



From the Editor's Desk

Rural Technology Action Group (RuTAG) at IIT Delhi has entered in sixth year of its existence. Within this period it has already published two newsletters (2013 and 2014). I am also happy to see that this year's (2015) newsletter has also come out. Happy New Year 2015 to all the readers!

This year, there is a change in its coordinator-ship. Prof. Rajendra Prasad, who has retired in February 2014, has handed over the responsibility to me. It was a great honour and responsibility at the same time. I hope I will be able to meet the aspiration of all the stake holders. However, I put on record the contributions of Prof. Prasad for RuTAG IIT Delhi. Due to his vast experience in this domain he will continue to be associated with the RuTAG as Co-Principal Investigator.

The year 2014 was also eventful as a Central Review Committee appointed by the Principal Scientific Advisor (PSA) to the Government of India visited several IITs to evaluate their RuTAG units including the one at IIT Delhi. Its recommendation to continue with the RuTAG activities at IIT Delhi with certain advices was possible due to the sincere work put up by different faculty. In this regard, I want to sincerely thank the Chairman of our Core Group, Prof. R. R. Gaur who with his vast experience in the area of rural development provided the able guidance to us. The other members of the Core Group including the one from an NGO and another one from the field are also thanked for their valuable inputs. The field partners are not to be forgotten in our endeavour.

Last year, a new focus was made in terms of making our students aware of the activities of RuTAG. An orientation programme was arranged after the new students joined in July 2014, which was attended by more than 70 students, faculty and others. It was really heartening to see such enthusiasm. In fact, this has led to the concept of RuTAG Club in order to provide an identity to those students who are interested to take up problems associated to the rural development as their academic projects. These days no interaction is complete without an online presence through avenues like Facebook, etc. as the modern generation understand this better. Hence, RuTAG IIT Delhi made its presence in Facebook also. The club students who go for field work also take detours for their fun by doing some sightseeing. This is extra benefits in addition to the satisfactions they get by doing social work through their technical knowledge. I feel satisfied in this that as a teacher I am able to reach the young minds.

(Prof. S. K. Saha)

Wishing You a Happy New Year 2015!

Message from the Principal Scientific Advisor (Government of India)

I am very pleased to learn that RuTAG IIT Delhi is bringing out another volume of their Newsletter, the first in the year 2015. It is important to spread the news of technology developments in the RuTAG Centres amongst the NGOs and other grass-root level organisations. While websites are important, sometimes a printed newsletter may have more impact and greater reach as well. The feedback would also help in enriching the activities further.

Apart from involvement of faculty members, RuTAG IIT Delhi has developed an innovative way of involving the students. This indeed is a very good step as the same students wherever they are would always have an inclination to support socially relevant work during their career.

I compliment RuTAG IIT Delhi for continuing with this initiative.

(Dr. R. Chidambaram)

Chairman's Column

RuTAG-Proving to be the Seed for Unnat Bharat Abhiyan

The RuTAG programme is gradually consolidating and manifesting its worthwhileness and further potential. Last January, a review committee was set up under the chairmanship of Dr. Punjab Singh which evaluated the present status of this programme and gave valuable recommendations for augmenting its effectiveness and for its consolidation as well as further expansion. The concept of RuTAG which was promulgated by Dr. Chidambaram, in an attempt to provide a meaningful S&T interface between the researchers in higher technical institutions and the NGOs and field agencies working at the grass-root level towards improvising rural technologies and facilitating their wider dissemination, has proven to be a unique catalyst for visualizing a much more comprehensive programme, named as Unnat Bharat Abhiyan for closer interaction of technical institutions, voluntary organizations and field agencies aimed at an effective and sustainable rural development.

The notion of Unnat Bharat Abhiyan came primarily from Prof. Rajendra Prasad (ex-Coordinator of RuTAG IIT Delhi) and Sh. Kripa Prasad Singh (a dedicated rural development visionary and field organizer) in the course of a regional RuTAG workshop at Jaspurnagar (Chhattisgarh) and was further developed at IIT Delhi with the active participation of Prof. V. K. Vijay and several others from inside and outside of IIT Delhi. To carry the plan further, a three-day National workshop was held during September 7-9, 2014 which was richly participated by all the RuTAG groups and experts from technical institutions as well as active voluntary organizations working at grass-root level. The concept was highly appreciated and supported by the Government through its concerned ministries viz. MHRD, MORD, DST, etc. Finally, MHRD has formally declared the launching of this programme, and efforts are on the way to delineate the strategy to systematically move further in this direction by establishing Unnat Bharat Abhiyan Cells in various IITs, which are planned to be expanded to other higher technical institutions. The programme is presently being coordinated by IIT Delhi with Prof. S. K. Saha as the coordinator of the Unnat Bharat Abhiyan Cell at IIT Delhi.

This initiative is a very significant development for which there has been a long-standing need in our country, but it is an equally great challenge too, to make it successful. Let us get ready to make a joint dedicated effort and contribute our mite to meet this challenge squarely!

(Prof. R. R. Gaur)

Projects and Activities at Glance

1. Adaption of Sheep-hair Shearing Machine Developed by IIT Delhi

Project Investigator: Prof. S. K. Saha, Mechanical Engineering Dept., IIT Delhi
Collaborative Agency: Jansamarth, Tehri, Uttarakhand.

Sheep shearing machine is used to cut the woollen fleece of the sheep, which is done by "Blade Shears" and "Machine Shears". Machine Shears are equipped with power driven toothed blade (cutter) which rocks over the surface of a comb and wool is cut off from it. The machine that was developed at IIT Delhi during 2006-2008 is a cost effective (Figs. 1 and Fig. 2). Adaptation of this machine will be done in Uttarakhand for removing sheep hair and goat hair.

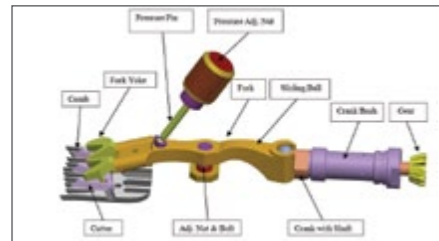


Fig. 1 CAD drawing of shearing machine



Fig. 2 Sheep-hair shearing machine



Fig. 3 Modified furnace by IIT Delhi



Fig. 4 Prototype of seating arrangement



Fig. 5 Modified Kalbhoot

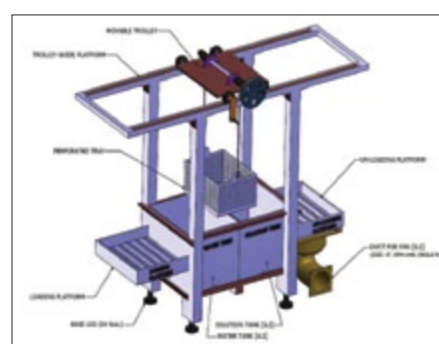


Fig. 6 CAD Drawing of Fruwash machine



Fig. 7 Fruwash Machine

2. Improvement of Furnace for Bangle Making and Working Conditions

Project Investigator: Prof. Sangeeta Kohli, Mechanical Engineering Dept., IIT Delhi
Co-Project Investigators: Prof. S. K. Saha and Prof. M. R. Ravi, Mechanical Engineering Dept., IIT Delhi
Collaborative Agency: Lupin Human Welfare & Research Foundation, Bharatpur, Rajasthan

Making green or red colour glass bangles is the traditional occupation of majority of families in the villages of Bharatpur district of Rajasthan. There are around 14 traditional community furnaces in the villages of Bharatpur district. The furnaces in that area use powdery agro-waste as fuel. They are inefficient, polluting and non-ergonomic. Over the years, the artisans have been improving these furnaces on their own for better performance but problems of inefficient fuel combustion, very high working temperatures around the furnace, discomfort in handling the tools, and health problems due to smoke and the working posture have been persistent. After the addition of a chimney to the furnace by Lupin foundation, an NGO, the smoke had been redirected away from the working area but other problems were still left unaddressed. The Rural Technology Action Group (RuTAG) IIT Delhi has taken the initiative for finding solutions to these issues. The furnace has been redesigned for higher efficiency and drastic reduction in smoke with the use of briquetted fuel on a grate, a compact combustion chamber and controlled air supply (Fig. 3). Foldable ground chairs have been provided for use by artisans considering the ergonomics of the operation (Fig. 4). Improvements in the tools have also been devised to reduce the discomfort in their handling (Fig. 5). It is hoped that the design improvements will help the villagers to have relatively comfortable ambiance and enhanced productivity. Besides, the development was presented in the "3rd International Conference on Creativity and Innovation at Grassroots", at Indian Institute of Management Ahmedabad held during January 19-22, 2015.

3. Facilitating the use of Fruwash Technology for Enhanced Shelf-life of Fruits and Vegetables

Project Investigator: Prof. H. M. Chawla, Chemistry Dept., IIT Delhi
Collaborative Agency: Swami Adganand Adyogik Prashikshan Sansthan (SAAPS), Gobar, Chouboli, Jagesharganj, Pratapgarh, Uttar Pradesh

Pratapgarh district in Uttar Pradesh is known for Amala (Indian Gooseberry) production in India. Amala fruit has a shorter shelf life (5-6 days) and is perishable. Farmers are forced to sell Amala at lower price because of storage limitations. The need to extend the shelf-life of Amala fruit was raised by the collaborative agency.

Prof. H. M. Chawala from Chemistry Dept. of IIT Delhi developed a bio-degradable emulsion made of completely natural elements, which when applied to fruits and vegetables, extends their shelf-life considerably while keeping their freshness intact even at room temperature. They named it Fruwash. With the application of Fruwash on Amala shelf-life could be increased from 5-6 days to 20-22 days. The efficacy of this technology has been amply demonstrated at various scales. Therefore, RuTAG IIT Delhi developed a small scale unit to facilitate the application of Fruwash on fruits and vegetables.

The CAD drawing and real machine is shown in Figs. 6 and 7, respectively. Fabricated machine was installed in Pratapgarh. A workshop was organized during December 23-25, 2014 to commission the newly fabricated machine for applying Fruwash and to give hands-on experience to farmers and traders in Pratapgarh.

4. Technology Standardization and Development of Testing-cum-training Facility for Ultra-micro Hydel Power Packages for Rural Areas

Project Investigator: Prof. P. M. V. Subbarao, Mechanical Engineering Dept., IIT Delhi

Ultra-micro hydro provides a huge potential for power generation from water streams spread across the country, especially in hilly regions. Recent thrust in the country to this sector has brought it into prominence. The focus also has been on innovation and capacity building. The need of having a testing cum training centre has been emphasized and hence this initiative for installing such a facility was conceived at IIT Delhi.

An artificial water fall of varying heads (heights) is the hallmark of this unit. This variability facilitates testing of turbine wheels of wide capacity and design in the ultra-micro range, and their operating performance can be evaluated. The unit has been flexibly designed for evaluating turbines of different heads and flows which otherwise would require numerous locations. The water flows back to a underground tank from which it is pumped again to the overhead tank of adjustable height creating the waterfall through a penstock channel. The water of the tank is perpetually used for the water fall.

A testing-cum-training facility for standardizing design of turbines (horizontal-axis, vertical-axis and PAT), along with loading and control package, is installed. The construction of underground tank, fabrication of overhead tank and stand were completed. Pumps, variable head tank, variable penstock, and horizontal axis turbine were also installed. The real system is shown Figs. 8 and 9.

5. A Device for Making Tulasi Mala Beads

Project Investigator: Prof. S. K. Saha, Mechanical Engineering Dept., IIT Delhi
Collaborative Agency: Lupin Human Welfare & Research Foundation, Bharatpur, Rajasthan

In the villages of Brij area of Rajasthan, some of the women are engaged in making beads from the stem or twigs of Tulasi plant for making mala (Garland) to earn their livelihood. A Bharatpur-based NGO, Lupin Human Welfare & Research Foundation organized such 400 women living in 18 villages of Bharatpur district into Self Help Groups (SHGs). They were using a wooden structure, in which a tailstock was fixed on the right side of the wooden base. A randomly selected DC motor connected to a 12 Volts DC battery was used in the device. The motor was held in the left hand for forward movement while turning and cutting of beads are performed using a tool in the right hand. A user sits on the ground, bends her body towards the device while working, which causes neck and back pain due to continuous bending of the body. Besides, to hold the DC motor along with the stem holder (Chuck) by hand and to stop the movement of the chuck for taking the bead out of the tailstock, the user had to press the chuck by her thumb and other fingers. This causes irritation. Besides, the productivity was low. The collaborative agency presented the problem to RuTAG IIT Delhi in a meeting and requested to address the problem and develop an improved device which could overcome the problems. RuTAG IIT Delhi studied the problems and developed an improved device for making beads for Tulasi Mala. Earlier the DC motor which was held by hand is now pushed forward and backward on a platform/guide. Users are very happy working on this improved device (Figs. 10 and 11). The users told that they operate this device even for about 12 hrs. a day without any tiredness and earn Rs. 1100-1200 per day. The earlier machine was giving only Rs. 300-400 per day.

The device was demonstrated in the Vatsalya Mela organised at Delhi Haat on November 15, 2012 by the Ministry of Women and Child Welfare and was highly appreciated. It was also demonstrated in National Fair-India Innovation Initiative, i3 2012 held on December 3, 2012 at Nalanda Ground, IIT Delhi. It was appreciated by the visitors. A village carpenter in Nadbai village of Bharatpur is manufacturing the improved device and selling at the price of Rs. 2500 per piece. The technology and its impact were reported by the newspaper The Hindu on September 7, 2013 (Fig. 12). Moreover, the development was presented in the "Indo-Dutch International Conference on Design for Sustainable Well-being and Empowerment" at IISc Bangalore during July 12-14, 2014. A paper out of this work was also accepted in the journal of Indian Academy of Science, Bangalore "Current Science."

6. Design of Treadle Pump using Solar Power

Project Investigator: Prof. Viresh Dutta, CES, IIT Delhi
Co-Project Investigators: Dr. Jitendra Khatait, Mechanical Engineering Dept., IIT Delhi
Collaborative Agency: International Development Enterprises in India (IDEI), Dwarka, New Delhi

Treadle pump is a foot-operated pump, which uses human power to draw water out of ground. These are particularly popular in areas where water level is not too low (around 10 meters or less). The need for solar operated treadle pumps was raised by the IDEI. This project is targeted towards the development of a suitable mechanism for the treadle pump so that it can be efficiently run using a solar power. One such prototype fabricated by the IDEI is under testing at Micro-model lab. at IIT Delhi (Fig. 13). The major work is to find out a motor which could meet the necessary torque requirement to draw the sufficient amount



Fig. 8 Ultra-micro hydel power package at IIT Delhi



Fig. 9 Overall view of Ultra-micro hydel power package



Fig. 10 CAD model of improved device for making Tulasi mala beads.



Fig. 11 Improved device for making Tulasi mala beads



Fig. 12 Coverage in The Hindu



Fig. 13 Solar operated treadle pump of IDEI

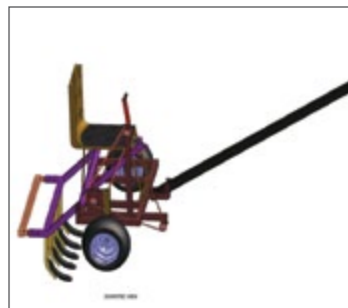


Fig. 14 CAD Model of BDT with lifting mechanism



Fig. 15 BDT with lifting mechanism



Fig. 16 Improved CAD model of the BDT



Fig. 17 Flour mill with ADGB



Fig. 18 Improved treadle pump installed at Micromodel lab.

of water from a depth of about 7 meters. The work also includes the designing of suitable transmission system to connect the driven shaft of motor to the pump plunger with minimum frictional losses in order to get the maximum efficiency of the system. The project will focus on the enhanced efficiency and economy.

7. Improving Design of a Bullock Driven Tractor (BDT)

Project Investigator: Prof. Ajit Kumar, IGNOU, New Delhi
Collaborative Agency: Social Centre for Rural Initiative and Advancement (SCRIA), Khori, Rewari, Haryana.

It is well known that animals are a holistic resource which must be promoted. In this context bullock driven tractor assumes an important significance because it reduces the increasing dependence on petroleum products. Tractor uses the draught power of animals. By Bullock Driven Tractor (BDT) it is implied to have a tilling device which is more efficient than the conventional plough. It also incorporates some of the features of the modern tractor such as providing comfort to the tiller etc. Presently, a number of BDT designs are available but no systematic evaluation has yet been done. Bharatiya Cattle Resource Development Foundation, New Delhi indicated a need to evaluate the design on BDT in a systematic and efficient manner. RuTAG IIT Delhi did a comparative study of three available models of BDT, in which it was found that none of them is suitable for the farmers. The basic problem was that the attachments could not be lifted without dismantling the BDT setup and it was quite difficult and painful for the animals to turn the BDT while the attachment is inside the soil. The huge torsional resistance to the attachment either break it in clay soil or the animals would give up. The objective of this project was to develop an improved prototype by overcoming the above-mentioned problems. To resolve this problem, a new design of a BDT was done with the lifting mechanism for the attachments. Three CAD designs were shortlisted out of which the one CAD model (Fig. 14) with lifting mechanism was selected for fabrication. The fabrication was completed and tested in Dahina village of Haryana State (Fig. 15). Few suggestions regarding the position of the lever of lifting mechanism and incorporation of a universal joint for the bullock and the tractor were made. A CAD model of the modified BDT (Fig. 16) will be fabricated and tested again in the Dahina village.

8. Evaluation and Standardization of Animal Driven Gear Box (ADGB) and Its Utilization in Multiple Rural Applications

Project Investigator: Prof. S. K. Saha, Mechanical Engineering. Dept., IIT Delhi
Collaborative Agency: M/s. Panchal Pumps and Systems, Kanpur

Animal power is a renewable source of energy and hence cheap for small farmers compared to other forms of environment polluting energy sources. Hence, in recent times, there has been growing interest in using bullocks for running several pre- and post-harvest operations in the villages. The concept behind the design and operation of this unit is not new or complicated. The design of an Animal Driven Gear Box (ADGB) was initially developed by M/s Panchal Pumps and Systems, Kanpur. Gear box was technically validated, improved, and standardized for use in the field through RuTAG IIT Delhi. The gear box was initially coupled with screw pump for fetching underground water. It was field tested for small farmers. Based on the successful use of the gear box in water pumping, it was felt that the same can be extended for the use in other applications as well, e.g., chaff cutting, paddy thrashing, oil expelling, grinding wheat, etc. Suitable designs of these application gadgets were identified from the market. These were appropriately modified for the present use. Trials were conducted with each prototype. Efforts were also made for simplifying the designs for cost reduction and user friendliness. Modifications were carried out in collaboration with the above said company who fabricated. RuTAG IIT Delhi provided technical guidance to the company. Figure 17 shows the flour mill fitted with ADGB.

9. Improved Design to Reduce Drudgery in Operation of the Human-operated Treadle Pump

Project Investigator: Prof. S. K. Saha, Mechanical Engineering Dept., IIT Delhi
Collaborative Agency: Gramodaya Rachnatmak Vikash Sansthan, Chariawaha Khas, Deoria, U.P.

Treadle pump is a foot operated device which uses the human power to generate the reciprocating motion of the piston by the use of a slider-crank mechanism to draw water out of the ground. These are presently being used by thousands of small and marginal farmers in various parts of eastern U.P., Bihar, Orissa and other places. The drudgery was the main problem and there is a need for improving the operation. Further, there was a problem of rapid wear of the piston washers. So, RuTAG IIT Delhi, first installed the existing pump in the Micromodel lab. of IIT Delhi for problem identification. After proper testing, an MS handle was fixed with the base of the pump to provide support to the operator's hand. An appropriate lever length was decided where the feet rest. Holes were made in the lever to make it adjustable. A pair of movable wooden pedals were attached for smooth operation. The cylinders were made using seamless pipe. Suction valves were fixed in the centre of the cylinder for smooth operation.

Bushes made of brass were also introduced in the holes of lever to avoid frequent replacement of lever. The washer was redesigned with tougher /stronger/more resilient rubber (NBR) which has lesser wearing component and a longer life. Improved model of the treadle pump is shown in Fig.18.

Regional Workshops Conducted

- a) Regional workshop was held on June 03-04, 2014 at Jashpur Nagar, Chhattisgarh with the help of Akhil Bhartiya Vanvasi Kalyan Ashram (ABVKA). The workshop was attended by 55 people from about 22 NGOs.
- b) Regional Workshop was held on November 06, 2014 at Jaipur, Rajasthan with the help of Indian Institute of Rural Development (IIRD). The program was attended by about 46 participants from about 21 NGOs, three faculty members, three Ph. D, three M. Tech., and twelve B. Tech. students from MNIT Jaipur.

Field Visits

1. Mr. Raj Kumar Gupta, Mr. Vamsi Aluru and Ashish Singh Bhandari visited village Karoli, Kanpur U.P. on March 28-29, 2014 to study the performance of atta chakki, chaff cutter and paddy thresher each driven by bullocks.
2. Prof. Ajit Kumar and Mr Mangal Sharma from RuTAG IIT Delhi visited Dahina village, Rewari, Haryana on April 29, 2014 for the testing of Bullock Driven Tractor.
3. Mr. Davinder Pal Singh, three M.Tech and four B.Tech students from RuTAG IIT Delhi visited Lupin Foundation and Welfare Association, Bharatpur during May 17-18, 2014 for studying in detail the Bangles making furnaces.
4. Mr. Davinder Pal Singh, two M.Tech and three B.Tech students from RuTAG IIT Delhi visited Firozabad, U.P. during July 18-19, 2014 for studying in detail of Bangles making furnaces.
5. Mr. Mangal Sharma from RuTAG IIT Delhi visited Swami Adgadanand Audyogik Prashikshan Sansthasn, Gobari, Pratapgarh, U.P. during Aug. 31-Sept. 02, 2014 for installation of Fruwash machine.
6. Prof. S. K. Saha, Dr. Jatindra Khatait, Major S. Chatterjee and Mr. Raj Kumar Gupta visited Innovative to Impact (I2I), village – Simar, Distt.–Khurda, a technology centre of International Development Enterprises (IDE) India at Bhubaneswar on October 28, 2014. Team observed the testing of treadle pump and interacted with the villagers. Team also visited Department of Farm Machinery Power (College of Agriculture Engineering & Technology), Bhubaneswar.
7. Mr. Davinder Pal Singh, Mr. Chandra Mohan, Mr. Mangal Sharma and Mr. Dharamveer visited Swami Adgadanand Audyogik Prashikshan Sansthasn, Gobari, Pratapgarh, U.P. during December 23-25, 2014 to commission the newly fabricated machine for Fruwash and to give hands on experience to framers and traders at Pratapgarh.

RuTAG IIT Delhi Club

To tell what RuTAG is and to develop interests in students of IIT Delhi for the rural technology, a new initiative has been taken by Prof. S. K. Saha. In regard to this, an orientation session was organised on September 5, 2014 to increase the awareness and students participation. Many mini projects and SURA projects were allotted to students. Also there have been monthly meetings to discuss the progress of various projects, their execution and other activities to be taken up by the RuTAG club members. The club aims to achieve a state where students can apply their knowledge and contribute to their nation with fun and joy.



Visit to a fort during Bharatpur trip



Taj Mahal during Firozabad trip



RuTAG club orientation on September 05, 2014



Conferences Attended and Publications

1. Mr. Vamsi Aluru, Saurabh Sahu, Ashish Singh Bhandari, Mr. Rajkumar Gupta and Subir Kumar Saha attended the 11th National conference on "Industrial Problem on Machines and Mechanisms" at ITS Engineering College Noida held during February 26-27 2014. Mr. Vamsi Aluru and Saurabh Sahu presented a paper on "Design Evaluation of an Animal Driven Prime Mover" authored by Ashish Singh Bhandari, Vamsi Aluru, Saurabh Sahu, Subir Kumar Saha, and Raj Kumar Gupta.
2. Prof. S. K. Saha and Raj Kumar Gupta attended the "Indo-Dutch International Conference on Design for Sustainable Well-being and Empowerment" at IISc Bangalore during July 12-14, 2014. Prof. Saha presented a paper on "Technical Interventions for the Empowerment of Rural Women: A Case study with the Manufacturing of Beads from Holy Basil (Tulasi)" authored by Raj Kumar Gupta, Mangal Sharma, Subir Kumar Saha, Rajendra Prasad, Rishi Raj Gaur, Jagpal Singh. The paper was accepted to appear in the special book on the compilation of presented papers.
3. Mr. Davinder Pal Singh attended the 3rd National Rural Management Symposium on "Rural Entrepreneurship and Enterprise for Inclusive Growth" at KIIT School of Rural Management, KIIT University, Bhubaneswar held on during November 20-21, 2014. Mr. Davinder Pal Singh presented a paper on "Technology Upgradation and Entrepreneurial Diffusion through Rural Technology Action Group (RuTAG) of IIT Delhi" authored by Davinder Pal Singh, Raj Kumar Gupta, Mangal Sharma, Sabyasachi Chatterjee, Subir Kumar Saha.
4. A paper on "Women Empowerment by Technology Supported Manufacturing of Beads from Holy Basil" was accepted in the journal "Current Science" on Dec. 2014. The journal is published by the Indian Academy of Science, Bangalore.

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RuTAG-IITD Core Group
 Prof. R.R. Gaur: Chairman
 Prof. S.K. Saha: Coordinator and Convener
 Prof. R. Prasad: Member
 Maj. S. Chatterjee: Member
 Prof. Satyawati Sharma: Member
 Prof. S. N. Naik: Member
 Prof. M.R. Ravi: Member
 Prof. V.K. Vijay: Member
 Dr. D. Raghunandan: Member
 Mr. Satpal Singh: Member
 All Principal Investigators (PI) of ongoing projects: Special Invitees

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