashtra. She completed her Masters' degree in the field of Environmental Science from the University of Pune. She has more than a decade of experience in the areas of biodiversity conservation and livelihood generation projects funded by national and international funding agencies. She has close ties with the Central Government (Wildlife Institute of India), State Government (Maharashtra Forest Department), NGO's (AERF, AFJ), Municipal Level (Environment Department of Pune Municipal Corporation), and Environmental Consultancy.

Ms. Daya Patki has been working in all the sectors of the bamboo industry and providing consultancy right from bamboo plantation to products. She actively participates in all biodiversity conservation and sustainable development activities. Her many achievements include:

1. Recognition by the Ministry of Skill Development and Entrepreneurship.
2. The 1000 Women Faces of Asia Award.
3. Successful completion of A Level 3 Course in Bamboo Cultivation and Practices at the Forest Research Institute in Dehradun.

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## BAMBOO PLANTATION AS A VALUE-ADDED PRODUCT

Farming is the backbone of India, and agroforestry practices are one of them. There are many species covered under agroforestry practices, in which bamboo is majorly practised because it plays a vital role in livelihood generation and can be cultivated in harsh conditions.

Bamboo is the fastest-growing woody grass with multiple uses. There are around 139 bamboo species found in India, of which we have recognized few that can be value-added by being in the class of farmer. One should only proceed with bamboo plantation of specific species depending upon the end product. If you take care of the plants for the first three years, this crop takes care of your generations. Selection of proper species with good planting material and proper management practices gives you good results. Immature harvesting leads to negligible income with bad timber, which won't last long and will give a bad name to bamboo and bamboo products.

We are seasoned producers of quality bamboo saplings and handicraft articles, especially bamboo jewellery and bamboo lamps. We aim to increase public awareness of this important natural resource. We at Bamboo Tantra promote bamboo artisans for their handmade products to conserve bamboo art skills and give work to hands more than machines. Below are a few species which we have found can be value-added to being in the class of farmer, as they carry five essential characteristics: straight growth in nature, uniform internodal distance, less branching, which makes them easy to harvest, tool friendly in nature, and multi usability.

*Dendrocalamus brandisii*

*Dendrocalamus giganteus*

*Thyrsostachys oliveri*

*Bambusa cacharensis*

*Bambusa polymorpha*

Below mentioned species can be harvested depending on the uses at different stages before gaining the maturity as well as can be utilized in matured condition, which ultimately gains more income due to maturity.

*Melaconna baccifera*

*Schizostachyum dullooa*

*Dendrocalamus longispathus*

*Bambusa tulda*

Gestation period for good timber is 6 years and value addition always gives you good amount as compared to raw material. Bamboo Products can be broadly classified as Bamboo poles (Raw as well as treated); Traditional products; Industrial products; Bamboo furniture; Bamboo handicrafts and Food Industry. Value addition can be done on farm with minimum efforts and minimum machineries.



## PROFILE

**Mrs. Neeramoni Sarmah** is a social activist who has been striving hard for the upliftment of rural youth by conducting skill upgrade programs. Her mission in life is to serve the poorest of the poor in remote areas of our country and provide them with alternate means of livelihood in a sustainable manner. With her motto “only a life lived for others is a life worthwhile,” she trains rural artisans in developing arts and crafts primarily using bamboo and other sustainable local materials.

She is a designer and trainer of eco-friendly handicrafts and bamboo jewelry. She specialises in converting local raw materials into natural organic artefact designs. Her training programmes involve working with the poorest of the poor artisans, especially for the mass production of creative and innovative designs from zero-cost resources, which, in most cases, are locally available resources such as seeds, bamboo, grass, cane, roots, thorns, etc., and forest and agricultural floor waste.

She specialises in using bamboo and cane of all varieties and shapes, tailoring them as per the design, which has received worldwide acclamation by fashion designers. Her main objectives are to ensure viable livelihoods for the forest dwellers of this country. She trained them to experiment with natural resources to create unique designs for products that are sustainably marketable.

She runs her own implementing organization called “NeeraSarmahs-The Bamboo Village,” established in 2003 and transforming several lives since then. The main task of this mission is to provide alternate income generation through skill development of creating eco-friendly bamboo and utility handicrafts using ZERO investment, i.e., using locally available raw materials and forest agro waste. She is also fondly known as ‘The Bamboo Lady of India ‘.

Ms. Neera Sarmah also worked with social and physically disabled groups, training them to overcome their natural deficiencies and face life’s challenges. Her work on recyclable and environmentally friendly products has had a tremendous impact in the tribal areas, paving the way for the upliftment and sustenance of the forest inhabitants, enabling them to become economically self-sufficient.

She participated in a various design development program conducted training workshops for the economically deprived tribal communities, handicap, neglected parents, widows etc. particularly poor women and villagers of remote areas. She is associated with several national and international organizations and institutions.

Ms. Neera Sarmah motivates the NGO partners and self-help groups to create awareness among the forest dwellers to stop cutting trees and create alternate livelihoods to save and protect our mother nature.

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## HELP NATURE AND COMMUNITY







# Session - VII

## Way Forward





## SESSION CHAIR

### PROFILE

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**Shri. Ranganath Krishnan** is an agripreneur based in Bangalore, India with strong ambition to lead India's Bamboo cause. Presently he is a National Governing Council Member, Secretary, and Treasurer of Bamboo Society of India. Also, he is the CEO of Goldensands Agrotech India Private Ltd. focused on contract farming and value addition of Bamboo. He is an MDP alumnus of IIM Ahmedabad.



Visionary leader with broad business knowledge across multiple verticals spanning over 30+ years of expertise in the field of Information Technology, Market Data, Agriculture, Horticulture, Project Management, Ecommerce and Skill Development.

Apart from this, he is also a Certified Blockchain Expert and Certified Ethereum Expert, Six Sigma Green Belt Certified, and having attended over 100 courses (both technical and self development) in his professional life.

Being part of the executive team of the Bamboo Society of India, he is currently focused on contributing towards building a sustainable climate through Bamboo cultivation, developing bamboo market linkages, and contribute in developing bamboo value addition ecosystem while helping India achieve the target of net-zero by 2070.

He is goal-oriented with excellent rapport-building ability across all levels, with a pleasant personality, and has strong interpersonal skills.

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## PROFILE

**Shri. S.T.S. Lepcha, IFS (Retd.)**, joined Indian Forest Services on May 31st, 1983 and retired as Principal Chief Conservator of Forests (PCCF) & MD of Uttarakhand Forest Development Corporation on April 30th, 2018. His key experience relates to forest management & augmentation, community forestry, watershed management through participatory techniques, preparation of forest working plans, logging, felling & marketing of timber, bamboo plantations, research & bamboo-based livelihood development, promotion of natural fibre-based livelihood development, planning and financial management for forests, forest land transfer and sale of forest produce, development of eco-tourism, etc.



Work Experience: Bamboo Related

1. Worked for bamboo-based resource and livelihood development in Uttarakhand as Chief Executive Officer of the Uttarakhand Bamboo and Fiber Development Board (UBFDB) since 2003 and as CEO, UBFDB & Mission Director, Bamboo Development Agency, Uttarakhand under the National Bamboo Mission till 2011.
2. Worked towards action research on bamboo preservation, bamboo processing & Value Addition, Capacity Building, Bamboo Resource Augmentation, Promotion of Nursery Techniques on Bamboo & Overall bamboo-based value chain development.
3. Former Expert Member of the Executive Committee, National Bamboo Mission, New Delhi.
4. Advisor to Uttarakhand Bamboo & Fibre Development Board (UBFDB), Dehradun.

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## THINK BEYOND ‘NATIONAL BAMBOO MISSION’

India is bestowed with 148 species of bamboo, with 29 genera covering 15.69 million hectares, mostly distributed in the forest areas. However, certain species are found growing only in homesteads, which is possible since people must have collected some useful species from the wild and grown them in the homesteads for their day-to-day use. This established the fact that bamboo has played a significant role in the livelihood of the people since time immemorial. It is linked with the livelihood of the people and has a role in fulfilling the sustainable development goals (SDGs) of India. Realising the value of bamboo in the rural sector, GOI started the National Bamboo Mission (NBM) in 2006-2007 under the ministry of Agriculture, the first phase of which was completed in 2015-2016. The second phase of NBM started in 2018-2019. During the first phase, the focus was on resource development through plantations and rehabilitation of bamboo in the forest areas. In the second phase, there is a greater focus on plantations in non-forest areas, value addition, and the establishment of linkages with related industries.

Despite the government’s push in the bamboo sector, the market share that India holds today is around 4%, lower than other countries like China, Vietnam, Thailand, Cambodia, etc. The total size of the bamboo market was around US\$ 72.10 billion in 2019 and is expected to reach at US\$ 98.30 billion by 2025, of which China has the largest market share of around 70%. India is still in the phase of the pre-industrial bamboo value chain market and is gradually shifting from the pre-industrial phase to the early industrial phase, while, China has already moved into the 4th industrial phase of the bamboo industry. Almost 25% of the total share in the bamboo sector is from the service sector. The slow progress of the bamboo sector in India may be due to two factors: (a) attitude towards bamboo and (b) lack of strategic planning and weak cross-sectoral synergy. Generally, in India, bamboo is still considered a poor man’s timber, whereas, in China, Vietnam, and other countries, it is considered a “friend” or “brother.” India also lacks an authentic database of bamboo resources to develop an industry, skilled manpower, efficient tools, enough financial support, and strategies to use bamboo industry waste material. In short, there is no ecosystem to start or develop a viable bamboo industry in India. The National Bamboo Mission is a stepping stone or launching pad for the development of the bamboo sector in India. To further augment industrial production, we need to look beyond and broaden the horizons.

For the development of an appropriate ecosystem for the bamboo sector, due focus is required on both vertical and horizontal policy actions. For all the bamboo growing states of India, there should be a broad policy or guideline for the states. At the same time, each state should critically focus on one, or in the case of bigger states, at the most, two species for the development of their bamboo industry. For example, China has so far concentrated all of its investment, research, and time on “Moso” bamboo. From almost no bamboo industry in the 1980s, China has jumped to a billion-dollar industry in four decades. Therefore, one species per one state or region could be the best strategy. Again, in the States, initially a few pilot areas may be chosen, focusing everything on these areas while slowly expanding the periphery of the area on the basis of a “growth pole strategy.” Each focus area may have a bamboo “Special Economic Zone” to reduce the wastage of bamboo, logistics costs, and to gain confidence from the bamboo growers and labourers. Moreover, bamboos are, in general, “end product specific” due to their chemical composition, inclusive of lignin, carbohydrates, silica, etc. Therefore, the application of bamboo differs from species to species. For example, some bamboos are suitable for paper and textiles, and certain bamboos are suitable for bamboo wood products.



As a solution, each state should focus on R & D, which is directly linked to solving industrial problems. Moreover, the research may be financed by the industry from their CSR funds. Scientists should be compensated with at least 30-40% of patent/solution revenue, and they should be allowed to join industrial research on a deputation basis for the duration of the research project. Initially, the government may incentivise such an industry in the form of a tax holiday for 3-5 years for green innovative products to compete with similar existing non-green products in the market. To bring cross-sectoral synergy in the bamboo sector, GOI should establish a full-fledged institution in the line of Tea Board, Rubber Board, Coir Board, etc. for accurate species-wise bamboo resource inventory to promote the bamboo enterprise, coordination, and to create appropriate policy with different ministries to further develop the bamboo sector in perpetuity. In a way, this board should act as a “single window facility” for the development of the bamboo industry in India.



## PROFILE

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**Prof. Sudhakar Puttagunta** (M.Sc., Ph.D., IIT Delhi) is currently associated with Haritha Ecological Institute, Haritha Association for Learning from the Environment, Paloncha-507115, Bhadrachari Kothagudem Dist., Telangana State. He is actively involved in conducting a number of experiments and Research & Development activities.

He was a faculty member at the Centre for Applied Research in Electronics at IIT Delhi from 1973 to 1984. He earned his Ph.D. in physics from the Indian Institute of Technology in Delhi. He was a Research Fellow at the Laboratory of Acousto-Electricity, University of Pierre and Marie Curie, Paris, France in 1979–80. Prof. P. Sudhakar was also at the Centre for Rural Development & Technology during 2006–2011. Prof. P. Sudhakar lead a major R&D initiative to explore bamboo as a modern green engineering material at CRDT, IIT, Delhi.



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## INNOVATIONS, DEMOS & IMPLEMENTATION IN BAMBOO USE: DESIRED ROLE OF HIGH SCHOOL ON ISSUES IN SOCIAL, ECONOMIC, AND POLICY DIMENSIONS

Promoting bamboo use has positive impacts in social and economic dimensions, but needs appropriate policies. Bamboo can be used in large quantities in shelters, residences, and other bodies in the transportation sector. However, the current preferences for raw materials by the elite in academics or in other sectors are clearly non-renewables like RCC, steel and other metals and plastics, with their large carbon and ecological footprint. The three primary reasons for the above scenarios are: i) good supply chain logistics for the raw materials with certified quality, ii) readily available finance for the structures built with such non-renewable resources, and iii) the reluctance of even the elite academic institutions to build shelters or bodies of transport vehicles with renewables like bamboo.

Our innovations in the use of bamboo are in load-bearing structures: bamboo tied arches, foldable bamboo structures for temporary shelters (for humans, cattle, or agroproduce), bamboo wall panels, and the bodies of small transport vehicles. Our innovations also include cost effective test equipment to certify bamboo for structural load-bearing applications. And these are designed with easily available off-the-shelf subsystems and components. Both at Haritha and IITD, we built facilities to treat bamboo by soaking it in water.

Schools and higher academic institutions are ideal places to disseminate innovative uses of renewables like bamboo for mass consumption. Building and operating such structures on the campus creates awareness of both the necessity of using renewables and the issues involved in using them. Such a scenario would be ideal to spur and inspire innovation and experimentation in places of learning, from schools to higher institutions. Again, elite learning institutions would be role models for other institutions. High schools and colleges are also ideal places to go to for setting up demos that should be in regular use. Only then would the students and teachers there experience the teething problems. In turn, their ingenuity would be challenged to address the issues even while seeking help from the elite institutions that designed and built them in the first place. The prospective entrepreneurs could run these demo units in the colleges and schools and ultimately shift the units to commercial ventures in the market.

Our suggestion for treating and seasoning the bamboo and such raw materials is to carry them out immediately after harvesting, preferably in or around the farm lands where the raw materials are grown. Development of mobile units for, e.g., treatment by the modified Busheri process is possible. Subsequent testing and certification for their suitability in load-bearing structural elements in the local schools and colleges would provide great learning opportunities and skill development for the local youth right from their schooling. The institutions could actually host the entrepreneurs that operate the bank of certified bamboo and other renewable building materials in the local area. Such a policy would go a long way towards utilization of MHRD resources in imparting holistic education encompassing skills needed for sustainable technologies and development from the bottom up.



## PROFILE

**Shri. Parameswaran Krishna Iyer** is currently working as the Director of Bamboopecker Lifestyle Crafts Pvt. Ltd., Bangalore. He is also a SLEC Member of the Karnataka Bamboo Mission and an NGC Member of the Bamboo Society of India.



Mr. Parameswaran Krishna Iyer is the founder of Bamboopecker Green Technologies. He has more than thirteen years of experience in bamboo and cane-based industries, including: bamboo farming, bamboo housing, bamboo tools and machines, mechanization as an end user, bamboo based eco-tourism, bamboo based rural economy, and bamboo sector entrepreneurship. Besides this, he has six years of experience in international commodity markets like crude oil, gold, silver, precious metals, equity and derivatives, and surveillance. At present, he is also a National Governing Council Member, Bamboo Society of India, HQ Bangalore, State Level Executive Committee Member, National Bamboo Mission, Government of Karnataka, and Advisory Board Member, Maharashtra Bamboo Development Board, Nagpur. He is a Guest Trainer (Bamboo Construction) at the Bamboo Research Training Centre in Chandrapur, Maharashtra, and a member of the Bureau of Indian Standards for Bamboo Furniture's Executive Committee (Bamboo Sector).

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## POLICIES AND ENTREPRENEURSHIP IN BAMBOO

Wood has been used for centuries as a common material in furniture. Similarly, bamboo also has a long-and well-established tradition of being used as a furniture material throughout the tropical and sub-tropical regions of the world. With the rising global concern, bamboo is a critical resource as it is very efficient in sequestering carbon and helps in the reduction of greenhouse gas emissions.

Bamboopecker entered the field and proved that there is a possibility and potential for the bamboo sector for a wide range of applications, from furniture to construction, by using bamboo. Mass production and distribution is possible in India, but still, basic sectoral infrastructure needs to be upgraded to make it possible and viable. With such a large domestic market, India has the potential to become one of the largest producers of bamboo furniture in the world. A boost in domestic production will automatically result in looking at markets outside India.

In today's world, where forest cover is rapidly dwindling and wood is becoming increasingly scarce, research and development over the last few decades has established and amply demonstrated that bamboo could be a viable substitute for wood and several other traditional materials used in the furniture industry and various infrastructure projects. It is used all over the world, with the exception of Canada, Europe, Antarctica, and Western Asia, where bamboo is not a native plant species. Most, however, occur at low to medium elevations in the tropics, growing wild, cultivated or naturalized in a great variety of habitats. In India, cane furniture and most bamboo products fall into the unorganized sector, and 95% of the bamboo and cane sector industries' production remains in the hands of rural craftsmen, especially tribes. Bamboopecker entered this sector with a vision of creating rural employment by making this unorganized sector in an organized way.

Bamboopecker Group has two production facilities and one showroom in St. Marks Road, Bangalore. We at Bamboopecker Lifestyle Crafts wanted to revive the dying art of bamboo craft making and showcase the artisan's abundant talent to the appreciative buyer with quality products. The encouragement from the bamboo lovers will not only make them economically independent but also keep nature green.

From 2014 onwards, Bamboopecker expanded its activities from furniture to bamboo construction, art installations, training for artisans and construction training, and industrial processing of bamboo material for B2B requirements.



## PROFILE

**Ar. Neelam Manjunath** is a designer, planner, activist, and theorist. Having started her private practise in January 1991 in New Delhi, the practise shifted to Bangalore in 1994. She has designed and constructed numerous reputed projects in India and abroad. Ar. Neelam Manjunath is a distinguished architect known for using low-energy materials and technologies with a particular emphasis on bamboo in her numerous reputed projects in India and abroad. Her buildings are an epitome of simple and direct solutions to problems concerning the general function of the building, accompanying sympathy towards the immediate environment in terms of climate, statement of the building forms, local and green building materials, etc.



With the qualifications of an architect, scientist, planner, activist, and theoretician, She has a much wider education along with training in several skills related to media architecture, sustainable architecture, and Charrette Training from the Graduate School of Design, Harvard University. She has two graduate degrees, in Science from REI Degree College, Dayalbagh, Agra and in Architecture, from the Govt. College of Architecture, Lucknow, as well as a PG Diploma in Theology from Dayalbagh University, Agra. She has been a practising architect since 1991. Some of her famous works include Meta SLUM, Cocoon for Krishi Vigyan Kendra, Bamboo Symphony, Two-Bedroom Bamboo House at IPIRTI, Bangalore, State Level Energy Park, Bangalore, Police Bhavan for KSRP, Prefabricated Bamboo House, Italy, etc.

Her expertise includes the creation of exclusive bamboo buildings, designing sustainable structures for interiors, institutions, landscapes, leisure spaces, and urban designs. With her passion and plans, she has made a difference in creating a sustainable society by promoting and exemplifying the use of bamboo as one of the most versatile naturally available materials, which consumes less energy, epitomizes sustainability, and is a better alternative to the use of conventional materials like concrete, which act as a catalyst to escalate the impact of global warming. With its three-times faster maturity rate and renowned strength that is comparable to steel, bamboo also acts as a substitute for the scarce availability of wood due to depleting forests. She believes in the use of bamboo as one of the most viable options for building construction materials that are widely available in India rather than seeking solutions from the West. Ar. Neelam Manjunath's innovative use of bamboo in construction and its significant contribution to environmental, socio-economic, durability, and safety aspects brought her recognition in the field of architecture. She has prototyped a variety of building typologies with bamboo, ranging from something as small as a low-cost bamboo toilet to an urban proposal for a metro station, serving a wide spectrum of needs for all the population.

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The National Institute of Rural Development and Panchayati Raj (NIRD&PR), an autonomous organisation under the Union Ministry of Rural Development, is a premier national centre of excellence in rural development and Panchayati Raj. Recognized internationally as one of the UN-ESCAP Centres of Excellence, it builds capacities of rural development functionaries, elected representatives of PRIs, bankers, NGOs and other stakeholders through inter-related activities of training, research and consultancy. The Institute is located in the historic city of Hyderabad in Telangana state. The NIRD&PR celebrated its Golden Jubilee Year of establishment in 2008. In addition to the main campus at Hyderabad, this Institute has North-Eastern Regional Centre at Guwahati, Assam to meet the NE-regional needs.

The **vision** of NIRD&PR is to focus on the policies and programmes that benefit the rural poor, strive to energise the democratic decentralization processes, improve the operation and efficiency of rural development personnel, promote transfer of technology through its social laboratories, Technology Park and create environmental awareness. As a “think-tank” for the Ministry of Rural Development, NIRD while acting as a repository of knowledge on rural development would assist the Ministry in policy formulation and choice of options in rural development to usher in the changes.

The **mission** of NIRD&PR is to examine and analyse the factors contributing to the improvement of economic and social well-being of people in rural areas on a sustainable basis with focus on the rural poor and the other disadvantaged groups through research, action research, consultancy and documentation efforts,

To facilitate the rural development efforts with particular emphasis and focus on the rural poor by improving the knowledge, skills and attitudes of rural development officials and non-officials through organising training, workshops and Seminars.

The Government of India has set up the Centre for Innovations in Public Systems (CIPS) in May 2010 as an autonomous body in pursuance of the recommendations of the XIII Finance Commission. In line with its mandate and objectives, CIPS located in Hyderabad, is working with State, Central and District-level Government Departments and functionaries in developing policies and practices for promoting an innovative culture for transforming creative ideas into sustainable practices for improving service delivery.

The **vision** of CIPS is to provide assistance to the state governments in developing policies for promoting innovative culture for transforming creative ideas into sustainable practices.

The **mission** of CIPS is to Nurture an ecosystem and develop a culture of Innovations in Public Systems.

The Centre has been contributing in a major way to the activity profile of the Central and State Governments with high visibility programs and projects that reflect the trust and confidence reposed by them and enhance its recognition and reputation for committed, high-quality work in policy advocacy and implementation support. The rich legacy and the reputation that the Centre has built over the years in carrying out projects and programs continue to add to the goodwill, and credibility of the Centre as a dependable think-tank for policy inputs trusted knowledge-source and reliable implementation partner. It is aiding the State Governments in developing policies for promoting an innovative culture for transforming creative ideas into sustainable practices at the local level. The Centre thus helps create a climate to nurture a culture for accelerating and diffusing innovation in public systems.



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