Technology, Development and Academics

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Acknowledgement

- Organizers:
  IUCEE, esp. Prof. Krishna Vedula
- Faculty colleagues and students at CTARA
- NGOs and other collaborators
- .. and of course, all of you!!
Outline

- Introducing CTARA
- Introducing RuTAG
- Introducing UBA & UMA
Centre for Technology Alternatives for Rural Areas (CTARA)

Established in 1985
Academic Programs since 2007
The Spirit of CTARA
(An Academic & Research Unit of IIT Bombay)

Our Niche’
- Inter-disciplinary work; Interaction with NGOs/ SHGs/ PRIs

Our Concern
- Celebrate development through technology

Our Focus
- *Bottom 80%; Commons; Region-Specific (Konkan)* needs with local resources, and within a Planning Perspective

Our Philosophy
- Global thinking & local action towards change
  - End-user defined/ demand-driven

Our Approach
- Experiential learning; Foremost Engineering loop (analyze, design, deploy, satisfy); To deliver technology, policy, capacity-building, debate
India Today: The Context..

- Current paradigm of development: Industrialization-Urbanization-Consumption
- Unidirectional flow of resources
- Rapid economic growth; Increasing disparity (India Vs Bharat)
- Dying villages; Over-burdened cities
- Relevance of (higher) education and research?
- **Technology: A part of the solution OR part of the problem?**
- **Need for Interface between “Technology” and “Development”**
Technology “&” Development

- **Technology**: Hardware + Technical Software + Social Software and Linkages
- **Development**: An act / process of improving human life by *triple bottom line* approach ensuring “Sustainability” i.e. Economic, Environmental and Social Wellness
- Managing /influencing /analyzing /innovating on the Interface / Interaction / Interrelationship between Technology and Development
CTARA’s Mandate

- Bottom 80%; Marginalized and disadvantaged sections of society
- Unorganized sectors
- Core areas: Energy, Water, Agriculture..
- Demand-driven, need-based research
- Direct engagement with the stakeholders
- Involve local institutions (e.g. engineering college) to ensure sustainability
Research Areas @ CTARA

- Water & Sanitation
- Policy & Governance
- Energy
- Land Use & Planning
- Food & Agriculture
- Health & Nutrition
- Housing

Faculty: ~ 10 (+10*)
Students:
  - MTech: ~60
  - PhD: ~35
The Key Questions

- Where will jobs come from?
- How will we fix basic services?
- Who will strengthen small enterprises?

Solution The New University

- A regional resource for people to analyse their problems
- A site for regional research and new professions.
- New curricula, new research and new engagements.
The Big Picture - What used to be

People
State, district, taluka, GP CEO, Collector

serve

Government
Companies

support

University

employees

What we now need...

People
State, district, taluka, GP CEO, Collector

support
advise, plan, assess

serve

Government
Companies

new job descriptions
knowledge products

employees

University

https://www.cse.iitb.ac.in/~sohoni/coep.pdf
Prof. Milind Sohoni, Former HoD, CTARA
The Development Professional

Technology

- Applied Engineering Science
  - Technology Development
  - Technology Assessment
  - (Appropriate Technology)
  - Technology Dissemination
  - Technology Impact Analysis

Development

Policy

- Applied Social Science
  - Political Economy
  - Public Administration
  - Project Management
  - Financial Analysis
  - Public Policy and Governance
  - PRA
  - Field Research Methods

Perspectives/Skill/Domain Knowledge

Field Orientation

Problems in context with concrete Stakeholders
Academic Program: M.Tech. (T&D)

Inter-disciplinary Program in Technology and Development

Perspectives; Sectors; Skills; Field work; Projects

Careers as Development Professionals

- Consultants/ CSR
- Government
- Grassroots Organizations
- Entrepreneurship
Summer Field Work: A Unique Feature

- 9-week long field work
- Rural home stay
- Facilitated by NGO/ GP
- May-June-July

- Participatory Rural Appraisal (PRA)
- Resource-technology-need linkages
- Familiarization with rural setting
- Research on a specific local issue
Project Areas

**Technology**
- Agriculture: DSS, Value-addition
- Energy: Biodiesel, Biogas, Briquettes from biomass
- Water: Rainwater harvesting, Wastewater treatment

**Policy**
- Public-Private-Partnership
- Jal-Swarajya
- Sanitation, MSWM
- RGGVY/DDUGJY

**Development**
- Livelihood issues
- Supply chain
- MGNREGS
- Regional planning
Technology & Development
Supervised Learning (TDSL)

- Socially relevant projects for UGs at CTARA:
  - Launched in July 2011
- The objective:
  - To enable (UG) students to participate in projects which have a **direct interaction with society**
  - To expose them to **LIVE problems** which need **inter-disciplinary research** within the development agenda
- Mandate:
  - The bottom 80%; core issues; stakeholder driven; delivery
- Current Status:
  - Several faculty members across IITB guiding ~100 UG students per year
  - Range of topics: water, energy, sanitation, public health, transportation, livelihood...
- Details:
TDSL Structure

TD 390 Study (6 credits)
- Introduction to field work, multi-stakeholder projects and study
- Identification and formulation of problem
- Bring formal analysis to the problem
- A feedback loop and a report

TD 490 Analysis (6 credits)
- Knowledge generation for a specific situation
- Inter-disciplinary inputs; Stakeholder interactions
- Formulating the key steps and execution
- Drawing conclusions and report/presentation

TD 491 Design (12 credits)
- Knowledge application with a creative component
- Clear objective, stake-holder participation and deliverable
Sample projects

- Drinking water security assessment
- Brick making practices and interventions
- NREGA analysis
- Understanding public health systems
- Design of piped-water supply schemes
- Analysis of sewage management techniques
- Techno-economic analysis of poultry farms
- Survey and analysis of bio-gas plants
- Documenting pottery making techniques
- Oral histories of peoples' issues
- Chulla dissemination and cooking practices
- Water sources status mapping
- Soil and agricultural practices
- Low-cost pulse recorder
- Economic analysis of weekly markets
- Failure analysis of water schemes
- Village-level environmental planning
Rural Technology Action Group (RuTAG)

Project supported by the PSA
RuTAG

• RuTAG is a project initiated by Dr. R. Chidambaram the Former Principal Scientific Advisor to the Govt. of India; Now, continued under the guidance of Prof. K. Vijay Raghavan, present PSA
• Mechanism to enhance rural development through S&T interventions
• Downsizing of technologies for rural areas
• RuTAG centers established in various IITs: (a) Madras (b) Guwahati (c) Kharagpur (d) Roorkee (e) Delhi (f) Mumbai (g) Kanpur and (h) Ropar.
Objectives

- Improving rural economy through S&T Platform.
- Technology delivery for non-farm/ agriculture sectors.
- Benefiting rural groups through network of NGOs.
- Reducing drudgery in various activities in rural areas.
- Adding value to the produce and enhancing quality of rural life.
- Dissemination of refined technologies suitable for rural areas.
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List of RuTAG Technologies developed by IITs

- Foot-driven Amber Charkha
- Pirn Winding machine
- Hank to Bobbin Winding Machine
- Eri Cocoon Opener
- Modified Bageshwari Wool Charkha
- Floating Fish Cages Structure
- Foot-driven Potter’s Wheel
- Modified Potter wheel
- Amla Pricking Machine
- A Device for making Tulsi Mala Beads
- Cylinder Type Grain Puffing-cum-Roasting Machine
- Integrated Rice Puffing (Muri) Machine
- Motorized Jute Rope Making Machine
- Motorized Sabai Grass Rope Making Machine
- Motorized Sisal Fiber Extractor Machine
- Multi nutrient compressed feed blocks
- Improved Bullock Driven Tractor
- Improved Metallurgy of Horse Shoe
- Mechanized Dhenki
- Modified Pump used as Turbine for Pico hydro
- Modified Bicycle
- Betel nut cutter
- Chaff cutting machine
- Coir Ratt
- Pedal Loom
- Potter’s Wheel

RuTAG IIT Bombay

- Established in 2010
- Regional Focus: Western India (MH, GJ & Goa)
- I am associated since 2014
- Close association with Centre for Technology Alternatives for Rural Areas (CTARA) at IIT Bombay
Process of Developing a Solution

**Problem identification**
through NGO workshops, field visits, TD609, students and faculty of CTARA

**Literature review**
Published and unpublished data is researched. Similar interventions by Government institutes are reviewed.

**Customization of technology**
Planning for customization based on identified need and existing solution is an important step.

**Technology Development**
IITB faculty members design suitable prototypes through project mode

**Deployment & scaling**
The technology that is technically sound and accepted by all stakeholders is considered as ready for deployment in field.
# Key Sectors Touched Upon

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<th>Design</th>
<th>Post-harvest</th>
<th>Assistive tech.</th>
<th>Water</th>
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Solutions Ready for Dissemination

- Floating fish cages for inland aquaculture
- Hirda decortication machine
- Chironji decortication machine
- Device for assisting a ‘Downer cow’
- Protective dress for harvesting honey from wild bees
- Water storage tanks using locally available natural fiber
- Liquid jaggery hygienic packing machine
- Small scale solar dryer
Floating Fish Cages for Inland Aquaculture

- Cage fishing is the process of controlled and protective rearing of fries to fingerlings within a 'cage' (a net that allows water flow) floating in a water body
- RuTAG IIT Bombay has designed floating fish cages for inland fisheries
- Enhanced fish production
- Better livelihood opportunity
- Food security
- Potential: Ornamental Fish
Dissemination of RuTAG IITB Fish Cages

- Deployed 32 cages in Maharashtra State with grant from TDD
- Disseminating 200 cages at North-East region under STINER initiative with help of grant from MDONER
- First two fish cages deployed at two locations at Manipur: Inaugurated in April, 2018
Hirda decortication machine

A portable cow lift

Wild bee protective dress
Unnat Bharat Abhiyan (UBA)

MHRD Initiative

[Image of Unnat Bharat Abhiyan logo]
Unnat Bharat Abhiyan (UBA)

- A flagship programme of the Ministry of Human Resource Development (MHRD), Govt. of India
- UBA is inspired by the vision of transformational change in rural development processes by leveraging knowledge institutions to help build the architecture of an Inclusive India.

**Vision**

“To involve the higher educational institutions (technical / non-technical / public / private) of the country in the process of indigenous development of self-sufficient and sustainable village clusters.”
Mission

- Coordination among educational institutions, implementation agencies and the grass root level stakeholders
- Effective participation in the holistic development of rural clusters using
  - Eco-friendly sustainable technologies
  - Harnessing local resources
  - Creating employment opportunities
  - Harnessing multifarious government schemes
  - Customisation of existing technologies
  - Use of local knowledge
- Reorienting the academic curriculum and research programs in higher educational institutions
Anand B. Rao, CTARA, IIT Bombay

IUCEE LS 2019 @ Goa, 12/07/2019
Organizational Structure of UBA
Unnat Maharashtra Abhiyan (UMA)

Mechanism

GR (13th January, 2016)

Objectives

- Reform teaching, curricula and research- topical case studies
- Train future professionals for development objectives
- Make institutions regional resources through key GRs
- Provide mechanism for citizens to approach institutions
- Create academic space for projects and studies in relevant areas
- Extends UBA
Organization of UMA

- Inter-disciplinary **Technology and Development Cell (T&DC)** at each UMA college
- UMA Program Cell at IIT-B
  - Head, CTARA (or nominee) as Chairman of UMA Advisory Committee
  - 2 Project Managers
- Project Coordination Unit at DTE
  - Nodal Liaison Officer on deputation
- Establish and strengthen T&DC’s at UMA colleges
Current UMA Institutions

Empanelment Target for next 2 years:

- 1-2 engineering colleges/Govt. Polytechnics in each district
Empanelment of UMA Colleges

UMA Selection Committee was formed, Call for participation, Selection based on defined criteria, Selection team visited each college, *12 selected*. Selection criteria:

- Past projects in the development sector (30)
- Academic flexibility and experience in inter-disciplinarity, fieldwork and reporting (20)
- Current infrastructural facilities (10)
- Faculty expertise and consulting and guest lectures (30)
- Student profile (Rural/Urban) (10)

GR released, empowering newly empaneled colleges to participate in UMA activities and projects such as:

- Training workshops and programmes
- Assessments, analyses, monitoring and evaluation of government schemes
- Technical support to government programmes
UMA Colleges and their work

- Plastic road (KBP Satara)
- Cleaning of Krishna River (BVP Pune)
- Irrigation at Sinnar (CTARA, IIT-B)
- Solar Dryers (SSVPS Dhule)
- Camlin Pencil Sorter (PVPIT Budhgaon)
JSA and RWS Work Done by UMA Colleges
Thank You!

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