



Editor's Desk

“Researchizing Rural Problems”

In this issue, I wanted to re-emphasize the concept of how to convert rural problems into research topics so as not only to be able to publish by the faculty of academic institutes and the researchers of R&D laboratories in high quality journals/conference proceedings for their professional growth but also let the knowledge be shared with the world population living in far way countries for them to adopt similar solutions. Quite often we miss the point that a typical research problem from the so-called hi-tech areas like Space, etc. are bounded by one-side, whereas the rural problems are bounded from both sides. What I mean is that due to no budget constraint in the areas like Space, etc. nobody cares what would be the cost of a proposed solution. Efficiency or performance is the only concern, not the money. However, in a rural setting, the users will not even listen about what improvements were done on their existing problems if it crosses their affordable limit. That way, efficiency and cost are both important. Hence, the latter problems are more difficult and the serious researchers from reputed institutes like IITs and others MUST take up such problems seriously along with their regular jobs like teaching/guiding students. In fact, exposure to the students to such social problem will make them connected more to the society where they live. Hence, my another slogan “Connecting Engineering Minds with Society” gets fulfilled.

In order to fulfil the dual objectives of “Researchizing Rural Problems” and “Connecting Engineering Minds with Society,” all RuTAG centres jointly took an initiative last year to organize an international conference on Rural Technology Design and Delivery (RTDD) at IIT Delhi. I am happy to announce that the proceedings of the same with only 26 peer-reviewed presented papers were published by Springer (page 9). Besides, we are proud to bring out the compendium of 52 technologies by 7 RuTAG centres which are ready to deploy/sell (page 9). We STRONGLY appeal to all to take this movement forward for a Happier World!

Prof. Subir Kumar Saha

Chairman's Column

“Let Sustainability be the Prime Concern in Technology Development”

There is an all-round explosion of knowledge and a great thrust has been generated towards the development and widespread applications of Science and Technology. However, in such scenario, even though we are now frequently talking about promoting sustainable technologies and sustainable development, the requisite ethos and understanding in this direction is not visible. As a result, in about practice, the sustainability aspect is pushed to backseat. This is a hazardous trend for the whole humanity, and it needs to be changed urgently to avoid a massive catastrophe on this planet. In this regard, the following points are pertinent to ponder seriously and to act upon in actual practice;

- A tangible and real thrust towards sustainability can only occur through a change in the worldview identifying the purpose, needs and relationship with other human being and rest of nature correctly.
- Ever increasing material needs prevalent currently can never lead to sustainable solutions. So, the focus has to be on appropriate need characterisation.
- We have to accordingly explore and adopt conservative and sustainable lifestyles.
- For this, it is crucial to acquire right understanding about sustainable “happiness” and “prosperity”.
- Then, it is also essential to recognize the co-existential and highly interconnected characteristics of existence and accordingly identify our own role.
- This realization will lead to mutually-fulfilling human relationships and mutually-enriching interaction with rest of nature – which is so vital for promoting sustainability. Endowed with such a worldview, we shall be able to chalk out effective strategies to move towards sustainability.

Prof. R. R. Gaur



Figure 1: Group photo of RuTAG Regional Workshop at KHAMIR, Bhuj, Gujarat



Figure 2: Prof. Saha distributing certificates to the artisans at Bhuj Haat



Figure 3: Team arriving by boat to Samsernagar village in Sundarbans



Figure 4: Cutlery made of coconut shell



Figure 5(a)



Figure 5(b)

Figures 5 (a) and (b): Designs of workstation of Sankheda



Figure 6: Trial of Paddy Thresher- February 2019



Figure 7: Unit setup and training, Meghalaya- February 2019

1. Livelihood augmentation using coconut shell with design and technology intervention, optimized production and contemporary design development

P.I. – Prof. R. Sandesh, IDC (Industrial Design Centre), RuTAG IIT Bombay

Collaborating NGO – *Lupin Foundations, Kudal, Maharashtra*

Coconuts are grown in over 86 countries across the globe, with an average production of 54 billion coconuts every year. India ranks 3rd in its coconut production with cultivation of over 13 million coconuts per annum. Coconut being a coastal crop, is mainly cultivated in Tamil Nadu, Kerala, Odisha, West Bengal, Karnataka, Maharashtra and Pondicherry. The crop is also cultivated in other non-traditional climatic regions by using the modern day agricultural techniques. The project aims to deliver relevant inputs in technology and design, for better utilization of coconut shell (which is otherwise wasted or used as biomass for fuel). The main objective of this project is to use coconut shell (Figure 4) creatively, engage the self-help groups with training and capacity building for making aesthetically appealing accessories, thereby, espousing craft based rural livelihood. The project has potential for generating livelihood opportunities for groups in (coconut growing) rural regions. Industrial Design Center (IDC) of IIT Bombay was involved with artisans working with Coconut shell products during student internship in Uravu, at Wayanad in Kerala. A master’s student from IDC, who worked with the artisans for his thesis project would act as reference person for the project.

2. Work process and product optimization, value creation and livelihood augmentation for Sankheda craft-based furniture making community

P.I. – Prof. R. Sandesh, IDC (Industrial Design Centre), RuTAG IIT Bombay

Collaborating NGO – *GRISERVE-BAIF, Vadodara*

Sankheda is a wood craft in Gujarat which is renowned for its wooden lacquer furniture with distinctive patterns and vibrant colours. This craft is losing its market potential due to the advancement of new processes and modernized furniture companies in the market. The current requirement is for repositioning the wooden craft [Figures 5(a) and 5(b)] in alignment with various urban furniture companies by developing a craft cluster which will cater as a subsidiary unit for big furniture giants. This will develop a bigger scope for the craftsmen which will orient them to new market opportunities and latest technologies for mass production. This project aims at designing a workstation for Sankheda craftsmen to reduce drudgery in work environment by ergonomic and user-friendly optimization of wood turning, painting and assembly in manufacturing. Industrial Design Center (IDC) of IIT Bombay was involved with artisans from village Sankheda in Gujarat, working on this craft. A master’s student from IDC, who worked with the artisans for his thesis project, would act as reference person for the project.

3. Design and development of small-scale Paddy Thresher

P.I. – Prof. Shankar Krishnapillai, Dept. of Mechanical Engineering, IIT Madras

Collaborating NGO – *Ms. Karpagam and Mr. Sriram- Farmers in Kanchipuram*

The Paddy Thresher (Figure 6) designed by two student interns Mr. Pravinkumar and Mr. Arul Prakash, under mentorship of Prof. Shankar Krishnapillai, was fabricated by Ganesh Fabricators and tested in Coimbatore on February 02, 2019. The Paddy Thresher is designed for marginal/small famers with tractor PTO for power. With a capacity of ~150 kg/hr., it has several modes for efficiently threshing paddy.

4. Setup of disposable compostable sanitary napkin production unit in Meghalaya

P.I. – Prof. S. Ganesan, RuTAG IIT Madras

Collaborating NGO-*Science & Technology Interventions in the North East Region (STINER)*

Under the Science and Technology Interventions for the North East Region initiative of setting up 20 units of sanitary napkin production units across the North East Region, Vatsalya Foundation, Vadodara set up a disposable compostable pad unit in Mairung, West Khasi Hills, Meghalaya on 21st February, 2019 and provided training to local SHG women (Figure 7).



Figure 8: Milk barrels (GI Cans)



Figure 9(a): Schematic of moment generation due to single wheel power



Figure 9(b): Marks of handle on hands of a Cycle Rickshaw puller



Figure 10(a): Vermicomposting Unit Developed by EPC Bikaner

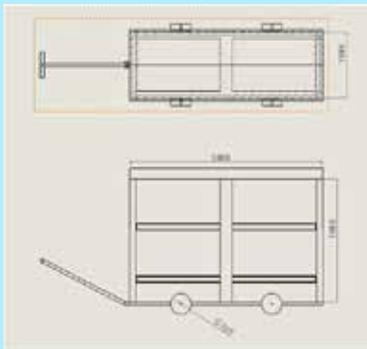


Figure 10(b): Design of the Portable and Vertical Vermicomposting System

5. Passive Cooling of Milk

P.I. –Prof. J. Ramkumar, Dept. of Mechanical Engineering Department, IIT Kanpur
Collaborating NGO – *Not available*

Milk is one of the most important supplements of the daily life. Throughout the world, more than six billion people consume milk and milk products. Over 750 million people live in dairy farming households. Fresh milk is bought to the city by vendors in cans (Figure 8) made up of GI sheet and now to some extent in plastic containers also, but during the distribution milk warms up and gets spoiled because of heating. Our objective is to explore the problem and give a cost-effective solution to the milk suppliers and make their business more profitable. In order to investigate this problem without much increase in cost, following design modifications are being attempted: 1) Testing the GI can with water, but without any modifications; 2) Testing the GI can with wetted gunny bags, the way it is used during the summer months; 3) Testing the GI can with wetted gunny bags and special design of can cover to hold some water, which will keep the cover cool and also provide trickling drops of water on the gunny bag; 4) Testing the GI can with foam insulation and keeping it wet; 5) Testing a plastic can with water, but without any modifications. Data are being recorded with above modifications and appropriate conclusions will be drawn by comparing the data.

6. Clutch Based Wheel Propulsion System Design for Cycle Rickshaw

P.I. –Prof. J. Ramkumar, Dept. of Mechanical Engineering Department, IIT Kanpur
Collaborating NGO – *Not available*

In India, about 0.86 million people are engaged in pulling cycle rickshaws as occupation in urban areas. Most studies have found that, on an average, a rickshaw puller earns Rs. 150 to 300 per day (In urban areas). The moment mismatch created at the propulsion shaft directly transfers to handles of rickshaw [Figure 9(a)] and causes rickshaw to move in the direction of free wheel and an additional force as much as 2 kgf must be applied to balance the rickshaw. This can cause generation of pressure sores in palm and chronic muscle deformities in arms of rickshaw pullers [Figure 9(b)]. Since only single wheel is being powered it also causes higher rate of wear in contrast to the free wheel. To reduce this turning moment created during running both rear side wheels have to be powered so that the generated friction force on the rear wheel will be in same direction and their moment about center of gravity will be neutralize and one-sided moment will not appear. Effort applied by the rickshaw puller will reduce significantly.

7. Designing of Vertical Vermicomposting Unit for Mata Vaishno Devi, Katra

P.I. – Prof. S. K. Saha, Dept. of Mechanical Engineering, RuTAG IIT Delhi
Co-PIs- Prof. Prof. Satyawati Sharma (CRDT, IITD), Dr. Kalpana Arora, (SESS Delhi) and Prof Balbir Singh (SMVDU, Katra)

Collaborating NGO – *Centre for Technology and Development, A unit of Society for Economic and Social Studies (SESS), New Delhi*

The processing of organic wastes into organic manures via traditional composting can be used to address the issues of environmental pollution related to solid waste and thereby minimizing the development of new dumps and landfills. But the major problem associated with traditional composting is that it is a time-consuming process requiring a minimum of 4-6 months to complete the process of degradation. In winter, the decomposition process is further slowed down. The use of winter tolerant (low temperature tolerant) microbes may be useful to enhance the composting rate [Figure 10(a)]. Along with this the frequency of turning of the material, loss of the nutrients during prolonged composting process are the major problems associated with this. On the other hand, vermicomposting is a kind of accelerated composting which involves earthworms to degrade the waste under anaerobic conditions, take over both the roles of turning and maintain the material in an anaerobic condition, thereby reducing the need for expensive equipment. Now, IIT Delhi is working on a portable vertical design of the vermicomposting unit [Figure 10(b)] suitable for Katra region where mule dungs are available in plenty.



Figure 11: Coconut Tree climber developed by IIT Delhi



Figure 12(a): Mrs. Omwati using the Tulsi Mala Making Device previously improved by RuTAG IIT Delhi



Figure 12(b): Tulsi Mala Making Device in use

8. Fabrication of Tree Climbing Device for Safe and Convenient climbing of Coconut Trees

P.I. – Prof. S. P. Singh, Dept. of Mechanical Engineering, IIT Delhi

Collaborating NGO – Mr. Vinod Kumar, Maithri NGO, Palakkad, Kerala

The project has its background in an old letter from the ministry that coconut tree climbing is a relevant problem in India and there should be put forward some solutions for efficient and safe climbing of these trees and working up to harvest the coconuts. In this relation, a project was proposed to two students as a part of summer undergraduate research project. They did proposed an initial design of the tree climber.

There are a few climbers already in use but they require the use of a coordinated hand and foot movements, and also have safety concerns. Thus apart from a development of the climber such that one can climb the tree with the ease of climbing a staircase with primary function of the foot and legs the hand and arms are used only for additional safety concerns which comes to fore whenever there is scope of accident or failure of the equipment. After the preliminary product was developed, a visit was made to Kerala (Maithri) who looks after the welfare of coconut planters as well as the workers. The presentation was made, and the device was tested (Figure 11). The concept was liked by the concerned persons. The product is further and taken up for further implementation.

9. Design Improvement of Tulsi Mala Making Device

P.I. – Prof. Subir Kumar Saha, Dept. of Mechanical Engineering, IIT Delhi

Collaborating NGO – Human Social Welfare, Moh. Ganesh Ganj Lalla Wala Nohara, Hathras

On February 07, 2019 RuTAG IIT Delhi in collaboration with NGO – Human Social Welfare, Mathura conducted a workshop and training at Jait village in Mathura to demonstrate Tulsi Mala Making device [Figure 12(a)]. Dhanendra Kumar, President of Human social Welfare Society, Mathura told that around 2000 families in the villages near Mathura make Tulsi Mala beads to earn their livelihood. Around 80% of the beads produced have size less than 15mm and remaining 20% of the beads produced have size ranging between 15 to 25 mm. The current design of Tulsi Mala making device which was developed by RuTAG IIT Delhi [Figure 12(a)] is capable of making beads around 10mm. The device uses a 12V DC motor which can draw current up to 5A. The NGO- Human Social Welfare Society, Mathura had expressed the need for updating Tulsi Mala device [Figure 12(b)] so that it can be used to make beads of size 25mm. It was also mentioned that the tulsi stem comes out of the stem holder (Chuck) while operation and adjusting the tail stock pin is a cumbersome process. During the training users also pointed out that the transmitted vibration from the motor was large. Hence, a modified design and fabrication is under progress.

Demonstration of Sheep Hair Shearing Device developed by IIT Delhi at Bhuj, Gujarat

Mr. Davinder Pal Singh and Mr. Ashish Dahiya visited Bhuj, Gujarat on March 15, 2019 for demonstration cum training programme in collaboration with KHAMIR and Gujarat Sheep and Wool Development Corporation (GUSHEEL). RuTAG Team, KHAMIR Team, GUSHEEL Team, some local sheep herders along with traditional shearers were present there. A total of 20 sheep were sheared by the device in front of all. A trained shearer (Figure 13) was arranged by GUSHEEL for the training and demonstration. The device performed very well throughout the day. Traditional shearer who use scissors for shearing also got exposure to the device. Traditional shearers tried the mechanized device for the first time and handled it very well. The shearers were very happy and keen to use the mechanized device.



Figure 13: Mr. Gokul demonstrating the device

Technology Development and Utilization Programme for Women: A Scheme for Women

Gender equality is important for the entire society. If given proper opportunity and encouragement, women have the potential to excel in every field. However, opportunities need to be provided to women so that they are empowered to face the world confidently. Empowerment begins with awareness and subsequently through capacity building. In 2017, Global Gender Gap Index's list of countries, India ranked 139th in terms of women's economic participation and opportunity. Women's economic empowerment is a prerequisite for sustainable development, pro-poor growth and is about rights and equitable societies. According to a McKinsey Global Institute study, India could boost its GDP to \$2.9 trillion by fully bridging the gender gap in the workplace by 2025, if female workforce participation rate is improved. This would be equivalent to bringing 68 million more women into the non-farm labour force. According to National Sample Survey Organization (NSSO), there were over 30 lakh unemployed women in India in 2012. The National Policy on Skill development and Entrepreneurship 2015 mentions the need for gender mainstreaming of training and envisions skill development as a vehicle for women's empowerment. In order to bridge the gap, the policy identifies the need for special delivery mechanisms such as mobile training units, flexible afternoon batches along with local needs-based training. The Department of Scientific & Industrial Research (DSIR), Ministry of Science and Technology, has a mandate to carry out the activities relating to indigenous technology promotion, development, utilization and transfer. Under this mandate, the "Technology Development and Utilization Programme for Women (TDUPW)" scheme was introduced in the FY 2004-05 to enhance the share of women in respect of beneficiary oriented schemes with the objectives to promoting the adoption of new technologies by women, create awareness and training of women on technology related issues, showcase appropriate technologies and organize demonstration programmes for the benefit of women as well as design and develop products, processes beneficial to women. Under the TDUPW programme, DSIR funds projects which lead to capacity building of women and reduce the drudgery of women.

DSIR under its TDUPW programme, has funded several projects leading to reduction of drudgery and financial empowerment of women. Several women have been trained in different S&T related skills which will reduce their drudgery and improve their condition of living. The main objective of the programme is to identify the requirements for the socio-economic development of women, prioritize them and to formulate specific projects for the cause of promotion and development of women and make the outcome accessible to the user clientele. Another component, establishment of Skill Satellite Centres has been added to the Technology Development and Utilization Programme for Women scheme. Both the components of the scheme are discussed below:

A) Technology Development and Utilization Programme for Women: The program is aimed to meet the specific needs of women and to enhance their technological capabilities. The objectives of the programme are:

- Promoting the adoption of new technologies by women.
- Awareness creation and training of women on technology related issues with regard to women related occupations.
- Promoting Technology up gradation (through technologies developed by scientific establishments) of micro, small and medium enterprises run by women Self Help Groups (SHGs)/entrepreneurs.
- Showcasing of appropriate technologies developed by scientific establishments and organizing demonstration programmes for the benefit of women.
- Design and development of products, processes (e.g., by utilizing waste) beneficial to women.

B) Skill Satellite Centres: A new component, establishment of "Skill Satellite Centres" has been added to the TDUPW scheme. The main aim of DSIR is to set up Skill Satellite Centres [Figures 14(a) and (b)] to enhance the quality of life of women by imparting knowledge and skills. Skill Satellite Centres can help women to be skilled near their home and eventually become economically empowered. Women thrive when their community truly values women's work both at home as well as in the public sphere and therefore, this initiative of DSIR is committed to working towards gender parity and making women's work visible at all levels of development.

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Figure 14 Activities of TDUPW
(a) Moringa plantation at village Sandhawali, Dist. Muzaffarnagar;
(b) Training on advance bee keeping technologies

RuTAG Management Development Programme at IIT Delhi October 2-4, 2019

(In association with IIT Kharagpur)

Theme

Development of rural entrepreneurship: how does one go from a technological solution developed to solve a local (potentially hyperlocal, e.g., one's home, residential area) rural problem to a full-fledged enterprise that manufactures, markets and distributes a product.

Sessions (Tentative):

Day 1 (each session approximately 1.5-2 hours)

- Session 1: Inauguration. Government Representation. Keynote address.
- Session 2: Begin with the basics: what is a product? What is difference between Product and Services? What is a rural Enterprise? Why it is important to discuss about Rural Enterprise today? What is the status of Rural Enterprise today in India and World-wide?
- Session 3: Interactive session on technologies developed by RuTAG- demonstration and Inputs from participants about their own technology and RuTAG technology and challenges faced.

Day 2 (each session approximately 2-2.5 hours, with breaks)

- Session 4: How does one know what to do with the technology? What do we know about Open and closed Innovation? How do these help? What is the role of community in technology development and maintenance? Learning from field.
- Session 5: How does one know that he has a scalable and marketable product on hand? How to assess marketability? Case studies to illustrate journey from a technological solution to potential product. Some involved practices on calculation of market potential.

Day 3 (sessions ranging from 1 – 2 hours)

- Session 6: Once likelihood of scalability and marketability of product has been established, how does one set up the enterprise? What are the critical factors of an organization? How does one obtain funding? What is the leadership requirement for these types of organizations?
- Session 7: Overview of finance, accounting, operations and human resources, including description of resources to learn more about each of these.
- Session 8: Closing – reiteration of focus on sustainability, and feedback.

Special Efforts

- The entire program will be designed, developed and coordinated propagating the theme of environmental sustainability. The use of resources, energy requirements, and waste management will be managed as promoting sustainability.
- At the level of the coordinating committee, during the workshop, decisions have to be taken for how to organize the same at different IITs? Who are the key coordinators from each IIT?
- How this program can help in extending the Philosophy of RuTAG in today's scenario?

Collaborative Effort with RuTAG IIT Delhi at Sundarbans, West Bengal

A one-day Workshop on **Rural Technology: Need of Sundarbans Area** was conducted at Samsernagar High School, Samsernagar, North 24 Parganas, West Bengal on March 7, 2019. It was a joint effort by RuTAG IIT Delhi with CSIR-CEERI Pilani along with RMSEE of IIT Kharagpur, CSIR-CGCRI Kolkata, CSIR-CSMCRI Bhavnagar, and IEST Shibpur (Figure 3). About 70 participated which included NIT Rourkela, local residents, voluntary organizations, students, and others. Followed by the presentations made about what rural technologies were developed by the organizing partners, the need of the area was discussed. For example, how to remove the salinity of the water, make honey processing more profitable, etc. Need of Tele-teaching and Tele-medicine were also emphasized. Finally, a proposal was made to form an informal local group called TIGER (Technology Implementation Group with Enhanced Research) with 8-10 people and few students of the local schools who will identify the projects that the village needs to undertake immediately. They will meet once in a month and discuss about the progress of the projects. The professors and scientists from the organizing partners can act as adviser to TIGER. Overall, it was an enriching and learning experience for all of us.

Prof. Subir Kumar Saha, Dept. of Mechanical Engineering, IIT Delhi

Second International Conference on Rural Technology Development and Delivery (RTDD), IIT Madras, March 12-14, 2020

IIT Madras will organize the second international conference on Rural Technology Development and Delivery (RTDD) during March 12-14, 2020. RTDD 2018, organized by IIT Delhi, focused on bringing together faculty and students from all RuTAGs to discuss their achievements, difficulties, challenges and the way forward in next 10-15 years. In addition, other organizations working in the similar directions were invited to submit papers and participate to evolve a sustainable synergy between participants. The conference also had discussions on 'Dissemination' and 'Scaling of Rural Innovations', and possibility of funding through other Schemes of the Government. It also emphasized how rural problems can be converted to publication research so that the mainstream researchers find them attractive while social problems get solved.

Concept note for RTDD 2020

IIT Madras proposes following themes for RTDD, 2020 under three verticals of **Research, Policy and Practice**:

- **Innovative design for rural livelihoods:**

Product and process design in various sectors such as agriculture and agro-processing, handicrafts and livestock management that impact rural livelihoods positively. Many of RuTAG projects are closely linked to this theme.

- **Rural water resources**

Rural watershed management for groundwater and surface water resources, decentralized water and waste-water management.

- **Rural energy**

Rural energy production, distribution, storage and use, decentralized energy management.

- **Smart technologies for rural development: Education, Healthcare and ICT**

Mobile apps, artificial intelligence, robotics, machine learning, virtual reality in sectors of rural education, healthcare and ICT.

Expected participation

Research	Policy	Practice
RuTAG faculty/staff/students; faculty/researchers/students from other academic technical institutions	Case-study discussions by bureaucrats, faculty/students/researchers from humanities & social sciences/policy think tanks/centres	NGOs, startups/local entrepreneurs, grassroot innovators, CSRs, RuTAG faculty/staff/ students

Buy RuTAG products

Since last year, RuTAG IIT Delhi has introduced a scheme for dissemination of its products through FITT IIT Delhi by which anyone can directly place an order for the purchase of the these listed below:

1. Animal Driven Prime Mover
2. Batasha Making Process
3. Bullock Driven Tractor
4. Crapet Loom
5. Ground Water Level Measuring Device
6. Marble Artefacts
7. Pottery Kiln
8. Sheep Hair Shearing Device
9. Treadle Pump
10. Tulsi Mala Making Device
11. RuTAG Compendium



So far, RuTAG IIT Delhi has successfully delivered seven Tulsi Mala Making Devices, two Treadle Pumps, and one Bullock Driven Tractor worth Rs. 80,000. Anyone may visit the official website of RuTAG IIT Delhi (<http://rutag.iitd.ac.in/rutag/?q=innovative-products-delivery-0>) and find the list of technologies available with their prices to be delivered under "Innovative Product Delivery".

Regional Workshop of RuTAG IIT Delhi at Bhuj, Kutch, Gujarat

RuTAG IIT Delhi organised a Regional Workshop (Figure 1) at Bhuj, Gujarat in collaboration with KHAMIR, Bhuj, Gujarat during June 3-4, 2019. Three faculty from RuTAG IIT Delhi, Prof. R. R. Gaur, Prof. S. K. Saha, and Prof. M. R. Ravi [Figure 15(a)], three project staff, Mr. Davinder Pal Singh, Mr. Ashish Dahiya, Mr. Yashwant Prasad, one RuTAG Club Member, Mr. Rutvik Solanki, and Mr. Raviveer Chaudhary, Assistant District Commissioner, DHC, Mr. Lal Rambhia, Kutch Nav Nirman Sansthan, three persons from KHAMIR, Mr. Ghatit Laheru, Mr. Shouryamoy, and Mr. Harish Hurmade along with 25 other delegates from various NGOs, institutions, and other organizations have attended the workshop [Figure 15(b)]. Prof S. K. Saha welcomed all the participants with his warmth gratitude and explained the RuTAG concepts and work, followed by the introduction of the participants. Prof. Saha presented the RuTAG technologies and interventions such as Bullock Driven Tractor, Treadle Pump, Ground Water Measurement Device, Sheep Shearing Device, Tulsi Mala Making Device, etc. Prof. Ravi presented the furnace related technologies such as Improvement of Bangle making furnace at Bharatpur, Rajasthan, updraft potter's kiln with the use of rat-trap technology, and bell metal furnace. Mr. Ghatit Laheru, Mr. Jigar Vaidya, and Mr. Shouryamoy Das presented about the technologies on which Khamir is working on such as Wool Development programmes in collaboration with Gujarat Sheep and Wool Development Board, Bhuj, supporting Copper bell making artisans, and other textile related technologies. They also presented some technical interventions required for the artisans near Bhuj. Prof. Gaur, along with session chairs, had conducted the Conclusion session in which he stated the steps to be taken for resolving the technical problems that were proposed by the participants. At the end, Prof. Saha and Prof. Gaur thanked the participants and invited them to join the field visit to nearby villages to look into the technical interventions required for them on the next day.

Next day (June 4, 2019), RuTAG IITD team along with Khamir team and some other Workshop participants visited Nana Reha Village where the work for making swords and knives [Figure 15(c)] was going on. The artisan showed his work and the furnace to the team for better understanding. They were using mechanical hammer machine for sharpening of the swords and a furnace for heating of the material upto the moulding temperature. The team noticed the living conditions and the techniques of the villagers to suggest some possible interventions. After that Mr. Ghatit Laheru took RuTAG IITD team and other participants to Zura village where about 35 families are working on making traditional copper bells. The main issue with the existing process is that the artisans could bake only one or two bells at a time and the way the furnace is being used is also not efficient and it consumes a lot of raw material. These technological inputs that were required to boost the livelihood of the community were noted down and Prof. Ravi from RuTAG IIT Delhi will be working on the same. Khamir had initially done some improvisations regarding the furnace in which the villagers bake the bells for uniform coating of copper. But still some significant improvisations are required which can help the artisans to improve their productivity and to reduce the time and raw material consumption. After that the delegates visited a pottery cluster in Bhuj, where team noted some of the problems such as requirement of improvement in pottery kiln, sieving of clay through screen, etc. After that team visited Hunnershala where Mr. Mahavir Acharya showed the campus made up of several organic building materials. Ms. Barkha invited RuTAG team to visit Shrujan LLDC campus, where they showed some museum preservation techniques that have been implemented for long lasting age of craft displayed. Then Mr. Raviveer Chaudhary invited RuTAG team to attend the on-going "Shilpotsav" event at Bhuj Haat. Prof. Saha, Mr. Davinder Pal Singh, and Mr. Ashish Dahiya attended the programme from RuTAG Team and Mr. Ghatit Laheru attended the programme from Khamir. There Mr. Raviveer welcomed the event participants and artisans, He invited Prof. Saha and Mr. Singh to dais. Prof. Saha addressed the participants and distributed the participation certificates (Figure 2) to the artisans. At the end, Prof. Saha and Mr. Davinder Pal Singh thanked Mr. Raviveer and the participants and returned back to Khamir.

Mr. Ashish, Jr. Project Assistant, RuTAG IIT Delhi



(a)



(b)



(c)

Figure 15: Regional Workshop at Bhuj, Gujarat; From left to right: (a) Prof. M. R. Ravi, Mr. Raviveer Chaudhary, Prof. S. K. Saha, Prof. R. R. Gaur, and Mr. Lal Rambhia on the dais, and Mr. Ghatit Laheru addressing the Workshop participants; (b) Workshop Participants; (c) An artisan melting material for the casting of knife handle

Events, Exhibition, and News

1. Ms. K. Nalini, Project Adviser and Ms. Sandhya Seetharaman, Project Officer, RuTAG IIT Madras addressed 15 young engineers from the Indian Oil Corporation Ltd. Southern Region Pipelines Division at Madurai on 7th December, 2018.
2. Mr. Suraj Bhat from RuTAG IIT Delhi visited IIT Bombay during February 6-14, 2019 to have an interaction with Industrial Design Centre, IIT Bombay regarding Palki.
3. Mr. Rajkumar Gupta and Mr. Mangal Sharma from RuTAG IIT Delhi visited Mathura on February 07, 2019 for demonstration of Tulsi Mala Making Device.
4. Mr. Davinder Pal Singh from RuTAG IIT Delhi visited Sundarbans (West Bengal) during February 21-26, 2019 for installation of Treadle pumps.
5. A one-day Workshop on Rural Technology: Need of Sundarbans Area was conducted at Samsernagar High School, Samsernagar, North 24 Parganas, West Bengal (Figure 3) on March 7, 2019. (see page 6 for more details)
5. Mr. Ashish Dahiya and Mr. Davinder Pal Singh from RuTAG IIT Delhi visited Bhuj, Gujarat for demonstration of Sheep Hair Shearing Device developed by RuTAG IIT Delhi during March 14-17, 2019 (see page 4 for more details).
6. Mr. Rajkumar Gupta and Mr. Davinder Pal Singh and Prof. S. K. Saha from RuTAG IIT Delhi visited Hyderabad during April 20-25, 2019 for the exhibition of RuTAG Technologies.
7. RuTAG IIT Madras conducted Technology need identification workshop in Coimbatore on May 09, 2019 in sector of agro-technology.
8. Mr. Mangal Sharma from RuTAG IIT Delhi visited Deoria for installation of Treadle Pump during May 16-20, 2019.
9. Prof. S. K. Saha, Prof. R. R. Gaur, Prof. M. R. Ravi, Mr. Davinder Pal Singh, Mr. Ashish Dahiya, Mr. Yashwant Prasad, and Mr. Rutvik Solanki from RuTAG IIT Delhi conducted RuTAG Regional Workshop at Bhuj in collaboration with KHAMIR during June 03-04, 2019 (see page 6 for more details).
10. Mr. Suraj Bhat, Mr. Davinder Pal Singh and Mr. Yashwant Prasad from RuTAG IIT Delhi visited Yamunotri for design interventions required in Palki during June 24-28, 2019 (see page 8 for more details).

Feedback and Students' perspective

India is a vast country with diverse economical environments and a perfect stage for technological advancements. In today's world, the bright minds of the nation are competing globally with their latest innovations and groundbreaking high-tech technologies. But when it comes to the overall development of the country, focus must be shifted to the rural India for improving the rural economy and upgrading the livelihood of the rural people as 70% of Indians reside in the rural parts of the country. RuTAG plays an active role in catering to the needs of rural India by providing them with appropriate technological solutions. The RuTAG group, as a part of the unique initiative taken by the Office of the Principal Scientific Adviser (PSA) to the government of India in 2003-04, has a vision of providing demand driven technological solutions to improve the rural economy and livelihood. Recently, our team visited RuTAG IIT Delhi as a part of the research work during June 17-21, 2019. The learning was very much interactive, unique and thought provoking in terms of the whole process of technological intervention and product development which RuTAG follow.

It was very interesting for us to know how RuTAG group goes through the whole process right from the beginning of acquiring demand driven problem statements from villages across India by conducting several workshops throughout the year involving several NGOs. It was an amazing experience to witness how a group of enthusiastic and motivated students along with the faculty from this renowned institute work dedicatedly to address the real life rural technological problems and brainstorm their way into finding effective solutions to these problems. The whole process is time consuming, iterative and faced with many challenges, but yet they are able to come up with effective solutions in terms of deliverable products in a cost-effective manner. We had an interactive session of presentations where our team discussed some unique ideas and interesting solutions to addresses some vital issues of technology dissemination and product life cycle management process for rural technologies.

We look forward to work with this amazing team of RuTAG hand in hand for solving various rural technological problems in future. We are highly grateful to RuTAG IIT Delhi group and Prof. Subir Kumar Saha for accommodating us in his busy schedule and giving us the opportunity to witness how demand driven low cost technological solutions are being developed in their facility. We are hopeful that these low cost rural technological products will help to develop the Indian rural entrepreneurial mindset for a better economic and social growth of the country.

Sanyka Banerjee, Jayshree Patnaik, Research Scholars, Rajendra Mishra School of Engineering Entrepreneurship (RMSoEE), Indian Institute of Technology Kharagpur (IIT Kharagpur)

Feedback and Students' perspective

I've been involved in various social service ventures over the past year, and RuTAG stands out among them. The reason being that RuTAG focuses primarily on technology to make lives easier for others, a job that can only be taken up by a technical institute. Being a part of the Street-Sizing Project, our team aims at designing a working model to reduce the efforts put into the process of street sizing at the village level leading to an increase in the number of individuals involved in the process. At the same time, we learn how such solutions are manufactured and implemented at an industry-level.

Shubham Mittal, RuTAG IIT Delhi Club Member

We feel blessed to work with RuTAG IIT DELHI, especially working under the guidance of Professor Subir Kumar Saha is once in a life time experience for us, every time we meet him, we experience a kind of positive energy flowing into us, the way Prof. Saha interacts with us raises our spirits and boosts our confidence.

We feel great to be associated with RuTAG IIT DELHI for the kind of work that is happening here for the betterment of society, working here is an entirely new experience. Our horizon got extended. We had observed significant changes in the way we think, act and approach to a problem. In fact, we were more inclined towards pursuing research, we would like to thank professor Saha for giving us the opportunity.

Chintha Sai Krishna, Adulapuram Navya, Mallela Mounika, Sharanya, Summer Interns, SR College of Engg., Warangal

A Sojourn in The Himalayas

One of the perks of being associated with RuTAG is that RuTAG problems more often than not takes us to fascinating locations. One such interesting problem was that of improving the existing Palkis used at Yamunotri Dham.

Situated at 10800 feet above ground level, Yamunotri Dham is a holy shrine visited by around 4,00,000 pilgrims every year. The shrine [Figure 16(a)] is built at the foothills of the Yamunotri glaciers, the source of River Yamuna. The nearest motorable road is at a distance of 6.5 km from the shrine. To trek the remaining distance, some devotees make use of wooden palkis. Four porters carry a single devotee in these palkis [Figure 16(b)].

To study the existing palkis and the practices being followed, RuTAG team - Mr. Davinder Pal Singh, Mr. Yashwant Prasad, and I undertook a visit to Yamunotri, Uttarakhand. The journey was filled with breath-taking views and equally breath-taking treks. We stayed in Uttarakhand (Yamunotri, Barkot, and Uttarkashi) for 5 days and interacted with the local people, porters, devotees, manufacturers, and the local administration to get an overall view of the existing conditions.

It was a fruitful visit as it gave us the first-hand insight about the problems faced by the porters and the devotees. We also got to know more about hilly areas and the constraints faced in such environments. These inputs will definitely be helpful in improving the existing design of the palki.

Suraj Bhat, Research Scholar, Department of Mechanical Engineering, IIT Delhi



Figure 16 (a): The Yamunotri Temple and Yamuna River flowing nearby



Figure 16(b): A devotee being carried on a palki by porters

लौट के समझदार घर को आये

हर युवा की तरह मेरा भी सपना था कि मैं आई आई टी जैसे देश के सर्वोच्च संस्थान में शिक्षा प्राप्त करूँ और वह सपना पूरा हुआ सन 2009 में, जब मैंने आईआईटी दिल्ली के मैकेनिकल इंजीनियरिंग डिपार्टमेंट में एम टेक में दाखिला पा लिया। वहां पर अधिकतर युवाओं के मन में एक ही लालसा देखने को मिलती थी कि वे कैसे एक मल्टीनेशनल कंपनी में नौकरी प्राप्त कर लें और हो सके तो विदेश चले जाएं। चूंकि मैं मध्य प्रदेश प्रदेश के एक छोटे से कस्बे के एक मध्यमवर्गीय परिवार से आता था और धर्म एवं गुरूओं से बचपन से ही लगाव रहा इसीलिए मेरे मन में समाज के लिए कुछ करने का भाव हमेशा रहता था किंतु परिवार के लिए उचित धनोपार्जन करना भी आवश्यक था। चूंकि मैं आपनी थीसिस प्रो. साहा के मार्गदर्शन में लिख रहा था तो मुझे रूटाग डिपार्टमेंट की जानकारी हुई और मैंने उसके कुछ प्रोजेक्ट में अपना योगदान देकर संतुष्टी का अनुभव किया। जल्दी से धनोपार्जन हो जाए इसलिए मैंने डेलॉइट कंसल्टिंग की नौकरी एवं लगभग तीन वर्ष अमेरिका का प्रवास स्वीकारा। इस सब के दौरान कुछ ज्वलंत प्रश्न लगातार मन में चलते रहते थे कि जीवन के मायने क्या हैं? इतने भागदौड़ करके क्या मिलेगा? जिस समाज या राष्ट्र ने हमें इतना कुछ दिया और हम असहाय अवस्था में केवल समस्याओं का विश्लेषण कर रहे हैं। इन सभी प्रश्नों का उत्तर मेरे गुरू और जैन संत 108 श्री विद्यासागर जी महाराज का प्रेरणादायी जीवन की ओर दृष्टीपात करने से सहज ही मिल जाता। सन् 2016 की गर्मीयों में गुरूजी का सानिध्य पाकर मैंने अपनी नौकरी छोड़, आजीवन ब्रह्मचर्य व्रत स्वीकार कर लिया। गुरूजी की भावना थी कि ग्रामीण युवा जो कि रोजगार हेतु पलायन के लिए विवश हैं उनको गांवों में ही कुछ काम मिल जाए। अच्छे ढंग से अध्ययन करके पाया कि खादी / हथकरघा इस घनघोर समस्या का रामबाण इलाज है। बेरोजगारी के साथ अन्य कई समस्याओं का निराकरण इससे संभव है इसलिए कुछ अन्य सक्षम युवाओं की टीम के साथ हथकरघा के प्रशिक्षण केंद्रों का संचालन करना प्रारंभ कर दिया। हथकरघा के माध्यम से हमने तीन वर्षों में लगभग 500 युवाओं को उनके गांव/घर में उन्हें रोजगार मुहैया करा दिया। इनमें से अधिकतर युवा ₹10-12 हजार प्रति माह कमाने लगे और कुछ तो ₹25-30 हजार तक भी पहुंच गए। इस तरह भारतीय कलाओं और संस्कृति को जीवंत बनाए रखने के साथ, श्रम पोषण करते हुए हम ग्रामीण युवाओं के माध्यम से अहिंसक वस्तु का निर्माण कराकर उसका विक्रय कर रहे हैं। इस प्रोजेक्ट के साथ एक दूसरा प्रोजेक्ट जिसका उद्देश्य गौ पालन एवं जैविक खेती को बढ़ावा देना है 2017 के मध्य में प्रारंभ किया। पिछले दो वर्षों में उस प्रोजेक्ट के माध्यम से लगभग 500 गौधन का पालन कर 120 एकड़ जमीन पर जैविक खेती की जा रही है और गौ-पालन के आर्थिक एवं सामाजिक पक्ष को सभी के सामने लाया जा रहा है। इन्हीं दोनों प्रोजेक्ट में आईआईटी दिल्ली के रूटाग डिपार्टमेंट के तकनीकी सहयोग के लिए पिछले दिनों बीना बारह, सागर, मध्य प्रदेश में एक बहुत सफल कॉन्फ्रेंस हुई। रूटाग की कुछ तकनीकों को हमारे यहां लगा लिया गया है आशा है परस्पर सहयोग से ग्रामीण तकनीक को नए आयाम मिलेंगे।

Amit Jain, Trustee, Mahakavi Pandit Bhuramal Samajik Sahkar Nyas, Bina Barah, Deori, Sagar, Madhya Pradesh

“हूँ "धर्मव अनाविसिस ओइ बेंगल मेडिंग इनेस" प्रोजेक्टमां प्रोजेक्ट नेता हतो. अमे यार सभ्योना जूथ हता. मने रुटाग क्लब आईआईटी दिल्ली जाते भूय ज लषातर अनुभव थयो हतो. मने प्रोजेसरो साथे नञ्जकथी वातयीत करवी पडी अने ग्रामीण लोकोने परेपर फायदो थयो तेवी समस्याओ पर काम करतुं पड्युं. दिवावना तापमान अने हवाना प्रवाहना दर नक्की करवा माटे मेटेडिकल मोडल (मेटवाबमां कोड) विकसाववा माटे मारुं कार्य हतुं. आपरे मिडेनिकवी डिजाइन करेव लहामां स्थिरता नक्की करवानुं नक्की कर्युं. मोडेवनी तैयारी पूर्ण कर्या पछी, मने लूज जाते प्रोजेसर साथेनी अेक क्षेत्रनी सडर माटे वठ जवामां आव्यो हतो, ज्यां में लहामां काम करवानुं जोयुं हतुं अने मारा कोडना व्यवहारिक उपयोगमां समस्याओ समज्या हता. त्यांना प्रोजेसरो अे मारा शंकाओने साइ कर्या अने मने मारा कार्यनी अेक मोटी यिंत्र प्राप्त करवामां सडाय करी. मने RUTAG कोन्डरन्समां पण लाजरी मणी हती ज्यां समस्याओ साथे यर्या करवामां आवी हती अने त्यारभाह प्रोजेसर द्वारा कार्यनी प्राधान्यता पर सॉर्ट करवामां आव्युं हतुं. व्यवहार अेक्विडेशनने ज़ाफ्या पछी, हवे हूँ वधु मूलभूत स्तर समस्याओ समजुं शकुं हूँ अने ज़ाफुं हूँ डे लोको शुं उत्पादन तरीके छथे छे जे स्टार्टअप माटे सारी तक पण आपे छे”

“I was the project leader in the project “Thermal Analysis of Bangle making Furnace”. We were a group of four members. My experience was very learning at RUTAG Club IIT Delhi. I got to interact closely with professors and got to work on problems that really benefitted rural people. My work was to develop a Mathematical model (coded in Matlab) for determining the wall temperatures and air flow rates from various windows and chimney ultimately determining the sustainability of the mechanically designed furnace. After completing the model preparation, I was taken for a field trip at Bhuj along with professors, where I saw working of the furnace and understood the problems in the practical application of my code. Professors over there cleared my doubts and helped me get a bigger picture of my work. I also got to attain the RUTAG workshop where the problems were discussed alongside with rural artisans and then sorted by the professors on the priority of work. Further after knowing the practical application, I now understand the problems at a more basic level and know what people want as a product which also makes a good opportunity for a start-up.”

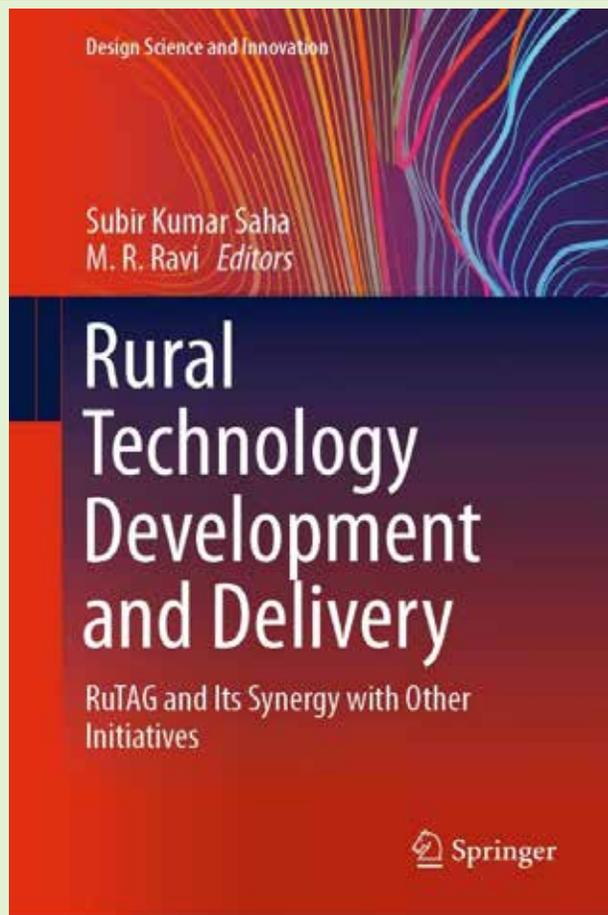
Rutvik Solanki, Member, RuTAG Club IIT Delhi, B. Tech. Student, Dept. Of Mechanical Engineering, IIT Delhi

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RuTAG Compendium

This document contains details of 52 ready to disseminate RuTAG Technologies from seven IITs (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras, and Roorkee).

The Office of the Principal Scientific Adviser (PSA) to the Government of India conceptualized a mission called Rural Technology Action Group (RuTAG) with an aim to provide a higher level of science and technology intervention and support for development and dissemination of appropriate technologies for rural areas in 2003-04. The office of the PSA allows RuTAG Chapters attached to any of the RuTAG Centres. Presently, IEC Greater Noida, and SMVDU, Katra is associated with RuTAG IIT Delhi. The important point of RuTAG is its projects are essentially demand driven, which could be for technology upgradation, hi-tech delivery, technology training and demonstration through any innovative method. Focus on problems associated with marginal communities in rural areas for livelihood creation, drudgery reduction, increase in efficiency/productivity of processes, provisions of higher income, generation of employment, downsizing of existing technologies, local resource management, and knowledge generation for further applications in rural context. This compendium is useful for those who want to get into rural entrepreneurship. A softcopy of this document is freely downloadable from (https://drive.google.com/file/d/1jMOYmJoKJrHYW6_irDjanlicC71D0WNF/view), whereas its hardcopies are available on payment from (<http://rutag.iitd.ac.in/rutag/?q=node%2F226%2Fedit&destination=rutag-compendium-0%23overlay%3Dadmin%2Fcontent>). Hence any college/institute/university interested to work on rural technology can approach nearest RuTAG for possible association.

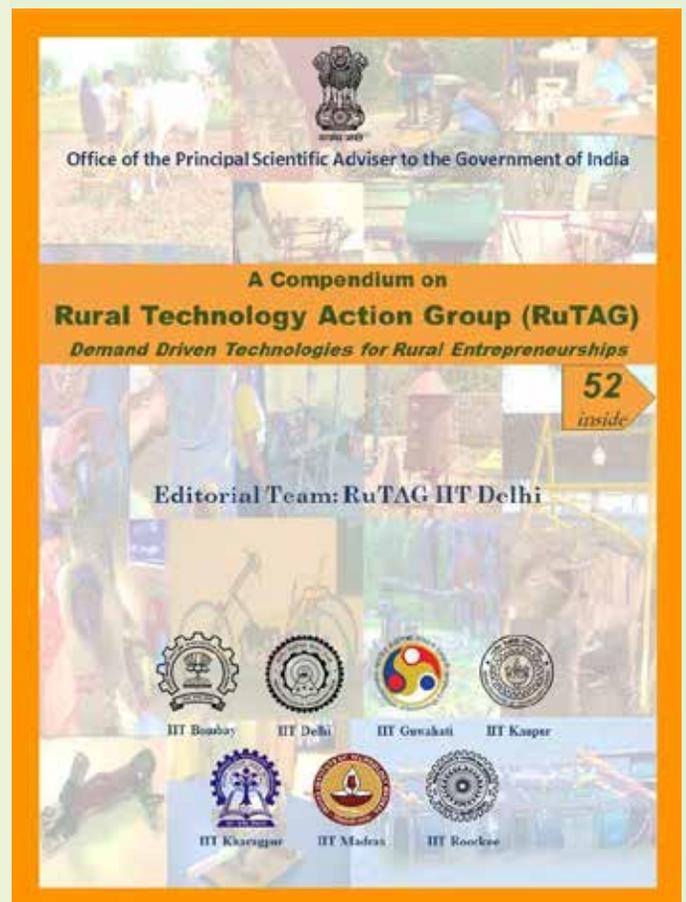
Proceedings

Rural Technology Development and Delivery Conference

The proceedings of the international conference on “Rural Technology Development and Delivery (RTDD): RuTAG and Its Synergy with Other Initiatives” held at IIT Delhi during March 9-11, 2018 was brought out in the form of a book. This book consists of 26 peer reviewed papers presented at the conference. The keynote lectures delivered during the conference are also included in the book. The book was published under the series Design Science and Innovation by Springer, Singapore.

This book can help expanding the outreach of RuTAG and similar organizations by making research related to rural technologies accessible to a wider scientific community worldwide. Further, this can act as an impetus to the researchers’ community to take up similar problems as research topics. The book can be purchased online from <https://www.springer.com/in/book/9789811364341>.

However, researchers/students who are interested with any of the paper can approach the authors or us for a personal copy.



This newsletter is compiled by Mr. Ashish Dahiya