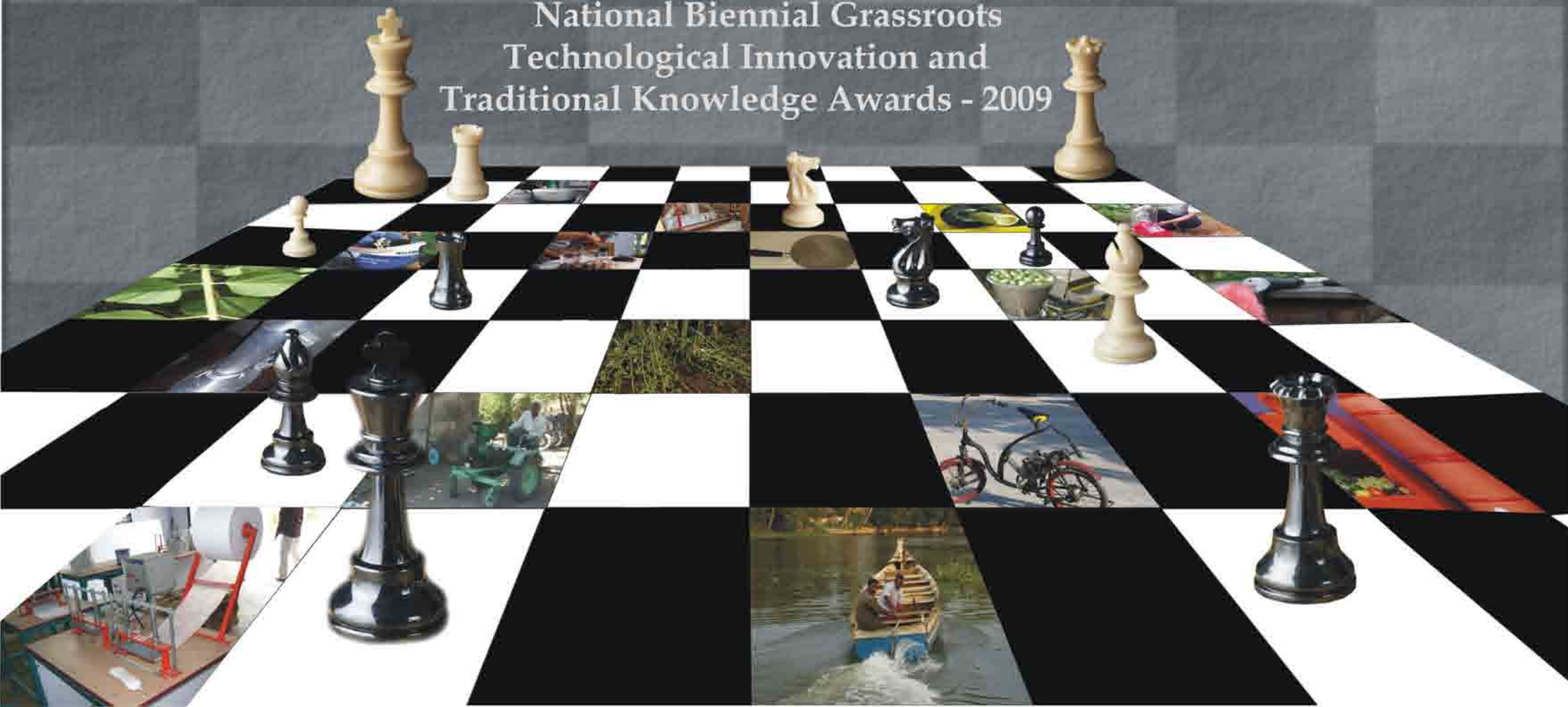
National Innovation Foundation

# 5th National Biennial Grassroots Technological Innovation and Traditional Knowledge Awards - 2009



## Fifth National Biennial Grassroots Technological Innovation and Traditional Knowledge Awards

**November 18-19, 2009**

Grassroots innovators are caught in a chessboard game. There are forces, which are determined to defeat them, deny them their knowledge rights. They are skillful, resourceful and know all the rules of the game. In fact, they make the rules. But the innovators win the world through their generosity. They are willing to share their knowledge, even when the formal institutions mostly keep their doors shut. Do they feel that in their defeat today, lie the seeds of their future victory.

NIF and Honey Bee Network are willing to stand by these pawns on the Chess board, will you too?

**National Innovation Foundation**
Bungalow No. 1, Satellite Complex,
Premchand Nagar Road,
Jodhpur Tekra, Satellite,
Ahmedabad - 380 015
Phone: +91 79 26732456, 26732095
Fax: +91 79 26731903
www.nifindia.org, info@nifindia.org

Making India Innovative...

**National Innovation Foundation**

# Index

**State Awards**

**Consolation Awards**

R. A. Mashelkar, F.R.S.
President, Global Research Alliance
Bhatnagar Fellow, National Chemical Laboratory
Former Director General, CSIR
Chairperson, NIF

# PREFACE

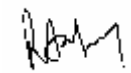
The fifth national campaign of NIF created a new benchmark in the field of knowledge economy. Nowhere in the world had any organization tried to map the mid of a civilizational society like India as had been attempted by NIF. It crossed the mark of 100,000 ideas, innovations and traditional practices from over 545 districts. It was an eloquent proof, if a proof indeed was needed, that masses in India are creative and communities and individuals possess tremendous knowledge that is worthy of being valorized. NIF showed that new ideas and knowledge emanate not only from national laboratories but from nation as a laboratory as well.

I do realize that the journey from mind to market is not going to be smooth. While NIF has licensed dozens of technologies in the last few years, a great deal remains to be done. Most of the innovations and traditional knowledge practices require enormous effort in terms of value addition and product development before these can stand the test of the market place. NIF has unfortunately suffered severe resource constraints. But, I admire the spirit of the volunteers of Honey Bee Network, who have contributed more than 90 per cent of the knowledge, innovation and practices in the database of NIF.

Being a custodian of so much of voluntary spirit, NIF is very different from many other organizations. It has continued to file patents, license technologies and diffuse innovations through social channels. The continuing research cooperation with Council of Scientific and Industrial Research (CSIR) and Indian Council of Medical Research (ICMR) is one of the most important building blocks of the grassroots innovation movement in the country.

I wish all the awardees a great success in future. I have no doubt that each one of them will continue to innovate and help others also to innovate.

I also compliment the communities, which have shared their traditional knowledge and reposed faith in the philosophy of NIF, which is committed to stand by with every knowledge rich, economically poor community.



(R.A.Mashelkar)

# INTRODUCTION

## The Chessboard of Creativity: Finding a Way Through

The life of a grassroots innovator is often like a pawn on the chessboard, easy to ignore but difficult to configure if the game has to be won. For long, the key players whether belonging to state or market and in some cases, even NGOs ignored the interests of the innovators. The traditional knowledge holders were approached primarily to access their knowledge without any attribution, acknowledgement, reciprocity or reward. Honey Bee Network evolved more than two decades ago to correct the asymmetry between the formal and the informal knowledge systems. Much before Convention on Biological Diversity (Earth Convention) and World Trade Organisation came on the scene to trigger discussion on the intellectual property rights or benefit sharing, the Honey Bee Network had begun to plough the lonely furrow in defense of knowledge rights of the people.

National Innovation Foundation (NIF) has ensured that the discourse on diverse strands of technological knowledge of traditional or contemporary origin in informal sector does not take place without recognizing the Honey Bee Network values. But we cannot say that the general norms in society have changed significantly. University Grants Commission and All India Council of Technology Education do not still require that every scholar who documents the knowledge of people does it after taking prior informed consent, shares her findings with the people in the local language, acknowledges the contribution by name and shares benefits if any commercial returns follow from documentation, publication or value addition. In that sense, much remains to be done. There is one more respect in which NIF has not achieved a great deal. While the database increased from 10,000 and odd ideas, innovations and traditional knowledge practices documented by the network in 2000 to 140,000 similar practices in 2009, the resources for adding value actually in real terms went down. The aspirations have gone up but the ability to meet them has gone down. This is a recipe for triggering frustration and disappointment. If in spite of limited direct benefits delivered by NIF, so many people continue to repose faith in the philosophy of Honey Bee Network and share their knowledge with the Foundation, it is because of the non-monetary benefits, social capital and the trust that available resources would be utilized most frugally but also fairly.

**Celebrating excellence**:

The 5th Grassroots Innovation Awards have been delayed because of unavoidable reasons. The distribution of awards is extremely widespread reflecting the diversity of knowledge system itself. As in the previous rounds, the entries which had promise were short listed for review. In the cases of herbal knowledge, the limitation of not having plant sample or scientific name meant taking into account only those practices where these could be organized. The ones documented during Shodh Yatra or through some of the collaborators qualified on this account. In case of innovations, the originality or cost effectiveness or social importance of the idea led to the decision about detailed documentation. In both the cases, after detailed documentation, prior art search was done to establish novelty and/or distinctiveness of the contribution. We did not take into account prior diffusion as a condition for selection. The reason is obvious. It is difficult enough to find a solution to a local problem without any outside help. It is even more difficult to diffuse it on one's own unless the pay off is immediate and very substantial. There are a few plant varieties developed by farmers, which have diffused very widely primarily on this account. But these are exceptions.

We consulted the institutional scientists as well as the previous awardees and other distinguished grassroots innovators to get their feedback on the short listed innovations and traditional knowledge practices. Simultaneously, we tried to get validation of the claims done to ascertain the true value of the innovation. In some cases, the results obtained may not be as rigorous as one would have liked (in terms of multi year, multi location trials). However, if the initial validation gave an indication of the promise, then the experts were consulted to find out their own assessment of the potential of technologies. The benchmarking of the technology with regard to available

solutions provided further evidence in favour or against the claims. Only after assuring ourselves of the validity of claims, did we consider them for awards. It may be added that full caution was exercised in the case of medicinal claim for human beings. In view of the available ethical guidelines, the medicine for human application would not be recognized till inclusive evidence about its legitimacy could be achieved. In the case of veterinary claims, reputed labs were requested to validate the technology using real life models. Wherever possible, on farm trials or user evaluation was also pursued.

Having decided to honour an innovator, the case for supporting further improvement or commercial or non-commercial diffusion gets automatically made. Except in those cases, where the award is given for uniqueness of the idea more than its applicability. One should not insist that only those ideas will be rewarded, which have immediate market potential. Otherwise, maverick ideas will never get traction. For instance, several people tried to use compressed air for running engine or a vehicle. This could be a clean technology just like electric cars (though pollution may be caused in the generation of electricity). Many of these ideas have not diffused. It does not diminish their relevance or importance slightest bit. Likewise, there are sustainable practices in agriculture, which may not diffuse due to massive subsidies and state infrastructure behind chemical technologies. However, having validated a claim, NIF would consider award as a means of giving a signal to society about futuristic grassroots-up solutions that should get support. So far, the policy and extension support for diffusion of green innovations has not been very significant. But the media and the markets have begun to show interest in these solutions. Central and State governments might follow in due course.

During the fifth round, the entries were received from all over the country as before (see Annexure 1 for state wise entries received). From Kerala, women members of Self Help groups were involved for scouting and documentation. Though a very large number of these entries were quite common in nature, yet, the fact that one block of a district could reveal so much of knowledge indicates is worth noting. If every self help group in the country devotes a day or a few hours in a month to just to map their local knowledge around any common problem or day to day activity, a knowledge revolution could come about which planners can not even imagine.

**What after award?**

Awards do not always make positive contribution. Sometimes, an innovator having been recognized for an idea may get disconnected with his roots or peers. In some cases, they may become over confident of their design and thus may not pay heed to the consumer feedback or suggestions from experts. Sometimes, they are not even willing to make a few pieces for market testing. They would only prefer that their technology should be either licensed for a very big amount or they should get a bulk order. Some of these expectations are not peculiar to grassroots innovators. Even among professionals, such cases can be found. But, among grassroots level innovators, disconnect from the peers may affect future evolution of ideas and innovations. The role of NIF and Honey Bee Network is to counsel the awardees and explain the harsh realities of real world. NIF also works with creative children. In their case, similar hazard can take place. The young kids may stop being curious or playful after getting too much recognition too early. In their case too, the counseling has to help in making them work harder to get their basics right and move on the path of bigger discoveries and innovations.

I must add that negative impacts are far fewer than the positive ones. In many cases, after having got awards, the licensing potential increases. The market seems to put more trust in such technologies and consumers are willing to try. Though in some cases, despite all the humility on the part of innovator, traction for the market does not come about. In such cases, innovators feel frustrated. And NIF can on its own do little. Many cycle-based innovations did not diffuse much because the cycle manufactures felt that market was quite good without these innovations. Why should they, then change? Shri Saidullah, whose video has inspired millions around the world, is one such innovator who NIF could not help much despite a considerable merit in his innovation. Several Eastern states have floods in a large part every year and this amphibious cycle could have been very useful in providing necessary help, distribute provisions, health and educational inputs but order for not a single cycle could be procured from any of those states. Innovator wonders then, particularly if some one is past seventy years, as in the present case.

The fact that awards help in creating new role models is incontrovertible. Fairer the awards are, greater is the respect for the values and the processes.

Fortunately for NIF, society has shown tremendous faith in its judgment so far. The scrutiny by media ensures that no flaw remains unnoticed. The potential for helping other innovators, not yet recognized also increases. Amrut Bhai Agrawat, a pioneering innovator of bullock driven implements and one of the oldest but committed members of Honey Bee Network helped in scouting dozens of other innovators. So have many others. Many innovators visit each other, write to each other, create a community or a knowledge network and thus start helping each other out. When some leading national newspapers started featuring innovators in regular weekly column, lot of people from around the country called them, some to congratulate, some to enquire, some to order and some just to share their own needs or ideas. Cultures of the country starts become a bit more appreciative of creativity at grassroots level. These awards also draw attention of scholars, policy makers and practitioners all around the world. Recognition by the Head of the State, that is President of India does make a statement about what importance India attaches to this potential for inclusive development. Honey Bee Newsletter has been used as teaching material in many universities worldwide and spread the information about these awards worldwide. President of a leading Chinese University is likely to visit Honey Bee Network next year. CHIN (China Innovation Network) has diffused this concept very vigorously in China. Awards have thus created waves internationally.

NASA (National Aeronautics and Space Administration) is launching a *Launcher Accelerator* for diffusing outstanding innovations from grassroots as well as high tech domains beginning with water based technologies. This will be launched at the time of next space mission in March 2010. Honey Bee Network's experience, insights and database are being drawn upon while founding this Launcher.

**Towards inclusive science:**

The response of the scientists has begun to improve in the last few years, thanks to the support from CSIR, ICMR, ICAR, SAUs, DST and DSIR. Many scientists and private entrepreneurs are coming forward to join hands. However, given the resource constraints, NIF is not able to engage as many of them as it needs to. Likewise, no product would really succeed in the market place without proper validation and value addition. A massive cultural revolution is called for. Every scientist in applied field will hopefully then take up at least thirty percent experiments based on people's knowledge. The value so added will create a new model of poverty alleviation, which will be entrepreneurial, knowledge intensive and competitive globally and collaborative locally because one may have to pool several practices for the same purpose to develop effective products.

NIF hopes that more and more scientists but also entrepreneurs, communication experts, designers and other stakeholders will join hands to alleviate the stress, reduce the transaction costs of the innovators and help develop affordable products and services.

Anil K Gupta
Executive Vice Chairperson
National Innovation Foundation
Professor, Indian Institute of Management, Ahmedabad

# ACKNOWLEDGEMENT

Last nine years have witnessed NIF making tremendous progress in its all its functional areas. The database of ideas, innovations and traditional knowledge maintained at NIF has crossed 140,000 mark. It has filed 220 patent applications in India, 07 patent applications in US and 01 under PCT. It has licensed over 50 technologies to small to medium level companies in India and received large numbers of requests from around the world for various products, either for technology transfer for exclusive/non-exclusive marketing/ manufacturing rights or for simple purchase of innovative products. Similarly, NIF has provided technical as well as financial support to the potential innovations for various incubation activities like prototype development, testing the innovation, design optimization and development of concept proof model. NIF's efforts for setting up a high risk fund dedicated to support grassroots innovation and traditional knowledge bore fruit when Micro Venture Innovation Fund (MVIF) was setup with the help of SIDBI in October 2003. Since its inception, a total of 143 projects have been sanctioned under MVIF, which are at different stages of incubation.

For the Fifth National Biennial Competition, which was held from January 1, 2005 to December 31, 2006, NIF received more than thirty seven thousand ideas, innovations and traditional knowledge practices from all over the country. Not all of these are unique or distinctive. Two Research Advisory Committees (RAC's), one comprising scientists from the formal sector and other one, the grassroots innovators, scrutinized the short listed entries for consideration of award. A dedicated and concerted effort was made by NIF, preceding the RAC meetings, to carefully short list the technologies based on different criteria of novelty, social utility, creativity and originality. NIF also facilitated the testing and validation of the promising technologies in top laboratories, research stations/labs and engineering colleges. We wish to thank all members of RAC for helping us adequately evaluate the entries. Special thanks are due to CSIR and ICMR laboratories, IIT Guwahati, BITS, Mesra, Ranchi, TERI, State Agricultural Universities and Research Stations, and other institutions which, proactively helped to test and validate different technologies.

Special thanks are due to our Honorary Senior Adviser and former CIO, NIF, Ms Riya Sinha Chokkakula, who with all her rich experience, provided insightful guidance to colleagues from time to time. Acknowledgements are due to, Dr O. P. Agarwal, Honorary Senior Adviser and Emeritus Scientist for his expert advices in various decision making processes of the organisation; Mr. Rajeev Karwal, Senior Adviser and Chairman, National Incubation Committee for overseeing the incubation activities of NIF and Dr. Manoj Haridas, Senior Adviser for spear heading the IP Management activities of NIF for the benefit of the grassroots innovators.

Much of the success NIF has achieved is due to relentless support put in by the Honey Bee Network collaborators, scouts and volunteers. I take this opportunity to thank Dr T.N. Prakash (Coordinator, Honey Bee Network), Mr. P. Vivekanandan, Brig. P. Ganesham, Dr. Balaram Sahu, Dr. Arun Chandan, Mrs. Anita Mahajan, Mr. Kamal Jeet, Mr. Ranjan Mahapatra, Mr. Ramesh Patel, Dr (Late) C. Sahasranam, Mr. Sundaram Verma, Fr. Hubby Mathew, Mr. Janmeja Singh Johl, Dr. Ranjay Singh, Mr. Ramjibhai Dabhi, Mr. Azhar Hussain Ansari, Mr. Zahoor Ahmed, Mr. Rajeev Ranjan Pandey etc. Thanks are also due to many of them for taking out regional issues of the Network newsletter and to the Honey Bee publication team. We express our sincere thanks to our Nodal officers who actively support our scouting and documentation activities in different states of India.

The teams of NIF, SRISTI and GIANs have to be specially acknowledged for their untiring efforts to promote the cause of the grassroots innovators and traditional knowledge holders, without which it was almost impossible to reach thus far.

We extend our deep appreciation to Mr. Ramesh Patel, Mr. R.P.S. Yadav, Mr. Mahesh Parmar, Mr. Purshottam Patel, Mr. Devshibhai Desai, Ms. Hemaben Patel, Ms. Alkaben Rawal, Ms. Aruna, Ms. Bhoomi Shah, Ms. Sumitra Patel, Ms. Daksha Makwana, Ms. Jayshree Patel, Ms. Nisha, Mr. Bala Mudaliar, Mr. R Baskaran, Mr. Unni Krishnan Nair, Mr. Shailendra Goraiya,

Ms. Anamika Dey, Ms. Meghal Choksi, Mr. Prateek Gautam, Mr. T. J. James, Mr. Lalmuanzuala Chinzah, Mr. Anil Pandey, Dr. Vikas Chandak, Dr. R. K. Ravikumar, Dr. Amit Singh, Mr. Rajasekar Tummala, Mr. Mahesh Parmar, Ms. Darshini Rawal, Mr. Mayank Bhavsar, Dr. Avni Bhatt Desai, Mr. Hiren Prajapati, Dr. B. Balaguru, Dr. Vivek Kumar, Dr. Sanjeeva Kumar, Mr. S. Rajasekar, Dr. Ashish Kanwal, Mr. S Pund, Mr. Rakesh Maheshwari, Mr. Kumar Vivek Shahi, Mr. Rajesh Patel, Ms. Hemangi Bodhankar, Mr. Hardik Dalwadi, Dr. Nidhish Bhardwaj, Dr. Nilesh Kumar, Mr. Raghuvirsingh Chauhan, Mr. Narendrabhai, Mr. Nilesh Jain, Ms. Deepamoni Tripathi, Ms. Shrida Amin, Ms. Kavita Sharma, Ms. Saswati Chandra, Ms. Sonali Barma, Dr. (Ms.) Debati Devi, Ms. Jigna Trivedi, Ms. Prachi Gupta, Ms. Ekta Srivastava, Mr Samiullah Mohd., Mr. Alok Gora, Mr. Manoranjan Kumar, Mr. Amaresh Sarkar, Mr. Arul Scaria, Mr. Siddharaju, Ms. Ajila, Mr. Abhilash Nambudiri, Mr. Vishnu Swaminathan, Dr. Hitendra Ram, Mr. Kunal Patel, Dr. Bina Sengar, Mr. Rajeev Verma, Mr. Ravindra Prajapati, Mr. Niranjan Prajapati, Dr. Falguni Sheth, Mr. Punit Gehlot, Ms. Sunita Malik, Mr. Utsav Patel, Mr. Durairajan, Ms. Sweta Jain, Mr. Pruthak Acharya, Dr. Amit Patel, Ms. Urvi Gupta, Ms. Sonali Pethani, Ms. Dhara Bhavsar. Ms. Kiran Rawat, Mr. Lalit Sati, Ms. Nita Patel, Ms. Lata Iyer, Mr. Dayashankar, Mr. Laxman Thokore, Ms. Surbhi Khandelwal, Mr. Nadim, Mr. Mahendra Maderna, Mr. Gaurav Soni, Dr. Nitin Maurya, Mr. Maheshbhai Patel, Ms. Ranjan Patel, Mr. Himanshu Patel, Mr. Ruchit Mehta, Mr. Jigar Parmar, Mr. Neeraj Verma, Mr. Rajeev Singhal, Mr. Rajeev Sharma, Mr. Vishnu Mathur, Mr. Piyush Sharma, Mr. Sandeep Sharma, Dr. Natabar Hemam, Mr. Kishore Kalita, Mr. Sudeep Mishra and Mr. Manish Saxena.

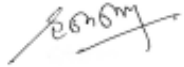
Thanks are due to many individuals who, though not associated directly with NIF spared their precious time for the cause of the grassroots movement. I would like to mention the contribution of Mr. V Nagarajan, Dr. Sanjeev Saxeena, Mr. Osama Manzar, Dr. Gautam Barua and Dr. Buragohain, current and former Director, IIT, Guwahati respectively, Dr. Anil D. Sahasrabudhe, Dy. Director, IIT, Guwahati, Dr. A. K. Gogoi, Dr. A. K. Das, Design department, IIT, Guwahati and many others have helped significantly.

We are indebted to our Governing Council members who always supported our recommendations, provided guidance from time to time and bestowed highest faith in us.

We also acknowledge the support from DST, TePP, TIFAC, ICMR, CSIR, DSIR, BSI, NBRI, IIT, Guwahati, IIMA, KAU, Planning Commission, Rural Development department, Rajasthan government and Gujarat government.

The support from the Director, Faculty and administration of Indian Institute of Management, Ahmedabad has been most invaluable in more ways than we can actually describe. Support to the Honey Bee Network, NIF, GIAN, and various policy and institutional initiatives of NIF has always been available unstintingly. Prof Samir Barua, Director, IIMA deserves our highest appreciation for continuing support to NIF and the Network. There are few academic institutions, which would have supported a grassroots innovation movement in this manner ever before anywhere in the world.

Last but not the least, I also wish to thank all the innovators, traditional knowledge holders, and local communities who reposed faith in NIF by sharing their technologies. I would also like to assure them that NIF would strive to support their creative aspiration in the best possible manner always. I wish the award winners all the very best.



Vipin Kumar
CIO (Acting)
National Innovation Foundation

# Governing Council Members

**Dr R A Mashelkar**
Chairperson, NIF
President, Global Research Alliance
Former DG, CSIR, Govt. of India
Bhatnagar Fellow, National Chemical Laboratory, Pune- 411 008

**Prof Anil K Gupta**
Executive Vice Chairperson, NIF
Indian Institute of Management,
Vastrapur, Ahmedabad - 380 015

**Ms Elaben Bhatt**
Founder,
Self-Employed Women Association
SEWA Reception Centre, Opp Victoria Garden,Bhadra, Ahmedabad 380 001

**Dr Vijay Kelkar**
Chairman, 13th Finance Commission
Hindustan Times House, Fourth Floor
Kasturba Gandhi Marg, New Delhi 110 001

**Mr K P Pandian**
Financial Advisor,
Ministry of Science & Technology,
New Mehrauli Road, New Delhi - 110 016

**Prof Inderjit Khanna**
I. A. S. (Retd.)
Chairperson, GIAN-North A-241,
Shivanand Marg
Malviya Nagar, Jaipur - 302 017

**Prof Kuldeep Mathur**
Retired Professor
B - 083, Belvedere Park, DLF City,
Phase - III Gurgaon - 122 002

**Mr D Rajgopalan**
Chief Secretary, Government of Gujarat, Sachivalaya, Block no : 1, 3rd floor
Gandhinagar - 382 010

**Dr Mangala Rai**
Director General
ICAR, Krishi Bhavan, Dr. Rajendra Prasad Road, New Delhi - 110 001

**Dr T Ramasami**
Secretary
Dept. of Science & Technology,
Ministry of Science & Technology,
Technology Bhawan, New Mehrauli Road, New Delhi 110 016

**Prof Ashok Jhunjhunwala**
The Telecom and Computer Networking Group, Department of Electrical Engineering,
Indian Institute of Technology Madras
Chennai- 600036

**Prof Samir Barua**
Director, Indian Institute of Management
Vastrapur, Ahmedabad - 380 015

**Finance Secretary**
Ministry of Finance,
Government of India,
New Delhi 110 001

**Ms Ranjana Kumar**
Vigilance Commissioner
Central Vigilance Commission,
Satarkata Bhawan,
GPO Complex, Block A,
INA, New Delhi - 110 023

**Mr R Gopalakrishnan**
Executive Director
Tata Sons, Bombay House,
24, Homi Mody Street, Fort,
Mumbai 400 001

**Chief Innovation Officer**
National Innovation Foundation
Bungalow No 1, Satellite Complex
Premchandnagar Road, Satellite
Ahmedabad – 380 015

*The Award Winners*

# Ribbed Tawa and Others

## Posthumous Award

**Late Ravjibhai Savaliya**
Ahmedabad, Gujarat

***Huun avvi shodh karva icchu chhun jethi karodo loko ni mushkeli pati jaye***[1]

"I want to innovate some thing of a quality, which could solve problems of millions of people."

Late Ravjibhai Savaliya (61 years at the time of his demise) was a prolific innovator. Through his innovations, he had proved that his intellect was quite ahead of time. From buttermilk churning machine to ribbed *tawa*; from the foot pump to an efficient firewood crematorium on the lines of electrical furnace, his innovations have addressed the problems of the commons.

**A life, a lifetime achievement**

Born on 1st June 1946 at village Babapur, to Madhabhai and Javalben, he was fourth among eight siblings and was gifted to be the most innovative one. As a small boy, he often stared at the new electronic toys in the

village exhibitions and thought of making them himself one day. He brought recognition to his school, Sarvodaya, by participating in various Science fairs. A particular incident in 1958, actually gave the prelude to the series of innovations he developed consequently. When a new water pump was installed in his village, the engineers were not able to start it. They were pondering over the problem, a villager insisted that Ravjibhai, only 12-year old then, should be allowed to tinker with the machine. With all the apprehensions, he was allowed, and to everyone's surprise, he made it work! Such was the genius of his mind and the streak of creativity was subconsciously showing its luminescence even then. Although a bright student, he could not pursue higher studies as his family could not afford his school fee of 50 paisa. However, his teachers Gunubhai Purohit and Hasuben, recognizing his aptitude towards science and his potential to innovate, sent him to Mumbai to do a vocational course at ITI. His stay in Mumbai was not very happy as he was prone to illness. But with the support of Gunubhai's family he could convalesce and finish his studies.

In 1966, he returned to his village Babapur with the dream of setting up a laboratory, which he did, in due course of time, so that his mechanical innovations could minimize hardships of the villagers. He often explained the working of the farm and water machineries to the folks around while he helped his father in his farms. Solving their day-to-day problems, technical problems in their equipments, he also addressed the science behind them. His mind was churning restlessly on several aspects of these issues and he started working ceaselessly in his own small lab at the village. His efforts were based on trial error and constructive innovation, but unfortunately, none of them were leading to any concrete formation of the object of utility. This not only taxed him mentally but physically as well and he fell ill. For the medical treatment he came to Ahmedabad in 1968. He stayed with his uncle's family. His cousin Ramjibhai Nakrani, also his best friend, became now his ardent follower. The duo kept on conducting all their erratic experiments together. In about six months' time, when he recovered fully, he became an assistant in an electric supply store with a monthly salary of Rs. 60/-. Simultaneously, both the friends also started a small workshop of their own at Bapunagar near his home in Ahmedabad where both the friends used to experiment on various issues, which Ravjibhai was pursuing during his stay at village Babapur.

In 1971, after getting married to Triveniben, Ravjibhai started an electrical shop. His wife became a strong link in the new chain of struggles. The electrical shop had to be closed as there was not much profit. Ravjibhai innovated his first 'social-appliance' *Chaas Valona Yantra* (Buttermilk Churning Machine) in 1972. The response to his first innovation was an outright rejection. Triveniben Savaliya narrated teary eyed, how those were the most difficult days. Ravjibhai had drained all his resources and had huge loans to be repaid. He had asked his wife to pack the bags to return to the village. But his uncle encouraged them to stay back. He sold his ancestral land to help Ravjibhai start afresh. Later, the Buttermilk Churning Machine was improved upon and in 1974 he developed a commercially suitable design. But selling an electrical gadget to replace the age-old wooden butter churner was tougher than all his previous struggles. The traditional churner was integral to the cultural set up of the state. All types of stories preceded its sales. People said that women could die of electrocution; some said that buttermilk from it was poisonous. Slowly, patience and consistent communication with the villagers started bearing results and the product started getting popularity.

Triveniben shared an incident of how once there was an order of 15 machines from a village near Surat and all the money that Ravjibhai had, went into manufacturing those machines. There was not enough money to even hire a tempo to go to the village. He along with his cousin Babubhai hitched a lift in a tempo that was going in the same direction, to deliver the machines. With no money they were dropped outside the village. They carried the machines on their head and walked through two feet deep silt to sell them. With determination, integrity and commitment Ravjibhai made some money and restarted his workshop. The buttermilk churning machine soon became a household object and people started calling him 'Ravjibhai Valonavala'. In 1977, the Savaliya Research Centre (SRC) was started along with his brother Babubhai. This gave the impetus to his vision of rendering social service. He always tried to find the scientific answers to the daily chores

and problems. And all his thoughts led to a single question, “Will this be useful for the society and available at an affordable cost?”

**Perception of the problem**

Ravjibhai noticed that a lot of heat was wasted in the conventional pan for making chapattis. He tried to look for the reasons and inferred it was because of the material of the griddle (*tava*). Iron was the material used, which is known to have a less thermal conductivity. Moreover the shape of the griddle was such that it guided the flames to the outer edge. He thought of a material, which will have a better thermal efficiency. And also thought of ways in which he could increase the surface area of contact so that the flames could be harnessed to their maximum efficiency.

**Ribbed energy efficient griddle (hot plate)**

The innovation is a griddle made of aluminum alloy with concentric ribs at the bottom.

The change in material and configuration leads to the saving of a significant amount of energy as compared to the flat iron griddle. The thermal efficiency of ribbed aluminium *tavas* was found to be 1.09 per cent more than the plain aluminum *tavas* and 7-8 per cent more than the traditional iron *tavas* as per the report of Indian Institute of Petroleum, Dehradun. This testing was facilitated by GIAN/ NIF. They further suggested varying the thickness and size of the *tava* and the spacing of the concentric ribs at the bottom for design optimization. Mumbai University Institute of Chemical Technology (UICT) also tested the same and confirmed the advantage.

The presence of the ribs increases the area of contact between the flames and the pan surface *i.e.* the surface area, which leads to better heat utilization. This griddle having 5 mm thickness ensures lateral conduction of heat as well. The prior art[2] discloses a variety of utensils for such cooking however, ribbed bottom utensil for cooking could not be found. Ravjibhai also got the Design Registration Certificate for the same.

In traditional griddles, the handle is riveted to the main plate, whether iron or aluminium. With use, due to the regular contraction and expansion, the handle and pan joint becomes loose. This sometimes makes the griddle dangerous to use as it may turn in the hand. Ravjibhai solved this problem by using a spring loaded bolt. He screwed the handle to the pan using this. Whenever the handle gets loose, it can be tightened using a screw driver. But this incorporation increased the cost of the product. Then much work was done to improve the riveting so that the handle also does not get loose with time and at the same time cost also does not escalate.

Thousands of these ribbed bottom *tavas* have been sold to satisfied customers in Gujarat and other parts of India and even abroad.

**A Social Innovator**

As Mahesh Patel from GIAN recollects, Ravjibhai was an innovator for the working class and all his innovations were aimed at reducing drudgery. These were centered on the problems faced by the villagers and hard working people. Through sheer self-learning he built his knowledge base of renewable energy - wind, water, aerodynamics and pressure. Energy conservation was also his passion and a frequent trigger for innovation. His innovations are as follows:

**Butter Milk Churning Machine (1974):** It reduced the time and drudgery in churning buttermilk by hands. The rural women who would sleep late doing household chores and get up early to churn the butter, got relatively free using this machine.

**Wheat Thresher (1974-76)**: This thresher reportedly saved 80 per cent energy as compared to the old models.

**Foot Pump (1984)**: Looking at the problem faced by the people in filling the air in the tyres, Ravjibhai innovated a foot pump, which made pumping air in the tyres easier. He was awarded by the then President of India, Giani Zail Singh for this innovation.

**Electrical Furnace Type Wood Based Crematorium (1991):** This furnace saved wood significantly. Gujarat Energy Development Association (GEDA) subsidized it and it is now widely used. Crematorium designed by him has sufficient air flow for better aeration from all three sides (bottom and two side walls) so that there is proper burning of wood.

**Water Harvesting Methods (1998)**: To recharge the ground water, Ravjibhai developed low-cost techniques for water harvesting. He even got a tank of one lakh liter capacity built for the same purpose in his house.

**Electrical Burner (1999):** Using this, the diamond industry has been saving power worth Rs 12 crore every year.

**Diamond Polishing Lathe (2001):** Used in diamond industry, this lathe replaced old machines, and saved energy up to 90 megawatt, equal to a small power station.


**Artificial Rain (2003):** He conducted artificial rain experiments in Kutch, Saurashtra and Mumbai. In his "Cloud Seeding" experiment he sprinkled the Silver Iodide (AgI3) on the burning coal. Instead of copying expensive experiments of Israel, he devised the economical method of dispersing the silver iodide on the coal.

**Agate Grinding Mill (2006):** This machine has helped thousands of workers who used to suffer with fatal silicosis disease in the Agate (*akik* - a type of chalcedonic quartz that has irregular or curved bands of color.) industry, in the Khambat region of Gujarat, famous for the gems industry. While polishing the gems, the workers used to inhale the dust of the stones, causing silicosis, which proved fatal in many cases. The Agate Grinding Mill has a vacuum pump that pulls the dust in the opposite direction.

**Permanent Magnet Direct Current (PMDC) Motor:** A brushless motor, as its name suggests, is a motor without brushes, slip rings or mechanical commutater, such as are required in conventional D.C. motors. Outer Rotor Brushless P.M.D.C. looms motor is believed to have high efficiency, which minimizes the electricity bills, besides bringing down the fabric cost. It gives much higher torque than other devices, which is a prior requirement for power loom. It does not heat up much and hence the need for lubrication, replacement of ball bearings, windings, and maintenance cost, etc., is reduced. The outer rotor also works as cooling fan.

Domestic floor mill (1990), oil free compressor (2005), battery bicycle, water generated engine, wind mill, etc., dental compressor for dentists, fuel-efficient I.C. engine with self regulated water injection system are all the other translations of his innovations.

Diamond polishing lathe brought SRC in close association with GIAN and National Innovation and since then several of his innovations have been consistently supported financially, value added and assisted business development as well. Another major project of Ravjibhai was farmers' wind mill; this innovation was meant to utilise the wind power as per the suitability of Indian farmers. Unfortunately, many of his innovation could not see the light of the day as he departed to heavenly abode on 6th June 2007. His absence has a strong jolt on SRC. His wife Triveni Savalia, recalled him as a loving father and a devout family man, who never disowned himself from

his family responsibilities inspite of his professional liabilities. She also said that he always motivated children to have scientific aptitude for learning new skills and for the cause personally used to visit schools and invited them to visit SRC. He was a voracious reader and curious to learn more about science and astronomy.

**A Philanthropic Rationalist**

Ravjibhai used to call himself "a mere matric fail". But as his family narrates, he was always studying, finding solutions and innovating. Einstein and Thomas Edison were his idols. Making the students aware of the world of science used to be his priority. He visited schools to give lectures and spot financially weak, but intelligent students and helped them. Garnering knowledge and spreading it were the most important endeavors of his life. His wife told how he would get up in the middle of the night and call up his 11-year old grandson to answer his query, after a whole day of searching in the Science encyclopedias.

GIAN remembered him as an ardent supporter of grassroots innovators. He would help them through his knowledge and resources. Inspite being an innovator himself, interaction with other grassroots innovators also gave him much inspiration and motivation. He also advocated policy changes in favor of the innovators. For an open bidding for his technology organized by state government, he wrote to the Chief Minister and the concerned Secretary demanding that there should not be any open bidding without legal permission from the innovator.

**Rebuilding Traditions: Gold for medals, not for dowry**

He was always a torch bearer to dispel the darkness of the ineffectual traditions. Instead of giving loads of gold (as is the tradition in the Patel society) to daughter Kirti in marriage, he got medals made of it and instituted awards and scholarships for poor but intelligent students. Though an atheist, he had read lot of religious books of Jainism, Buddhism, Christianity and Hinduism. He would laugh away astrological predictions related to birth and auspicious occasions, saying actual birth time is biological not physical. How could our recitation of hymns affect the crores of planets in the void space with no atmosphere above five miles from the earth? According to him our actions determine our good and bad, not the movement of the planets or silent corners (*vaastu*) of the house. His daughter-in-law informs that there is no worshipping of idols or incense burning at their home. His family did not perform any traditional rituals after his death on June 7, 2007. That is the way Ravjibhai lived and inspired others also.

Ravjibhai used to call himself Eklavya, the epical Mahabharata hero who pursued training in archery, in spite of lack of resources and rendered his most important art to his teacher as obeisance. This modern Eklavya gave to the society much more than he received. His last wish to construct a 'Science Temple' still remains a dream. His son Vinay Savaliya told that the concept of Science Temple was to attract millions of people, who would visit temples, not Science Museums. He wanted to keep at least 1000 prototypes of his inspiration, Thomas Edison there.

---

[1] The memorial movie on Lt. Ravjibhai Savalia by Nagendra Vijay, Senior Editor of magazine Safari (in Gujarati language), 2007.

[2] Use of aluminum for cookware is well known in art some of the results can be seen at http://www.prestigesmartkitchen.com/cookware-non-stick-cookware-omega-select.aspx ,http://www.nirlep.com, ,WO2004/019742 - March 11, 2004, US patent 4768427 (Sep 6, 1988) has disclosed use of fins in the cookware but that are in the internal surface and for the purpose of preventing food stuff from adhering.

# Laxmi *Asu* Making Machine

**National First**
Mechanical and Electronics

**C Mallesham**
Nalgonda, Andhra Pradesh

Before weaving various patterns on the loom, a hand winding process of yarn is required in the traditional 'Tie & Dye' Pochampalli silk saree tradition. This is a very tedious and cumbersome process and involves two and fro moving of the hand thousands of time in a span of four-five hours. Mallesham (37), a traditional weaver, has made a device to mechanize this process and relieve women, who generally do this task, from the drudgery involved.

**Learning early:** Chintakindi Mallesham was born in a traditional weaver's family in a small village of handloom weavers, Sharjipet. His parents, Laxminaraan and Laxmi taught him to weaving from his tenth year onwards. By studying during nights and working during the day, he could complete his studies regularly till class seventh. Thereafter he took private tuitions to fulfill his desire of completing class tenth, which he could clear only after three attempts. But in view of weak financial condition of his family, he finally gave up studies in 1986. Though he did not have much time for other pursuits, he did like opening up dysfunctional radios and transistors and see the arrangement of components inside.

**Keeping a tradition alive**

His family has been pursuing the tradition of weaving Pochampalli saris for several generations. Pochampalli[1] silk sari is an exquisite tradition of double *ikat* style of weaving with a wide variety of colours and intricate designs of geometrical patterns. It is distinguished because it has similar appearance of design on the front as well as the back side of sari. Before weaving these patterns on loom, hand winding process of yarn has to be pursued, called *Asu*. This process involves moving hand, over a space of one meter up and down around semi-circularly arranged pegs, 9000 times for one sari, demanding high concentration and accuracy. On each peg one has to wind four times before moving to the next peg. For each sari almost four to five hours are required. Entire design on the saris is totally dependent on the *Asu* process. Traditionally, ladies of the family performed this activity as it was done sitting under the shade or at home. But it involved long hours and lot of physical effort. After the *Asu* process, designs are marked on the threads and tied suitably, and then dyed in selected colours. The coloured threads are wound on spindles and used in looms for weaving sari, incorporating the beautiful designs and patterns of this tradition.

**Genesis: All for mother's pain**

His mother, Laxmi, used to do the *Asu* for the saris woven by his father and him. In a day, at the maximum, she could do the *Asu* for two saris only, as it involved 18000 *to* and *fro* movements of one hand. This caused tremendous pain in her shoulders and elbow joints. She would often tell her son that she could not do this any more. She also did not want his would be wife to go through the same ordeal and suggested him to look for other avenues. For untrained and less educated Mallesham, it was not easy. Also, doing *Asu* just for two saris per day was not enough to fetch sufficient income. This was not the case with his family alone. Women of his community looked after family, performed usual household chores and also worked for 8-9 hours to supply *Asu* material for two to three saris per day for eking out a precarious living. Working on the loom was not too strenuous for him, but the pain of his mother did bother him a great deal. He wondered if there could be an alternative method for *Asu* that would mean a better living condition as well as less physical drudgery for his mother. If there is a power loom to replace manual loom, why can not there be a mechanical device to alleviate his mother's pain? This thought became the genesis of the *Asu* Machine. And at the age of 20 years, in 1992, this young innovator started his dream project.

**Earning, Saving, Improving Machine, Again Earning...**

Mallesham, did not have much knowledge about mechanical or electrical technology. But what he had was a strong desire to relieve his mother's pain, which egged him on to achieve his goal. He started working on the idea and divided the entire process into five different parts. Part by part, he developed and fitted mechanical devices to a wooden frame. Since he did not have the right technical knowledge many times he ended up wasting money in buying incorrect parts. That money used to be the savings of days of his hard work. He then had to wait for some time to pool in his savings again and buy more parts. He did not get much free time since he had to work on loom by the day and on the *Asu* machine in the night. Earning, saving, spending on his project, became a cycle that went on for four years. At the age of 24, he married Swarna. His wife supported him by giving him whatever money she had. With that money, he managed to complete three parts successfully in 1997. But by then he had drained all his resources. He stopped weaving and looked for loans.

**Perseverance**

No one was ready to give him loans. Everyone knew that he might default at repayment. As it is, it was difficult for most of the weavers to make two ends meet, repaying a loan for R and D would have been quite difficult for him to pay. Determined, he approached all the people with the hope that some good hearted Samaritan might help him financially. Some did help by

extending loans. With that money some more parts of the *Asu* machine were completed. He used to go to Hyderabad to shop for relevant components. By observing different machines parts, he managed to complete some more portions of the machine successfully. After sometime he reached a stage where he did not know what to do, which components to fit and from where to get more money. He needed some technological help also but did not know whom to approach.

By then, his family was fed up with his desire of making a machine for the *Asu* process. They perceived it to be a useless distraction. His father, uncle and in-laws advised him not to pursue the idea of the *Asu* machine and get back to weaving seriously. Frequent visits of money lenders demanding repayment, also stressed the family. His neighbours mocked at him commenting that he did not want to work and making the machine was just an alibi. "*Asu poyadamlo kastalu oka mee ammake unnaya*? (Is your mother alone going through this ordeal and not any other woman?" they quipped.

He decided to leave the village to make a living in Hyderabad. This way, he thought he would be able to clear the debts and avoid constant discouragement. Packing the semi-finished machine in a room, he went to Hyderabad in mid 1997 and started working with an electrical contractor on daily wages. There he worked for a year, regularly sending home some money. After a year, he shifted the unfinished machine to Hyderabad and fitted it in his rented room. He started working part time to earn more money. The additional money was used for buying machine components. Within a short while, it was almost ready except for one movement. He reached a blind alley where he had no idea about which part to use in the machine for a particular activity that involved the thread to go round the peg and slide down to the last thread perfectly. This action was taking a long time in becoming functional in the machine.

**The Breakthrough**

In Feb 1999, he went to work in a machine shop in Balanagar area in Secunderabad. A number of machines caught his attention. He started observing each one of them. The owner shouted that he had come for work and not for watching the machines. This incited him to watch the various machines even more seriously. In one, he noticed a movement similar to what he required in his machine. Immediately he told the shop owner that he was off for the day and was prepared to forego the wages. He rushed to a workshop, and got a component manufactured to suit the requirement. With his heart palpitating, he reached his room, fitted the component to the machine, and started the operation. The machine worked to his great excitement. Next day he disassembled the machine and took it to a friend's house in Aler. The machine was reassembled and Mallesham demonstrated the *Asu* process. His friend used the *Asu* machine processed yarn for weaving a sari. The quality that came out was better than the one obtained through hand operated *Asu* process. The news spread like wild fire and there was a beeline at his friend's house to see the *Asu* machine.

History was made that day. It was for the first time that a machine was used for *Asu* process, which was done by hands for centuries.

The first machine, made in 1999, was mounted on a wooden frame. Next year, in the second machine, the same was changed to steel, also the speed of operation was marginally increased, a provision for stopping the machine when the thread got cut was incorporated in addition to some other minor improvements. This was the first machine to be sold. This was followed by sale of sixty machines in 2001 followed by the sale of almost hundred pieces each year from 2002 to 2004. In order to improve the automation process many electronic components were incorporated by him in 2005. The number of threads on each peg could also now be adjusted. These changes resulted in almost 90 per cent noise reduction. The revised design also helped reduce electricity consumption. Considering the fact that most weavers would not be able to afford the new machine, Mallesham took special care to incorporate such changes which did not escalate the cost.. He has sold over three hundred such machines over the last few years.

Using this machine, the time to finish one sari has reduced from four hours to one hour and thirty minutes. This means that instead of two saris per day, now six saris could be made and that too in a wide variety of designs, which was not possible earlier. Also, the mechanized *Asu* making process need not be supervised much.

**A Social and Financial Revolution**

Overwhelmed by the response of the weaver community, he decided to pass on the comfort to all the women of weaver community. No mother would undergo the suffering like his mother did, for so long. With the help of his brother and other family members he started a workshop in 2000 to produce the *Asu* machines for supplying these to the weavers. He was now a contented man as his machine helped a wide cross section of weaver community involved in Pochampalli silk sari tradition. Employment, productivity and marketability have visibly increased. Separate work centers for only *Asu* have come up especially by those who could not afford a loom. Ladies who were hitherto engaged in manual *Asu* process have now learnt to weave on looms like men. They have been able to supplement their family income. Some loom-less weavers have set up '*Asu* Machine Center' only and started supplying *Asu* to weavers with looms. This is a new opportunity, only possible with Mallesham's machine. For those weavers who wanted to stop weaving due to the difficulty in manual *Asu* process, he has become a ray of hope. His mother can't stop praising him.

**Support and recognition**

A prominent local news paper "Eenadu" covered his story in 2001. A demonstration was also organised in Bangalore in 2002, which was covered by the Times of India in its local edition. Subsequently, Maa TV, a local telugu TV also channel covered his innovation in the same year. Recognising the utility of the *Asu* machine, in 2001, an international aid agency in Bangalore provided a grant of Rs 1.5 lakh for the purchase of a lathe machine and a milling machine besides Rs 1 lakh given as working capital to start the manufacturing of *Asu* machines for supply to the weavers.

For the last two years, Honey Bee network in Andhra Pradesh has been actively supporting his endeavours. Thanks to their efforts, Silk board was persuaded to give subsidy and State Bank of Hyderabad agreed to finance the buyers of this machine. His machine has been demonstrated before the students and faculty of Mallareddy Institution, who also felicitated him. His story has been published in both English and Telugu in Honey Bee and *Palle Srujna* newsletters respectively.

In October 2008, Mallesham was felicitated in a Workshop at Osmania University Engineering College, Hyderabad. His machine was named "Laxmi *Asu* Machine" after her mother and dedicated to her. The machine is in the process of being patented. When invited to the Inventors of India workshop, November 2008 at IIM Ahmedabad, Mallesham's story inspired all the participants no less. The possibility of introducing his machine for different weaving styles in other parts of India is also being explored. He also participated in the "*My Story.*" session of TIE Conference in Bangalore in December 2008. This was followed by his participation in the FAB 5: *The Fifth International Fab Lab Forum and Symposium on Digital Fabrication*

meet organized by MIT, Boston, NIF, IIT Kanpur, and CoEP, at Pune in August 2009, which was attended by over a hundred participants from India and abroad. He has also developed a machine for wire winding for gelatin rods used in mining exploration.

**The road ahead**

Till date Mallesham has sold over 600 *Asu* machines. His mother does not complain of pain in her arms any more. And Mallesham's happiness is beyond measure noticing the relieved faces of the women of the weaving community. But he is not satisfied yet! His first aim is to provide *Asu* machine to all the families of silk sari weaving community in the state. He then plans to develop a loom for weaving sarees, which would do away with the need to use hand and legs for operating the loom. He has already developed a small prototype. He mentions that most of the younger generation is keeping away from weaving due to the very strenuous leg and hand work required for working on the looms. It involves 3000 movements of legs and similar number of hand movements per sari, over a period of 2-3 days. Because of this many weavers are switching over to other jobs, which require less physical work. Mallesham has almost completed a machine, which imitates the manual movements of hands and legs to weave a sari. Another tryst with destiny probably!

---

[1]*Pochampalli sari got geographical indications certification (GI) a few years back making its copying outside its region illegal. The saris of this tradition are woven by over 30000 families residing in 3000 villages of Nalgonda and Warangal districts of Andhra Pradesh with about 90 per cent of them being located in Nalgonda itself.*

# Mini sanitary napkin making machine

**National Second**
Mechanical and Electronics

**A Muruganantham**
Coimbatore, Tamil Nadu

Sanitary napkin, a universally needed product, has a very low penetration in India due to the high price and the tradition of using cheaper but unhygienic old cloth pieces. The innovator has developed an assembly of low cost and portable machines that produce quality sanitary napkins at a low cost. It requires four persons to produce two pads per minute. This machine produces sanitary pads @ Re.1 to Rs. 1.50 per pad approximately. The innovator has also improvised a vending machine that can dispense single pads with the insertion of a coin.

**Background**

Muruganantham (47) hails from Pudur in Coimbatore, Tamil Nadu. When he was young, he lost his father, Mr. S. Arunachalam, in a road accident. His mother, Mrs. A. Vanitha, who was a housewife, had to work as a farm worker to support the family. Around this time, he discontinued his studies after SSLC to earn a living and help his family financially. During his formative years in school, he displayed a keen interest in science and astronomy. His science teacher encouraged him to experiment and give

birth to new ideas. He had participated in a school science exhibition and won an award for a chicken incubator that he had developed. Most of his classmates came from neighboring farms. He spent a lot of time visiting the farms, learning about farm implements and also tried his hand at modifying and repairing them.

For over three decades, he faced economic hardships while trying his hand at various trades to support his family. He worked in various capacities; as a part time technician at Lakshmi Machine Works, Coimbatore, machine operator, insurance agent, farm laborer and yarn selling agent. Currently, he runs his firm, Jayashree industries, which he has built from scratch centered around commercializing his innovation- the mini sanitary napkin machine.

**Genesis of innovation**

Once the innovator noticed his wife going to the toilet with an old cloth. On his enquiry, she said it was not an issue related to the concern of men. He surmised that she was using the old cloth as a substitute of sanitary napkin. When asked as to why she was not using a regular sanitary napkin her answer was a revelation to him. She said that if all the female members of the family were to buy sanitary napkins, then they would have to cut down on the family budget for milk every month.

This response from his wife was an eye-opener for the innovator. He realised that, like his wife, millions of women in the country do not buy sanitary napkins because they simply cannot afford them. He decided to develop low cost sanitary napkins that could be used by all sections of society. Initially, he worked with cotton but could not get the desired result. He then got the commercially available napkins tested in a laboratory and found out that they use wood fiber. He realised that the wood fiber was good not only in securely draining the fluids but also in retaining the shape of the pad. He then procured the raw material from Mumbai that came in the form of sheets and boards.

Next, he set about developing his own de-fibering unit to process the raw material in desired sizes and shapes. Having succeeded in this, he developed the machines for subsequent stages to do the core forming and sealing of napkins. Muruganantham developed the final assembly of machines in 2004. He distributed the first set of samples among his neighbors to get their feedbacks. He got encouraging inputs on its efficacy. Subsequently, he improved on the machine by adding the UV sterilization unit, calibration for various pad sizes and increased the production rate to target 1000 pads per day.

After seeing the ATM in cities, dispensing cash to the customers as required, the innovator decided to build a sanitary napkin dispenser (vending machine) with a coin slot that could be set up in hospitals, colleges and public places to supply napkins on demand. The vending machine was developed in 2008 and has a capacity of 25 pads.

**Product details**

The semi-automatic mini sanitary napkin making assembly deploys four stages to produce the finished sanitary napkins. The main raw materials used for making sanitary napkin in this machine include wood fiber; thermo bonded non-woven, polyethylene – barrier film, release paper, super bond paste & LLDPE 50 GSM – packing cover.

In the first stage, the raw material in the form of wood fiber is taken into a de-fiberation unit (36'' x 24"x 30"). The raw material is cut up by 4 blades, fitted on a disc at the bottom of a conical vessel, to deliver de-fiberated wood pulp with a filament length of 1 to 1.5 mm. The unit is powered by a 1 HP single-phase motor rotating at 10,000 RPM to deliver the cutting action and deliver soft pulp at the rate of 150 gm per minute.

The second stage involves compressing the de-fibered pulp to the required shape of the napkin. This is done using a core-forming unit (24" x 24" x 30"), operated by a foot pedal. The mould or core block is made of food grade aluminum and facilitates making two kinds of sanitary napkin pads; one with a variable density and the other with constant or equal density. The variable density pads have more density of material at the bottom for better absorption.

The third stage involves sealing the pads in the napkin-finishing machine (36" x 30"x 30"), where they are wrapped with non-woven fabrics such as polypropylene and sealed. The operator uses the foot pedal to power the unit and seal the pads in three sides. The unit is rated at 40 Watts and seals about 4-10 napkins per minute using a cam operated limit switch, which facilitates fast heating and cooling within two seconds per stroke.

The fourth stage involves passing the sealed pads through a dedicated Sterilization unit. The sterilization can be achieved either by manually exposing the pads to the UV lamp or by batch-type sterilization unit. The sterilization units consist of a closed container with UV lamps. In the UV chamber, sealed pads are sterilized by exposing them for 10 seconds. The UV sterilization is achieved by using short wave Germicidal Erasing Lamps with specific wavelengths between 240 - 280 nanometers with a peak wavelength of 265 nanometers. Once the sterilization is complete, the pads are ready for the finishing operations consisting of trimming, position strip fixing, packing and dispatch. The machine can produce over 900 sanitary napkin pads per day @ 4 napkins per minute. It needs a maximum of three people to operate the three main production stages. The rate of production can be enhanced using two core-forming dies. In India expensive imported machines costing over twenty five lakh rupees are used in manufacturing. This makes the price of the product beyond the reach of women in middle class and lower income group.

**Product application and dispersion**

This machine heralds a new revolution in personal hygiene, for women across all sections of society, while creating potential perennial revenue stream for small scale entrepreneurs, and self help groups by deploying a self sustaining micro-enterprise model. With this machine slowly gaining national recognition, many self help groups, corporates and organizations such as M S Swaminathan Research Foundation, All India Woman's Conference, DATA, Malabar Hospital, Community Center-AAI Delhi, Mandal Mahila Samkiya and Sammilana have placed orders for this machine. Local entrepreneurs and SHGs have launched the low cost pads in various trade names (EASY FEEL, FREE STYLE, STYLE FREE, FEEL FREE and BE FREE). These products are available in the local market at an affordable cost range of Rs 13 for a set of 8 pads and Rs 15 for a set of 10 pads.

With the support from the Micro Venture Innovation Fund (MVIF) at NIF, the innovator has been able to install over eighty units in thirteen states across the country. He has received support from other sources as well.

# Bamboo processing machine (Arulepsa)

**National Third**
Mechanical and Electronics

**Imli Toshi Namo**
Mokokchung, Nagaland

Toshi always had a keen interest in machineries and automobiles, which led him to develop many of his innovations. He has developed a Bamboo processing machinery/lathe for the removal of nodes and outer surface. Using bamboo powder, a by product of this machine, he developed a composite material, which he used in further developing a small electric hydro generator and a low-cost bamboo wall.

**Background**

Imli Toshi (28) is a serial innovator originally hailing from Mokokchung in Nagaland. Having remained unemployed after completing BSc (Geology) in 2002, he started trying his hand at innovating new products that may show him and other unemployed youth avenues for employment.

Many of his innovations are the result of his observation and heightened awareness. In 2003 for washing his family car, he needed water from a water fall by the roadside which was located some distance away from road level. He decided to install a pump in the water channel itself to pump

the water to road level. Unlike conventional pumps, this zero head energy pump is placed axially in the direction of flow in river to capture the energy from flowing water. Axial momentum of water is harnessed to drive the centrifugal pump vanes and generate power. This innovative pump was awarded by NIF during the third National Biennial competition. NIF has extended Toshi financial assistance under MVIF and Value Addition, and Research and Development from time to time.

**Genesis of innovation**

While more than 50% of the bamboo species and 66% of stock out of about 80.42 million tonnes (GOI, 2001) occurs in North-East India, there were very few technologies to add value to Bamboo, say for furniture. In Nagaland, bamboo based furniture is often made by local carpenters using inadequate hand tools. Lack of dedicated machines at affordable cost has stymied the efforts of the local woodworker. Even removing the hard green covering on the bamboo has remained a challenge for many users.

Having worked extensively with bamboo, Imli Toshi recognized the need to build a user friendly machine that would handle the sequence of tasks. When the design idea first crystallized in his mind, he built a simple prototype. Next, he approached NIF NE Cell for funding and submitted the proposal and drawings.

The prototype named as *Arulepsa* was developed with the help of National Mission on bamboo Application (NMBA) funding and NIF support. It was capable of processing bamboo, remove the outer knots, smoothen the surface, while enabling wood carving and final surface finishing of the job.

While taking trials of his *Arulepsa*, Toshi noticed that there was a lot of bamboo dust/powder produced as waste material. Having an innovative temperament he made a composite material by mixing this powder with locally available resin and made a portable hydro generator combining the design of his earlier zero head water turbine and a Chinese made hydro generator.

**Innovation**

The dedicated bamboo processing machine is an integrated unit that can remove knots, do the planing and polishing of the surface and facilitate inner and outer contouring of the job.

Precision control is achieved with a soft touch, four-way joystick linked to a robust electro-mechanical control logic kernel. The machine has overall size of 4x2x12 ft and weighs 75 kg. It is electrically operated using a 1 HP motor running on 230 V AC supply to drive a spindle at the range of 40 to 90 RPM. It has been built with dedicated and independent sub-systems including the two stage planer, the bamboo feeder assembly, the self adjusting gripper assembly and two sets of fixtures for inner and outer contouring (carving).

The Planer assembly is the heart of machine and consists of a two-stage planer unit. The first stage achieves removal of the outer green covering and knots and the second stage makes the surface smooth. Prior art mentions machines for removing the outer green layer and knots of bamboo. Prior art has also disclosed individual machines for multipurpose and cross cutting, parallel splitting and sizing of bamboo.

Universally, complete woodworking on bamboo needs an assortment of machines such as Four Side Planer, Sanding machine, Finger jointing machine, Double End Cutting and Shaping Machine and Stick Sizing machine for making the stick in the desired size. Separate machines have also been used for internal and external knot removal, slicing the bamboo

for making slivers, and making the square bamboo sticks and a tool post accessory fitment for polishing them.

The highlight of Imli Toshi's equipment lies in using a single versatile wood processing platform that facilitates seamless removal of knots, planing, polishing and carving of bamboo. The precision in work is achieved by deploying the dedicated control center and a user friendly four way joystick.

For his hydro generator made out of the composite material, first, he developed a lightweight yet strong composite material using bamboo and resins. The constituents were bonded by pressure and heat. He used this material to design the components of a hydroger. Field trials were done using this hydroger in a small stream. A 20 feet long, 8 inch dia. feed pipe was fitted to the inlet channel of the hydroger. When the water flow hits the impeller, it rotates and the change of flux in the field coil induces the desired current. The arrangement of the magnets and the field coil was configured to produce 1 kW of electricity.

**Portfolio of innovations**

His product portfolio includes an innovative egg boiler, a hot water filter, and bamboo strip making machine for agarbatti sticks , an incense stick making machine and a weed uprooting device for hilly regions.

One unit of the Bamboo processing machinery/lathe has been purchased by the Nagaland Bamboo Mission. Five units of his bamboo strip making machine for agarbatti sticks were also purchased by the Garo Hills unit of the North East Region Community Resource Management Project. This was facilitated by NIF. Incorporating several iterations and improvements, his novel machines have broken new ground in design, utility, elegance and social relevance.

# Onion Transplanter

**National Second**
Farm Machinery and Food Processing Technologies

**Pandharinath Sarjerao More**
Ahmednagar, Maharashtra

Scout: G M Bhise/ Late Ramesh Mahajan

The task of transplanting onion seedlings manually is time consuming, labour intensive and toilsome process. PS More (66), a farmer and an innovator, has developed an affordable, semi-automatic transplanter for timely sowing of onion seedlings. He has also laid no restriction for anyone to copy and use his technology, and in fact wants the technology to diffuse widely for the betterment of the farmers.

Pandharinath has 33 acres of irrigated land in his village, Sangavi Bhusar where he grows sapodilla, guava, gooseberry, drumstick, sweet lime and mango. Few years back he grew sugarcane, soybean, wheat and onion but 2006 onwards, he switched over completely to horticulture. His village, with rich farmlands, is located on the banks of the river Godavari and is about 45 km from Shirdi. The area is rich in black soil and agriculture is the mainstay of the people.

His father, late Sarjerao More, was a trader of farm implements and had an agency in partnership dealing in Caterpillar farm machines. Pandharinath,

the youngest among five siblings, graduated in arts from Fergusson College in Pune. During this period, he developed a keen acumen in mathematics and physical sciences, which helped him later in his analytical approach leading to refined innovations.

He was keen to pursue his MA, but his father asked him to return and take charge of the farm. In 1967, he married Meeradevi. He has two sons and one daughter. Both his sons have completed their respective diplomas in Mechanical engineering and Printing technology, and now assist him in the farm. His daughter, a state hockey champion, discontinued her diploma in engineering and is married to a chemical engineer posted at Ahmednagar.

Over the last five decades, Pandharinath has donned hats in multiple areas. He has developed solutions in the field of farm implements, agricultural machinery, electrical systems, horticulture, low-cost housing, rainwater harvesting and water conditioning systems.

**Genesis of innovation**

In the year 2000, Pandharinath, on a pilgrimage to Pandharpur, was sitting devotedly and listening to *bhajans* (devotional songs). A line in a *bhajan* by Saint Tukaram *meant" paras also cannot make gold without touching iron"* struck in his mind. This line moved him a lot and he resolved to use his skills to improve the lives of fellow farmers.

Many of his subsequent innovations including the onion transplanter were born as a result of this resolution. Farmers in south Maharashtra cultivate onion as a cash crop during the Rabi season from October to January. This is done by transplanting 8 to 10 weeks old seedlings. Transplanting is one of the most labor intensive operations in onion cultivation. When pencil-thick, onion seedlings are transplanted as soon as possible in permanent, slightly raised, precision-leveled "panels" in the field, and watered regularly after bulbing.

Pandharinath observed the scarcity of skilled farm workers in the planting season. Even when adequate farm hands were found, lot of expense was incurred in bringing them from their villages to the farm every day. As for quality harvest, accurate row and plant spacing and handling transplants without damage was required, he decided to build a device to mechanize the sowing of onions.

He failed in his initial attempts to make a fully automatic version. The problem lied in separating, picking up and dropping individual seedlings. However, on 14th January, an idea clicked his mind and everything else fell into place. He did not sleep for the next four days as he burnt the midnight oil, building and iterating the parts. Surviving a major mishap when a cutter wheel flew off while testing and struck his chest, he continued unabated. As the sun pierced the wintry dawn on 19th January 2005, Pandharinath stepped out of his workshop. He asked his wife to prepare *pakodas*…it was time to celebrate.

Spending a month on various configurations, he was finally able to build a semi-automatic working model in 43 days at a cost of Rs 18,000. About his experience he says, "*Chetanwadi dimaag mein jad bhi bolne lagti hai,pyaaz ka paudha bhi mere se bolne laga tha...*" (Even inert things communicate to aware minds, the onion plants were talking to me…).

**Innovation**

Pandharinath's onion transplanter is a tractor drawn semi- automatic unit. It can perform three functions at a time *viz.* transplanting the onion, applying the fertilizer and making the irrigation channels.

The unit assembly consists of a cultivator frame, fertilizer box, fertilizer conveying tubes, trays for keeping the seedlings, two ground wheels, furrow openers, chutes to deliver the seedlings and seating arrangement for up to four people.

The working width of the equipment is 4.5 ft with 8 furrow openers. The weight of empty machine is 3 ton. The additional fertilizer drilling arrangement weighs 0.5 tons. The machine needs rotavator operation prior to the planting operation.


It can be retrofitted to tractors in the 22-35 HP range using a three point linkage system. When the tractor moves forward, the star wheel type metering mechanism gets the drive to release the fertilizer in the tubes. On the field when starting, the speed of operation is kept at 1-1.5 kmph. The seedlings are delivered manually in the delivery chutes for planting. The inter-row and inter-plant spacing can be adjusted in the machine to a finer level. The row to row distance of 7 inches and plant to plant distance of 3.5 inches can be maintained using this machine, whereas conventional methods usually achieve a distance of 9 inches and 4-5 inches, respectively. Two depth controlling wheels fitted on either ends of the equipment maintain the uniform depth of onion planting, which is kept at 1 cm.

In the conventional method of planting, it is very difficult to maintain straight rows, which is a barrier in mechanical weeding. However, this machine facilitates the mechanical weeding thereby reducing the cost of weeding. It can cover one hectare per day (2.5 acre/day) using a driver and four workers.

This is superior to the coverage of 0.05 hectare per day achieved in conventional methods using the same number of people. At Rs 1000 per hectare, this machine achieves a cost savings of 80 per cent in transplantation cost in his region.

Also, in the conventional method of onion planting, roughly 1, 70,000 to 1, 90,000 seedlings per acre are transplanted using 40 people whereas 2, 25,000 seedlings per acre can be transplanted using this machine. Using this machine, owing to the uniform furrow and spacing, mechanical harvesting of onion becomes easier once transplanting has been done. . This also results in uniform bulb size, which fetches a good price in market.

The machine eliminates the inaccuracy, drudgery, low yield and high labor costs of manual planting and can also be used to sow seeds of cereals and pulses.

There are various types of seed transplanters available *viz.* disc type furrow openers (US 4622906), mechanical planters with spot planting mechanism through spot holes (US 4807543), runner type furrow opener (US 3108551), mechanical seedling transplanter with electronic controlled system (US 5823126), mechanical transplanter with roto-till or mini-mulcher unit in dual row arrangements (US 060308) and a few others.

However it was found that most available semi-automatic or automatic transplanters are equipped with disc type press wheels and or wedge shaped runner type furrow openers, well suited for the raised bed cultivation. The advantage with this machine is its unique design of blunt nose furrow opener for planting with fertilizer dispensing arrangement. Moreover, it is a dedicated vegetable transplanter for onion seedlings, with controls on row, plant spacing and depth with 100 per cent utilization without damaging the onion bulb while planting.

**The open source model**

More made one transplanter for himself and thereafter declared the technology as open source for people/firms to manufacture/sell as per the

requirements. Though Pandhurinath did not want a patent for this machine, NIF filed a patent in More's name in 2008 to keep the legal rights with him. However, no restriction in the copy and use of the technology has ever been implied. Some manufacturers in nearby Pune and Nashik apart from some in Ahmednagar have been manufacturing and selling the transplanter to customers. On an average, the Onion transplanter costs Rs. 30,000 with a fertilizer drill and Rs 18,000 without it.

Users' feedbacks indicate that the machine has bettered their profit margins and improved their savings. Some users also give the transplanter on rent on per acre or per day basis. Onion is the most important crop among various alliums grown in India and occupies an area of 3, 20,000 hectares. The total production is 3.35 million tons with an average yield of 10.5 tons per hectare. There has been a steady increase in area and production of onions in the last decade. India exported 4,16,000 tons of onion valued at Rs. 1630.6 million, which accounted for about 75 per cent of total foreign exchange earning among fresh vegetables. Thus, there appears to be a huge potential for this machine. While some customers do not use the fertilizer drilling feature, the performance of the machine has been appreciated by farmers as well as professionals from Directorate of Agriculture, Govt. of Maharashtra and National Research Centre for Onion and Garlic, Rajgurunagar, Pune.

**Journey of innovations spanning decades**

More started early. Once, while in third standard, he spent hours observing a craftsman make a duplicate key at his home. When he went out for lunch, he quickly took up the tools and fashioned a duplicate key of his room. This incident not only generated confidence in him but also incited him to look around and learn.

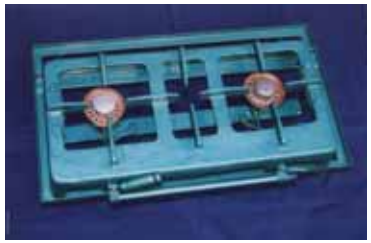
Learning by experience in his farm, by 1968, he had mastered many trades. He was an expert in motor winding, modifying tractor and bullock operated implements, and delivering engines and threshers with enhanced performance. He also started developing metallic farm implements that were more durable than wooden implements prone to wear and tear.

The next year, in 1969, he developed an improved bullock operated seed drill. It was an automatic model with a dedicated orifice type metering system and 4 furrow openers. It was also 40 kg lighter than the then existing conventional machine developed by Rauri Vidyapeeth. The seed drill changed Pandharinath's life in many ways. The Chairman of the local sugar factory saw the efficacy of this drill and asked his father to open a workshop for him. On 10th Feb 1970, his father opened a workshop for him so that he could continue his research and development.

In the next five years, he made and sold over 1000 seed drills in Maharashtra. But the very success and dispersion of the seed drill caused a few issues. By the year 1975, he faced the twin threats of product saturation and a spate of copycats who did a poor job of even copying his designs. He also lost his workshop in a family separation case. As a result of which the production and sale of the seed drill stopped after its successful golden run.

In 1990's he worked on the rain water harvesting concept and improvised it. In 2003, he made a biomass digestion plant. Same year he also developed an automatic water pump controller and a water conditioner. The water pump controller is based on the principle of float and can automatically switch on/off a pump. It is a very simple design and can be made by any one having preliminary knowledge of electrical. It took him three years to develop the water conditioner, which can treat the highly alkaline water in a village. This technology is customized as per the soil and water type. It integrates three facets of water conditioning. This includes a venturi like geometry combined with magnetic and catalytic methods. He used a mix of 16 ingredients (powder of semi-precious components) to condition the water. Educated farmers who could measure and monitor the soil chemistry were given access to this technology by him. He has sold a few hundred pieces in Maharashtra and some even in Chennai, Kanpur, Hyderbad, Goa and a few places in Gujarat. This water conditioner can be used for domestic as well as agricultural purposes.

He also developed an improved biogas stove, having a new nozzle design fabricated in copper instead of CI and fitted with a modified burner. The unit



manages to separate hydrogen sulphide and moisture from the gas. It has been claimed to have increased the efficiency by over 50 per cent.

His trail of innovations over four decades has resulted in receiving many awards. The then Speaker of Lok Sabha and Kulpati Dhyaneshwar University of Pune felicitated him in May, 2003 for his contribution to agriculture. He also won the *Baliraja Jagrit Vachak Patra Puraskar* in 2005 and awards during Sevar Falotsav from 2004 to 2007. He was awarded the *Pragatisheel Krishak Samman* by the Indian Society of Agriculture in 2007 and *Lekhan Puraskar* by Baliraja Marathi Vaigyanik Parishad for Krishi Sansodhan in the same year. Recently, he was awarded the '*Krishi Bhushan Samman*' by Maharashtra Government in July 2009 for the water conditioner, onion transplanter and other innovations. He has also been well covered by local and national print and electronic media. ETV, ZEE Maharashtra and DD National and news papers such as Sakal and Times of India have have featured his innovations.

"*Ye to bhagwan ki di huvi bhent hai, aur bhagwan to kabhi apni vastu par patent leta nahi, to fir unki gift par patent kyun? Ye to sabki pahunch main hona chahiye*"

(The knowledge I have is a gift from God. God never get his knowledge patented. Why should I get patent over his gift, let this knowledge be accessible to all)

While many villagers do not share his altruistic approaches, they have great regards for the quality and relevance of his innovations. At the age of sixty-six, Pandharinath leads a pious, active and disciplined life. Waking up much before dawn at 3.30 am, he absorbs himself for three hours in *puja* before walking six kilometers to work. He, in his own way, has imbibed the hoary *Bhakti* traditions of Maharashtra. He is an ardent devotee of Saint Gyaneswar Maharaj and this has shaped his values and social approaches. Using an open source model, he has allowed free access to the general public and manufacturers to build and sell his innovations. He mentions the following to answer skeptics who find it hard to believe his open source approach.

## Pomegranate de-seeder, arecanut peeler, bamboo splitting machine and others

**National Third**
Farm Machinery and Food Processing Technologies

**Uddhab Bharali**
North Lakhimpur, Assam

Uddhab Bharali (45) is a serial innovator who has designed and prototyped an entire range of mechanical innovations since his first innovation in 1987. He has innovated around eighty-five engineering devices for different purposes. Out of these thirteen have found commercial applications, albeit most being individual custom orders from different parts of the country. As of today, he has set up a research workshop in his idyllic hometown of N Lakhimpur. It is a small town, on the banks of the Brahmaputra river and in the foothills of the Himalayas, surrounded by lush tea gardens on gentle slopes. He has set up a workshop to help local communities and industries solve their technological needs.

**Background**

Born in a middle class family in North Lakhimpur District of Assam, Uddhab completed his schooling from Lakhimpur. After that his interest in making machines prompted him to take admission in the Jorhat Engineering College. Unfortunately he had to leave the course after three months because of the recurrent problems due to Assam Agitation. He then thought of doing the

same course via correspondence and took admission in the Institute of Engineers-India Madras chapter, in Chennai. Unfortunately, this time also he could not complete the course and only had time to complete the AMIE Sec-a due to the sudden death of his father. He was called back as his family was neck-deep in debts. However, he used his flair for developing machines to repay his father's debts by starting a polythene film making industry in 1988 to cater to the demand from the surrounding tea estates. Instead of buying the "Polythene Making Machine", which then costed around four Lakh rupees, he designed and developed the same machine at a cost of only sixty seven thousand rupees. The success of this machine gave Bharali the confidence to develop more machines. After repaying his father's debts, in 1995, Uddhab Bharali got a contract for looking after the machineries used in a hydropower project in Arunachal Pradesh at a place near the China Border, where people usually didn't prefer to work. After three years he had to come back to his hometown due to the death of his elder brother due to liver sclerosis.

At present, Bharali's extended family comprises his wife and a five year-old son, his widowed mother, widowed sister-in-law, three young sisters and a younger brother. Bharali, a positive thinking person, also plans to get his widowed sister-in-law married as, according to him, everyone has the right to live his or her life to the full content of his/her heart. Besides innovating new machines, Bharali likes to read books on medicine and also has an informal degree in Homeopathy.

**The innovations**

Since he first developed the Polythene making machine in 1988, Bharali has developed a number of machines, which he considers as his main assets that have and will always help in his time of need. Some of these machines are:

**Pomegranate De-seeder:** It separates the outer cover and thin inner membrane without damaging the seeds. It has a capacity of deseeding 50-55 kg of pomegranate fruits per hour. The machine has been exported to Turkey and USA.

**Arecanut Peeler:** Annoyed by the injuries caused while peeling the areca nuts manually, he developed an areca nut peeling machine with a capacity of peeling 100-120 nuts per minute.

**Cassava peeler:** It is a portable electric machine that can process up to five kg of cassava per minute. NIF facilitated the technology licensing on non-exclusive basis to a Guwahati based entrepreneur. One unit has even been sold to a customer based in Kenya.

**Bamboo processing machines:** Bamboo processing by hand is a time consuming and difficult process. Bharali has developed an assembly of machines that can perform operations like splitting long lengths of bamboo, sizing, surface finishing, polishing etc. These units have been installed with the help of NIF in a CFC (Common Facility Centre) of the NERCRMP (North Eastern Region Community Resource Management Project) at North Cachar hills.

Bharali has also developed *remi* recortication machine, garlic peeling machine, tobacco leaf cutter, paddy thresher, cane stripping machine, brass utensil polishing machine, safed musli peeling machine, Jatropha de-seeder, mechanized weeding machine, passion fruit juice extractor, trench digger, chopper for cattle and fisheries feed and portable *dheki*.

For many of his innovations, the innovator was supported under the Micro Venture Innovation Fund scheme (MVIF) at NIF. Facilitated by NIF, the innovator was also supported from the TePP scheme at DSIR, Govt. of India.

**Product application and dispersion**

Apart from having his innovations like the pomegranate-deseeding machine being sold to customers in countries like Turkey and USA, Uddhab has had a lot of distinction to his name.

Presently, he has been made a Resource Scholar by the Indian Institute of Entrepreneurship in their recent venture "Technology intervention in academic Education". Uddhab received a mention in MIT Journal for his innovation of the pomegranate-deseeding machine. He is also acting as a technical consultant to RUTAG (Rural Technology Action Group) for the development of *Endi* technology in IIT, Guwahati. Central Silk board has also sought his help to redesign a sophisticated version of *Muga* reeling machine. He has also designed a stevia pulveriser & passion fruit gel extractor for NERCRMP (North Eastern Region Community Resource Management Project). Financial institutions like NEDFI also want his skill with a proposal for developing bamboo *tarja bera* making machine. On request from several NGOs of the NE region he has also come up with several low cost manual bamboo craft machineries. In April 2009 he came up with a root-slicing machine for ASHRAMS Biotech Pvt Ltd, an herbal medicinal farm in West Bengal.

**Strategy and Vision**

Uddhab is of the view that every human being has a hidden scientific inclination, which requires nurturing. He thus selects youths having potential for learning, irrespective of their academic qualifications. He selects eight youths per batch and trains them on various machine technologies. The training is imparted for a period of three months on a condition that each trainee has to be able to draw at least INR 800/- as salary per month from him to be qualified as a skilled workman. He provides food and lodging completely free. In addition to free food and lodging he also pays a stipend of INR 300 per month to meet their pocket expenses. He provides free medicine to each trainee and his or her family members as an incentive to create a pull for other potential youths for training. He conceived the idea of costless word-of-mouth marketing of his training program since he cannot afford any marketing budget.

Uddhab says that his greatest achievement and contribution to mankind would be the successful commissioning of a mechanized toilet for the handicapped. He hopes to accomplish this by the end of October 2008.

Uddhab has two dreams; one is to set up an unconventional orphanage in his hometown, which will produce technical experts. He has designed the training module in such a way that he will devote time in empowering these orphans only in technical know-how so that they become employable in the least amount of time. Once they start earning money, they will be able to acquire knowledge on other important subjects like history, mathematics, sociology etc.

His second dream is that of an industrial village which will have a multi-specialty skill development centre as well as a common facility where each person can bring in raw materials and get the intermediate product as per requirement. He also wants to enable senior citizens to learn scientific skills to become self-dependent when it is no more assured that younger children would take care of them in old age.

# A farm implement without a steering wheel and others

**National Third**
Farm Machinery and Food Processing Technologies

**Bachubhai Savjibhai Thesiya**
Jamnagar, Gujarat

Doing away with the steering wheel, Bachubhai (58), an inventor and innovator, has developed a lever operated farm machine capable of doing most agricultural operations. He also has many more innovations to his credit *viz.* motorcycle operated agricultural device, sensor system for irrigating fields, a personalized bulb with an added circuit to increase life, multi-purpose machine consisting of a generator, a water lifting pump, a flour mill and an iron cutting machine, among other things.

"Necessity is the mother of all inventions", an oft repeated quote, holds true for many but in case of this ingenious innovator, it becomes an understatement. Inventing, for him, is the necessity to keep himself going and has become a way of life. He lives in village Kalavad, 30 km away from Jamnagar. The eldest among three siblings, Bachubhai neither had the aptitude nor the interest to take up agriculture, his family's traditional occupation. As a child, Bachubhai had great interest in electronics and other mechanical works. He recalls of having made a radio set in his school days, which is still kept in his school as a relic. Whenever he accompanied

his father to the fields, he would make different things resembling devices and instruments with the wet soil of the field. There must be something wrong with him, Dahiben, his mother, thought once, as he wept and cried almost continuously for nearly a month after his birth. Something wrong indeed and in what a prolific way!

After studying till class tenth, Bachubhai went on to do a six month course in radio repairing and opened a repairing shop, Jyoti Radio Service in 1984 and ran it for over fifteen years. With the advent of televisions, slowly, his earnings dipped, prompting him to do another course in television repairing. He then opened a shop, Bhagyalakshmi Televisions, which he closed down after the death of his father. His father was a worried man as there was nobody to look after his eight and a half bighas (about two acres) of agricultural land; while two of his sons were away, working in Chennai and Rajkot, Bachubhai was busy churning out innovations after innovations. The wish of his father had to be fulfilled by Bachubhai, who realizing that his brothers would mostly be away had to forego his temptation to continue inventing.

Under the expert guidance of his father, he learned the nuances of agriculture for three years and after his demise has been actively engaged in it. His wife, Jayaben, recalled how after marriage, Bachubhai, seldom went to farm. She worked hard on fields and he sat in his *karyashala* pursuing all the experiments. She, however, does not miss a chance to take a dig at him jokingly and mentions that he does not know anything about agriculture and still it is she who guides him. Jayaben mentions that earlier she had no interest in her husband's innovations, '*temne khub paisa khoto kariya...hu khetar ma jaine kaam karati hati ane te ghar ma betha betha kai nu kai karata rehta hata*.'(Bachubhai was wasting money trying different things out while I was looking after the farm. He would stay in the house, tinkering with one or the other thing). She had once suggested him to look for jobs just like his younger brothers, instead of wasting time. But she now adds that had his father been alive, he would have been very happy.

**Building the lever operated farm machine**

In 2003, on hearing about his idea about a motorcycle operated agricultural attachment, his father quipped that if motorcycles would do ploughing, what would the bullocks do. He later improvised two motorcycles to build his own farm implements. It may be added here that Mansukhbhai Jagani of Amreli had already made similar agricultural attachment for Bullet motorcycle and had been awarded by NIF earlier. These subsequently got copied and replicated by fabricators of his village and nearby areas.

While planning to further improve the technology, he was reminded of his father's comment about bullocks. The idea of making the lever operated farm machine came from the rope tied to the bullock cart oxen. As one pulls the rope on the left or right side, the animal turns and when one pulls it hard, it stops. With this basic thought in the mind he set out to make his own design. It then took him four to five months laying out the blue print on paper and once every thing appeared correct, Ghanshyam bhai, his friend helped him in the fabrication work that took close to six months. Over all, he spent nearly Rs 90000 over a period of one year in its development.

**The bullock kind of a tractor**

To turn the vehicle, say for example to the left, the left lever is pulled in and the right lever is pushed in front. The front wheels that can turn close to 90 degrees help the vehicle to rotate almost at its axis at 360 degrees.The tillage implements are

mounted through a three point linkage system as in conventional tractors.The machine consumes about five litres of diesel in almost eight hours of work.

The 360 degree rotating technology is well known in prior art but the novelty lies in the control system and the functional levers, which act as a steering, clutch and brake system. For this farm machine, NIF filed a patent in his name in 2008. This farm machine is able to perform all the tasks a tractor can perform and that too at a fraction of its cost. One problem associated with conventional tractors is soil compaction due to their heavy weight. This machine prevents soil compaction due to its light weight. The story about his machine was published in The Hindu in September 2009 after which he received numerous enquiries about the same.

**The saga of innovations**

Bachubhai is known as 'Khopadee' (a brainy) in this small township. To many he may appear a persistent explorer of crazy ideas, but his reputation as a serial innovator has spread far and wide. His workshop and many unfinished projects testify to that. There is no dividing line between his living rooms, workshop and the junkyard. And yet, there is a serene orderliness in this chaos. His simplicity and humility becomes evident when he describes his experiences, in a very unassuming manner, not a trace of self-glorification or for that matter, no attempt to mask many failures.

There are a whole range of things that he has tried his hands on. The story of the radio transmitter he made is an interesting one. More than a decade and half ago, he started broadcasting, of course, on experimental basis at the same frequency at which local radio station was broadcasting its programmes. A case was filed against him and he was about to go to jail, when a local leader came to his rescue. His wife jokingly says, "May be the jail term would have saved him from toiling in the farm".

Among other things that he has made are a sugarcane juice extractor albeit of a smaller size, groundnut pod breaking machine, a motor coil winding machine, a manual pipe bender, slide projector for schools, a windmill, radio transmitter that works for small range, voice amplification system, a circuit for explosion, a metal stand used for tube well digging now innovatively used as a 'jhoola' at his house, motor lifting machine, etc. Interestingly, Bachubhai also claims to have made a helicopter thirty years ago. Similarly ten years later he made a motor operated mini model aeroplane, which is commonly shown in Durga puja pandals or other such melas.

Ghanshyambhai narrates how Bachubhai would come to his house now and then for fabrication related work. Whenever he had something new in mind he would share with him. He told us that Bachubhai stopped sharing his plans with villagers as they would always discourage him. That was the reason why the two of them became good friends, as even he was interested in all this. His two sons, Pankaj, the elder one who works in a bank in Rajkot and Alpesh, the younger who is a garlic dealer in Gondal (Rajkot), have been quite supportive and understanding. Bachubhai himself consults his sons in every experiment he does, evaluating the financial risks and taking their help wherever required. Some of his interesting works are described below.

**Diversity of imagination and innovation**

**Four-in-one machine:** The device has actually four functions incorporated in one machine and contains a generator, water lifting pump, a flour mill and an iron cutting machine. It operates on a three HP engine and depending on its usage, the consumption of diesel comes to about 1.5 litres per month. The

engine costed him Rs 8000 and the flour mill another Rs 2000.

**A simple seed sowing rolling device:** It consists of a cylindrical PVC tube with perforations at equal distance. The seeds are put inside the tube. An iron spike wheel is put on both sides of the cylinder sealed from both the ends using PVC caps. Using a U shaped rod, the device is rolled on the field. The seeds fall on the ground from the perforations. He made two models of the device, one with smaller holes for smaller seeds and the other one with larger holes.

**Circuit for explosion:** He made this 30 years ago at a cost of Rs 700, it provides 500 V power for exploding dynamite sticks to dig open well in hard rock area.

**Bulb that you can call your own:** The modified bulb of Bachubhai elongates the life of the bulb many times due to a small circuit that he inserts. The light is good for farm though not for home because of slight quivering effect. He has been making and selling such bulbs for the past twenty years. To prevent theft, he also puts the name chits of the owner inside the bulb. Idea of chit evolved because of frequent theft of these long lasting bulbs. The chit does not burn but gradually the ink fades with time. He sells these bulbs at Rs 15 after modifying the ordinary bulb available in the market at a lower cost. *A rural innovator modifying the technology developed by large corporations!*

**Motorcycle Plough Scooter Wheels in Rear:** In 2004, he made a santi (multipurpose tool bar) using a Suzuki Max 100. He fitted the tyre of a scooter in the rear instead of the original wheel to get more stability during agricultural operations. Two smaller wheels were put besides the motorcycle to balance the vehicle in the field so that the driver does not need to put his legs down every now and then. The modifications in the Suzuki Max 100 cost him nearly Rs 4000. Later he replicated the same in a Hero Honda motorcycle making certain other changes.

**Electricity Tester:** This device can test current without touching wires and can be used even for concealed wiring up to one-inch depth. Detecting current, the tester shows light and also gives a mild alarm. He made this five years ago at a cost of Rs 50. This is very useful for detecting breakage of concealed wires.

**Metal Comb:** He saw a somewhat similar comb being used in Rajkot and replicated the idea in his home. The device is a simple metal comb, which is used for removing the chickpea pods from the plant.

**Herbal loosener:** Using extracts of a couple of herbs, he has developed a formulation that loosens rusted nuts and bolts in almost no time.

Though many of his innovations may appear simple and not uncommon, yet it is the sheer ability of the person to think creatively and solve the problems faced by him, which is highly appreciable. Not looking at others to work out a solution, he himself goes ahead and finds one. Bachubhai is now busy making a remote control tractor. The frame is similar to the rotary tractor and he is planning to incorporate circuits in it to make it remote operated. Maverick at work again!

# Reversible reduction gear for marine diesel engine and Z- drive propeller

**National Second**
Transport

**B Mohanlal**
Alleypey, Kerala

Scout: Peermade Development Society

Mohanlal observed the inconvenience of the local fishermen while fishing with boats using diesel engines or petrol-start kerosene run engines, with an inbuilt gearbox. The boats with diesel engine had a long tail propeller system without gearbox, which affected their maneuverability. The kerosene run engines consumed more fuel and pollute the water affecting the marine life adversely. Moreover, beach landing is very difficult using the conventional inboard marine diesel engines. After rigorous research and development, Mohanlal developed a gearbox and manually tiltable Z-drive system for small capacity diesel engines to overcome the above problems.

**Background**

Mohanlal (52) is an accomplished boat mechanic and technician with experience of over three decades in repairing marine engines and fabricating drives and assemblies used in fishing vessels.

From a young age, he developed his skills in repairing fishing vessels while working at his uncle's workshop for five years. He then moved to

Mumbai to work in a dye-making unit for a couple of years. After that, he spent nearly eight years working in the Gulf**,** at a Mazda car dealership center on an ad-hoc arrangement as a lathe operator and bits-and–pieces mechanic, before heading home to Kerala. In 1987, he started his own workshop "Kaveri Engineering works" in Alapuzha dealing with repairing of boats, drive and motor systems. He also started repairing the trolling boards, as one of the very few experienced technicians around, used in fishing vessels for opening and spreading of fish net under the sea.

During late 1990s, one boat owner approached him to make a new trolling board and gave him an advance of one thousand rupees. Though he protested, citing his lack of experience, the customer reposed his confidence in him and asked him to take the advance and build the new one. Feeling encouraged, he bought the raw materials and delivered the new board in five days flat.

This was a turning point for him as a designer and fabricator. His fame reached nearby villages and towns from where he received a large number of orders. At that time, he employed up to eighteen workers in his workshop and developed and delivered more than 350 boards. At present, the innovator resides in Aleppey with his wife Sreedevi and their two children. The elder son is pursuing a bachelor's degree in commerce and the younger son is in the third standard.

**Genesis of innovation**

Having expanded his trolling board business, Mohanlal purchased a new boat with Yamaha engine for nearly thirty thousand rupees. This kerosene engine consumed thirty liters of kerosene everyday. Cost of one can of kerosene is sixty rupees with only a few liters of kerosene available at subsidized rates and the rest from the market at prevailing high costs. He observed the profit margin for two months and noticed that the profit was negligible due to the high operational cost of fuel. He noticed that all the fishermen were experiencing this. Thus, a large amount of fuel had to be carried aboard, also adding to the vessel loading. The exhaust after using this fuel pollutes the water, and affects the marine life adversely resulting in lower catch. After a few months, he decided to stop the business and started thinking of cheaper alternatives for kerosene-based engines.

The other alternative viz. diesel engines had poor maneuverability, with rudimentary gearbox options unable to handle various operational modes of the fishing vessel. For the engines used in local fishing vessels, the gearboxes fitted from the available market options were a mismatch. With the non-availability of a gearbox, the propeller of the boat was often directly coupled to the diesel engine, making vessel handling more difficult and dangerous. The long tail propeller fitted with a diesel engine, without any gearbox, made by YANMAR at over seventy thousand rupees is costly, and weighs over two hundred and ten kilograms reducing its maneuverability.

Having assessed all possible alternatives, the innovator felt the need to develop dedicated gearboxes suitable for the fishing vessels and decided that on board Diesel engine is the only alternative.

In 2001, he started working on diesel engine. Initially, he thought, the entire work would be over in two weeks. He reduced the weight of the engine from 83 to 63 kg and further brought it below 30 kg by using aluminum alloys instead of steel components. Cost of mould and pattern for the castings and machining individual components drove up his development costs. Next, he focused on the boat performance and optimization and shortly achieved a speed of 18 km/ hour. He introduced the clutches and two gears- one each for forward and reverse operation and an exhaust pipe.

When the news of his innovation appeared in the newspapers, Mr. P.H Kurian, Director of Kerala State Industrial Corporation, invited him to explain the advantages of his innovation. Seeing the potential of the product for the state fisheries sector, the Kerala State Industrial Corporation extended a loan of three lakh rupees on a condition that, if the project became successful, he would pay the money back to department. He continued his experiments with more vigor. Several field tests were completed and. problems were rectified. He participated in various boat shows exhibiting his innovation. All this helped him to improve upon his innovation.

Seeing the potential of his machine he got an unexpected order of a hundred engines from a reputed engine manufacturer, ELGI Equipments, of Coimbatore. ELGI needed gearbox and other accessories from Mohanlal for relief work in Tsunami affected area. The existing gearboxes marketed by ELGI made maneuvering engine difficult. At this critical moment, Mohanlal received the financial assistance from Dr. Binnoy who came forward and agreed for the necessary investment. But, due to lack of dedicated production setup, they were not able to deliver the order in time.

Meanwhile, 'Matsyafed', a society established by government of Kerala for the welfare of fishermen got interested in this gearbox. Since they spent a lot of money on kerosene subsidy, they realized the potential of this innovation vis-à-vis limitations of kerosene engines and were looking for cheaper alternatives. They decided to help in the field trials and marketing efforts. Since Mohanlal had submitted the entry to NIF, he received assistance for technical documentation, filing of patent and financial support for developing the prototype and liaison with Matsyafed for marketing. NIF also funded a specially designed gear fabricated by Lakhsmi Machine Works, Coimbatore.

The next round of tests revealed problems of propeller damage in beach landing and shallow water; Mohanlal developed a Z drive for solving these problems. The propeller system can be tilted to avoid touching on the beach while landing and can be lifted up by 90 degree during landing. In this project, with no other income except from his workshop, the innovator had to spend more than thirty lakh rupees and mortgage his house. He even had to sell all his ancestral land.

**Innovation**

The gearbox has been developed for a 12HP diesel engine with 2400 RPM idling speed and around 12 liters fuel tank capacity. The diesel engine directly couples with two reduction gears through flange coupling with the engine flywheel. The innovativeness lies in the application of helical gears

with inner spline cut with dual sided jaw and dog clutch. This provides smooth running and better power transmission for the marine diesel engines.

The Salient Features of the Z drive system to go along with the gearbox for diesel engines are that it is manually tiltable and can be locked at 90 degrees while landing. It also reduces loss of power through horizontal shaft power transmission and results in a smooth drive and better maneuverability.

**Applications**

This gearbox is a boon for fishermen who wish to switch from costlier, polluting kerosene based vessels to a robust, cheaper and maneuverable diesel powered vessel with a matching gearbox.

Using a diesel-powered engine with gearbox cuts down the fuel cost to one-third of it in petrol engines. Mohanlal's innovation has several advantages. Apart from the large savings in running cost, it causes

minimum pollution with a projected cost of less than sixty thousand rupees. There are more than 20,000 boats in Kerala alone who may benefit from this innovation.

With the assistance of NIF, the innovator has signed an agreement with MATSYAFED, the Kerala State Co-operative Federation for Fisheries Development Ltd., for commercialization of his innovation. MATSYAFED now plans to demonstrate the system at different ports and coastal areas in Kerala. This will give hands on experience of the new system to the fishermen. Nif has facilitated linkage of innovator with the South India Fisheries Federation (SIFF), for promotion of the technology. Good results are expected.

# Serial Innovator: Hover craft, amphibious craft, rumble strip for generation of electricity, car run with compressed engine and others

**National Third**
Transport

**Kanak Gogoi**
Guwahati, Assam

Kanak Gogoi, since childhood, always had a dream and hobby to do things unique and different and innovate things for the betterment of humanity in a cost effective way. He started developing in 1996 after setting up a small garage at his home in Mathura Nagar, Guwahati. . From a businessman and product designer, Kanak has evolved into a serial innovator. Over the years, he has primarily developed transportation solutions encompassing air, land and water.

**Background**

Kanak (47) hails from Tekelbora village in North Lakimpur District of Assam. His father, Buduram Gogoi, worked as a clerk in the land reform department. Kanak completed his primary education and high school at Laluk. After his High School he went to Jorhat and joined the pre-university course. Dropping out of the course, he decided to stay back at Jorhat. To earn a living, he started collecting milk from villages around Jorhat and selling it in the city.

He continued the milk business for three years. He supplemented this income by doing other odd jobs. While working at various mechanical

workshops in Jorhat, his thirst for technical knowledge increased. He spent his waking hours in experimentation and reading technical publications. In spite of being financially insecure, he had found a new confidence in his abilities. He started his own signboard workshop in rented premises. In the year 1986, Kanak's hard work paid off and his signboard business earned good revenues. He diversified into the transportation business after investing in a taxi and matador. Unlike job work, this business experienced wild swings and needed social networking. Kanak could neither manage nor compete in this business and ended up in the red.

The news of his bankruptcy filtered back to his village. His parents got worried and asked him to come home for the second time. Kanak refused, as he was confident that he would live to fight another day. He sold all his belongings and shifted with one taxi to Guwahati. He was back to square one and now had to start things right from the scratch. After getting knocked about for some time, he settled down to be a general order supplier to various parties and government departments.

In 1996, Kanak married Manju, his good friend's sister. His friend was a doctor who admired his zeal for innovations. His passionate zeal for innovations and unconventional non-commercial lifestyle created problems with his wife. It finally led to separation. Currently Kanak lives with his second wife at Guwahati and his four children from two marriages.

**Genesis of innovation**

The first innovation Kanak made was an air gun, almost soundless, when he was a student of class six. He won first prize when he displayed it in an exhibition. But the gun was thereafter taken away from him for safety. It was only after he settled down to be a general order supplier to various parties and government departments that he could focus on his childhood dream of building cars, planes and boats.

**Gravity operated cycle:** He has built an arrangement in the bicycle to harness the repeated downward movement of the rider on a spring-loaded seat. This would charge a spring that would release the energy and make the cycle move without much pedaling. The rider on the cycle appears like galloping on a horse as he sits on a reciprocating seat fitted to the fulcrum lever. Due to the eccentricity of the rear wheel and the spring loaded lever arm, the person on the rider's seat gets lifted up with changes in the levels of potential energy and spring recoil. Against this, gravitational force again pulls the rider down. Prior art does not disclose any comparable model where the principle of gravity, rider's weight and conservation of energy have been combined. Kanak Das did use similar motion in his rider induced bicycle for which he was awarded earlier by NIF.

**TRYGO X, a three wheeler**: He developed it to fulfill the wishes of his seven year old daughter. As she was tired of traffic jams in the city, she asked him to develop a small vehicle that could smartly zip in and weave through the city traffic. The TRYGO X could weave in a lane with a span of 6 feet, and sharply turn and park perpendicular to the curb. It can travel at 60 km/hr and has an average mileage of 30 km/liter.

**Kanso hybrid car:** This is a new concept hybrid car without gears that runs on solar power as well as on fuel. The car has a 100-cc engine powered by four solar panels generating 320 Watts of energy. The engine of the car is basically powered by battery power. The battery charger is hybrid, during daytime the battery can be charged by solar power and at night or in emergencies the battery can be charged by the fuel.

**Retrofitted rickshaw:** This is a rickshaw fitted with a differential to enable each driving wheel to rotate at different speeds, while supplying equal torque. The low rolling resistance and lightweight made the vehicle energy efficient and comfortable to drive and handle.

**Compressed air car:** This is a car with a unique arrangement; integration of motorcycles and Maruti car engines, run with compressed air. Kanak claims to get a maximum speed of 120 km/h in this car.

Some of the other innovations that Kanak has come up with are Powered hang glider using a 2-stroke motorbike engine in 2001; Aeroboat (Shallow bottom boat propelled with on board aero-propeller) in 2002; Amphibian boat using on board aero-propeller in 2003; Water bicycle; Treadmill bike; and "Kontilo" 5.5 hp Mini Tractor for ploughing, tilling and rural transportation both for hilly and plain terrain

**Product application and dispersion**

After a lifetime of effort and struggle, Kanak's innovative spirit seems to be finally getting recognition at the national and global platforms. He received the Vocational excellence Award for the year 2007-2008 from Rotary International, Durgapur. He also attended the International seminar on Renewable Energy at New Delhi and Husum, Germany in 2008. NIF facilitated participation of the innovator in a Fab Lab conference organized by the Massachusetts Institute of Technology at Chicago, USA in 2007. The innovator has also received enquiries from countries like the United States for exploring possible technology transfers for his technologies.

## Biomass based gasifier

**National Second**
Energy and Environment

**Rai Singh Dahiya**
Hanumangarh, Rajasthan

Rai Singh Dahiya (46) has developed an efficient biomass gasifier where he has changed the conventional design, especially of the filters and cooling unit to get clean gas, ensuring smooth operation of engine at low operational cost.

He is engaged in the repair of agricultural machines, pumps and allied machines. While he has had no formal education, he has gained knowledge on science and technology by dismantling and repairing gadgets, and exposure to radio programs.

Rai Singh was born in January 1963, to Sri. Ranjit Ram Dahiya and Smt. Manidevi, in the village *Pili Madori*, Haryana. Soon after his birth, his father left the ancestral village with his family and settled in the *Thaldka* village in Ganganagar district of Rajasthan. His parents started farming to earn their living and as Rai Singh grew up, he also joined them. While other kids went to school, Rai Singh was busy working as a farm hand and irrigating barren land, as that was the need of the hour. Missing out on a formal education, he made himself literate by studying his brother's books.



Blessed with a keen mind and natural curiosity, he has tried to develop novel solutions. First, he tried to develop a sound alarm to be used in the field by setting off burning sulfur to scare animals and birds. Starting with a watch given by his brother, he dismantled and put together many objects and gadgets and sharpened his knowledge of components and systems. Being a regular listener to BBC radio for science programmes, such as "*Gyan-Vigyan*", since childhood, he enhanced his knowledge of science and technology. This program motivated him to tinker and develop new concepts.

In 1979, he was working in the fields when the engine of a pump broke down. Instead of finding a mechanic, his brother asked him to fix it. He struggled the whole day but succeeded in setting it right finally. This gave him a new confidence and understanding about engines and their functioning.

His major innovation is the biomass based gasifier and engine. He also developed other ideas like foot operated valve, car running on battery charged by windmill, which uses vehicle motion to rotate the windmill blades.

**Genesis of innovation**

In 1982, he set up a kiln for baking bricks with a capacity of about 12000 bricks at a time. In this kiln, he observed that burning of wood and other fuel was also producing some gas, which was burning more vigorously. Later in 1991, he set up his workshop for repairing tractors, jeep, trucks and other engines. Looking at the increasing demand of diesel engines in agricultural sector, he modified it to operate on LPG as the cost of diesel was growing and operating it on LPG was economical.
When this experiment was successful, he wondered if it was possible to run the engine on the gas produced by burning wood instead of LPG. He decided to build a device to generate a gas to run diesel engines.

After a series of experiments, he finally developed a system, which consisted of a gasifier that could convert biomass into producer gas. The conventional diesel engine was modified by replacing diesel injector set-up with a spark plug and a fuel pump with a distributor set up. This gasifier could run the modified diesel engine, but for a very short duration. Rai Singh realized that the engine was not performing well due to the impurities in the producer gas fed into it. He worked out several mechanisms, and filtering sieves, and then developed a filtering mechanism so that pure gas could be supplied to the modified engine.

Initially four such systems were developed and installed in the village and local people were trained to operate them. The latest unit of the gasifier system is capable enough to operate 40 hours continuously with reduced maintenance.

**The Biomass Gasifier**

The unit consists of a gasifier, which generates producer gas from bio-waste and uses it to run an engine. The gasifier is conical in shape, compact in design and surrounded by a water jacket with the capability to handle multiple fuel sources.

Fuel wood or briquettes from agricultural residues can be fed to this gasifier. The air inlet is provided at the bottom. The system has two stages for removing ash, charred residue and tar. The primary filter unit comprises a series of rows of filtration units; each series consists of a rod over which semicircular baffles having perforation are welded. Perforation becomes progressively smaller from the first to the third filtration unit.

The filter can easily be cleaned by pulling out the rod with the baffles. It is surrounded by a water jacket. The secondary filter has layers of different sizes of sieves ranging from 2" to very fine size, with the cleaning gate at the bottom.

**The Process**

First, the bio-waste is deposited in the gasifier unit from the top. This unit acts as a furnace and heats upto 200 degree centigrade to generate the

producer gas. The gasifier is monitored and fed continuously for about first 30 minutes. Aspirator is turned on for sucking producer gas until the flame appears. Later, the supply of air from the bottom is cut off.

The producer gas is now passed through the first cyclone where water-cooling is done; the gas is cooled and partial cleaning is also achieved. The gas now goes through the second cyclone, which removes carbon and ash based residues. Now the gas passes through the filtration unit consisting of sieve grills and cloth. This cleans up the gas completely.

After cleaning, the gas is fed into the mixer unit, which mixes the gas with air in the right "fuel-air ratio", which is set for the engine and power rating. There is a calibration mark for optimal ratio based set by the innovator, but the user can override that and choose his settings. Alternatively, the nature of the knocking sound, which changes at optimal ratio, can also be used as a cue for optimal mixing ratio setting. The fuel mixer then feeds the fuel-air mixture onto the modified engine, which runs on this clean fuel.

This biomass-based gasifier can process about 20 kilograms of bio-waste to run an engine of 30 HP for one hour. Also, the furnace in the gasifier unit can be built to different capacities as per availability of biomass and agricultural residue. Considering the cost of machine, fuel-biomass and local labor, this arrangement is estimated to cost less than half the cost per unit power when compared to normal electricity grids costing 4 Rs per unit.

Concept of biomass gasification[1], up draft gasification[2], cleaning by cyclone filter[3], and use of scrubber[4] are well known in art. Prior art also discloses other such devices[5], however a compact gasifier surrounded by water jacket with the arrangement of two stage filters are not available in art. Accordingly, NIF filed a patent in Rai Singh's name.

**Product Application and Dispersion**

The biomass based gasifier can be used to operate pump sets in remote fields, lift water in homes, operate basic machines such as saw mills, flour

mills and generate electricity by charging the alternator. While similar systems with various configurations are in use, the Government of India has dedicated renewable schemes for the development, installation and use of such biomass based systems.

The fuel consumption of Dahiya's gassifier is reported to be 1 kg/kVA, which is claimed to be almost 30-40 per cent less than other available designs. The prices vary from Rs. 1, 25,000 for 10 kW unit to Rs. 3,25,000 for 35 kW unit. Rai Singh was supported from the Micro Venture Innovation Fund (MVIF) of National Innovation Foundation through GIAN North, Jaipur. As a result of which, he has been able to manufacture and sell over 50 units of varied capacity to farmers and owners of flour and saw mills. For his work, Rai Singh was also honored by Gram Panchayat in 2002 and by the District Collector in 2004.

---

[1] Rai, 1997; Singhal, 1996; US4929254 -May 29, 1990; http://www.teriin.org, http://www.biomassgasifier.com, http://www.ankurscientific.com/ http://www.cosmogasifiers.com/, US5666890, US5580362; US7228806; US 70138169; US 6871603, etc

[2] http://www.cosmogasifiers.com/, Rai, 1997; Singhal, 1996

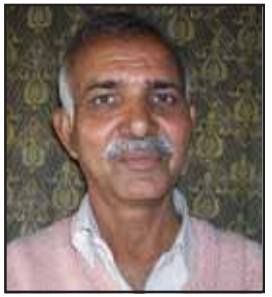
[3] Rai 1997, US5666890; US4929254; http://www.teriin.org, http://www.cosmogasifiers.com/

[4] http://www.cosmogasifiers.com/, http://www.teriin.org/, http://www.ankurscientific.com/ Rai 1997

[5] Fluidized bed biomass gasification system including a bulk biomass feeder, a variable speed pressurized pneumatic conveyor system, a high pressure feed tank / reactor vessel and cyclone filter (US5666890); gasification of liquid and/or fine-grain solid using a gasification agent, where heat is supplied by heat carrier particles (US5580362); methodology and apparatus to produce syngas, which is a thermal decomposed gas produced by thermal decomposition reaction of a liquid or solid fuel and high-temperatu
re steam and air (US6837910); plurality of combustion chambers for efficient combustion (US7228806); gasifier suitable for large pieces of solid fuels, especially bales of biomass (US 70138169); Biomass gasifier and boiler for combusting gaseous fuel from the gasifier to produce useful energy (US 6871603)

## Generator accessory for cleaner exhaust

**National Second**
Energy and Environment



**Virendra Kumar Sinha**
East Champaran, Bihar

**Scout:** Azhar Hussain Ansari

*"Mehnat kijiye, achha rahiye. Parishram hi sabkuchh hai. Imandari se rahiye, pehle dikkatein to aayengi parantu safalata avashya milegi agar nischay dridh hai to"*
(Hard work is everything. Be honest, initially there would be problems but success will eventually come if there is a firm desire to succeed)

There are absolutely no generators/gensets in the country that have a pollution control device attached to them. Even, there is no requirement for the same under the present rules. However, Virendra Kumar Sinha (58), a self-taught welder and fabricator, has made a pollution control device for gensets. This attachment precipitates the suspended particulates present in the exhaust gases making it clear along with reducing its temperature.

**From a Playful Childhood to a Struggling Career**

Born in a middle class family in 1950, Virendra is the eldest of six siblings- two brothers and four sisters. Unlike his siblings, he was never interested in studies. But, being the eldest, he was not scolded and was in fact quite pampered. Apart from football and marbles, he would often play with wires and electrical gadgets. He was always restless and inquisitive. Growing up, he started repairing sewing machines, air pumps, bicycles etc. for the family and neighbours as well. Though his siblings continued their studies, he could not clear the class 12 exams and took admission in an ITI course. However, he had to leave it midway to attend to his family duties. He started his career as a road and building contractor in early seventies. Thereafter, he started cloth export to earn more but soon had to close down, as it also did not fetch him a steady income.

Pondering over various options, he decided to assist his friend in his fabrication workshop. Gaining exposure in the field for close to a year and a half, in the early eighties, he decided to move on to set up his own fabrication unit for manufacturing iron gates and grill works with a small loan from a bank. Struggling initially in the first six-seven months, he started networking with the local hardware storekeepers to get orders. He recounts that during this period his deceased friend Bachchubhai was a great support, as he always encouraged him to persevere. His workshop was in Motihari town, but with low income and high rent, he had to shift to his house in Belwana village, two kilometers away from it.

His fabrication unit, Kaajal steel, named after his elder daughter, made slow but steady progress over the next twelve-thirteen years. But around 1994, a difficult phase started when his firm had to face fierce competition from other workshops. To keep himself in the competition, he started innovating designs for gates and grills and kept their prices close to the older ones. Also, to maximize returns, he retained more skilled workers and increased their wages, relieving the rest. Gradually, things improved and today he is in a much comfortable position.

**Staying afloat**

Just opposite to a school, Virendra operated his fabricating workshop in his home, in a congested colony. He used a diesel genset (generator coupled with stationary engine) as an alternative to the erratic electricity supply. The problem was that the genset made a lot of noise, released considerable smoke causing pollution and also disturbed the children. But neither the school nor the workshop could be moved away.

Virendra had to face hostile neighbors who went to court over the high decibel noise and pollution from the generator used in his fabricating unit. The SDM and court authorities also asked him to either solve the problem or close down his unit. With his limited resources, he could not relocate the unit. Resolving to settle the issue once and for all, he thought about designing an attachment that would drastically minimize the noise as well as the smoke. While pondering on how to build the device, he remembered the science teacher of his school mentioning- *"When we make a noise in a closed room, its effect on the people outside is much less than when we make same amount of noise in open public space".*

He then decided to experiment and build a special chamber to muffle the sound and break down the exhaust components. Using commonly available materials such as an iron drum, perforated iron pipes, steel channels, baffles and soot collecting tray, Virendra built the first prototype with multiple muffling chambers. It cost him Rs. 4000. This unit was fitted to the 10 HP engine being used in his workshop. This resulted in considerable noise reduction. Over a period of eight months, he continued to invest and experiment and finally made a device that reduced the noise further. So much so that some of his neighbours even came to inquire if all was well in his workshop. The emission also reduced but not to his satisfaction. He continued to improvise and after for about a decade gave the machine its present shape, which matched the level of perfection he was looking for.

Apart from his compassion towards the children and the environment, the court judgment against him in response to the protest by neighbours also led him to develop this device,

**The Pollution Control Device**

This is an accessory that is attached to the genset. It precipitates the particles of the flue gases, lowers their temperature and also dampens the noise considerably.

The attachment consists of a cylindrical drum having concentric perforated screens and a few long perforated tubes having equally spaced mesh linings. Fins have been provided on the internal surface of the cylinder for breaking the sound waves. The cylindrical drum, weighing 65 kg, is placed between the generator and the exhaust pipe. The exhaust gases, which enter the unit, strike against the array of protruding fins and perforated tubes continuously. The vortex results in the dissociation of CO and $CO_2$ into carbon particulates and oxygen.


The innovation also works as a silencer by internally canceling out sound waves as they pass through a series of concentric channels. The geometry and construction of the unit also delivers removal of carbon-based effluents as soot and solid deposits. The exhaust gases, which come out eventually are very clean and leave no trace of carbon on the leaves of the tree growing nearby. The unit functions as an attachment, not only for precipitating carbon particulates from the flue gas and damping the sound, it also reduces the temperature.

On an average, after 3000 hours of engine operation, the innovator removes about 5 kg of soot using the chute at the bottom of the drum. In about six to eight months, it collects 12 to 14 kg of carbon, which can be easily taken out from the opening at the bottom.

The innovativeness of the machine lies in its design and construction. The variation in geometries, zonal volumes and pipe segments create "area discontinuities" which act as an impedance mismatch for the sound waves to travel further. Secondly, there are the multiple reflections of sound waves internally, which cancels them out.

Testing of the device was done with 5 BHP Kirloskar engine under different loads in BIT Mesra, Ranchi where reduction in CO and $CO_2$ up to 30 % and considerable reduction in temperature was observed. NIF has filed a patent (1520/KOL/2008) in the name of Virendra Kumar Sinha for this innovation.

**Other solutions in the domain**

Prior art discloses various methods such as catalytic filter scrubbing using catalysts, scrubbing with diluted basic solutions, scrubbing by water *i.e.* use of water as an absorbent, scrubbing by any undisclosed liquid, catalytic systems including fuel reformers and after treatment systems, such as the selective catalytic reduction (SCR) of $NO_x$ under oxygen-rich conditions.

Other methods include ozone injection and absorption–reduction technique for removal of sulfur dioxide and nitrogen oxides, reaction with N radicals for reduction of NO in the exhaust gas, braided wire damper for noise reduction, electrostatic precipitator for attracting particulate matters in an exhaust gas, treatment of flue gas by electron beam for simultaneous removal of $SO_2$ and $NO_x$.

Akasi from Sivakasi, Tamil Nadu had developed one such device (an environmental friendly oil engine with a modified silencer that reduced sound better than other silencers) way back in 2000. He was awarded in NIF's First National Grassroots Innovations Award Function in 2001. Having compared with other designs in prior art, it is evident that the construction and design made by Mr. Virendra Sinha is unique.

**The family man**

Azhar Hussain Ansari, his scout as a fabricator, knew Virendra Sinha. After returning from NIF's Third Award Function at Ahmedabad in 2005, he met Virendra once. Sipping tea at a roadside shop, he narrated about his visit to him and mentioned about NIF. During the ensuing discussion, he came to know about the work done by him, which was later documented and sent to NIF.

Though Virendra had to pass through many ups and downs in his journey of innovation, yet he never let any of his tensions, stresses or frustrations spill over to the family. The only person with whom he shared everything was his wife, Sudha, who stood by him in every test and supported him to the hilt. He wanted his three children, Kaajal, Priti and Vivek to study and do well. He did not want the adverse conditions to have any affect on their young minds and together the couple tried their best to make it appear as if everything was normal. Together, they have bailed out the family from tough times to a position of relative comfort. His elder daughter has been married and the younger daughter and son are studying.

During the 22nd *Shodh Yatra* (journey through rural areas in search of local creativity) in Bihar, in December 2009-January 2009, the *Shodh Yatris* visited his workshop and appreciated his work. He was also felicitated the next day at the Gandhi Memorial, Motihari for his ingenuity.

**The road ahead**

Virendra has received several queries from companies but so far he has not found the right party and the price to license the technology. Most people are bound to use engine generator sets. As an accessory to engine setups, this attachment holds promise for universal use to remove noise and deliver cleaner exhaust.

Many hotels and business establishments, which use generators, have come forward with enquiries for this effective low cost solution. The extensive carbon deposits collected periodically can be reused as raw material for shoe polish and local small-scale industry units. Large numbers of workshop mechanics use such engines, which create both noise and air pollution and yet there are not many examples of such devices.

Virendra is now working on to fine tune the device so that it can be fitted to any generators/gensets from 5 kVA to 14 kVA. He is also trying to keep the cost down, to enable its maximum usage. He proudly says, "*Pehle ye kaam pet ke liye kiya tha, ab ye desh ke liye kar rahe hain*" (Earlier I had to do this for survival, now I am doing this for the country).


## Earthen kitchen products

**National Third**
Energy and Environment

**Mansukhbhai Raghavjibhai Prajapati**
Rajkot, Gujarat

Scout: Gauri Vagnar, Ahmedabad

Mansukhbhai Prajapati (44), a traditional clay craftsman, has developed an entire range of earthen products for daily use in the kitchen. These products include water filters, refrigerators, hot plates, cooker and other such items of daily use.

Born in the Prajapati family, originally belonging to the village Nichimandal of Morbi, Rajkot, Mansukhbhai had exposure to the clay tradition since childhood, as this was his family's traditional profession. Being the only son and the eldest child, though he helped his father in his work, he was more interested in cricket and other games. He used to load clay from the ponds and fields on the donkey and ferry it to his place. Other than this, his contribution was limited as he was not much interested in the pottery work. After the breakdown of Machhu dam of Morbi in 1979, his family lost everything and they had to migrate to Wankaner, where his father took the job of a mason to support the family. It was here that his journey as a worker in a small rooftop tile manufacturing unit started, which today has reached a point where he is recognized as a successful entrepreneur.

The place, Morbi, is a taluka in Rajkot district, located in the Saurashtra region of Gujarat. It accounts for more than 70 per cent of the total ceramic production in India and is home to more than 350 ceramic products manufacturing units. Than, Wankaner and Morbi form the ceramic triangle of the region. The products manufactured here are not only for domestic consumption but are also exported.

**The initial struggle**

Though his family was struggling with finances, his parents motivated him to study up to class ten. He then left studies to provide a helping hand in augmenting family's resources. He started to work in a small factory. But, in the very first month, while working inside a chimney, his left eye got injured because of which he had to quit work for over eight months. Once his sight improved, in 1984, he started his tea lorry near the highway but some how due to the persistent comments of some of his acquaintance he closed it down within six months.

Earlier, one of his uncles had visited him at the tea lorry inquiring about a person who would be interested to work in a rooftop tile manufacturing unit. He had shown his interest then and after closing the tea lorry joined the unit, Jagdamba Potteries, as a trainee at Rs. 300 per month in 1985. He worked hard for three years and learned all the related works of the unit. During this time, he also helped his parents marry off his younger sisters.

**The entrepreneurial streak**

Having gained a sound knowledge while working in the pottery unit, the desire to start an enterprise of his own started to grow in Mansukhbhai's mind. During his childhood, he saw earthen pans/hot plates (locally termed as *Kaladi/Tavdi*) being manufactured manually on the potters' wheel (locally termed as *Chhakdo*). Using this, one person can only make about 100 units per day. He had seen roof tiles being manufactured in large quantity on hand press, which made him think why cannot earthen pans be made the same way?

In 1988, he left his job and took a loan of Rs 30,000 from a money lender to start his own earthen plate manufacturing factory. He purchased a small piece of land for the factory, dyes and presses, soil mixing machine, electric potter's wheel and other scrap objects. Then he modified the roof tile making hand press and developed a hand press machine having capacity to produce 700 earthen pans per day.

It took him eight days to put everything together and on the ninth day, the first day of his work, he made 50 pieces of the earthen plate. He put all of these in a container tied to the carrier of the cycle and went to the nearby villages to sell the same. He sold one piece for 0.65 paise and within two days he could sell the entire first batch. This was the first income of the budding entrepreneur.

This continued for some time. He then realized that there was difference in making earthen objects on manual potter's wheel and making them on electric potter's wheels and using presses. Also there was another problem with his *tavas*. They used to break if the heating went on for a while. He got negative feedback from many of his customers. He tried reducing the price of his *tavas* but still people did not find it as a good value for money. He then experimentally varied the proportions of different types of clay to obtain the preferred mix. Gradually, he increased his production and in six months time started hiring *chakda* (motor rickshaw) to go around nearby villages to sell his products. He also got married in the same year, in 1989.

In 1990, he got his unit registered in the name of Mansukhbhai Raghavbhai Prajapati at DIC, Rajkot. Once, in 1992, a trader from Bhuj came to Wankaner. Seeing Mansukhbhai's improvisation of the tile press, he got impressed. He then offered to purchase all the 3000 *tavas* that Mansukhbhai had ready with him. His plan was to purchase them in bulk from Wankaner and sell them at slightly lower rate than the prevailing market price back home. For Mansukhbhai this was the first bulk order, which not only gave

him money but also much confidence. For the next two years, he catered to both retail and bulk orders from Bhuj. Though the earning was not great but he managed to somehow stay afloat and clear all his debts also.

**The turning point**

In 1995, a business man from Rajkot, Chiragbhai Patel came to Wankaner looking for a vendor who could provide him clay water-filters. Chiragbhai was an exporter who had to deliver this order to Nairobi, Kenya. He got the lead about Mansukhbhai from Jagdamba Potteries, where Mansukhbhai worked earlier. They recommended his name to him. Mansukhbhai was shown the design of the filter. He was expected to deliver the water filter in a month's time but he delivered within eight days. It was a terra cotta filter having a ceramic candle for filtration. Looking at the quality of the output, Chiragbhai immediately ordered 500 pieces at a price of Rs. 200 per piece, which was double the earlier decided price of Rs. 100 per piece. The product was sold in the name of Aquatech through Chiragbhai's marketing agency.

This incident changed his life. A business of Rs. 1 lakh not only gave him financial freedom but also the confidence, social respect and identity.

Under the guidance of Chiragbhai and Parabbhai, Patent Officer at Ahmedabad Branch, who saw the product first in a fair at Ahmedabad, Mansukhbhai filed for Design registration and also the Trade Mark application in the name of *Mitticool* in 2001. Presently, he is manufacturing and selling the water filter of different capacities viz. 8 litre (Rs. 300/-), 10 litre (Rs. 350/-) and 12 litre (Cost Rs. 400/-). Masukhbhai has sold more than 800 pieces till date.

**The *Mitticool* story**

In the fateful earthquake of January 2001, Mansukhbhai suffered huge loss, as most of his stock got broken. He distributed the stock that escaped the quake to the quake affected people of Kutch. In February 2001, Sandesh Gujarati Daily had a photo feature on the earthquake where at one place it showed a broken water filter of Mansukhbhai with the caption 'the broken fridge of poor'.

This caption ignited a thought in him to work on a rural fridge that did not need electricity and could be used by masses. Though he started thinking about it after the Gujarat earthquake of 2001, it was 2002 when he actually started his work. Almost the same time, Mansukhbhai came into the contact of Gujarat Grassroots Innovation Augmentation Network (GIAN), Ahmedabad. After a painstaking journey of three years during which he tested all sorts of soils and fridge designs, he finally came out with *Mitticool* fridge in 2005. A civil engineer saw the fridge and looking at its applications gave him the order of 100 pieces and an advance of Rs. 2 lakh. This news was also covered by local dailies.


***Mitticool*- the fridge**

It is a small refrigerator made of clay for storing vegetables, fruits, milk and water. It does not need any external source of energy for the cooling effect. The first version of *Mitticool* had two water chambers, one at the top and the other at the bottom. Water filtered from the top chamber (20 litre capacity) and got collected in the bottom chamber, which also had a dispensing tap. Between the two water chambers was a space for storing vegetables, fruits (up to 3 kg) and milk. The principle of cooling in the *mitticool* is same as that of clay pots, or '*matkas*'. Mansukhbhai sold this fridge for Rs 1500, but discontinued its production after developing a better version of the same.

In the second version, Mansukhbhai did away with the bottom water chamber thereby increasing more space for storage. The tap was fixed on the top

water chamber whose capacity was reduced to 10 litres. The two bottom compartments together can store about 5-7 kg of vegetables, fruits and milk. The natural cooling process inside the refrigerator can keep vegetables and fruits fresh for around six to seven days, while milk can be preserved for three days. Apart from saving on electricity bill, the new device also preserves the original taste of fruits and vegetables.

Testing of the fridge was facilitated at KVK, Chaswad, Bharuch by GIAN. It was found that the temperature inside the fridge was 4-5º C lower than the room temperature. The shelf life of coriander kept inside the fridge was found to be 4 days as against 1.5-2 days normally at room temperature. The shelf life of brinjal, chilly & okra kept inside the fridge was found to be in the range of 6-7, 4-5 and 5-6 days respectively. Similarly, in the refrigerator the shelf life was found to be 4-5, 4-5 and 5-6 days.

GIAN facilitated design improvements in the fridge through National Institute of Design (NID), Ahmedabad. It also helped Mansukhbhai to appropriately ascertain the packaging requirements so that it can be comfortably transported over long distances. Subsequently, a neat package was designed using thermocol casing.

*Mitticool* was featured recently at a conference organized by the Centre for India and Global Business, Judge Business School, University of Cambridge, UK in May 2009. Bosch and Siemens Hausgeräte (BSH), Germany, one of the world's largest home appliance companies have also written to GIAN and showed interest in the product.

**Non-Stick Clay *Tava***

In 2003, Mansukhbhai's wife asked him to bring a non-stick *tava* from the market. He inquired and found that such a *tava* costed a minimum of Rs 200. He thought that in his firm *tavas* were already being made, why not make them non-stick and affordable so that they come within the reach of the masses.

Mansukhbhai did some market research on the product. He found out that apart from being costly, Teflon coated non-stick *tavas* did not retain the natural taste of the food. Also the coating wears off quite soon.

He visited Mumbai to learn the process of non-stick coating and looked for appropriate materials to use in his clay *tavas*. A Mehsana based non-stick manufacturer helped him in perfecting the process of adding layers on the earthen *tavas*. After about a year of research, and after making and breaking almost one lakh trial *tavas*, he succeeded in developing the non-stick coated earthen pan using Azo Noble, another food grade non-stick material like Teflon.

Mansukhbhai's *tava* is an earthen griddle with a non-stick coating. It gives advantages of non-stick cookware while preserving the natural taste of food cooked using earthen griddles. Costing between Rs. 50-100 for *tavas* 8'-10' in diameter (with and without handle), it is a cheaper alternative to metallic non-stick cookware. Also, in this case, the consumption of LPG is low. As the coating gets absorbed in the pores of the earthen material, it does not wear off easily too.

The non-stick coating has been tested at the Institute of Chemical Technology, University of Mumbai. Mansukhbhai has sold more than 50,000 such *tavas* till date. Feedback was collected from different users who have been using this *tava* thrice a day for a minimum of three months to more than two years. Maximum reported no problems while using the *tava*. A few people reported loosening of handle in *tavas* with handle. While most mentioned the ease in handling, some added that as the oil requirement was less, the cooked food was healthier and tastier. For this product, Mansukhbhai was also supported with an investment of Rs. 1,80,000 under the Micro Venture Innovation Fund (MVIF) of NIF. GIAN also helped him to set up a company, Clay Creations, in 2008. He was also assisted to develop the online retail portal (www.mitticool.in). Adding value to the original

innovation, GIAN also gave Mansukhbahi the idea to have a metal ring around the *tava* so that a handle can be attached apart from guiding him in designing the packaging material.

**The road ahead**

Mansukhbhai participated in the *Saatvik*-the Traditional Food Festival in 2008 where he sold his innovations apart from the regular clay products. Seeing the traditional black *haandi* (pot) at his stall, many visitors asked him to improve it also. This gave him an idea to develop the clay cooker. He has also developed earthen utensils- eating plates with separate dish holding sections, glasses and bowls. The cooker and the entire range of utensils would be unveiled in the next *Saatvik*- the Traditional Food Festival at IIM Ahmedabad in December 2009.

An idea of a student from Bihar, Ankit Tiwari, to develop earthen thermos was shared with him by NIF and the design discussed. Masukhbhai promptly worked on the idea and made the thermos in 1 litre and 2 litres capacity. He has sold over 500 such thermoses till date and share of the profit has also been shared with Ankit.

His success story has been widely covered in the regional and national media. The Discovery Channel, Aaj Tak, NDTV, IBN 7, DD News, BBC and Vividh Bharti, AIR have covered his innovations.

Mansukhbhai is a man with a mission and always keeps himself occupied. If he is not experimenting in his factory, he is mostly traveling in connection with the marketing of his products along with his wife. After inventing a fridge made of clay, he further wants to improve it by fitting a RO (Reverse Osmosis) unit to it so that one can get pure water of good taste and quality. He is now contemplating of making small '*Minute Mitticools'* like 5 minute *mitticool* or 2 minute *mitticool*, which essentially means that the *mitticool* would be able to cool water in either 5 minutes or 2 minutes.

He has also conceived an idea to develop a house, which would not require electricity connection for any purpose. The cooling in the house would be natural with no need of a fan. Similarly the lighting would also be natural. He also wants to get his name included in the Guinness book of records for his inventions and also get an award at the hands of the President. He is working to make a complete range of cooking utensils using clay. Currently, he is trying to improve on the design of the non-stick *tava* so that it can be made flat and be used for making *dosas* and other preparations.

Mansukhbhai has his parents, wife and two sons in his family. His father Raghavbhai and wife Hiraben help him in his work of designing and making potteries. His younger son is in school while the elder one is completing his diploma in ceramic technology. He always had the support of his father who used to give him tips from time to time based on his own experiences. His wife was another pillar of strength, always co-operative and understanding, helping him during odd hours and motivating him in times of failures. She is always at his side whenever he goes for an exhibition and takes care of the sales. Apart from the family, he got support from others too. He used to take his inventions to his friends and other 'more educated people' (as he puts it) for suggestions and criticisms. Their feedback has resulted in making *Mitticool* and other products, a success story, as we see it today.

# Multipurpose twin chambered cooking vessel and others

**National Second**
Household & General Utility

**Abdul Razzak**
Madurai, Tamil Nadu

Abdul Razzak (47) is an electrician by profession. Over the last two decades he has developed a number of innovations including a multipurpose twin chambered cooking vessel, a burglar alarm system, a phone with built-in charger, a dual faced fan, a letterbox with an audio alarm amongst many others.

He stays with his family in Bibikulam in the temple city of Madurai, whose literary and historical antiquity dates back over 2500 years. His father was cook and had to toil hard to earn a living for his family, which included his wife, four daughters and three sons. For him, it was a continuous struggle to make ends meet. Owing to this condition, Razzak could only study till matriculation and that too, facing great hardship. Though average in studies, he was bestowed with a good observation and used to notice things, gadgets minutely to understand their functioning. After leaving school he joined a small workshop where he gradually picked up the skills of repairing electrical gadgets, progressively moving into coil winding and fabrication of household items.

**The problem of rice steep draining**

Razzak noticed the hardship faced by his wife, Anarkali in handling the hot rice cooking pot. He realized that this was a universal problem faced by housewives as well as caterers who cooked rice in open vessels. As these hot vessels/pots could not be comfortably held, tilted or carried, they faced difficulty in completely draining off the residual water from them. They would sometimes burn themselves either by the hot vapours or by accidental splashing of the hot residual water. Across the length and breadth of the country this water has its own use; some discard it as waste, some use it to starch their clothes, while others from low income groups, consume this drained water for its nutritive value. It is locally called *kanji* (gruel) and is generally consumed in the morning by people before going out to the field for work.

Reflecting on the problems, he started thinking of designing a vessel, which could prevent accidental injuries while making life a bit easier as well. He also noticed that most of the rural folk had only a single cooking stove. This meant that if one wanted to prepare rice and *sambar* or lentils it had to be done sequentially taking a lot of time.

He then decided to make an improved cooking unit that would facilitate quick and effective cooking of various items simultaneously. It would also provide a facility of filtering the residual water safely while keeping it separately for consumption.

**Multipurpose twin chambered cooking vessel**

The innovation is a stainless steel cylindrical cooking vessel with two compartments and a lid fitted with two pressure valves. It is also provided with a perforated aluminium plate to be used in one compartment. The two compartments are used to cook rice and *sambar* simultaneously. In the compartment where rice is boiled, the perforated aluminium plate is kept. On the same side of the vessel, a drain valve or tap is provided for the user to drain out the residual water after cooking. The nutritive value of the residual water or *kanji* can be then harnessed.

While cooking, when the steam pressure increases inside the vessel, the two pressure valves on the lid open up to release the extra steam. These valves can also be opened to view the status of the cooked rice or to take out the rice grains to check their softness. The vessel is provided with handles on the top as well as on the sides, allowing easy handling. The whole unit weighs one kilogram.

This unit facilitates simultaneous cooking of rice and *sambar* thereby reducing the total cooking time to almost half. The rice cooked with drained off water has lesser starch levels and is a healthier alternative for the modern lifestyle. This unit, using the same arrangement, can easily be scaled up and built as a large unit suitable for catering operations.

The methods of cooking rice by boiling, steam cooking or pressure cooking and the removal of gruel in conventional cooking are well known. An online article[1] mentions that boiling rice in excess water and discarding the gruel (*kanjee*) results in loss of some amount of minerals and vitamins. However, in parboiled rice, the nutrients diffuse into the grain and a gelatinized starch coating gets formed over the grain. There are other references of such vessels available in the patent literatures[2]. However, Abdul Razzak's innovation distinguishes itself by achieving simultaneous cooking of rice and cereals, at the same time facilitating the draining of residual water. He has filed a patent for this device in 2006. His innovation has been covered by national dailies like The Hindu and various local newspapers.

**Applications**

The innovation is viable alternative to those users who wish to cook rice and lentil simultaneously saving their invaluable time. The taste of pot boiled rice with its low starch levels and distinctive taste makes it a part of

the Indian culinary tradition. Many people in rural and tribal belts prefer this cooking method over the pressure cooked one.

This unit offers safer handling and complete drainage of residual water. The system is superior to local units that consist of metal cooking units with perforated holes draining into a bucket, commonly available in local Kerala markets.

Abdul Razzak has made and sold over 100 units in and around Madurai. The user feedback has been very good and marketing is mostly through word of mouth. The five liter vessel based system is sold at a cost of Rs 550 and has good dispersion potential among low-income households and caterers.

**Other creative ideas**

**Revolving ceiling fan**

Razzak has mounted a ceiling fan on a circular ceiling rail so that it can be manually moved to obtain proper air flow in different parts of the room. He plans to make it remote controlled. Similar idea was also given from Abdul Rasheed Qureshi from Delhi.

**Dual face table fan**

In the existing table fan, Razzak has extended the shaft to the other side and fitted another set of fan blades. This dual table top configuration can be placed centrally. When switched on, it can fan air all around using nearly the same energy.

**Burglar alarm system**

This system can be installed on a door. When a burglar breaks in, the system would alert the police or the owner by dialing the set of fixed numbers. In case, the system cannot connect to a particular number, it will automatically dial the next number.

**Letter box alarm**

This is a letterbox with an alarm to alert the presence of letter in the box. The post box consists of an electronic circuit, a letter receiving plate, which senses the letter inside and triggers the circuit to produce an alarm. It is also provided with locking system and twin LED.

He has conceived many other ideas and is working on them. His wife did not support him earlier but given the response he received from the press and the buyers of his innovations, her view changed. Others in the family were also not much appreciative of his creative pursuits. As a result he had to shift to another residence, where he is presently living with his wife and three children. While he was a kid, he had read about Mahmud Ghazni, the ruler from Ghazni (now in Afganistan) who attacked Indian princely states many times and plundered them. He wants to be famous like Ghazni through his innovations. He also idolizes Dr APJ Abdul Kalam for his contributions as a great scientist of the country.

[1] http://www.webhealthcentre.com/general/diet_nutrition_cooknut.asp#rice

[2] US patent 2007/0190221A1 reveals the method and apparatus for healthy rice cooking and removing starch by soaking rice in hot water that gelatinizes the amylpectin in the rice. The rice is cleansed with flowing i.e. removing the starch before cooking, and US patent 2005/021020887 A1 discloses the partition of electric cooker with perforated basket and discharge valve, a detector is provided to activate the discharge valve automatically once the cooking is over.

# Automatic pump operator

**National Second**
Household & General Utility

**Manoharmayam Manihar Sharma**
Imphal, Manipur

M Manihar Sharma (59), a mechanic and an innovator, has developed a system for automatic control of the water pumps for domestic and industrial use, in filling up overhead water tanks and ground reservoirs.

Second eldest among seven siblings, Manihar lost his mother when he was eight years old. He was brought up by his aunt. His father, a priest by profession, was a good scholar of Sanskrit. After Manihar passed class two, his father shifted him to a Sanskrit school, which did not go well with him. He left the school and completed his studies till class six privately and resumed regular schooling thereafter. After matriculation, he abandoned his studies due to financial problems and got married in 1972. He then started working as a labourer on muster roll for two years with the Engineering Department, Thoubal. The job was on daily wages basis.

Given the irregular nature of the job, he switched over and joined a shoe shop as a salesman but because of his health, had to leave it within a few months. He then decided to drive an auto rickshaw. Starting early in the day and working till late night, he did well as an auto driver and became the

Secretary of the Auto Association of Manipur in a few years. His irregular eating had an adverse effect on his already weak body system. Frustrated at being unable to give the desired attention to his family, specially children, he gradually started reducing his working hours and finally left driving in 1992.

Doing some jobs off and on, he started his restaurant in 1994. The restaurant ran well and he could earn a surplus and even buy some gold for his family. One day, during a regular medical check up, his Doctor friend asked him to join him and manage his clinic. Initially, he was a bit skeptical but later decided to go ahead as the job gave him plenty of time for his other innovative pursuits. This continued for twelve years after which their association ended due to some misunderstanding.

Since childhood, Manihar had never played with anything bought from the market rather he had always developed his own stuff like toys and small machineries. As a young man, he mastered all the nuances of repairing and maintenance of light vehicles and other engines. His constant inspiration has been his mechanic teacher, who used to repair or modify complicated and advanced machineries without any use of sophisticated tools and equipments. The mechanical tips and logical but informal steps, shared by his teacher have been the backbone of his innovative spirit.

After working as an auto rickshaw driver, running a small restaurant, serving as an assistant to his doctor friend, Manihar Sharma is now a full time innovator. His innate creativity has not been tampered by the constant struggle of making his ends meet on a day-to-day basis. The society and his own family members mockingly branded him as the man who would go to "*numit*" (sun) for his lack of pragmatism.

**Developing the Automatic Pump Operator**

While working with his doctor friend, the sight of the water overflowing from the overhead tanks in the nearby houses used to disturb him because his family members had to walk a long distance to fetch drinking water. He thought of a machine that could minimize the wastage of water and human power and started working on his first innovation, Automatic Pump Operator (APO) machine.

A crude prototype of Pump Operator, made in 1997, boosted his spirit but lack of money depressed him. Appreciation and recognition at the exhibitions could not bring in the financial support for his innovation. Fortunately, an officer from Manipur Science and Technology Council (MASTEC) helped him to get the Technopreneur Promotion Programme (TePP) support in 2005-06 for the prototype development of his machine.

The initial glitch was just over but more of it was to come in the future. The mechanical and electrical parts that he needed were not available in the local market. They could only be bought in bulk, either from Kolkata or Guwahati. The inability to buy expensive parts from the markets outside the state forced him to manufacture those plastic parts himself. Making molds for every part would have costed him several lakhs of rupees that he couldn't afford. So, this perfectionist and frugal innovator enrolled for a three months course on plastic molding techniques at Central Institute of Plastic Engineering and Technology (CIPET). He is the only trainee, among hundreds, who has actually made use of the technology.

The obsession to do the things perfectly made him to first practice the art of manual molding of plastic for years. His skill, hard work and sheer perseverance makes even CIPET send him works sometimes. The process is not a simple one. He still experiments and works on his molds, whenever he gets time. So far, for his Pump Operator he has developed more than 30 wooden molds. Each part or component (except the electrical components) is hand made by him**.**

While fixing the electronic circuit components, he had a lot of trouble in using the small hand-held drill to pierce through the circuit board. To overcome this challenge, he developed a micro-drill using old transistor-motor and other components. The micro-drill works very efficiently and is light and easy to use.

The APO is a mark of genius; not only all the components were hand made after years of learning, the equipments to assist him in his small work-shed were also modified or re-built to meet his requirements. After 15 years of struggle, he completed the APO machine with seven variants.

**Automatic Pump Operator (APO)**

The APO is a hassle-free household water management device that integrates the ground reservoir, water pump and the overhead tank.

Using a central control panel, the pump switches on automatically as soon as the overhead tank goes below the threshold level and switches off as soon it gets full. It also takes feedback from the source of water (reservoir-ground or overhead) to check if there is enough water. When there is little or no water, the APO does not switch on the pump. Thus it prevents damage to the motor.

In the most advanced version of the APO, Manihar has incorporated a system such that the feedback is available from multiple overhead tanks and the ground reservoir as well. The overhead tanks can be at different heights. If there is a surplus in a particular tank and deficit in another, irrespective of the fact whether ground reservoir has water or not, the APO can switch on the motor to pump water from the tank with surplus water to the one with deficit.

The APO covers the entire spectrum of a thorough water pumping system – from a running pipe, pond, river, tank, etc. It can lift water in higher tank from lower one and *vice versa* depending upon the need. Depending upon the complexity of the system and the features required, the cost of APO varies between Rs. 2000-3500.

Most of the automatic pump controllers[1], use feedback from overhead tank only, while the present innovation has also used feedback from reservoir to ensure no damage to motor due to empty running. The controller systems using the feedback of reservoirs are completely electronic and are costlier[2]. Interestingly, he has not filed any patents as he lacks the knowledge of patenting.

**Other Innovative Pursuits**

Around 1960, when still a bachelor, Manihar Sharma thought about a passenger pedal rickshaw with a capacity of six to seven people. But, he did not dwell hard over it. After developing an APO, he started to revive the idea but due to the lack of technical instruments and financial problems, he could not complete it. His other innovative works include a dryer and a *dhoop*-making machine.

**Innovative Dryer:** This machine is a simple dehydrator with an efficient mechanism. Hot air is blown into the drying chamber from below with the help of normal heating rods and air blower. Every layer of the drying tray is attached with an air guide that provides uniform distribution of hot air. On the upper corner of the machine, an exhaust fan continuously takes out the moisture. Preliminary trials indicate much faster and more uniform drying process for fruits and vegetables. The added advantage is that the machine is run by a single-phase power; which means any domestic line can be used. It also consumes less energy. A similar capacity standard dryer runs on 15000 watts, whereas the present machine consumes only about 6000-8000 watts.

***Dhoop* (Incense Sticks) Making Machine:** His wife used to make the incense sticks manually to generate income for the family. Her pains made him innovate a *dhoop* stick making device. This manual device has two blade arrangements, one for making small bamboo splints and the other for making small sticks. For stick making it has a multi-bladed arrangement for different stick sizes. Both the blades are fixed on two sides of a small

wooden block. The main advantage of this efficient machine is that, it is the only machine that can make sticks from both green and dry bamboo. In fact, dry bamboo is the preferred type. The quality of *dhoop* is superior to any of the available ones – both manual and machine. The Bamboo wastage is also very minimal.

**An Individual Innovator Based Incubator**

Even in his worst times, he has been helping other innovators or those who need his help, without any qualms. He has helped his doctor friends by repairing their hospital equipments. He has also helped desperate individuals by making plastic spare parts, which are not available in market (photocopy machine gears, or wheels for gym equipments). In his home-cum-makeshift workshop, if not engrossed in innovations, he is busy in the repairing work of local machineries brought in by his neighbors, friends and relatives or fabrication of small plastic equipments. He often spots the fault just by a close look at the machines. This, he considers as a god gift and so he does not charge the people who come to him to get their gas stoves, radios, TV, lighter, torches, table clocks, umbrellas, etc., repaired, unless there is a component to be replaced.

As a part of Honey Bee Network, he hosted a workshop for the innovators in March 2009. Initially he was reluctant to do it, but he was convinced to use the *mandap* (an open religious space in every Brahmin's house) for the meeting. He was a proud and happy host to all the innovators and the invitees. He also has been providing support to many innovators from Manipur – he has completely transformed the *Muga/edi* reeling machine of another innovator named Maimu by replacing almost all the wooden movable parts with plastics without charging any extra money for his work.

In a place where kinship and personal relationships count more than anything else, his absence in social functions never calls for a reprimand. Once he even missed his best friend's brother's funeral because he was engrossed in his work and completely forgot about it. The next day his friend turned up at his work place and spent hours talking about his new machineries; there was not an iota of remorse and ill feeling between them.

There is a certain degree of innovativeness to his house's entrance also. His house is surrounded by a two feet drain. Instead of building a small permanent bridge over it, he has made a draw bridge like arrangement, which he lowers only when a visitor is there. The bridge leads to his workshop from where one can then enter his house. He has three daughters and a son. One of his daughters is differently abled. Mrs. M Geeta Devi, his wife, is the breadwinner, earning around Rs 3000 per month by preparing *dhoopbatti*, *agarbatti*, doing embroidery work and tailoring. His innovations are just an erratic source of income. Her initial complaints have now changed to appreciation and support. His neighbors initially branded him as mad. When different government officials started visiting him and he received the government grants they realized his caliber.

**Hope Survives**

Manihar Sharma had always longed for a small workshop in which he can make innovative products. A few months back, NABARD provided him a grant for developing a manufacturing unit and to meet the demand of his products. Some of his innovations have huge application potential – the only hurdle is to make a breakthrough in commercial terms. A lavish and comfortable life, through his innovations, is not on his wish list; he just

needs a support system for his family. Often the difficulties bring him on the brink of giving up, but his spirit endures.

Complacency and drudgery have not touched him. He does not let his mind and hands rest until he has developed every part of different innovative machines to a perfect finish. He wishes that someone should take over the business part and let him concentrate only on his innovations. At the end of the day, he goes back to the same workshop and spends the rest of his day perfecting his innovative works or completing an unfinished task.

Manipur may be on the margins of the socio-political consciousness of the country but it is at the heart of innovative spirit of India. Manihar Sharma has proved that insurgency of mind can be a prime mover for transforming lives at grassroots and making life easier for common people.

---

[1]http://www.pumpsdelhi.com/automatic_pump_controller.html, http://www.indiamart.com/achalaengineering/electronicproducts.html, http://www.tradeindia.com/selloffer/1496982/Automatic-Water-Level-Controller.html?source=rss-lead, http://www.pumpsdelhi.com/automatic_pump_controller.html, NIF database

[2] http://www.classifieds.ivarta.com/Bangalore-Automatic-Pump-Controller-Level-Indicator-Home-Appliances/43913.htm, http://cgi.ebay.com.au/ELECTRIC-WATER-Pump-Digital-Control-pressure-switch_W0QQitemZ170271191567QQcmdZViewItemQQimsxZ20081014?IMSfp=TL081014124001r15001

## Electric shock proof converter

**National Third**
Household & General Utility

**Kshetrimayum Nickolson Singh**
Imphal East, Manipur

An electric shock occurs when a person comes into direct contact with an electrical energy source. K. Nicholson Singh (28) has developed an innovative device, which converts all electrical lines to shock-free power lines. If accidentally someone touches these lines, then also s/he does not feel any shock.

Nickolson was born to a poor family at Wangkhei Khuman Leikai, Imphal in 1981. He is the third child and first son of K. Indrajit Singh. He had his early studies in local government schools. Since his early childhood days, he had always been a difficult child with very inquisitive mind who always wanted to do things on his own ways. Such level headedness often landed him in troubles on many occasions, and got severe rebukes from his father time and again.

When Nickolson's father got a job at Regional Institute of Medical Sciences (RIMS), Manipur in 1989 as an electrician, the family moved to the official quarter. That's where Nickolson's inquisitive journey of exploration started,

keenly observing and following the foot-steps of his father. He learned the basics of electrical machineries from his father from a very young age.

He completed his studies till class ten but could not complete his class 12 because of his ill-health, and subsequently left studies.

Nickolson's father used to repair all kinds of electrical appliance at home, and he joined his father's electrical repairing work to give him a helping hand. He started with dismantling works electrical devices and later on moved to small repairing works. In the beginning he had to fight with his father as he always wanted to lay his hands on anything and everything, often making a mess of many devices. But, as he made progress in his skills, he started doing regular repairing works in his father's absence.

He was taught by his father all the basics of electrical components, and more importantly the precautions one needs to take to avoid any possible electrical shock while dealing with repairing works. His father also bought many electronic books to read so that Nickolson could also learn theoretical part of it. To upgrade his skill level, he was sent to a private electronic center for four months. After acquiring his basic skills, he again branched out to learn power transmission system. Again, it was his father who came to rescue and taught him the fundamentals.

**Genesis of the idea**

After retirement of his father, together they opened an electrical repairing store in Uripok, Imphal. In one of those repairing sessions he got a serious electric shock. From then onwards he started thinking about electronic equipments, without the danger of having electric shocks. He first consulted his father about availability of such devices, but got no definitive answer. He was told that he had not come across any such device that protects from electric shock. That was the trigger for Nickolson to come up with a device that would solve problems of all electrical devices users and provide answers to his unresolved questions.

There are many shock control devices[1] available in the market. But these devices do not convert the electrical current to a shock-free current. His father had bitter experiences of purchasing such devices for RIMS, and failing miserably on many occasions. He even started worked on such machines to correct the flaws in the system. Unfortunately, he was not very successful though he did find out where the possible fault lies.

Both father and son had discussions on this issue on many occasions and concluded the only possible way to prevent electric shock was to prevent the output phase electron flow or earthing energy passing through to any living body.

Nickolson then started experimenting on his new concept for years and finally he came up with the first device in 2003. Though he had used the device in his workshop he was afraid to do a thorough test or tell others about the machine. And in fact it was his father who found out the device first. One day his father came to the store for some repairing works; he kept the switches on and started working. Accidentally he touched on of the live wires but felt no electric shock. Till then he didn't know that his son had developed the device and the line he was working on was the output line of the device.

Then he called Nickolson and informed him about his experience. Nickolson also repeated the same process and realized that the live wires didn't have any shock. Both father and son were very excited having achieved their long cherished dreams and the first prototype of electric shock proof device was born.

**The shock free converter**

It is an electronic system attached to the main electricity board of the house, which coverts all electrical lines to shock free power lines. NIF facilitated the testing of his device at IIT Guwahati, which evaluated it and has explained it as below.

The working of this device can be explained in three stages

1. At the input stage a Multiphase change over through Automatic switch is built in. This comprises 3 relays and 3 transformers. Purpose of this mechanism is to automatically provide single phase output from 3 phase input when any phase fails or all the phases are active but we need only single phase output as is the case with most of the domestic appliances. Significance of this phase is that input voltage has been reduced to low output voltage so that it will not cause electric shock.

2. Output from stage 1 i.e. Multiphase change over through Automatic switch is fed to second stage called as Double phase/High Voltage vs. Normal Voltage device. In this device 1 relay and 2 transformers are used. Here in case of high voltage due to mixing of 2 or more phases of input supply is taken care of. Also if there is any touch by human being at the final output stages on the live wire, its relay immediately switch the phase to no current stage and prevent electric shock.

3. Output stage uses a specially fabricated transformer with winding for both primary and secondary coils. This transformer steps up the voltage to usable voltage of 220 volts.

So when there is a contact of human being at the output stage even with the live wire, due to the relay in the second stage, electricity circuit becomes open through the relay. Hence there is no electric shock. If a human being touches both the wires in the output stage, he gets shock. This aspect is found advantageous for domestic purpose for shockproof working of appliances without any loss of current and also applicable for electric heaters etc. drawing high current compared to electric lights etc.

The device can be constructed rugged enough to withstand poor current characteristics that can facilitate its use in conjunction with captive electric generator source too without manual change over and in rural areas where current quality is poor with low voltage, higher fluctuation. This is a very useful device for every household/commercial establishment with electrical installation.

However, the experts at IIT have suggested a few changes before commercializing the innovations. The various stages of the device can be integrated with a Single Protective cover for the machine to be aesthetically attractive. The quality of the material could be improved, which would increase the durability and reliability.

Nickolson is a prolific innovator and has many other innovations to his credit like the reuse of fused tube lights, longer lasting modified tube light choke, and movable solar energy panel. Given his innovative pursuits, he was invited to participate in the Third Inventors of India workshop at IIM, Ahmedabad in October 2006 where he described his innovations to other invited innovators of the country. He was also nominated for a workshop at Centre of Bits and Atoms, MIT, Massachusetts, USA in 2007.

He was also provided a scouting fellowship briefly to look for other innovators like him from different parts of Manipur. Nikolson provided a lot of help in organising the regional workshop of grassroots innovators in Imphal in July 2007. He identified more than half a dozen grassroots innovators from the region and helped them bring them to NIF fold.

[1] The commonly available device is the GFCI (Ground Fault Circuit Interrupter) or what is commonly known as the safety switches. In this device when someone gets a shock it automatically switches off the system. After that one has to switch on the safety switch to run the system. Though it prevents any fatal inquiry by cutting off the main line but still it does not prevent the shock. In this case there is no electric shock at all.

## Pressure cooker coffee maker

**National Third**
Household & General Utility

**Mohammed Rozadeen**
East Champaran, Bihar

Scout: Azhar Hussain Ansari

Conventionally, the pressure cookers have been used for making food only. However, Rozadeen (46) has modified the ordinary cooker to convert it into an espresso/cappuccino coffee making machine. The modified cooker is used to boil water and generate steam. Through a long delivery pipe having a regulator, high pressure steam is used to make frothy, tasty coffee.

Rozadeen alias J P Ustad was born in Motihari, Champaran in 1963. Champaran has a special place in the history of the country because Gandhi perfected the instrument of Satyagrah here in 1917 after lessening the exploitation of indigo farmers within six months. This experience eventually led to the call for full freedom in 1929.

Coming from a very poor background, Rozadeen could not study at all. His father died when he was only ten years of age. While his father was alive, he spent his time playing marbles, *gulel*, *kabaddi* and catching fishes from the pond and the river. Things changed after that. His mother took to tailoring to support the family of seven. Starting in his early teens, he has spent

over three decades of his life working as a mechanic of bicycles and rickshaws, and in battery manufacturing & repairing works. Presently, he does the job of gas and electric welding. He has a small thatched shop on rent where he does all his welding works. He has his wife, four daughters and two sons in his family. Two eldest daughters are married while the younger daughters are studying. His sons, still in their teens, discontinued their studies after class eight and have been working as plumbers in Motihari.

**The idea**

Whenever Rozadeen used to go to marriage parties, he used to observe people thronging at the coffee stall. He reflected and realised that not many actually drink coffee otherwise in their daily lives and have tea instead. Also coffee is not an available option at all places and most tea stall owners cater tea only. Exceeding Rs. 5000, the electric coffee making machines were costly and out of reach for most road side vendors. He thought if he could make a device at low-cost, it may help him augment his finances and supplement the income of tea vendors also. He conceived this idea in 1993 and thought about it for a while as it involved some investment. He took some time gathering information about the coffee making process so that errors could be minimised. His income was already insufficient and an investment of a few hundred rupees without the guarantee of success was a risky proposition. However, he went ahead and slowly over a period of a few months and investing some three thousand rupees then, he finally made a prototype using an old cooker and tubes of copper. For this he had to take a loan of Rs 2000 from one of his friend, which he repaid later.

**The coffee cooker**

The innovation is a pressure cooker modified to incorporate a copper delivery pipe on its lid to transfer the steam generated inside to a container outside.

Fabricated from locally available material, this coffee cooker consists of an ordinary pressure cooker fitted with a copper pipe, a pressure releasing valve actuated by moving a lever (screw driver originally used). The copper pipe along with valve has been fitted on the top of lid by gas welding.

Water is heated in the cooker. Once sufficient steam pressure is reached, it is released by moving the lever upwards. The delivery tip of the copper pipe has been constricted to create more pressure at the point of release of steam. The safety valve below the handle and the whistle has not been touched. Rozadeen has named it as 'JP Ustad coffee cooker'.

The cost of coffee cooker depends upon its size. A new 10 litre capacity cooker costs Rs. 2000 while a modified old one costs Rs. 750. Similarly a new 5 litre cooker costs Rs 1000 and an old one Rs. 500. If someone brings his own cooker, he does the modifications in only Rs. 250. This modification can be done in any size of pressure cooker. There are other coffee makers available[1] but in this case the novelty lies in generating the steam in pressure cooker and directing it through a delivery pipe into a jug containing coffee powder, milk and sugar. NIF has filed a patent in his name for the coffee cooker.

**Diffusion and feedback**

Taking 50 per cent advance Rozadeen only prepares coffee cookers on demand. He has sold over 1500 such coffee cookers in Motihari and other areas namely Bagaha (Indo Nepal border), Dhaka, Bairgania (Sitamarhi district), Raxaul, Bettiah, Sugauli, Samastipur and many other places. The demand is highest during the winter season.

This low-cost coffee cooker has good potential in road side hotels, tea stalls, small *dhabas* and other places where as choice coffee can be offered

along with tea. It can even be used at homes for preparing coffee. One just has to change the lid of the cooker and the pressure cooker gets converted into coffee cooker.

This coffee cooker is common sight at any tea stall in Motihari. Feedback was collected from many tea stall owners who had been using this cooker for years. Most of them said that it has increased their clientele by drawing in the people who prefer coffee over tea. The cooker is economical and affordable. The coffee cup is sold for Rs 6-10 depending upon the size of the cup. The taste of the coffee is also different than that from an electric espresso machine. It feels and tastes soft and frothy more like a cappuccino than an espresso.

Rozadeen is looking for support to scale up his innovation. Presently he is making the cooker on demand only. He wishes to have some support so that he has make and keep 5-10 pieces ready for customers as many of them come from different districts also. He was felicitated during the 22nd Shodh Yatra in Bihar in 2008-09. A story on his innovation was done by a prominent newspaper, *Dainik Jagaran* in November 2008 and also by ETV channel during the Shodh Yatra. "*Paisa hoi tabhina dimaag badhi*" quipped Rozadeen when asked about any other idea.

[1] Prior art discloses a kitchen appliance to brew coffee without having to boil water in a separate container is well known concept (http://en.wikipedia.org/wiki/Coffeemaker). It also discloses steam-driven, piston-driven and pump-driven espresso machines (www. http:/ en.wilkipedia.org/wilki/Espresso_machine). The first one uses steam pressure while the other one uses pressurized hot water for brewing coffee. In the South Indian method of making coffee (http://vegeyum.wordpress.com/2008/05/09/tt11/) hot water is dripped very slowly through the coffee, milk is separately boiled, sugar is added, both coffee concentrate and milk are hand mixed using two mugs by pouring from one mug to other many times.

# Improved varieties of wheat, paddy, mustard and pigeon pea

**National First**
Plant Variety

**Prakash Singh Raghuvanshi**
Varanasi, Uttar Pradesh

*Apni kheti apna khaad, apna beej apna swaad*

Promoting self-sustainability through the above lines, Prakash Singh Raghuvanshi (49), an enterprising farmer, has always strived to develop better seeds for the farmers. He has developed many high yielding varieties of wheat, paddy, mustard and pigeon pea.

Prakash lives in a joint family along with his mother, wife, six children and one of his brothers in the Tandia village of Varanasi. Two of his brothers are also farmers while the one living with him owns a seed company and sells the seeds developed by him.

Raghuvanshi has three and a half acres of agricultural land on which he cultivates wheat, paddy and pigeon pea. His family members especially his eldest son, Ranjeet, help him in farm work. All his children are studying.

**The inspiration for research**

To keep himself updated with the latest in agriculture, Raghuvanshi has been regularly participating in agricultural fairs, and meets scientists and agricultural officers. His inspiration to develop new varieties came from Dr. Mahatim Singh, former Professor at Banaras Hindu University (B.H.U.) and former Vice Chancellor, G.B. Pant University of Agriculture and Technology (GBPUAT). Dr Singh motivated him to develop better varieties that could be used by other farmers to improve their livelihood.

**The Innovation**

Raghuvanshi has developed a number of improved high yielding wheat, paddy, mustard and pigeon pea varieties, which are resistant to major pests and diseases and have seeds with good flavour and taste. These varieties have been developed using simple selection based on specific character features of the plants.

**The improved varieties of Wheat**

The three wheat varieties, *Kudrat 5*, *Kudrat 9*, *Kudrat 17* were developed from *Kalyan sona* and *RR21* varieties. The plant height of *Kudrat 9*, *Kudrat 5* and *Kudrat 17* is 85-90 cm, 95-100 cm and 90-95 cm respectively, where as the length of the spikes is 9cm, 6cm and 10 cm, weight of 1000 seeds is 70-72 grams, 58-60 grams, 60-62 grams and the yield per acre is 20-25 quintals, 15-20 quintals and 22-27 quintals respectively.

The wheat varieties in general are characterized by higher number of ear bearing tillers, lengthy spikes, and more number of seeds per spike, hardy stem and high protein content.

**The improved varieties of Paddy**

The three varieties *Kudrat 1*, *Kudrat 2* and *Lal Basmati* of paddy were developed from *HUVR-2-1 and Pusa basmati* varieties. The number of days to maturity in cases of *Kudrat 1*, *Kudrat 2* and *Lal basmati* varieties are 130-135 days, 115-120 days and 90-100 days respectively while the yield per acre of each (mentioned in order) is 25-30 quintals, 20-22 quintals and 15-17 quintals. The paddy varieties are having higher number of ear bearing tillers and more number of seeds per spike.

**The improved varieties of Pigeon pea**

The three Pigeon pea varieties, *Kudrat 3*, *Chamatkar*, *Karishma* were developed from *Asha* and *Malviya 13* varieties. *Kudrat 3* is a perennial variety while the other two are annuals. The number of pods per plant in cases of *Kudrat 3*, *Chamatkar* and *Karishma* are 500-1000, 400-600 and 450-650 respectively while the yield per acre is 12-15 quintals, 10-12 quintals and 10-12 quintals respectively. These varieties possess bold seeds, robust stem and more number of pods per plant.

**The improved varieties of Mustard**

Three mustard varieties *viz. Kudrat Vandana*, *Kudrat Gita*, *Kudrat Soni* have been developed by him using simple selection. The average seed yield of the varieties are 1430.52 kg /ha, 1405.24 kg/ha and 742.23 kg/ha with an average oil content of 42.30 per cent, 39.00 per cent and 35.50 per cent respectively. The special features of *Kudrat Vandana* is having higher number of seeds per pod and high oil content while for both *Kudrat Gita* and *Kudrat Soni*, it is the occurrence of bunchy pods and bold seeds. The mustard varieties have been evaluated at NRCRM, Bharatpur.

**Diffusion and feedback**

Raghuvanshi is an innovative farmer and has participated in a number of *Kisan melas* and agriculture fairs across northern India. He has distributed seeds of his wheat varieties to the farmers of Varanasi, Allahabad in U.P, Jabalpur,

Narsingpur, Khargaon, Indore, Bhopal, Ujjain in Madhya Pradesh, Raipur, Bhilai, Dhamtari in Chattisgarh, Jalgaon, Yawatmal, Amrawati and Pune in Maharashtra and Kota, Bharatpur, Dungarpur, Jaipur and Sikar in Rajasthan and Ahmedabad, Gandhinagar, Amreli, Sabarkantha in Gujarat and some parts of Bihar, Haryana and Punjab from where the reports and farmers' feedback has been appreciable.

Encouraging feedback has also been received from farmers from U.P., Rajasthan, Punjab, Bihar and Haryana for his mustard and pigeon pea varieties. His new crop varieties have received appreciation in a *Kissan mela* (Farmer fair) and from *Banasthali Vidyapith,* Rajasthan, which tested his wheat varieties.

He has been part of the NIF's informal Research Advisory Committee (RAC) for evaluating technologies for the Fourth Competition. Raghuvanshi also participated in the traditional food festival, *Saatvik,* organized by SRISTI-NIF in 2006, where he got good response for his varieties. He won a consolation award in NIF's Fourth National Competition for Grassroots Innovations and Traditional Knowledge in 2007. NIF has filed applications under the PPVFR Act 2002 for his wheat varieties *Kudrat 7*, *Kudrat 11* and pigeon pea variety *Kudrat 3*.

He has also been supported financially to the tune of Rs. 1,90,000 under the Micro Venture Innovation Fund (MVIF) for nursery development, cultivation and scaling up manufacturing channels for his improved varieties.

All the hard work that he does in developing improved varieties of different crops is based on a single simple premise. He wishes that every farmer should have access to good quality seeds of higher yielding varieties of crops so that it is beneficial for the farmer and for the country as well.

# High yielding improved varieties of Wheat, Paddy, Pigeon pea and Mustard

**National First**
Plant Variety

**Jai Prakash Singh**
Varanasi, Uttar Pradesh

Jai Prakash Singh (45), a farmer from Varanasi, has developed a number of high yielding varieties of wheat (*Triticum aestivum* L.), paddy (*Oryza sativa* L.), pigeon pea (*Cajanus cajan* (L.) Mill.), and mustard (*Brassica juncea* L.) following simple selection method.

His village Tandiya is 30 km away from Varanasi, Uttar Pradesh. It is a small village with about 60 households. Popular for its vegetable market, the villagers also grow wheat, barley, gram, mustard, chilly, pea, brinjal and *barseen* in the *Rabi* season while bajra, sorghum, paddy, *tuwar*, moth bean, green gram and groundnut in the *Kharif* season. The soil type is predominantly alluvial but due to occasional floods, the salt content has increased over time. Being close to Varanasi, the infrastructure facilities are also better than other far flung areas.

Jai Prakash Singh's father late Shitala Prasad Singh was a primary school teacher. In his family apart from his wife are his four children who all are studying. One of his brothers is a seed merchant in Allahabad while the other, Prakash Singh Raghuvanshi is an experimental farmer. His three

sisters are married. As a child he had keen interest in studies but could not continue after failing in class ten. It was the time when his elder brothers separated with their families and his parents could not support his education. Slowly, he got inclined towards agriculture and started experimenting in his fields. He now has 5 acres of land where he cultivates wheat, paddy, pigeon pea and mustard. Besides farming, animal rearing also keeps Jai Prakash occupied.

**Triggering the interest**

He recalls that his father, Shitala Prasad Singh, had obtained license from National Seeds Corporation Agency in the year 1989 for the sale of seeds. One farmer approached him to get good quality and high yielding seeds of wheat. That time government released UP-2003 variety was in their fields, his father advised him to purchase it. The farmer had a very good crop and was willing to pay higher amount the next year for the same variety.

This intrigued Jai Prakash and he started experimenting to develop improved varieties of various crops using the selection method in the year 1990. He started spending more time in the field to develop unique and higher yielding varieties of wheat and paddy. But suffering huge losses in the experimentation, in 1993, he had to go to Surat (Gujarat) to earn his living. However, he returned after a year and restarted his research. Gradually, he developed his skill in the selection of varieties based on various morphological characters and disease resistance.

**The improved crop varieties**

Jai Prakash Singh has developed many improved and high yielding varieties of wheat, paddy, mustard and pigeon pea.

**The varieties of wheat**

JP 33, JP 52, JP 61, JP 64, JP 81 and JP Karishma 100 are the improved wheat varieties developed by Jai Prakash. The days to maturity in these varieties varies from 95-100 days in JP Karishma-100 to 120-130 days in JP 81. The number of tillers per plant varies from 2-4 in JP 61 (un-irrigated) to 25-30 in JP 64. In general these varieties have bold seeds and excellent taste. JP 52 has high iron content (as per the Officer-in-charge, ICAR All India Co-ordinated project on Micronutrients, Lucknow) while JP 61 has high protein content (12-14 %). The yield per hectare varies from 15-16 quintals per acre in case of JP 61 and JP Karishma-100 to 25-30 quintals per acre in JP 64 and JP 81. Experimental results received from GB Pant University of Agriculture and Technology, Pantnagar showed at par results for yield of two of his varieties JP 33 and JP 52 with other check varieties UP 262, UP 2382, PSR 1 and PSR 2.

**The varieties of paddy**

Paddy varieties JP 51, JP 71, JP 72, JP 80 and JP 115 developed by Jai Prakash are very good in taste, flavor and are resistant to major diseases and pests. The days to maturity varies from 80-90 days in case of JP 51, which is a dwarf variety to 135-140 in case of JP 115 developed by crossing Jeera 32 and Dhania varieties. The maximum yield obtained is in the case of the varieties JP 72 (24-25 quintals per acre) and JP 80 (25-26 quintals per acre).

**The mustard variety**

The mustard variety JP Vishwajit is aphid, white rust and shattering resistant. The siliqua (fruit) comes in bunch. This variety can be sown with wheat, gram and peas as an inter crop as well. The variety matures in 100-110 days, bears 1000-1200 pods per plant and yields 6-7 quintals per acre.

**The varieties of pigeon pea**

Jai Prakash has developed many pigeon pea varieties *viz.* perennial JP 5, JP 6, and annual JP 7, JP 9 and ICPL 87. The perennial varieties mature in 190-220 days while the annual ones in 190-230 days. The yield varies from 10-15 quintals per acre in the perennial ones to 5-10 quintals per acres in annual ones.
Apart from the above varieties, he is also developing a variety of *Bel* (*Aegle marmelos*), in which fruits come in bunch (8-10 fruits), and variety carries less number of seeds in fruit with appreciable improvement in taste.

**Diffusion and feedback**

Jai Prakash has distributed seeds of high yielding wheat and paddy varieties to the farmers of Maharashtra, Bihar, Haryana, Madhya Pradesh, Uttarakhand and Uttar Pradesh from where the reports and farmers' feedback have been encouraging.

The varieties of wheat and paddy have attained wide popularity in the northern and central states of India and are grown in different regions of the states of Bihar, UP, MP, Punjab and Haryana. A farmer, Babban Singh from Bhojpur, Bihar mentions that the wheat variety (JP 33) is very good for unirrigated regions. It is tasty and protein rich. JP 61 matures in 120-130 days and gives a yield of 20 quintals per acre. He states that the pigeon pea variety (JP 9) is not eaten by the blue bull; it is tasty and protein rich. Another farmer, Ganesh Choudhary from Harda, Madhya Pradesh mentions that the wheat varieties are high yielding and good for the farmers. Raj Bahadur Singh, of Kaimur district, Bihar produced 2000 quintal of wheat in the last season.

**Participation in agricultural fairs and recognitions**

Jai Prakash has participated in a number of Kisan melas and Agriculture fairs across northern India. He learnt about NIF in 2000 when he participated in a farmers' fair at Narendra Dev University of Agricultural & Technology, Faizabad, Uttar Pradesh. For his efforts to develop plant varieties, he received a consolation award in NIF's Second National Competition for Grassroots Innovations and Traditional Knowledge Practices in 2002. He also got a regional award from Banaras Hindu University and NDUA&T, Faizabad.

NIF, in August 2009, provided financial support of Rs. 2 lakhs to Jai Prakash through Micro Venture Innovation Fund (MVIF) for promotion of two of his high yielding wheat varieties (JP33 and JP52). A VARD grant of Rs. 36,200 was provided earlier through for experimentation and on-farm validation of five wheat varieties in July 2009. The filing of applications for his wheat varieties under the PPVFR Act 2002 is under process.

**The journey so far**

Jai Prakash Singh finds agricultural research a very joyful and interesting engagement. However, he believes that the lack of sufficient resources and support from formal research institutes are the major hindrances for innovative farmers like him. He remembers the contribution of his wife in preserving and taking care of the seeds of wheat, paddy, pigeon pea and mustard, selected by him. She also helped in various other farming activities and in his absence took care of the all the responsibilities.

There have been times when the seeds of his varieties were stolen by others. At other times his crops were damaged by animals due to the lack of a boundary wall around his farm. He had to survive in tough financial conditions and fight depression. In all the ups and downs of the life, his wife and children have supported him thoroughly.

He desires to establish a seed farm where he will be able to produce good quality seeds in large quantity at affordable prices.

# Groundnut variety Dhiraj 101, which is resistant to wilt due to stem rot

**National Second**
Plant Variety

**Dhirajlal Virjibhai Thummar**
Amreli, Gujarat

Scout: SRISTI, Ahmedabad

A new wilt resistant groundnut variety has been developed by a farmer Dhirajlal Virjibhai Thummar (38). This early maturing variety also gives higher yield than other locally popular varieties.

Dhirajlal lives in a joint family with his mother, wife, children and the families of his two younger brothers. Due to his father's ill health and financial constraints, he had to leave studies after class tenth and take charge of the family's 50 *bigha* land and the cattle. With five wells and a bore, the land is well irrigated where the family grows groundnut, cotton (BT and Shankar varieties), sorghum, wheat and vegetables. Sorghum is grown primarily for the cattle and vegetables for own consumption. His village, with a population around 2500, is predominantly agriculture based where the farmers mainly grow groundnut, wheat, sorghum, pearl millet and cotton.

**Selecting the plants**

Groundnut production is the major source of income for their family. The disease of wilt, locally known as *Sukado*, is responsible for the reduction in groundnut yield. In the year 2004 he had sown GG-20 groundnut variety in

his field. The whole crop got infested with the stem rot disease resulting in wilting and almost complete failure of the crop. However, he identified a few plants, which were not affected by this disease. Believing that these may have some inherent property that makes them stem rot resistant, he harvested and kept the seeds of these plants separately. He sowed the seeds separately in the next season and continued the screening and selection for three consecutive years. Finally he obtained the plants, which were free from stem rot and wilt as a result of it.

**The new variety**

'Dhiraj 101', the new variety of groundnut, selected from the GG 20 variety is early maturing and is resistant to wilt due to stem rot.

Flowering in 28-30 days, Dhiraj 101 matures in 95-105 days. The plant is 30-45 cm high and is of the semi-spreading type. It bears 35-40 pods per plant with a seed rate of 90-100 kg per hectare. At 3200-3500 kg per hectare, the yield is also higher than that of the locally cultivated varieties (GG 20 & GG 2). The oil content is also higher at around 42-45 per cent. This variety performs well in average monsoon as well as in less irrigation conditions.

To promote the growth, Dhirajlal, used only herbal pesticide for the control of insect pests and diseases. The formulation that he used was prepared using *Limda* (Neem)*, kidamari* (Dutchman's Pipe)*, tulsi* (Holy Basil) *& akda* (Swallow-Wort). Dhirajlal has distributed seeds to some farmers in Amreli, Rajkot and Bhavnagar districts of Saurashtra region in the current season. A few of them have given their feedback mentioning that the variety is free from wilt and rust diseases, also giving higher production than the GG20 variety. They add that it has relatively stronger pegs/pods, which remain at a lesser depth than the GG20 variety in the soil.

NIF facilitated the field trial of 'Dhiraj101' at the Oil Seed Research Station, Junagarh where the report was very positive. The report mentions that it is resistant to stem rot also and its production is 1.5 times more than the variety 'GG-20'. Also that it performs well even in average monsoon and less irrigation facilities. This variety matures eight to ten days earlier than the GG-20 and also has average oil content more.

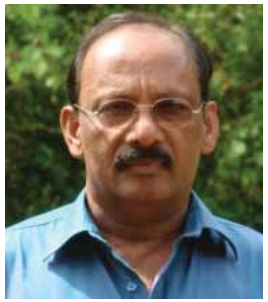
**Other pursuits**

Dhirajlal is an avid reader and also writes articles about environment, pollution and social problems in regional news papers apart from stories and dramas. He also participated in the *Akashwani Krushi Shiskhan* Programme, 2000 at Akashwani and Prasar Bharati, Rajkot. He has also inherited the knowledge about rain forecasting from his father, about which he has written quite a few times. He Understanding the importance of education, he makes sure that the children of the family study and not spend too much time in the fields. They are, however, free to assist in the field during their spare time.

He has received quite a few awards for his innovative efforts in the field of agriculture. Dept of Agriculture & Cooperation, Gujarat Government gave him the Sardar Patel Agricultural Research Award (2004) for developing a bicycle based agricultural implement as well as for pest control practices. He has also received appreciation certificate from *Sanatan Dharm Sewa* Trust, Thumarwadi for weather forecasting and various agricultural innovations (2003). He has also been participating in different agricultural training programs from time to time. He has attended the Training for Balance Nutrient Management in Agriculture sponsored by International Institute of Potash-Switzerland from Gujarat Agricultural University, Junagadh; *Yuva Khedut Talim* Programme from GSFG Ltd (1998) and participated in the Agricultural and Rural Development Programme by *Akashwani Krushi Shikshani*, Rajkot in 1994. Recently he has also been nominated for an award of Rs 1, 00, 000/- from ASPEE Foundation, Mumbai for highest cotton production in his Gujarat and his talent of rain forecasting. In 2008 he was also awarded by the Chief Minister, Gujarat for cultivation of "*Kaju*" and high yielding wheat (JWD366) variety. He was also felicitated by SRISTI in 2006 for "*Sthanik samasyano ukail taymaj havaamaanni jaankari*" (Solution of regional problems and weather information). He also regularly organises a *Shivir* (camp) for nearby farmers to meet and discuss various aspects of farming.

## New Cardamom Variety "*Panikulangara Green Bold No.1*"

**National Third**
Plant Variety



**Joy Peter**
Idukki, Kerala

Scout: T. J. James, PDS

*'Our economy is based on agriculture; innovation and innovators are very much essential for the sustenance of agriculture, but unfortunately they are not getting adequate respect and recognition'*

Progressive farmer Joy Peter (60) has developed a cardamom variety through selection process. The new variety is less prone to biotic and abiotic stresses and its ripe capsules retain green colour and size even after drying.

Farmers of Idukki, from where Joy belongs, are known for their hard work and determination. They struggle and fight with the extreme hardships of natures for survival. Steep slopes, adverse climatic conditions and problems of wild animals are main obstacles faced by these farmers. Joy Peter, who has studied only up to class four, has 50 acres of land. Here he grows plantation crops like cardamom, pepper, coffee, vanilla, clove, nutmeg and arecanut. Of the total area, 20 acres is devoted to cardamom cultivation alone. In his family, there are seven members including three children (two sons and a daughter), his mother and a sister.

Joy Peter's family migrated from nearby Ernamkulam in 1948 when he was 10 years old. His father, a business man, due to business failures, had to sell off their native land and purchase nearly 2 hectares in Adimally, Idukki. Later, his father started the business of spices at Adimally. Since his school was ten km away from his house, Joy discontinued his regular studies and joined his father. He grew up to be a successful farmer and expanded his father's work.

Joy Peter specifically narrates an incident, from where he got the inspiration and determination to do well in life. During his school days, after a long walk, he came back to his home when his father asked him to go to the market and purchase grocery. As he too tired, he refused to do so. This irritated his father, who then commented that he was good for nothing and it was waste spending on him. His father did not mean to hurt him intentionally but this comment left a deep impact in young Joy's heart. He then decided to prove himself before every one. That day onwards he started working hard. It was quite emotional when one day his father was praising him for his success that he narrated this incident.

**Motivation for experimentation**

Being a man with scientific outlook, curiosity, and keen observation, he spent most of his time experimenting in the field so as to substantially incre-ase the production and income from his farm. He used to grow and experiment with arecanut and coconut crops on his farm. But since cardamom was more profitable, he decided to concentrate on cardamom plantation. In 1990s most of the cardamom varieties grown were traditional ones, *viz.*, *Malabar* and *Vazhuka*. He heard about *Njallani* variety and tried to cultivate it. But because of the low altitude, the yield was not good. Also it was more susceptible to thrips and stem borer. Still he was able to cultivate 300 to 400 *Njallani* variety plants by clonal propagation. He was well aware of the efforts of Sebastian Joseph (NIF awardee 2001) in developing *Njallani* variety. This inspired him to start experiments to develop a locally adaptable variety.

**Developing *Panikulangara Green Bold No.1***

Joy was growing *Mysore*, *Malabar* and *Vazukka* varieties of cardamom in his field. The *Vazukka* variety was grown in between the other two varieties. In 1993 out of grown cardamom plants (*Vazukka* variety) he noted two plants having special characters of thick and long leaves, and vigorous growth. He closely observed these plants for two years. He then collected the seeds from these two plants and he got around 1 kg of cardamom from these two plants. He separated two clones each from two plants and planted them nearby his kitchen for close observation. By 1998 he was able to separate 12 clones and obtain 70 plants by clonal propagation by 1999.

From these 70 plants he was able to develop another 1000 plants. Most important characters that he found in this variety was increased and uniform production of tillers. The variety was adaptable to less altitude, drought conditions and was less prone to pest attack too. The tillers were branched and 95% berry setting was observed in this developed variety. He then gave his house's name '*Panikulangara'* to this variety and started commercializing it in 2000.

**The *Panikulangara Green Bold No.1* variety**

Productive tillers in *Panikulangara Green Bold No.1* are comparatively higher than *Mysore* and *Malabar* varieties. As the capsules of innovator's variety are bolder (80% of the capsules are of more than 8mm size) than *Mysore* and *Malabar* varieties, farmers growing this variety (*Panikulangara Green Bold No.1*) have the advantage to get more profit. The variety is less prone to thrips, borers and Azukal disease, so it can be grown without much care. It is also a short duration variety (75 days after flowering).

Lack of adequate irrigation facilities is a major constraint for cardamom cultivation in Idukki district. But Joy Peter's variety performs well under rainfed condition and hence it is suitable to be grown in the areas where there is a lack of irrigation facilities. Significant differences in the characters viz., yield per plant, capsule's shape & colour and its duration are observed

in *Panikulangara Green Bold No.1* after selection from a land race, *Vazhukka* type.

This new variety *Panikulangara Green Bold No.1* was formally released by the former Director of Development, Spices Board in 2000. That year itself he sold more than 6000 clones. Farmers from different parts of Kerala, Tamil Nadu and Karnataka approached him. Media also gave quite a bit of publicity to this variety. Local KVK also studied the variety and felicitated him. Scientists from Kerala Agricultural University also visited his farm. Till date he has given more than one lakh seedlings all over Kerala.

Subsequently, NIF requested experts to evaluate the variety and verify the innovator's claims. Indian Cardamom Research Institute in its report mentions that the variety is tolerant to drought and seems to be resistant to stem borer also. The variety is more greenish, requires less shade (40%) and bearing tillers range between 110-120 numbers. The yield per plant is 6-8 kg and the capsules retain an attractive green colour after drying. Also its dry recovery percentage is 4.5:1kg.

Director Research, Indian Cardamom Research Institute, Spice Board, in his report mentions that the quality characters of the capsules like colour, size, oil content, oleoresin, etc are at par with other landraces and released varieties.

Cardamom Research Station, Kerala Agriculture University mentions that this variety responds well under average management conditions. The variety is free from blight disease even in less shade area and is moderately tolerance to thrips, stem borer and other leaf diseases. The capsules retain attractive green colour after drying. They also compared this variety to the locally popular *Njallani* variety and found that it has more no of tillers (150-200 as compared to 90-100), productive tillers (70-80 as compared to 45-50), panicles (3-4 as compared to 2-3), panicle length (100cm as compared to 60cm). However the number of capsules/panicle (235) is lesser than in *Njallani* variety (265). It also has the advantage over *Njallani* variety in having moderate tolerance to thrips, stem borer and other leaf diseases. *Njallani* variety is highly susceptible to all.

**Diffusion, Awards and Recognition**

So far Joy Peter has sold more than one lakh seedlings all over Kerala. The success of *Panikulangara* has given him courage and confidence to continue his research. In his farm he found another plant, locally known as *malainchi* (wild ginger), which was very similar to cardamom. The plant can be grown in less shade and is disease resistant. He has developed a cross between *Panikulangara* and wild ginger. The cross showed vigorous growth under less sunlight condition. A common disease of cardamom, *azhkal* (rotting of shoots) was not observed in this variety. He has undertaken its clonal propagation and given the name *Panikulangara* No 2. He has also started selling this variety along with *Panikulangara* No 1. Till date, he has sold about 23 thousand seedlings. He is also preparing an improved cardamom curing house.

For his innovative efforts he has been honoured by KVK, Santhapara, Idduki in 2002. Prasar Bharti, All India Radio has also awarded him for adopting modern agriculture techniques in April 2008 at New Delhi.

## Yellow Mosaic Virus resistant white gourd variety

**National Third**
Plant Variety

**Joy A S**
Thrissur, Kerala

Joy (32) is a farmer engaged in agriculture for the past twelve years. He has developed a Yellow Mosaic resistant white gourd variety by crossing a local variety with a resistant variety, followed by repeated selection.

Joy's father was an agriculturist. They had coconut, plantain, paddy in their half a hectare land. He studied in the nearby school and after the high school he joined college to study economics but could not complete. Then he joined a local computer training institute to do a one year diploma course in computer applications. Since his mind was preoccupied with agriculture he could not concentrate in studies, and every now and then took a break and diverted his attention to his farms.

Considering the unreliability of agriculture, his father wanted all his sons to engage in professions other than agriculture. Joy's elder brother is a bank employee and the younger one works in the Middle East. However, the charm of farming was too much for Joy that he did not pay any heed to any one and started farming simultaneously with his college. His family members and other relatives criticised him for this but he remained undeterred.

In 1995 government announced a subsidy of Rs. 4000 for vegetable cultivation. He obtained the subsidy and expanded his cultivation with the support. He took one acre of land for lease, and started the cultivation of snap melon, ash gourd, bitter gourd and pumpkin. In fact, it was Joy, who introduced the snap melon cultivation in his village, after which a large number of farmers adopted its cultivation. This has resulted in his village becoming the main area of snap melon cultivation in the region. He used to load his produce in a hired tempo and sell it in the market but it did not provide him a decent earning. As the cultivation of vegetable in the village grew, the gross production increased and the rates fell.

**Developing the variety**

In 1998, mosaic virus had destroyed the entire crop of gourd in the region. One day while walking through the village, Joy saw a few white gourds in the field of a farmer, Kannichaye Narayanan, which were not affected by this disease. The farmers whose crops got affected were cultivating the variety released by the Kerala Agricultural University.

He collected few seeds from Narayanan and sowed them in his field. As he had observed that the effect of the disease was less in these gourds, he decided to purify this variety and selected 8 good plants. To prevent cross pollination he covered the flowers with polythene cover. From these 8 plants he got 8 eight gourds. He collected seeds of these plants, which numbered about 600. He sowed these seeds in a bed and again selected 10 plants based on the vigour and growth of the plant, pest attack, colour of the leaves and the size of the gourd.
He selected smaller gourds over bigger ones as bigger gourds were not preferred in the market. He repeated the process and after five years of continuous selection he was able to develop this variety. He cultivated this variety and obtained very good results. Not a single plant was affected by the mosaic virus attack.

He informed the agriculture officer about this variety who appreciated him and linked him to the Agriculture University. A couple of professors who took seeds from him later informed him that the variety did well but nothing after that.

**The virus resistant variety**

The newly developed variety takes 35-40 days to flower and 90-100 days to mature. The average weight per fruit is 12 kg during monsoon and 4-6 kg during summers. The average yield is 250 quintal per hectare with the average yield per plant being 10 kg. It is a short duration variety and has good cooking quality. Dark green colour of the leaves is the major speciality of this variety.

NIF facilitated the evaluation of the variety at Kerala Agricultural University from where the reports have been very promising. The results during both the seasons indicate that the number of fruits and yield of fruits of the ash gourd (white gourd) was on par with that of the high yielding accessions and released variety, KAU Local. Also in both the seasons, Joy's variety was free from mosaic virus disease while all other varieties/accessions showed mosaic symptoms.

He has distributed the seeds of this variety to neighbours also who have also appreciated it. Joy mentions that the farmers are not able to identify the attack of the virus. Yellowing of leaves was the symptom of several diseases. Nutrient deficiency may also contribute to the yellowing of leaves. So farmers without knowing the exact reason may attribute the yellowing to virus.

**The vegetable cultivation scenario**

Joy is also concerned about the decline in vegetable cultivation in the region. The market is highly unpredictable and profit from vegetable

cultivation is quite less. The cost of production being lesser in Tamil Nadu, much of the vegetables are procured from there. This results in competitive disadvantage for the farmers in Kerala. Also during special festival seasons, the government gives special discounts, which again dents into the already less profits. This is the reason, he mentions, for farmers shifting to cash crops or looking for other jobs. Also, the agencies started for promoting vegetable cultivation are not performing well. The cost of production is increasing day by day and climatic changes are also affecting the produce.

However, inspite of these, his innovative spirit has not dampened. He is in the process of developing a disease-free medicinal white gourd variety. But the problem that he has at his hands presently is that this variety is highly susceptible to the virus attack. He has started his work to further improve it. Recently, he has also developed a simple mosquito trap, which was featured in a leading daily. In nutmeg he has developed a new grafting method about which farmers from far off places also call him for advice in budding in nutmeg.
Seeing his interest in agriculture, agriculture officer also recommends his name for major trainings and workshops, some of which he attends also. But he mentions that these training programs are not practical as the actual field conditions are quite different from the laboratory conditions under which most experiments operate.

Joy feels very happy while walking across his farm. ‘The growth of the vines of ash gourd in the evening can actually be seen while walking through the fields, this fills my heart with pleasure and I feel very much satisfied’.

# Herbal formulation for termite control in groundnut crop

**National Second**
Plant Protection

**Nathubhai Becharbhai Patel**
Sabarkantha, Gujarat.

Scout: Ishwarbhai P Valand, SRISTI

Termite infestation is major problem in different crops and results in major losses. Nathubhai Patel (65), a farmer from Sabarkantha, has developed a formulation for termite control in groundnut crop.

His village, Rampur, where he lives with his wife, is a predominantly agricultural village with a population of about 1800. The main crops grown in the region are groundnut, maize, cotton, castor, sesame, pulses and various vegetables. Nathubhai owns 2.6 ha of land with sandy loamy soil where he grows cotton, groundnut, pigeon pea, mustard, castor and maize. For irrigation, earlier he depended on a well but after it dried up three years ago, he has been using water from a bore. He has been completely involved in agriculture ever since he completed his class tenth.

**Genesis of the innovation**

About fifteen years ago, Nathubhai used to grow cotton varieties- *Shankar 4* and *Shankar 6* in his fields. For this he employed labor from Rajasthan,

which were arranged by his friends Vaktaji and Kamji Tavara. He once discussed with them the problem of insect pests (*eeyad*) in cotton for which they suggested the use of a local herb for control.

Keeping this in his mind he made a concoction of the fruit of the plant and leaves of *neem* and sprayed it over the cotton crop with good results. He noticed that after continuing the practice for a few days there were no more insect attacks.

He had some area under groundnut cultivation also. The groundnut field had a serious termite problem. Experimentally, he sprayed the herbal solution to find out if there was any effect of the same on the termites. To his surprise, the solution was effective against termite also. His yield increased by almost 150-200 kg, which inspired him to take up groundnut cultivation on a wider scale. Gradually he reduced the area under cotton cultivation and started growing more groundnuts.

**The formulation**

To prepare the formulation, crush the fruit of the local herb and mix 2 kg of *neem* leaves. Add 10 liter of water and boil. When the solution reduces to one-fifth, allow it to cool. Filter the solution and dilute it by adding 5 liter of water. This solution can then be sprayed on the standing crop near the lower part of stem nearest to the ground. He advises to repeat the spray thrice at three days interval till the complete control is gained.

**The problem**

Termites are a serious problem in the less/unirrigated and sandy or sandy loam soils. They are one of the most damaging pest in the tropics and a considerable problem in agriculture, housing and forestry. But the termites also help the food chain by recycling wood for the soil. Fungus growing termites are most dangerous type in agriculture, followed by harvesting termites. Chemical pesticides have commonly been used to control termites but they have adverse effects on the environment.

Prior Art Search reveals that ingredients of the formulation possess larvicidal, nematicidal activity and insecticidal compounds. Similar search in patent literature did not yield any result for the use as an anti-termite. However, the second ingredient Neem (*Azadirachta indica* A. Juss) has been widely used to control pests since a long time. The leaves and seeds of this plant possess termiticidal and antifeedant effect.

Formulation has been tested against termites in SRISTI laboratory, Ahmedabad, on treated wood of cactus. It was observed that the extract was effective in controlling/eliminating the termites completely. SRISTI also conducted on-farm experimentations in farmers' fields at Gandhinagar & Ahmedabad districts of Gujarat. The formulation showed significant effect on the termite population, which resulted in reduced damage in different crops.

## Picture tube charger, rat trapping machine, and many other ideas

**National First**
Student

**Meraj Ahmad**
Pashchimi Champaran, Bihar

Scout: Azhar Hussain Ansari

*Pratyek vyakti vaigyanik hai aur uski pratham khoj hai apane bhitar chhupe guno ko khojana, nikharana*
(Every person is a researcher in himself and his first job is to discover his hidden talents)

A serial innovator, a teacher, a writer, an artist, a poet, a singer, a lyricist, Meraj Ahmed (23) is a man with multiple talents. Among the numerous things that he has made, a few interesting ones are black and white picture tube charger, rat capturing device, and magnetic weighing balance.

Originally hailing from Gopalganj, Meraj's family shifted to Bettiah in 1990 due to his father's transfer. His father works as a clerk in Sikata block of West Champaran but does not contribute financially to the family due to his personal reasons. Hence, Meraj is the bread earner of the family. He has two brothers and a younger sister. His elder brother, who is an electrician, also contributes a bit. They live in a small two room house.

Due to the financial crunch, Meraj had to start earning early. He was good in studies and as a routine always got over 95 per cent marks in physics, chemistry and mathematics. He started giving tuitions to the children of his own class when he was in class nine. He did this for three years and completed intermediate in 2004. He then took admission in graduation but could not continue due to the dwindling finances. All the while, he supported his family, paid for his siblings' education and also found time and energy for his other creative pursuits.

In 2005, Meraj rented a room to start his tuition center. He named it Spenin Institute after an award that he got in Ranchi the same year. Teaching maths and science to students upto class twelve, he is able to earn Rs 4000- 5000 per month. He recalls an incidence before his matric exam when he needed Rs 550 to fill up the form. With no money in his hand, he was forced to ask for some money from his parents. But, they did not support him. Dejected, he lost the hope of appearing in the exams and felt he would never be able to study again in life. But just on the last day, one of his students gave him the money to fill the form. He then decided to continue his studies along with the tuition classes.

He always had a special liking for science and maths. In his free time, he likes reading biographies of scientists as their life motivates him to do better. Apart from science, he has great affinity towards literature as well. The first story he wrote was when he was in class seven. It won him an award in a competition. He has never looked back since then, and has published in over 150 magazines and newspapers. He has won numerous awards in science exhibitions, essays, poetry and story writing, and drawing competitions not only in Bihar but in different states. He has also penned songs for a few regional films and made three music albums of Bhojpuri songs.

He came in touch with NIF through Azhar Hussain Ansari who saw the circuit of one of his work in a magazine and motivated him to submit his entries.

**Working on the picture charger**

Somewhere in 2003, the picture quality of his second hand black & white television became very poor. The display became unclear and there was a lot of snow. He thought about purchasing another picture tube, but it costed Rs. 800, which was beyond his reach. He considered recharging the picture tube through conventional means, which could be done by any electrician. But his elder brother advised him not to use the method as it might have damaged the picture tube beyond repair. Also the charge did not last more than ten days.

'Can there be another way?' he thought. He started studying his brother's electronics books, at times discussed with him. As he was very good in science, it did not take him much time to understand the basics. He prepared a circuit to charge the television and theoretically discussed its feasibility. When he was sure about the success, he experimented on his television set in 2005. The television set, needless to say, is still working fine in 2009.

While working he had some financial problems procuring some of the components but he managed somehow using waste electronic parts with him and his brother. The first prototype of the picture tube charger was made of these waste materials and was successfully tested on his television. In the first prototype he used a 15 watt bulb. Working on improving the charger, he reduced the size to almost half in the second prototype and replaced the bulb with a fuse. The breakage of the fuse signals that the picture tube has charged. Meraj mentions that it took him three months and an investment of about Rs. 3000 to develop the first prototype but he can now make the same in half an hour spending only Rs. 100. He has made three of such picture tube chargers till date. NIF also helped him with a sum of Rs. 5000 to develop this picture charger during the 22nd Shodh Yatra in Motihari in January 2009.

**The picture tube charger**

Meraj has developed a device, which can charge the picture tube of a black and white television, when the display becomes unclear and snowy.

The charging device consists of a transformer, a bell switch, two switches, CRT (Cathode Ray Tube) base and a bulb. Before starting, all wire connections of the picture tube are removed. The CRT base of device is connected to the CRT pin of the picture tube and 220 volt AC is given to it. There is a transformer inside the device, which supplies 12 V DC output. There is a bell switch, which is pressed frequently till the attached bulb glows fully. A bulb signals that the picture tube has been charged completely. Meraj has been using 100W bulb but any bulb can be used.

For making the charging device durable, Meraj has incorporated a resistance, a bridge rectifier, and a condenser so that limited voltage can be supplied. This protects the picture tube's filament from damage and also the charging lasts longer.

This operation of this device is so simple that even a small boy can charge the picture tube and that too in two minutes. The life of picture tubes charged this way gets extended by another few years. This device can be used to charge black and white picture tubes of all sizes and types.

The patent for the device has been filed by NIF. Though the demand of black and white televisions has taken a beating in recent times but still many local companies are thriving by selling black and white televisions mostly to the rural consumers. Such a picture charger gives an option for people like Meraj, who cannot afford to buy a new picture tube or a television, to revitalise their television sets. In patent literature, there are many instances available about various apparatus that can be used to charge a photoconductive layer disposed on a conductive layer (US 5083959, US 5132188) or electro-photographically manufacture a luminescent screen assembly on an interior surface of a CRT (US 4921767). However, the charging apparatus of Meraj was found to be simple, uncomplicated and affordable.

**The rat trapping machine**

Meraj has developed a machine, which captures the rat. It may sound common but this one is a bit different. It has an electric circuit that gives an alarm when the rat gets caught.

It is an electronic machine of dimension 6.5"x 10" x 12". It works on 4 cells of 6V each and weighs almost two kg. The cubical body of machine is made of wood, one side of which is the entry for the rat. Inside the box, on the opposite end, is an iron plate, which is connected to one end of a circuit. To the other end is connected a metallic flap, which is located just above the iron plate. A piece of bread is kept between the plate and the flap. When the rat pulls the bread then metallic flap falls on the plate and the circuit gets completed resulting in the alarm and closing of the entrance of the rat trap.

The path for the rat inside the trap is zig-zag so even if it wants to run fast, it cannot escape before the entrance closes. There are three switches of the machine viz. main switch for power, the trap switch and the release switch. Keeping the main switch off, bread is put between the iron plate and the metallic flap and the entrance is left open. The main switch is then switched on and the device put in the trap mode by switching on the trap switch. When the rat gets trapped and has to be released, the release switch is switched on, which opens the entrance and the rat can then run out. The battery is used only when the rat pulls the bread and hence need not be replaced soon.

Meraj spent about a week developing this device and now can replicate it in an hour's time. Using sun mica, it can be made at a cost of Rs. 150 while using steel; he estimates that the cost may increase by a few hundred rupees. He has sold this device to seven people till date, mostly after the 22nd Shodh Yatra, when his innovations were widely publicized. Almost all have been quite satisfied with its working.

**The magnetic weighing balance**

Meraj has developed a weighing balance, which works on the principle of repulsion of the like poles of the magnets.

The idea to develop such a balance came while watching a consumer awareness advertisement on the television. He recalled that many a time, shopkeepers cheated their customers by either forging the weights or making certain changes in the balance itself.. Thinking hard about the problem, he came up with this idea, which he discussed with his younger brother. His brother appreciated the idea and advised him to go ahead and make such a weighing balance. His idea was simple; there should not be any weight or spring in the balance that can be tampered with.

In this balance, two concentric cylindrical pipes, of two different diameters are taken and used vertically. To the pipe with smaller diameter on the top is attached a bowl to hold different articles to be weighed. To the bottom, a magnet is attached. The pipe with the larger diameter is fixed vertically on a stand. At the inside bottom of the pipe another magnet is placed such that when the pipe with the bowl is inserted both the magnets have the same poles facing each other.

When the inner pipe with the bowl is inserted inside the outer pipe, due to the repulsion of the like poles, the inner pipe does not go down. When a weight is kept in the bowl, it moves down a bit in proportion to the equilibrium between the weight and the force of repulsion. Using standard weights then the inner pipe is calibrated. This magnetic balance can then be used to weight different things. Presently, the version developed by Meraj can weigh objects between 25g to 500g. The total weight of magnetic balance comes to be about 400g and its performance depends upon the quality of the magnets used.

**Other ideas**

He has a number of other ideas and keeps on thinking of ways to materialize them. He used to see his neighbours struggle to lift their two wheeler to put on a pedestal three steps high. He thought of a simple idea where a flat board can be pulled out from the top of the pedestal. It can then be used as an incline to move the vehicle up. Once the need gets over, it can then again be drawn inside like a drawer in the chest. As the doors of most of the houses open into the streets, people generally get cemented inclines made, which encroaches on some part of the road. Apart from occupying public space, sometimes accidents occur if any such incline extends much inside the road. In all such cases, where such need is there, this idea can be tried.

For charging mobiles generally we have either AC or DC charging kits. Meraj has made a charger, which can work both on AC (220 V) and DC (12 V) power at the cost of a normal charger. He has made some modifications in the original AC charger. He made a DC kit which converts 12 V to 4-5 V. The output of DC kit is connected to a point in the AC kit where it converts 220 V to 4-5 V. Both the kits are placed in the same box. Accordingly, from this charger, three wires come out *viz.* DC (12V) input wire, AC (220 V) input wire and the third one for output to the mobile. He has also sold this charger to many people who are satisfactorily using it.

His other ideas and innovative works include a vegetable cutter that cuts all type of vegetables in small pieces, hand operated mobile charger with an extra battery, a mobile holder for two wheelers on the handle, an energy efficient *chulha* among many others. He idolizes Dr APJ Abdul Kalam and wants to be a scientist like him serving the people to the best of his ability. Meraj was felicitated during the 22nd Shodh Yatra for his multifarious talents.

# Auto Stopper for LPG gas stove

**National First**
Student

**Davalsab Ladammanavar**
Dharwad, Karnataka

Imagine your mother is alone at home and is away in the garden watering the plants. She has kept a dish in the pressure cooker on the gas requiring one whistle. But the whistle sound does not reach the garden. The dish gets over cooked and the gas is being burnt unnecessarily. To solve these problems, Davalsab (20), a young student with multiple talents, has come up with an auto stopper, which senses the whistles and at preset numbers, gives an alarm and turns off the knob of the gas-stove.

**Childhood achievements**

Davalsab Ladammanavar, fondly called Daval, was born on 14th February 1989 to Mahammadgouse, who was a Government school Principal and Razia Begum, who is a primary school teacher. He is the youngest of three siblings. His elder sister has completed her medical course and his brother has done a health inspector course.

Although stubborn and naughty but he was good in studies and always stood first in the class. During his school days, he liked to visit automobile garages and scrap shops. He enjoyed collecting scrap or abandoned parts and repairing them. His father, a National level swimmer himself, wanted Daval to become a good sportsman. Drawing inspiration from his father, he participated and won two silver medals in State level swimming competition, and participated in the National level event as well. Apart from swimming, he is a good athlete too, and had won consecutively six times at the intra and inter school athletic meets. He was also a N.C.C candidate with a C.S.M rank in school. Not only this, pursuing his hobby of fine arts, he also procured two gold medals in State level Handwriting and Painting Competition, which was held at Dharwad Art Gallery in 2003. He also won the Dr. Dara Bendre award for painting given by the Karnataka Government in 2003.

Born with a scientific temperament and abundant creativity, he never missed any chance to take part in science exhibitions. When he was in class five, he made a boat model that was different from the commonly used boats in the state. This was published in local news papers and his interview was also aired on the All India Radio. Next he made a customized model of a truck for an exhibition in class nine. He wanted to put the truck model in the science exhibition but the teachers did not allow him as they did not find it worthy enough for presentation. He took this insult as a challenge and thought of coming up with a good exhibit for the next function.

He used to watch Discovery and National Geographic channels very keenly and happened to participate in one of the competitions, which invited entries regarding innovative designs of planes. The reward was a chance to visit the NASA, USA. He participated but did not win the competition. However, he received a letter from them, with a pamphlet about the educational materials they offered to sell. As he did not have money, he discontinued the communication and got ahead with his life.

Unfortunately, he lost his father when he was in class ten and was preparing for another science exhibition. The loss of his father came as a shock to him and he withdrew himself from all the sports activities. Despite of the deep pain though, he designed the model for up coming science exhibition. This model was that of the Auto stopper for gas. The idea for which came after noticing the losses in LPG at his home and his friends' when mistakenly or carelessly, the gas regulator remained open even after the required time for cooking. Also, some times his mother used to put the cooker on the gas and then engage herself in some other task. She used to ask him to switch off the gas after preset whistles. This made his think of an automatic system to regulate this.

His school teachers, S. Gaonkar, Hullur, Prakash & Hadli supported him and motivated him all this while to do well. His friend, Manjunath, who was his partner in the first exhibition, was also a great pillar of support. Though in the exhibition, they did not win any award but many media person, both print and electronic, interviewed them and shot their innovation. This made the duo wonder if something was wrong in their innovation.

Undeterred, he continued with his experiments. He made an auto lever control system for his seniors who submitted it as a part of their annual project. He helps people with their projects without slightest hesitation. His parents have been supportive of his orientation towards mechanical gadgets and sponsored to an extent. At times his friends help him with the finances to get the materials. He has been interviewed twice by A.I.R. and he has been widely covered by the local media.

**Auto Stopper for LPG Gas Stove**

It is an electrical device with timer controller to stop the gas flow according to the preset time. The timer switches off the gas regulator after cooking. It has digital display system for cookers to count the number of whistles too. The preset cooking time for different varieties of rice or different dishes can be preset with the clock and this system will automatically switch off the gas once the cooking gets over. This system also gives an alarm when the gas stove is switched off.

It consists of two DC motor powered by a 12 volt battery with an analog clock. The timer is connected to the knob of the stove with thread. The timer will switch off the knob once the preset time is over. This device will also give alarm signal when the gas stove is switched off. This device prevents food from being over-cooked, saving fuel, time, energy and money.

There are different devices available in literature[1] that cut off the gas supply but they are stand alone devices. However, the present innovation is a retrofitting device that can be attached to existing gas stoves. In addition, it has the option to provide an alarm and also to count and display the number of whistle while using pressure cooker. A patent (73/CHE/2009) has been filed by NIF in his name.

**Dreams!**

Till now he has done about six experiments and plans to do a lot many in future. He feels strongly for Dr A P J Abdul Kalam's 2020 dream and wants to work towards achieving it. He wants to develop modern rifles and certain other equipments for the defense utilizing the knowledge gained during the NCC days. On the other hand, he also wants to come up with other innovations, which address the problems of the teeming millions like proper drinking water and ways of filtering hard water, energy related issues, automatic brakes when the vehicle runs out of control and an ambulance, which can run fast even in bad and dumpy roads. He is hopeful that his mechanical engineering education, which he has embarked upon to get, would be able to provide him necessary technical knowledge to make his dreams for the country come true

[1] http://www.fuzing.com/vli/001117a2e202/Gas-Cooker-and-Oven describes the auto-choke safety device (switches off the gas automatically in case of unwanted flame) for thermostatic assisted gas stoves. http://www.alibaba.com/product-free/101366809/Timer_Controlled_Halogen_Cooker.html discloses an electric cooker using halogen lamp (far infra-red technology) with 6 temperature settings up to 480 minute timer and can use to switch off/on cooker at desired setting. The Indian patent application No 2256/CHE/2006 discloses a safety device for LPG gas shut off in the event of a leakage and indicating the gas nearing to get exhausted. Conventionally, many systems are available on safety valve arrangements especially on gas leaking e.g. US patent 5722448 and 5628242. US patent 6234189 B1 describes electric stoves which are provided with preset timer for desire cooking time Another, US patent 6733276 B1, describes an existing gas cut off device needs radical design changes in the gas stove suitable for the outdoor gas fueled barbecue grill.

## Modified silencer and air intake system

**National Second**
Student

**Bhagwan Singh Vishwakarma**
Bhopal, Madhya Pradesh

Bhagwan Singh (23) is a student innovator with a few innovations and scores of other ideas. While in graduation he developed many innovations, the most promising among which is the modified silencer and air intake system for two-wheelers.

Born in village Kotra to Kailash Narayan Vishwakarma and Kalabai, Bhagwan Singh comes from a modest background. His father is an assistant sartor in a boutique while his mother is a housewife. Growing up was not easy due to the limited financial resources. However, he and his two brothers worked hard to study well and ensure a better future for their family. His elder brother Jaipal, a science postgraduate, is working as a lecturer in mathematics in a regional college while his younger brother Vinod is an undergraduate student. Bhagwan Singh himself is completing his post graduation in Geology (at the time of submission of his entry to NIF he had just entered his graduation).

Bhagwan Singh was shy and quite as a child. He liked being alone in his own world. He was average in studies, in fact did not like it much. Reading,

learning and remembering the syllabus was quite a bit for him. Everyday, he used to walk down to his school alone as he did not have many friends. In the school also, he kept to himself. Though he never had any surplus to buy things, he maintained a box where he kept all the things (mostly scrap) needed for his creative works, collected from all possible places. He recalls himself as a child playing with tape-recorder cassettes and making models of tape recorders and similar electric gadgets. Sometimes, his younger brother used to assist him in his work. Struggling to make ends meet, his parents and elder brother seldom took note of his avocations. All they mentioned to him was to also concentrate on studies and not to do anything wrong.

Life changed in class nine when he participated in a science exhibition and won a state level award for making a model of a JCB crane. Suddenly he became famous and everybody in his school knew him. His skill to make good projects started getting appreciated. This opened up a source of income for him too. He started making science projects for students with which he financed his studies as well as generated funds for his innovations. He started to dwell more in his innovations than in studies, for which he was reprimanded by his family. Left with no choice, he worked on his innovations after midnight when all other family members were fast asleep. His mother, understanding her son's desires, took special care of him amidst all the scolding at home and ridicule outside. His elder brother, being a student himself, was not able to support him financially but he always encouraged him.

He took a break from studies after class 12 in 2003 to prepare for engineering entrance but as he could not get through, he had to take admission in graduation in 2004. During his preparations he took electronics hobby classes at Jawahar Bal Bhavan, run by the State Government. There he met a couple of teachers who motivated him and egged on him to develop more innovations. Another major source of support was his school teacher and NCC coordinator.

**Modifying the two-wheeler silencer**

While facing problem commuting to his college everyday in the undulating terrain of Bhopal, Bhagwan came up with his E-Bicycle in 2005. In this E-Bicycle, he used a dynamo, which charged a battery. The power from this battery was used to run the bicycle when required. But the problem with this E-Bicycle was that due to the use of dynamo, the resistance increased and more effort was required to pedal. While working on the E-Bicycle, Bhagwan started to think of ways to increase the mileage of two-wheelers so as to reduce the running cost saving money and fuel both.

Being a science student whenever he read about a new law or a theory, he tried to find its practical applications. He observed that the heat of the exhaust gases of vehicles remained unutilized. He started thinking for its useful application. He read a lot of material to understand the whole process and functioning of the engine and concluded that pre-heating of intake air may increase the combustion efficiency and hence the mileage.

He tried to develop two prototypes to harness the heat of exhaust gas, but failed on both the occasions. After some hard work, on the third occasion, he was able to develop a prototype that could preheat the intake air and partially exchanges heat with charge (the mixture of air and fuel). He replaced the silencer of his brother's moped (Hero Puch) with the modified attachment and took test drives with and without silencer. He observed an increase in the mileage by almost 25 per cent when this system was incorporated.

**The modified silencer**

The innovation is a modification in silencer of the two wheelers where part of the exhaust gas is used to pre-heat the air and charge leading to increased combustion efficiency of the engine. It results in the increase in the mileage by 25 to 30 per cent.

The exhaust gas enters the heat exchanger through the nozzle attached to the main exhaust line and supplies the exhaust gases from the same pipe to the heat exchanging chamber. One end of the modified intake air line is kept between the engine fins so that it gets fresh air easily and the other end of the pipes is connected with the filter. This line is made of copper. The additional chamber is situated behind the main chamber is connected with smoke outlet nozzle on the other side. Its purpose is to reduce the noise level. The aluminium covers are provided at both the sides of main chamber and make the device cool from the outside.

In this system[1], the intake air is passed over the exhaust manifold (silencer), which results pre heating of the intake air. NIF facilitated its testing at BIT Mesra, Ranchi. The test report mentions that the use of the modified silencer and the system for preheating of intake air increases the mileage by 25 to 30 per cent. This technology is still in the process of being refined so that it can be used at a wide scale and needs some adjustments in filter, intake manifold and the timing of fuel supply. NIF also filed a patent (1460/MUM/2009) in his name for the technology.

Bhagwan Singh is a serial innovator and has contributed many ideas and innovations a few of which are mentioned below.

**Front wheel driven E-bicycle:** It is a battery operated bicycle where the front wheel has been powered[2]. It can be operated both manually and through a battery. However, further work is required on this as this may have some steering and braking issues.

**Multipurpose jogging machine**: This machine serves the dual purpose of exercising as well as electricity generation, which can be stored in batteries. This idea is not entirely new and NIF database has many such references apart from others available on the internet.

**Electricity control board:** It is an electric circuit that disconnects the power supply if there is voltage fluctuation for more than a preset time in seconds. Also when connected an appliance, this system switches off the power supply whenever the load is less than a preset value. The technology may possibly be available but is not in much use either in industrial setups or at home.

Apart from these he has also developed a timer system that switches on/off a device as per the predefined value, centralized control system for electricity connections, theft alarm system, motorized wood cutter, etc. NIF supported some his innovations for prototyping apart from providing support for basic fabrication machines like hand grinder, welding station, etc. His work has been covered by local print media and also by Sahara Samay, C TV, Bhaskar TV and Raj News earlier.

Bhagwan Singh is a hard working, perseverant and an optimistic person. Apart from his scientific explorations, he likes motorcycling and watching television. He specially likes Discovery Channel and Hollywood movies. He continues to work away in small workshop and study as well. He mentions that one's head and heart should be at the right places. Doing innovations may be a passion but earning a living is also a reality and is necessary. He wishes to make a career in earth sciences and continue working on his innovations too, some of which, he hopes, may attract entrepreneurs. To the youngsters his message is "*Agar unka dhyan vigyan mein hai aur wo kam umar mein hi kaam shuru kar dete hain to wo satrah saal ki umar tak hote-hote apne naam kisi technology ka patent karva sakte hain*" (If they develop interest in science at an early age and start experimenting, they may have a patent in their name by the age of 17 years).

---

[1] Prior art discloses preheating method of intake air (for cold start) for small period of time (US 499164 4, US 7084374-August 1, 2006, US 7064293,-June 20, 2006, US 4665880-May 19, 1987, US 5758610- June 2, 1998, US 4548186-Oct 22, 1985); heat exchanger for preheating of intake air (US 4723527-Feb 9, 1988 and US 4155338-May 22, 1979); use of external source of
or preheating of intake air (US 4122679-Oct. 31, 1978, US 5655506-Aug. 12, 1997, US 4628889-Dec. 16, 1986, US 5205250-April 27, 1993, US 4516556-May 14, 1985 and US 5280776-Jan 25, 1994)
It
also discloses modified auto engine for increasing the mileage (Sib Shankar Mondal, NIF database). However, it does not disclose the use of exhaust gas for preheating the intake air on a continuous basis, which results in the increased combustion efficiency (and hence the mileage) of the engine.

[2] http://www.cruzbike.com/
; http://www.made-in-china.com/showroom/richardjian/product-detailueSxJPdKaGUg/China-128-Bldc-Motor-Front-Wheel-Drive-for-E-Bike-HD-1002-.html

## Automatic watering system in flower pots, short-circuit alarm, GSM based burglar alarm and others

**National Second**
Student

**Abdul Kaleem**
Deoria, Uttar Pradesh

*"Chhamtaon ka vikas vyakti ko pratibhawan banata hai. Iske liye gyan, dhairya tatha sahayog awashyak hai"*
'Development of capabilities makes a person talented and for it one needs to have knowledge, patience, and the support of people'.

A young man from Deoria, Abdul Kaleem (24), is a serial innovator. He has developed a number of innovative projects, interesting among those are automatic watering system in flower pots, short-circuit alarm, GSM based burglar alarm, overhead tank monitoring and regulating system.

After graduating in arts in 2007 from Gorakhpur, he is contractually associated with Non-conventional Energy Development Agency (NEDA) in a project related to a street light controller device. *He was still a student when his entry was received by NIF for fifth campaign.*

He comes from a well educated background. His father is a teacher and all his four elder siblings are educated, married and settled while the two younger

brothers are still studying. Theirs is a joint family staying together in a two floor house. His father also has little less than half hectare land where he cultivates sugarcane, rice, wheat, gram, mustard, maize, pulses etc., as per need. Abdul performed average in studies but took interest in electrical/ electronics since childhood. Due to his habit of experimentation, he was often punished for messing things up.. Many a times, he was reprimanded for wasting time. Though, mostly he used scrap articles but at times he even spent his pocket money to purchase different items from the market. At other times, he had to do an odd job or two for some extra money. His friends sometimes used to tell him that such things would not take him anywhere. But, nothing could deter him from doing the things that he liked. His elder sister and her husband, his class teacher and one of his friends always encouraged and supported him to do better.

He once read about NIF in a local newspaper and through a correspondent got the address. The thing that appealed to him the most was that such an organisation was there to support grassroots innovators like him. His creative pursuits have been covered well by local electronic and print media during the last two years. He was also given the *Nav-anveshak Samman* in February 2009, by the Uttar Pradesh government, for his efforts in promoting science and technology through his work.

**Automatic watering system in flower pot**

Many times we see plants and flowers in our garden getting wilted due to lack of timely watering. Gardening has been Abdul's hobby for long. Having noticed the problem he made a sensor controlled device that automatically switches on and off a motor depending upon the moisture content in the pot.

The device is designed in such a way that when the moisture content in the soil gets below a preset value, the sensor gets activated and switches on the water pump. When the soil gets sufficiently watered, *i.e.* moisture goes above the preset value; the sensor switches off the motor. There are two LEDs, red and green, on the sensor box. The red coloured LED indicates water deficit whereas the green one indicates water sufficiency.

He had to face considerable financial problems while developing this device and had to make and break many prototypes. The cost of the final prototype came to around Rs. 600. He has applied for patent through NIF[1]. He wants to modify the device by doing away with the motor and incorporating a magnetic system. He is still working on the concept. NIF assisted him for the development of this prototype along with a few other innovations.

**Short-circuit alarm**

Many a times, in the newspaper, Abdul found news about people's death due to electrocution by touching a faulty device. Abdul used to wonder if he could do something about it. He realised that such deaths were mainly due to short-circuits. These, sometimes, result in electric shocks to the user and could even lead to fire in some cases.

He thought of a device that could alert the user if he had inserted a faulty device into a power plug or if there is some internal short-circuit. This device consists of a transformer, diodes, capacitor, an alarm, LED, one switch and one socket for output supply. In the first version, he had used Miniature Circuit Breaker (MCB) but that increased the cost, so in the second design he did not use it. The first design also had a fire alarm, which was removed in the second one. The device weighs 400g and is put near the main electricity board. One wire is connected to the meter while the other is earthed. When a faulty appliance with a short circuit is connected to any socket in the house, the alarm goes on. Once the appliance is unplugged, the alarm automatically goes off. This device works only in cases of appliances where earth wire is given (i.e. appliances that have three-pin plugs).

It took him around six months to develop the device and cost him Rs. 700. He estimates, now the same would cost only Rs 300.

**GSM based burglar informer**

This is a system to inform about attempted break in the house when owners are away.. In this device, there is a leaf switch on the main door. When door is forcibly opened, a relay switch is triggered, which activates the circuit. The GSM system attached to the circuit then dials a preset mobile number. It continues the dialing until either the system is switched off or the user of the preset mobile number accepts the call. The system can be switched on and off as per the requirements. It can be used in houses, offices, shops and even in a vehicle.

Presently, Abdul has used a cardboard box to fit the assembly, which took him three months (and the sacrifice of two mobile sets) to complete. Excluding the mobile cost, the system costs Rs. 1500.

**Ceramic pot with heating filament**

At a cost of Rs. 50, Abdul has incorporated an electrical heating filament in a ceramic pot, which can be used to burn slowly, small mosquito coil fragments/tablets, dry *neem* leaves, *havan samagri* of the Hindus or even *loban* used by Muslims. After burning, the ash and the residue can be easily disposed by inverting the pot. The whole process, thus, remains very clean.

**Automatic water pump controller**

Abdul Kaleem has developed a water pump operating system, costing about Rs1000 to manage the filling of overhead tanks in houses and buildings. The device can start on its own and control the filling of the tank. The device switches off the pump when the tank gets filled. Similar systems of course already exist in the market.

**Automatic flood alert using GSM**

Abdul has developed a flood alert model. Noticing that flash floods often result in great loss of life, property and livestock, he decided to make this model. In this model, there would be a GSM based transmitting tower in the river with sensors at different heights. Complementarily, there would be similar receiving towers in nearby villages. As and when the water level rises in the river, the sensors at different heights pick up the rise and transmit signals to the receiving towers in different villages. The degree of water rise can then be indicated by the receiving towers by means of lights or alarms. Abdul has used lights of three different colours for the same.

His mother says that he takes a lot of interest in doing such things and even forgets having his food when he is absorbed in some serious thought/ work. He is very frugal in his approach and tries to collect all his requirements first from the waste materials available with him or his friends. It is only in extreme cases, when some things are not available anywhere, he purchases it from the market. He wants to open a science club to promote scientific thinking among people. His friends and family have been generally supportive of him but there are many others who have made fun of him. To such detractors, he wishes to say

*Yadi koi samanya vyakti koi naya aviskar karta hai to samaj ke achhe logon ko us vyakti ki kalpana aur navnirman ko protsahan dena chahiye. Use hatotsahit nahi karana chahiye.*
*(If a common man has come up with something useful, people of the society should appreciate the imagination and creativity of the innovator rather than demotivating him)*

[1] The concept of automatically watering plants is available in art however, prior art discloses multifarious approaches for the same. US patent 3758987 discloses an automatic plant watering device, which includes a porous sensing device that functions as an air valve and responds to the moisture condition of soil to control a water supply. US patent 6128856 discloses an automatic watering pot for dispensing water into the soil at or below the root level of a potted plant. The device has a bottle, which serves as a water reservoir, a cap for the bottle having a rotary valve, a delivery tube inserted into the cap, and a dispersion fitting at the free end of the delivery tube. The automatic watering device is disposed with the bottle inverted above the level of the soil, the delivery tube extending into the soil, and the dispersion fitting to a depth equal to or below the level of the roots. The dispersion fitting has a plurality of pinhole orifices, which serve to provide a path for water to flow from the tube

into the soil, for air to enter the tube and as a filter to prevent the soil particle from entering the bottle. US patent 20020024445 discloses a flower container having a control unit comprising a water sensor for directly or indirectly detecting water content in soil in a flower pot, a memory and a speaker. When receiving detection signal from the water sensor which indicates that the water content is decreased to below a predetermined level, the message is read out from the memory and outputted through the speaker to urge the user to supply water. US patent 20080190020 discloses a plant watering system comprising a sensor buried in the soil in the root region of plant, the sensor passing a low voltage current through the soil to measure the moisture content of the soil and with the sensor being switched on and off in a pulse like manner. The detected moisture level is processed by the system and water supplied to the plant when said moisture level is below a predetermined moisture level for that particular plant or groups of plant. US patent 4885869 discloses an automatic water- supplying flowerpot and its water supply control method in which a principal of capillary action is utilized. The URL http://images.businessweek.com/ss/05/06/idea2005/source/48.htm discloses a self-watering flowerpot in which a wick is placed in the holes of a ceramic flowerpot. The plant is placed in the pot, which is then placed on top of a glass container filled with water. The wick dangles into the container and the plant can then take up the necessary amount of water through the wick.

# Motorised cob web, pick pocket alarm and other ideas

**National Third**
Student

**Ankush Kumar**
Dhanbad, Jharkhand

Young Ankush (17) has a mind beaming with ideas. He has made a number of small utilitarian gadgets that can help in every day life like pick pocket alarm, cob web cleaner, and an alarm system that informs if your little child moves out of a particular range.

Ankush is a student of class twelve. His father used to work in the Food Corporation of India (FCI), Sindri, which is 28 km away from Dhanbad. Unfortunately, the FCI Sindri unit closed down in 2001 due to some administrative reasons. Many families shifted to other places in search of livelihood while many others joined ACC Ltd. (a cement company) or started their own work. His father now works as an insurance agent while his mother gives private tuitions. His younger brother is a student of class ten.

He has been a good student, securing between 70 to 80 per cent consistently in studies. Science is his favorite subject. Since childhood he has had the habit of tinkering with different things specially electronics. His parents though do not mind him doing such things but believe that first he should concentrate on his studies, which are most important. His younger brother

has little interest in such activities and prefers playing games in his free time. When asked about his friends Ankush says, "*Samajh mein nahi ata hai unko isliye nahi batata hu, sb majak udate hain*" (They don't understand what I do and make fun of me hence I don't tell them anything). Apart from his family, his science teacher also motivates him to work more. In fact it was he only who suggested Ankush to keep a diary handy so that whenever some interesting idea comes to his mind, he can note it down in it to work on it later.

He also likes watching science related programs on television. In fact, it was through the NDTV program, Avishkar India that he came to know about NIF and got in touch with it. Apart from doing innovations himself, he also actively looks for other such creative children and motivates them to send their entries to NIF. For the IGNITE 08 and 09 competitions (national competition for children's ideas and innovations), he documented dozens of creative ideas from students and forwarded it to NIF.

**The motorized cob web cleaner**

How many times we frown at the irritating sight of the cob webs in the corners of our rooms, which refuse to go away completely with the traditional cleaners. Ankush also used to get irritated with these. Once while working with a small toy motor, 9 years old Ankush observed that it was able to wind a thread that was lying close by. This triggered a thought that he could use such a motor to clean the cob webs.

He developed the first prototype within a few days of conceiving the idea years very small using a small DC motor, two torch batteries and a piece of rod. It was a small hand held device made from items available at his home. Then later in 2006, he improved it and developed the second prototype with some improvements by spending Rs. 250/- of his own. This model used two long rods that could be attached and removed as per the requirements. It was this cob web cleaner whose entry was sent to NIF, Ahmedabad for the 5th National Biennial Competition. Later in 2007, Ankush developed the third prototype with the financial support of Rs. 500/- from NIF, Ahmedabad. This was same as the earlier one. In 2009 he has developed an improved version of the same.

The motorized cob web cleaner has a 6 V DC motor, soft plastic brush, long plastic pipe, extendable wires and one electric switch. It uses four pencil cells. The motor is attached to the end of the pipe, which is used to locate the motor at the place of the cobweb. The plastic bush is attached to the motor shaft. When it is switched on, the shaft rotates the bush, which winds up the cob webs. This device can also be operated by domestic AC supply of 230 V using an adaptor having output of 6 V DC. As the weight of the device is under 500 g, it is easy to use and is convenient. The pipe is in three pieces, which are coupled to each other such that they can be folded at the hinges like that in a table lamp.
NIF, which has filed a patent for this device[1] is already working on it to improve the aesthetics and the efficiency. He was also supported financially for prototype development by NIF.

**Other ideas**

Another innovation of Ankush is the "Pocket Police', which is a pick pocket alarm and gets activated when someone tries to steal something from the pocket. He developed it in 2006. In this device a red LED bulb is fitted to a spectacle through wire and a sensor is kept inside the purse. When someone touches the purse, an alarm is sounded and the LED starts to glow in the spectacles. He received an award at Birsa Institute of Technology, Sindri for this device in 2006 when he was in class 9.

Another alarm based anti-theft system is the 'Guard 2000' where jewellery or other valuables are placed in a box fitted with an alarm. The alarm is sounded when anyone tries to have an unauthorized access to the box. One of his ideas, 'Helmet as a Communication Device' recently got published in the Honey Bee newsletter (Honey Bee 20 (2): 12, 2009). He suggests that a walky-talky speaker can be installed inside a helmet. The antenna

can be affixed on its surface. During an emergency, it would be easy for policemen to connect with their head quarters even while riding a two-wheeler. Another interesting idea from his creative mind is that 'Child detector' as he calls it. Ankush has thought about a system where the wrist watch of a child will have GPS facility, which would be integrated with his/parents mobile. Whenever the parent wishes to know the location of the child, he could use the software in his mobile to find out the exact location. The wrists watch of the child would also have an emergency button, which when pressed would send an SMS to the parent's mobile about the location. This would be helpful in cases of kidnaps for locating the victim.

He has submitted numerous other ideas to NIF as well. He wants to study engineering and develop solutions for the masses. He also plans to start an enterprise based on any of his innovations till date or in the future.

[1] Manual cobweb cleaners are available in the market along with some semi-automatic ones. Motorised cobweb cleaning devices using electric power (US Patent 5682636), battery operated cobweb vacuum cleaner (US Patent 4748712), battery operated spinning cobweb cleaner (http://www.elexp.com/kit_s100.htm); web vac for cleaning ceiling including cobwebs using vacuum (US Patent 6049944). Also automatic cobweb eliminator are available in art (http://www.touchoforanges.com/clco.html), Battery-operated hand held duster (US Patent number 7086115), manual cobweb eliminator having a brush ratable by hands (http://www.bugspray.com/catalog/products/page1228.html, http://www.pestproducts.com/cobweb_eliminator.htm#Description). In the available technologies there are no soft brushes in the rod therefore cob web gets tightly wound around the rod therefore to remove the cob web from the rod is very difficult & time consuming.

# Easy and Inexpensive Ways to Control Water Pollution

**National Third**
Student

**Nikhilesh Das**
**Debanjan Mukherjee**
Guwahati, Assam

Water pollution has become one of the biggest issues of the modern era and the most hazardous of all the water pollutants is oil. The pollution due to oil effluents not only destroy the aquatic life but also make the water completely unsuitable for irrigation. Debanjan Mukherjee (20) and Nikhilesh Das (19) from Guwahati were in class nine when they devised a simple set up to combat oil pollution of water bodies and submitted their entry to NIF.

**The Young Enthusiasts**

Debanjan is presently studying in 1st semester (electrical) at Assam engineering college. His father is a mechanical engineer, working in the railways and his mother is a housewife. Being the only child of his parent he got enough freedom to explore his talents. From childhood, he has taken part in co-curricular activities such as debates, speech competitions,

seminars etc. He is a die-hard fan of sports; the favorites being cricket, football, volley ball, and chess.

Nikhilesh's father is a business man and mother is a school teacher. He has been a good student throughout his school years. He represented his school at various science exhibitions, debate, quiz and speech competitions; and won many prizes at state level. He has had a keen interest in science since his early childhood. When he was just in class six he made a herbal repellant for cockroaches and rats, which was very effective. When he was eleven years old he underwent a bone grafting operation in his left leg and was bedridden for three months. For another four months he could only move using a walker. His friends and relatives feared that he would never be able to stand and walk. But it was his immense mental strength that he overcame the odds and now has recovered fully. His dream is to become a nuclear scientist and find a solution to the never ending energy crisis of the world.

Nikhilesh and Debanjan devised the project titled "water pollution and some easy and inexpensive ways to control it" when they were in class nine. They put forwarded their views and ideas to their parents and teachers who acknowledged the novelty and encouraged them to go forward with their ideas. The only hardships then were the lack of experience and proper time management. But with proper guidance and motivation they succeeded in their project. They participated in the regional level science fair and got selected for the eastern India science fair. They got the "best state exhibit" award and a fair amount of recognition.

**The project**

Basically their project puts emphasis on curbing oil polluting the water. Staying at Guwahati and seeing the pitiable condition of the river Brahmaputra behind the Numaligarh refinery moved them a lot. Not only Guwahati but throughout the country tons of oils are thrown directly into the water bodies, thereby, destroying the ecosystem and its balance. So, they thought of helping the environment in an "inexpensive and easy" way.

They were discussing possible ways of addressing this problem when Nikhilesh recollected his childhood experience. He shared that when he was a child his mother always used to put oil in his hair, which he disliked a lot because the oil used to stick to his hair. They thought that human hair must be possessing some property because of which the oil sticks to it[1]. They experimented with it and succeeded.

Both of them then were surfing the internet one day when they came across an article about an oil tanker spillage in the Persian Gulf. They read about the death of sea-gulls and other migratory birds whose feathers had got soaked in oil rendering them unable to fly. They brought some bird feathers and put it over some engine oil floating in water kept in a beaker. When they picked up the feathers, they found much of the oil sticking to the feather[2].

Another incident gave them their third ingredient. A carpenter, at Nihkilesh's house, cleaned some oil off the floor by putting and rubbing some saw dust[3] over it. They tried it in and succeeded. The use of hay was also serendipity. After finding four such ingredients that could absorb oil, they planned to combine the four and test the efficacy in curbing oil pollution.

**The Experiment**

One day Nikhilesh and Debanjan took 4 beakers from school and collected some waste human hair, sawdust, bird feathers & straw from different places and then poured water on the 4 beakers and then added oil to each of the beakers. Then, they added waste human hair, sawdust, bird feathers & straw respectively and on the very first attempt all the oil present in the

beakers was absorbed and removed completely. Later on analyzing further they found that the oil was removed due to the phenomenon of adsorption.

**Advantages and possibility of diffusion**

There are many advantages of this idea. Firstly, the materials that have been used in removing the oil effluents from water such as waste human hair, sawdust, bird feathers & straw, are all wastes themselves. Hence this process involves using one waste to clean up another. Secondly, this system is very much effective and cleans up almost 100 per cent of the oil effluents from water. Thirdly, this is a simple, cost effective and environment friendly idea and can be used economically in refineries.

Before submitting this project to NIF, they had presented this idea in State Level Science Fair held in Guwahati in the year 2005 where they won the first prize and also won the very prestigious Tulika Das Memorial Award. They were selected to present the project in the Eastern India Science Fair held in BITM Kolkata in the same year where they bagged the best State Exhibit Prize. This event was even telecasted on a number of local news channels and was covered in a number of news papers including The Telegraph. Both of them are now completing their studies and plan to work more on such innovative ideas that can solve persistent problems of the society.

[1] While hair does not technically absorb the oil, the oil does coat the hair. The oil is unable to completely absorb into the hair. Instead, the oil coats the hair by latching onto cracks and holes in the hair shaft. (http://www.ehow.com/how-does_5267579_hair-absorb-oil.html). United States Patent 5453191 describes a device comprising human hair which may be used to absorb oil which is floating on water. Human hair is formed into a generally planar layer. The layer may comprise a center scrim to which the human hair is attached. The device is buoyant when saturated with oil and water. The device is used to remove oil from water (United States Patent 6146529);

[2] The feathers of birds have natural oil cover for protection. This natural oil breaks down/ partly dissolves due to the crude oil, which then sticks to it. (http://www.newton.dep.anl.gov/askasci/zoo00/zoo00161.htm) United States Patent 4919820 discloses a method of removing oil from a body of water using waterfowl feathers.

[3] Among all the existing techniques used for oil treatment, sorption is a popular technique because it is cheap, simple and effective. Among the various sorbents used, sawdust appears to be the most attractive material in terms of cost, versatility and abundance. Banerjeea, S.S., Joshi M.V. and Jayarama R.V. *Treatment of oil spill by sorption technique using fatty acid grafted sawdust.* Chemosphere 64 (6): 1026-1031, 2006.

# Self Dispensing Jug

**National Third**
Idea

**Sukomal Basak**
Cooch Behar, West Bengal

An interesting idea to have a jug that can automatically dispense the liquid contents in the glass has been conceived by Sukomal Basak (36) from West Bengal.

Born and brought up in Tufanganj, Sukomal runs a grocery shop. Tufanganj is a small densely populated municipality of Cooch Behar. Predominantly middle class, the people here are engaged in various services. He lives in a joint family with his parents, wife, son and two younger brothers. A school drop out, he did not continue his education beyond class ten as he had to assist his father in running the grocery shop. His immediate younger brother is also class ten pass and runs a pan shop nearby. The youngest brother completed his graduation in commerce and works in a mobile shop.

Since his childhood, Sukomal had a keen interest in the biographies of great innovators like Edison and Graham Bell. He also liked the science subjects. Of and on he did conceive many ideas but did not think sufficiently hard enough to convert them into prototypes. Lack of funds also did not help his desire to innovate. One interest that has continued till date unabated

is his liking for newspapers. In fact it was through the *Anand Bazaar Patrika*, one of the most read and influential news papers of West Bengal that he first came to know about NIF. After the NIF's Third Award function in 2005, the news about Mahabir Chaube of Bankura winning an award for his idea about an innovative screw was published in the news paper. This intrigued Sukomal and he decided to do something of his own too. To get better ideas, he even started watching Discovery and National Geographic Channels.

When the advertisement of NIFs' Fifth National Competition for Grassroots Innovations and Traditional Knowledge Practices got published in February 2006 in *Anand Bazaar Patrika*, he ascertained his eligibility for participation and started thinking about different ideas. Finally a few months later, he submitted his idea about the self dispensing jug.

**The thought about the idea**

Sukomal started going to the ration shop to purchase kerosene for the household class five onwards. He used to observe that how the helper in the ration shop transferred kerosene from a larger container to a smaller one by sucking an end of a plastic pipe. One day he tried replicating the same at his home using water. He was successful. He started thinking of using this concept somewhere for practical utility. While in class eight he read a story, 'Technology for Mankind', where there was a reference to restaurants and serving of water. It immediately struck to him that he could develop this idea for such an application. The idea lay dormant in his mind till he submitted it to NIF many years later.

**The self dispensing jug idea**

Sukomal thought about an apparatus having a container and a dispenser that pours liquid as soon as a glass is kept below the dispenser. The main container with four dispensers (on four sides) would be kept on a stainless steel base. Below each dispenser, on the platform, there would be four switches. These switches will be connected to a valve, which opens when the switch gets pressed due to the weight of the glass placed on it. As a result, the liquid from the main container will flow out through the dispenser into the glass. The liquid would only be dispensed till the time the glass is on the base.

Initially, Sukomal sent only an illustrated idea to NIF but later made a model in paper and sent it across. Taking out time from his regular work, it took him four months to develop the model. NIF evaluated the feasibility as per the model's description and through its Value Addition and R&D fund, supported him financially to develop a working prototype. Prior to the support, elaborate search was performed to ascertain the novelty of the idea. It was found though different dispensing mechanisms and jugs of different shapes and design existed but no such jug was available, which had multiple dispensers activated by mechanical switches. NIF also filed a patent in the name of Sukomal for this apparatus assembly.

Sukomal did not have any formal training in fabrication. It took him time to understand the characteristics of different materials that he could possibly use to make the apparatus. Working slowly over another few months he was able to complete the prototype of the self dispensing jug apparatus made in tin using GI and aluminium pipes.

Being an amateur attempt, the finish was not upto the mark. Also in execution two of the four dispensers failed as the joints were not properly done and the spring attachments were improper. However, with some design inputs, the overall look, feel and efficiency could be improved. NIF has engaged experts for working on the concept of Sukomal. This self dispensing jug apparatus can be used in restaurants, homes, public water/milk booths or even in ration shops or chemical industry to dispense liquids/chemicals.

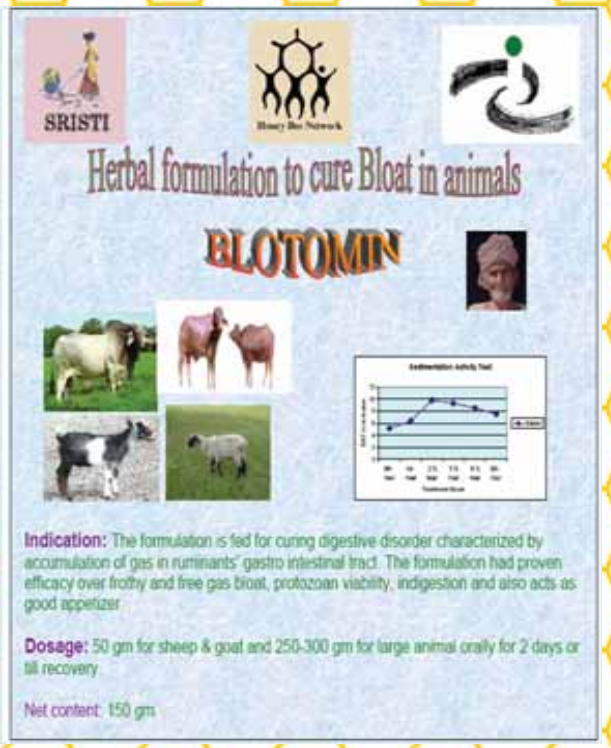
While developing the self dispensing jug, Sukomal also conceived an idea about an economical manually operated mixer, which can be used in kitchen for smoother mixing of different ingredients or for any other mixing or blending task. He is quite happy and satisfied about his work and looks forward to complete his self dispensing jug and then with the help of NIF, move on to do some other innovations, which can be used by masses at large.

# Herbal formulation for treating bloat in animals

**National Third**
Herbal Animal Health

**Sakrabhai Kallubhai Bhariya**
Dahod, Gujarat
**Kapuriben Sardarsingh Baraiya**
Panchmahal, Gujarat

Scout: Parshottam B Patel, SRISTI




Sakrabhai (80) is an illiterate farmer and a herbal healer from a small backward village of Dahod district in Gujarat. Kapuriben (60) is a house wife with a lot of expertise in providing herbal medications. They have developed a herbal practice to prevent and cure bloat in animals.

Dahod district is predominantly rural and majority of the residents are tribals, mostly Bhils. Agriculture is the principal activity of the district, which is one of the largest wholesale grains market in Gujarat. Sakrabhai's village is a small one with a population around 300. The villagers mostly engage themselves in agricultural activities, rearing animal and working as daily wage labourers.

Sakrabhai owns 2.5 acres of land where he grows rice and pulses, used for self-consumption for his family comprising his wife and son's wife and children. The main source of income for the family is his son who works as a daily wager in Ahmedabad. He also has few cattle heads whose products are consumed domestically.

His father, a farmer, was also an adept traditional healer. Sakrabhai's learning started early observing his father practicing herbal medicines. Gradually, the interest in him to develop medications for animals started to grow. By the time he turned 18, he was already giving medicines under the guidance of his father. His hard work and dedication, over so many years, has earned for him a lot of social capital. But all this was not easy, remarks Sakrabhai. Recalling his first failure while treating a case of prolapse, he mentions that the remorse made him work harder. With time his reputation grew and now people even mention that he can cure an animal just by touching it.

Though he is not well-off yet he does not charge any money for his medications. Somehow his family members are not convinced of his free practice at all. They believe that people who can afford the cost of medications should be charged while for others, who cannot pay, the services can be free. This is quite understandable given their economic condition. But Sakrabhai believes that his social status has increased in the community due to his selfless service and continues undeterred.

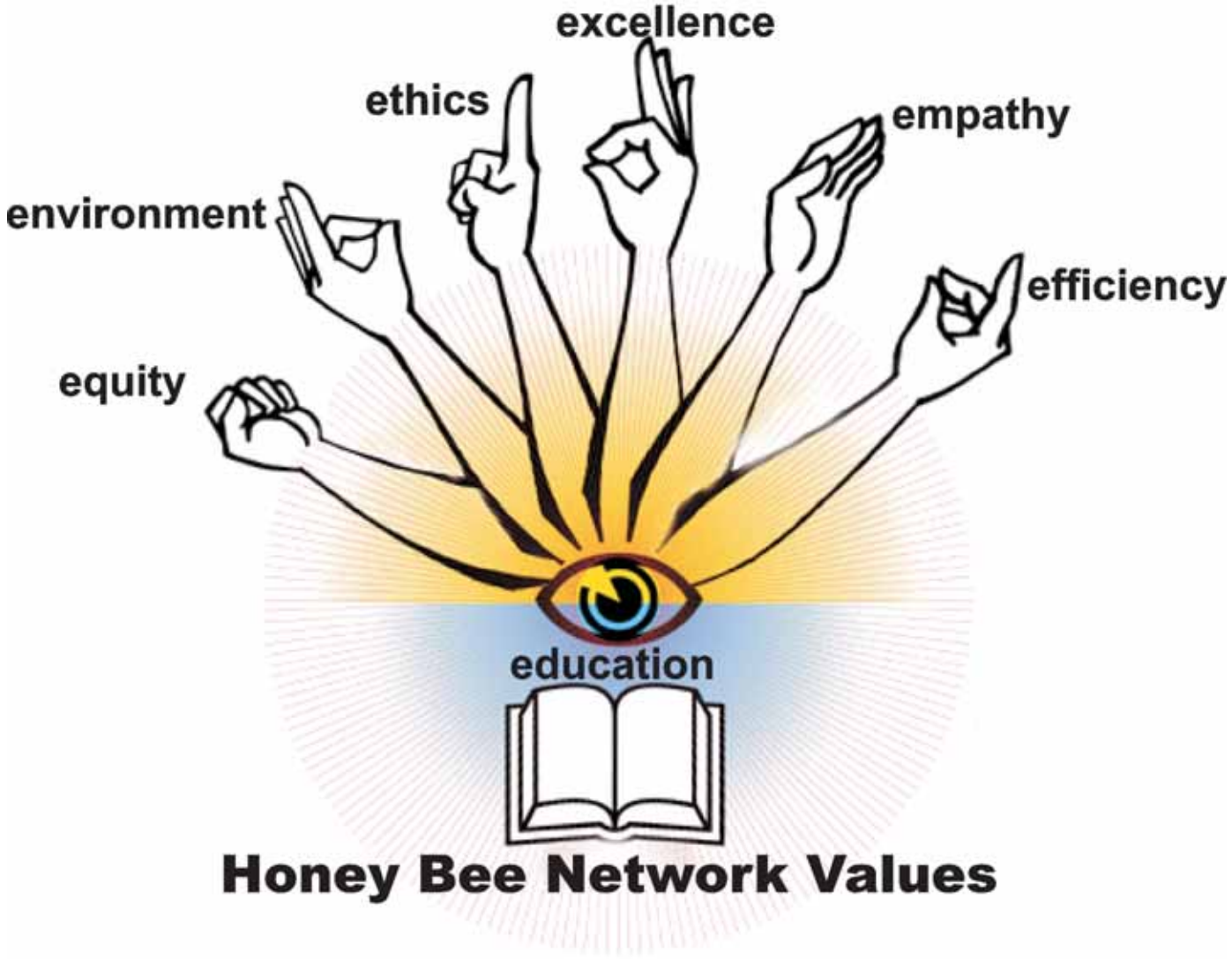
Sakrabhai recently participated in the 23rd Shodh Yatra in Dahod (Gujarat) and Alirajpur (Madhya Pradesh) in May-June 2009. He walked barefoot all the way, and citing his example, he exhorted other herbal healers to share their knowledge for the development of new drugs and the betterment of the society.

Kapuriben was born in Jambusar village, the youngest among five siblings-all girls. Education for girls was never a priority for her parents, so she was always absorbed in household activities and farming. The family grew maize, black gram, groundnut and rice on their small piece of land. At the age of 16 she got married to Sardarsingh of Dahod. Here also she assisted her father-in-law in his farm to grow rice, black gram, maize, pigeon pea and groundnut. Along with farming, her father-in-law-Rupsingh Patel, also had interest in animal health. He used to treat animals for bloat and taught the same practice to Kapuriben. She took care of agriculture and animals efficiently as her mother-in-law died just a month after her marriage. Presently, she lives with her husband, a son, daughter-in-law and three grandchildren.

Sakrabhai and Kapuriben use a local herb to cure bloat within a very short time. Bloat is a medical condition in which the stomach becomes overstretched by excessive gas content. This gas is generated as a result of the anaerobic microbial fermentation processes taking place in the rumen (front part of the stomach in ruminants). It is a serious medical condition and results in mortality if not treated properly. Earlier studies on the local herb indicate that the plants of the genus possess hepatotoxic activity and anthelmintic activity. However, no such report was found for treating bloat. Similar search in the patent literature also did not yield any result.

Simultaneously, NIF facilitated the validation of the practice at Bombay Veterinary College, where the dosage standardization was also carried out. Subsequently, a product was developed under the brand name Blotomin. The details about the same have been shared with Karnataka Antibiotics, a Government of India agency for which technology licensing is being discussed.

Meanwhile back home Sakrabhai and Kapuriben are happily doing what they know the best *i.e.* treating veterinary cases with all their knowledge and skill. Even at this prime age and responsibilities, they do surprise everyone with their energy and enthusiasm.


excellence
ethics
empathy
environment
efficiency
equity
education
Honey Bee Network Values

# Toothbrush with paste dispensing mechanism and a safety valve

**State Award**
Delhi

**Agastya Narain Shukla**
New Delhi

An innovator and an entrepreneur, Agastya Narayan Shukla (39) has developed a toothbrush with an integrated toothpaste dispensing mechanism. The toothpaste is filled in the body of the brush and need not be put separately.

Agastya was born on 15th August, 1970 to Shri Prahlad Bhaktraj Shukla and Smt Kamla Devi. His father owned a power loom unit at Anand Parvat in Delhi. Unlike his five elder siblings, he used to assist his father at the factory when he was still a kid. Working with him and learning the nuances, his little eyes starting dreaming of running his own factory soon. The zeal to do something independently made him realize his dream when he was just 12. He set up his own small factory in partnership with one of his friend. While other children of his age were busy in learning books or playing games, he was engrossed in making spare parts in his factory.

He continued his schooling for two more years, though he preferred to spend time in his factory than sitting in the class. Hence, when he was 14 years old and studying in standard eighth, he dropped out of school and

completely devoted himself to the factory, learning from real life situations and dealing with practical problems. He continued to enhance his knowledge by exploring relevant technical books and attending informative programmes. His father's work was also not going on smoothly, for the past few years, and there were certain financial problems. He therefore did not mind young Agastya pursuing an alternate choice and trying to be independent.

Life changed its course when a tragedy struck in 1985. The untimely death of his father left behind huge debts to be repaid. His elder brothers washed their hands off the matter. With no other resource on hand, Agastya had to sell his factory to pay off the creditors. With the loss of his father and his brothers turning their faces away, his world had turned upside down. With Rs. 20,000 left in his hand, after clearing the dues, fifteen years old Agastya decided to go to Mumbai to earn a living.

The bustling city of Mumbai welcomed him with its cut throat competition and a sea of uncertainties. He got involved in various activities; from making documentaries to selling diamonds and doing some odd jobs even. After three years of hard life there, he decided to come back to Delhi and revive his father's unit.

He reopened the factory. His professional life started gaining momentum with slow and steady progress. He got married to Bharati, daughter of his father's friend, in the year 1994.

The next few years passed peacefully. Business grew and they made a tidy profit. However, things changed in 2000, when tighter environmental laws led to the closure of many small scale units.. His factory went into loss and had to be closed down. But, unlike the previous occasion, when he was alone to handle the atrocities of life, this time he had friends to help him financially and his wife to encourage him. With their support, he fought once again. One of his best friends, Ramandeep Gandhi helped him to set up a low-cost unit wherein he outsourced all his production thereby bringing down costs and risk. With his new business, he got ample time to think about various ideas and applications, which could become potential businesses.

**The string of ideas**

In 2001, he saw an advertisement in the Navbharat Times soliciting entries for the national innovation awards. His curious mind started to tick and he started sending his ideas. His ideas included a device for spreading perfume during public performances, harnessing the energy generated while exercising, audio controlling device, using the energy of vehicle exhaust to keep food warm in food-delivery vehicles and an air vehicle dashboard to indicate air pressure.

Next, he made and tested a prototype of a safety valve for kerosene stoves. This safety valve was built to prevent the explosion of stoves that killed or maimed a large number of users across the country.


He came up with an idea to prevent people from getting run over by trains while crossing the tracks. His solution consisted of hanging ropes dripped in used black engine oil at the unmanned crossings. Anyone jumping the tracks would have to go through the mesh of old oiled ropes which would soil his clothes. This was expected to be the deterrent to those in a hurry to attempt crossing the tracks.

Having faced a lot of ups and downs in his life, today, he has become cautious in making long term plans. His focus is on living in the present moment and working hard on new ideas and business opportunities. He gives a lot of credit to his wife who has stood through thick and thin and supported his zeal for innovations.

**The trigger of the idea**


In the year 2002, the telecom revolution had begun in India. A merged conglomerate; Aditya Birla Group, Tata Group and AT&T executed a major branding exercise to launch "IDEA" in the prestigious Delhi telecom circle. It was a launch that attracted millions of eyeballs across the nation. While passing the road on his scooter, Agastya was struck by a message in the IDEA hoarding which read "An IDEA can change your life". He took the message as an inspiration to come out of the rut he was in.

He started thinking about that one golden idea that would enable him to move out of his labor intensive scale unit with wafer thin margins. His small scale unit with its irregular work orders kept tripping into losses every second quarter.

In June 2003, he was travelling in a train when he noticed people looking for toothbrush and toothpaste in their luggage. He thought why can't the brush be fitted to the toothpaste tube itself. On his return, he started thinking about one such product. He made a study of the design issues related to the bristles, contours and grip. Next, he examined various material choices and developed the first prototype in December 2003 wherein he fitted a brush's head to a syringe. Apprehensive of his innovation, he demonstrated it to his family and friends. But they encouraged him to go ahead with it.

He then showed it to a group of students and Honey Bee Network members, whose encouragement boosted his spirits further. Improving the design, he developed a toothbrush with the toothpaste tube integrated into the handle itself. He had to struggle hard to make the toothpaste retain its character and flow on demand though the holes near the tip of the bristles. Proper design of the front portion with hollow bristles became difficult as he lacked the knowledge of proper injecting machines. Starting in 2003, it took him more than two years and around three lakh rupees to fine-tune the technology and develop commercial samples.

**The toothpaste dispensing toothbrush**

The toothbrush has an integrated arrangement for providing toothbrush and paste in a single assembly. The knob at the bottom of the tooth brush is twisted to push the paste up and out near the tip of the bristles.

The toothbrush is made from a suitable food grade material. All the individual parts are replaceable. The idea is to use the toothbrush for a long time and refill the paste when required.

Comparable toothbrushes are found in prior art, albeit with a modified configuration[1]. But these differ in construction and design from the current innovation.

The innovator has been granted a patent for this toothbrush in 2007. He has also received a Micro Venture Innovation Fund (MVIF) investment from NIF. He has sold more than 250 such brushes at Rs. 125 per unit, through different outlets and got the user's feedback to improve it further. The toothbrush has a potential market among children who are curious and intrigued by its unique design and also the people travelling frequently. The convenience of carrying the toothpaste and the brush in a single unit might attract them. Apart from his business and innovations, he is also interested in parallel cinema and harbors a dream of trying his hand at filmmaking.

[1] US Patent discloses a toothbrush operated by spring and piston (US6948875) and foldable toothbrushes with periodontal attachment heads (US5735298). Other citable patents include US US5842487, US4717278, US5181531, US5425590, US5439014, US5746532, US5911532, DE3312392, DE1000391, US4521128, US5913632, US5100252, US5066155, US4291995, US6056469, and US 6062233.

# A lifetime spent in innovations

## State Award
West Bengal

**Nitai Dasgupta**
Murshidabad, West Bengal

Scout: Jaydeep Mandal

During the journey of over seven decades, Nitai Das Gupta, (78), a fabricator, has done a lot of work in developing customized solutions for his clients, for himself and for others. His skill lies in understanding the need and coming up with simple, cost-effective and efficient solutions.

Nitai Das was born in Berhampur, Murshidabad district of West Bengal in 1931. His father was a labourer in a tannery. He was average in studies and in fact did not like it much. But his school gave him something that has remained with him at all times- the skill to write with both hands and that too simultaneously. It so happened, that as a natural left-hander, he used his left hand to write and do things. He was punished by the teacher while thrusting out his left hand to take the chalk from him. (In some local traditions, left hand is considered inauspicious or socially unacceptable) The teacher asked him to use his right hand for writing. This made him train his right hand and he became ambidextrous in simultaneously writing with both hands with equal precision and speed.

Certain financial problems forced him to drop out of school after class eight. In 1942, at the age of eleven years, he opened a cycle repair workshop. Having no agricultural land, this was the main source of income. While picking up various skills in the workshop, he became a self-taught technician and a fabricator.

With a wide experience spanning over 50 years, he has developed a series of innovative applications, ranging from customized vehicles for land and water to developing rides and other structures for amusement parks. Currently, in his ripe old age, he has cut back on new innovations and spends his time supervising workers in his fabrication workshop, Das Gupta Engineering Works. He stays near his workshop, which is close to Berhampur railway station with his wife. He has three daughters; all are married.

**The saga of innovative works**

Nitai was doing routine bread and butter jobs in his workshop till a brainwave stuck him in 1953. He thought of building a bicycle driven by two people. In three months, he built a unit with five gears with an average speed of 30 km per hour. The five gear system was used to drive on inclines as well as plain roads.

Encouraged by this success, the next year, he built a bicycle driven by three persons simultaneously. By this time he had become quite popular in Murshidabad district for his innovative vehicles and he started receiving orders for developing structural items used in amusement parks, circus and village fairs.

He started manufacturing and supplying wheel sets, merry-go-rounds and toy aero plane used in circus and specialized rigs for Durga puja pandals. He started fabricating and selling such custom products to customers all over West Bengal and Eastern India.

Later in 1958, impacted by frequent floods, which washed away roads and marooned people for days, he decided to build an amphibious three-wheeler, which could pedalled across flooded lands and waterways alike. He developed the “Three Wheeler Amphibious Vehicle – Waland”.

In 1999, he developed “Motor Cycle Driven Ambulance”, which is used to carry patients to hospitals from remote villages. Earlier, considering the need of ambulances in remote villages without petrol pumps, he had developed ambulance unit driven by two people manually like a cycle rickshaw.

Improving it further, in 2002, he developed “Four Wheeler Vehicle Driven by Four People”, which can also be used for transportation or simply as a fun vehicle by tourists. The central portion of this vehicle had a caged receptacle to keep the luggage with the added seating facility for another passenger.

Having built many devices for amusement parks and fairs for decades, Nitai Das developed a good understanding of steel structures, trusses and their capacity. Trying to move off the beaten track, he took up a new challenge and then designed and built a suspension bridge at Jangipur in Murshidabad in 1995-96.

He feels blessed that he has consistently received the support of his family members, neighbors and friends in all his endeavours. Having built a lot of goodwill over five decades, it is not surprising that often customers have paid him full in advance for developing specific designs.

However, he feels he could have done much more in shorter time with the financial support from private organizations and government agencies which could also have expanded the scope and reach of his innovations. Nitai Das, inspite of his frail health participated in the 20th Shodh Yatra in West Bengal in 2007-08 along with his wife. His life story and the zeal to work even at such an age inspired most. He was also felicitated during the Shodh Yatra by the yatris.

**The motorcycle driven ambulance**

Rural India is witness to the difficulty and delay faced by lakhs of accident victims, patients and pregnant women in reaching the hospital in time. Most hospitals are located far way in developed areas. Ambulances and emergency response is almost non-existent in most hamlets.

Village communities and hospitals find it difficult to buy the existing ambulances, which cost a few lakhs and are expensive to run and maintain. Nitai first started work in 1970 and built a manual ambulance, driven by two people using a bicycle based mechanism. In the same year, he built another version, which could be pedaled by a single person. Since these units took only 15 days to build and could be made with an expense of a few thousand rupees, Nitai continued to make them by in dozens and sell them to customers in Murshidabad and other districts of West Bengal.

In 1999, he got a commercial order from Suman Mitra, the then district Superintendent of Police at Murshidabad, who asked him to develop a low-cost ambulance driven by motorcycle. The client provided Rs. 20,000 as an advance and two old motorcycles to be used for retrofitting. The innovator only took three months to retrofit the motorcycle with a custom built ambulance trailer unit to create a patient care and ferry unit.

**Innovation details**

The patient transportation unit consists of a 2.5 HP Yamaha motorcycle, which provides the traction to pull the trailer unit equipped with standard ambulance amenities. Apart from the driver, upto three people can be ferried in the ambulance unit, which also has a modified suspension to handle the rough road conditions.

The ambulance unit is provided with doors at the rear and has the facility to keep oxygen cylinder, first aid box and saline solution dispensing station and the attendants can sit inside at a seat height of 1.5 feet.

The ambulance cabin has a footprint of 8 feet by 5 feet and can be attached or detached from the motorcycle when required. The ambulance unit is provided with a stand to anchor it on to the ground to take the load when the motorcycle is detached. The linkage mechanism is similar to the mechanism used in tractors. It takes less than 2 minutes to fix the motorcycle unit to the trailer and make the system operational.

This unit provides a quick and cost effective way of providing emergency response and care and transported at upto 40 km/hour. Costing less than Rs. 60,000, this unit is an effective and affordable emergency response solution[1] at a fraction of the cost of conventional ambulances. The main cost is the cost of the motorcycle, tyres and fabrication of the ambulance unit. The commercial ambulance built around the Maruti Omni costs more than Rs. 2.6 lakhs and out of reach of thousands of rural clinics and hospitals. The innovator has made and sold two motorcycle driven ambulance units. These units are being used locally in Murshidabad.

**The manual ambulance**

For covering shorter distances of less than 30 km and for those village dispensaries with a tighter budget, Nitai has built and offered the “manual cycling version”, which can be driven by a single person or two people at a speed of 10 km/hour. For less than 10 km, the single person driven version is preferred. For longer distances of 10 to 30 km, the ambulance powered by two people can be used.

In the last few decades, the innovator has made and sold more than 2000 manually operated ambulances in Bengal and Bihar. In the rural areas, the high cost of the motorcycle ambulance unit has been a deterrent though there is a clear increase in demand in last five years.

Using a conventional motorcycle to drive the ambulance makes this a flexible and universal patient care solution. The same vehicle can suit different occasions for various mobile services. This approach is in synergy with the value proposition required in villages where one utility is used to deliver multiple conveniences in a cost effective manner.

**The amphibious three-wheeler**

Nitai Das lives in the flood prone Gangetic region where every year, a large number of people lose their lives. Whether it is women or children or those who do not know how to swim, many marooned people became flood victims. While fleeing to safer areas, quickly changing from boats to vehicles when encountering water and vice versa becomes difficult due to limited inland and water transport options.

Pondering on this universal problem, in 1954, Nitai conceived an idea about a three wheeler, which could be quickly deployed both on land and water. Due to lack of funds, he had to wait four years to start work on the first prototype. In 1958, he took three months and about Rs. 7000 to design and build his first amphibious three- wheeler to move on land and water.

**Innovation details**

The amphibious thee wheeled Vehicle, named “Waland” is 8 feet long, 4.5 feet wide width and 3 feet height and weighs 120 kg. It is essentially built as a boat on three wheels: two at the sides and one in the front. A pair of long cylindrical floats has been provided, which is parked inside when traveling on road. While in water, the floats are suspended on either side of the structure to act as buoyant stabilization arms.

Equipped with a steering system, two people sitting in the front seats can run it by pedaling. The pedaling unit rotates a set of blades that work as propeller to move the vehicle in water. Two people can sit in the rear also.

In 1959, a rigorous testing of the amphibious vehicle[2] was done by various users who used it across India. The route taken by road included traveling from Berhampur to Kolkata, then Kolkata to Delhi, then Delhi to Haridwar, which took one month and 5 days. While testing over waterways, first it was used to travel from Berhampur, in Murshidabad to link with the Brahmaputra river by traveling 700 kms. The return, from Haridwar to Kolkata on the Ganga, took two month and twenty days.

Starting with the very little exposure in 1959, over the next three decades, the amphibious vehicle garnered media attention with over 40 articles published till 1990. In 1990, Nitai sold this unit for Rs. 20,000 to the Assam government and personally handed this over to Prafulla Kumar Mohanta, the then chief minister.

**Five gear bicycle pedaled by two people**

In the early 1950s, Nitai started developing a series of vehicles built on extending the features and applications of human powered bicycles. After developing the amphibious three-wheeler, he started working on an all-terrain bicycle powered by two people requiring reduced driving effort.

**Innovation details**

The first model, built in the 1958, used 26" standard tyres and consisted of a steel frame body and weighed 60 kilograms. It could be driven by two people and was provided with five gears and a braking system for downhill

driving. Two gears were designed for use on level roads while other two gears were used for running on inclined slopes. The five sprockets were fitted in the bicycle and a small adjuster was located in the center of the chain drive.

No automatic gear shift was provided, and the driver had to get down and manually change the drive for the required sprocket set for climbing uphill. Costing less than Rs. 8000, this transportation unit found many buyers locally.

Prior art[3] clearly discloses that multi-gear and multi-speed bicycles currently available in the national and global markets. All of them use the same chain and sprocket arrangement for power transmission. But at the time when Nitai made this innovation, in the late fifties, these types of cycles were unknown and unseen in Indian markets and his visionary thinking and development skill could be recognized here.

**4 wheeler driven by 4 people**

In 2002, the local Superintendent of Police asked Nitai to fabricate a custom vehicle, which could be driven by many people for a road show in South India. Sourav Das, the District Magistrate inspired him to go ahead and provided monetary help of Rs. 5000. Taking up the work, Nitai completed the design and fabrication in 15 days.

**Innovation details**

The overall dimension of the vehicle driven by four people is 8' length, 3.5' width and 2.5' height. The total weight of the vehicle is 80 kg and there is a provision provided in the center of the vehicle for keeping the luggage.

To conduct a thorough test of the vehicle, it was first used in a cross country tour by four people who traveled from Berhampur, Murshidabad, West Bengal to Chennai in Tamil Nadu. This tour was completed in two month and five days. Nitai observed that this unit delivered an average speed of the 30 km per hour when operated by four people. At present, the working model of the vehicle is kept in the office of the District magistrate of Berhampur, Murshidabad.



---

[1] Prior art search disclosed the motorcycle driven ambulance of similar technologies and combination of technologies and instances of box attachment with motorcycle as per US 9,10,728-dated Jan 26, 1909, US 2007/0120340 A1, dated May 31, 2007, US 2007/0176396 A1-dated Aug. 2, 2007, US 7,011,320 B1-Mar. 14, 2006, US 3,840,085- dated Oct. 8, 1974 and US 2007/0216118 A1-dated Sep. 20, 2007.

[2] NIF database discloses amphibious vehicles made by Mohammad Saidullah, Dwarka Prasad Chaurasia and others. Prior art search disclose a human-powered wheeled amphibious vehicle (US 5782480), amphibious vehicle has a hull with a seat portion formed on its upper side (US 178088), a three wheeled amphibian vehicle operated by pedal power (US 3941075 & 4357893) and an integrated system for land and water (5803774). Also see *Let no Water Come in the Way: Traveling the Amphibian Way*. Honey Bee 19 (4): 16-17, 2008.

[3]The Prior Art Search discloses the variable speed bicycle, Hercules Wow, ranger DTB (Hero Cycles), US 4119326, US 4277077 and US 5342075 and discloses the tandem bicycles as in US 6612597 B2.

# Modification in Jacquard loom for extra weft insertion

**State Award**
Assam

**Deepak Bharali**
Sualkuchi, Assam

Conventionally the task of the insertion of weft threads to make a variety of designs is done manually by tying knots. It is tedious, cumbersome and time consuming. The thread is also wasted in the connection between one motif and another. Deepak has come up with a device consisting of three components; base frame, magnet-bearing shaft and specially designed bobbin. These components can be fitted to any handloom Jacquard machine. The innovation reduces the time required for making designs to one third of what is required in the traditional way of doing it.

**Background**

Deepak Bharali (33 years) hails from Napara in Sualkuchi in Kamrup district of Assam. The village, also locally known as the “Manchester of the East”, is situated at a distance of 35 kms from Guwahati along the banks of the river Brahmaputra. The economy of the area is mainly dependent on weaving of muga silk using traditional looms.

Deepak is the seventh child of his parents. His family hails from Sualkuchi and has been engaged in production and trading of silk goods. His father, Late Haren Bharali, was a distributor of silk items. His mother expired when he was six years old. His father died while he was doing his graduation. Since then, he has been the breadwinner and has continued the family business. He makes a living by producing and selling muga silk using his looms.

Even as a young child, Deepak had a keen eye for detail. One day, while pulling out an old cycle tyre from a ditch, he observed that the inner sides of the tyre were lined with different types of small fish. As an experiment, he put another tyre into the ditch and noticed that after few hours, this tyre too was filled with lots of fish. Since then, this had become his unique technique for catching fish. Continuing further, he noticed that he could also use a bamboo cylinder to catch the fishes. Using every available object, even discarded bearings, he has built model cars.

After completing his graduation, Deepak looked for jobs and applied for various posts in both State and Central government departments. Later on, he decided to pursue his family business. He started with his first loom in 1998, for weaving plain cloth shorn of any design or ornamentation. Using the looms himself, he wove the cloth and learnt about various aspects of production. After nine months, he installed his second loom and diversified into producing silk with designs. Here he ran into heavy weather as he tried to increase production by adding more looms, and hiring skilled but expensive workers. The slow speed and limitations of traditional silk producing methods added to his troubles. He circumvented this by innovating and developing a new accessory for the Jacquard loom which could ensure nine fold reduction in time, simplify work and lead to better utilization of looms per day. Secondly, it might become possible to hire unskilled workers as well.

Deepak appreciates the support received from family members in developing new tools and devices for silk production. His wife helps him in production work such as cutting and sanding. His brothers often help him in marketing the raw materials and tools. Many of his friends and members of local community are impressed by his innovation and think it is nothing short of magic in the world of weaving.

He is a role model in his locality and for all neighboring loom owners as he had started out from his home with one loom and now he runs 19 looms successfully.

**Genesis of innovation**

Over the years, the weavers faced common problems while working with the Jacquard looms. Firstly, the handling of weft threads at various intervals and the tying of knots caused drudgery and required a lot of time and effort. An average fabric, consisting of 30 rows of lines with 14 designs in a row, would have at least 3 knots per design. This would mean a total of 1260 knots and that would require almost 10 hours, assuming the weaver takes 30 seconds to make each knot. Secondly, working on designs that need simultaneous handling of five or more threads requires great skill that only a few skilled weavers possess. Thirdly, while handling broad designs or when the gap between the weft threads is too small, the weavers find it difficult to slide their finger in to handle the wefts. To increase production speeds, automate and cut down the repetitive process in routine tasks, Deepak decided to create a dedicated fixture style attachment that can be fitted into the standard Jacquard loom.

**Product Details**

The design making device is an attachment which can be fitted into any Jacquard loom. The device has three components; a base frame which acts as a shaft holder, the magnet bearing shaft and the specially designed bobbin. The uniqueness lies in using the magnetic clamping systems and specially designed bobbin to achieve its efficacy.

The attachment facilitates the Jacquard loom to do automatic selection and lifting of warp threads for design making. The magnet fitted shaft is

fitted into the base frame. The number of magnets will vary upon the number of designs that one has in each line. Unlike normal loom where design-making each weft thread is connected to a bobbin, these bobbins are placed on the lower surface of the base frame, just on top of the corresponding magnets fixed on the shaft.

Once the magnet sensitive bobbins are glued to the surface, the frame is taken on top of the warp threads. As the Jacquard machine selects and lifts the warp threads, the device is placed on top of the warp threads. The device is placed in such a way that the bobbin's attached surface faces downwards and each bobbin falls in between two sets of lifted warp threads.

As the magnet fitted shaft moves from one side to the other, it also drags along the bobbins attached to it from one side to other. In the process, the simultaneous crossing of all weft threads for design making takes place. Once the weft-thread bobbins are crossed, the whole device is lifted to continue with the normal loom weaving process. The same process is continued for all the weft thread configurations till the design making is completed.

The prior art search in both the patent and non-patent databases shows the existence of a number of handlooms which require the design to be threaded manually, which is extremely time consuming and requires a lot of effort as well as skill. US patent 4581905 (15/04/1986) reveals a process and a knitting machine to produce figured fabrics. WO/2006/027240 (Pub. Date 16/03/2006) discloses a gripper device for weft threads for a loom in which the gripping force can be changed during weaving according to the pattern of the material to be produced. However, prior art search does not indicate a similar device in handloom fabric weaving.

**Product application and dispersion**

The attachment of this fixture to the Jacquard loom achieves increased productivity, ease of use and better fabric quality. It also facilitates automatic selection and lifting of warp threads to handle elaborate fabric designs.
The innovation facilitates a productivity boost of over 60% while eliminating the drudgery. This attachment to the Jacquard loom allows unskilled workers to enter the industry and produce elaborately designed fabrics.

Using locally available components, and low cost, this attachment could deliver a lifetime value for thousands of handloom units by achieving better utilization of loom and time spent by workers.
Till now, Deepak has set up the preliminary device in his ten looms. In the next step, he wishes to extend it to another nine looms with the refined model. If he becomes successful he will start the business by selling the device first in his village, then in Assam, India and aboard.

IIT Guwahati, has been guiding the design process lately. Despite numerous iterations, the final design has not yet been fabricated successfully in Guwahati. A firm has been contacted in Delhi to get casing for magnetic bobbins designed and fabricated in plastic properly.

Deepak also has a dream to make modifications in the power looms. Generally, in power looms the insertion of extra weft is done by using shuttle and then cutting the unused portion. Such cloth normally looses its demand in the market. He wants to study the working of power loom so that his device can be installed there. The innovator has been extended venture finance from MVIF at NIF and also product development support for technical improvements in his innovation.

# Electro Tyre Retreading Machine

**State Award**
Kerala

**Augustine Thomson**
Thrissur, Kerala

Scout: Raesh T R

*"It is ironical that in some instances, I was called to replace the tread machines of those local businesses who had tried unsuccessfully to copy my machine".*

Usually tyre retreading is done using steam based heating system, which consumes about 1.5 tons of firewood to cure a 14 kg of matrix. Proper vulcanizing requires about 150° C temperature and 80 psi steam pressure. The tyres are directly exposed to heat, which results in reduction in life also.

Thomson has developed an electrically heated matrix system for tyre retreading. The system has coil heaters with ceramic beads, digital thermostat control and timer to maintain constant temperature throughout the process for balanced curing. One can complete the operation in 18-20 per cent of the cost of the conventional process by using this innovative process and mechanism.

**Background**

Thomas Augustine (53) hails from Athani in Thrissur, which is the rubber heartland in Kerala. Augustine was born in a small village of Vazhoor, Kottayam in an average middle class family on 12th June, 1955. His father was a primary school teacher in a nearby St Dominic School and mother was a housewife. His family consists of an elder brother, sister, two younger brothers and a younger sister. They had around 12 acres of land in this village, where rubber, tapioca and tubers were cultivated.

His entire life took a new turn, when his father died in a bus accident, while he was studying in the 8th standard. By that time, his elder brother had got a job in Andhra Pradesh and the responsibility of the family fell on him. While continuing his studies, he took up agriculture as a full time vocation to support his family.

During this period, he felt the desire to move away from farming and wanted to start a business in the village. At that time, his maternal uncle was running a rubber treading unit nearby, in which old vehicle tyres are made serviceable by removing worn out treads and replacing them with new treads.

He decided to start retreading unit, nearby his village, in Manimala. His brothers also joined him. They took a loan of Rs 48, 000 from Kerala state financial cooperation by mortgaging their farmland and started the workshop in 1978. Business started off well. The unit started with just one machine for retreading the tyres of trucks and two wheelers. The tread rubber is made from natural rubber by adding carbon black and a synthetic material through a process called extruding. But, they soon faced the problem of getting quality raw material in the form of tread rubber rolls.

In 1979, they decided to start a production unit for manufacturing tread rubber. Subsequently, they got a big order to supply tread rubber to a well-known company named Midas based in Kottayam. The company 'Midas' was a bulk supplier of tread rubber to Kerala State Transport Cooperation (KSRTC) and with these large orders. Slowly, their manufacturing unit started flourishing. By then, the focus had shifted from rubber retreading to manufacturing the tread rubber. They took loans and added another unit to manufacture tread rubber.

**Genesis of innovation**

In 1983, with great expectation, Thomson had added another manufacturing unit to produce tread rubber. Calamity befell when KSRTC suspended the agreement with Midas. Midas, in turn refused to buy the large quantity of tread rubber manufactured by their unit. Left with large amount of stock, they were forced to sell this at throwaway prices. Having taken loans from banks and private parties at very high interest rates, the debt had accumulated to a big amount. They were forced to sell four acres of land and even decide to wind up the manufacturing units.
Augustine then decided to revive the old business of tyre retreading.

Over the years, he had observed many problem areas in the existing steam based units. These units usually deployed boilers, which consumed upto 1.5 tonnes of firewood to cure a 14 kg of matrix and generate a temperature of 150 degrees for proper curing. The bulky units required a lot of space and manpower, lacked operational precision, and depleted natural resources. The rudimentary steam based units could not maintain the constant temperature required to deliver high quality treads. It was observed that a 10% variation in the steam temperature resulted in more than 20% reduction in service life of the tyre. The boilers sprung leaks in three to four years, thus, altering performance and requiring recurring maintenance.

The units required more than 30 minutes to deliver the required pressure of 80 psi, and involved heating the entire unit along with the casing. Workers used hard tools to pry open the tyre and load into the machine. This heating of the entire tyre unit and rough handling often damaged the casings and reduced the service life of the tyre.

Since, the heavy tyre disc also had to be fitted into the machine; it entailed, employing sturdy labor (more than one person) and also keeping a watch on the steam and air pressure. Observing that chappal making units used electricity instead of steam boiler, he thought of using an electric powered

heater for the tyre retreading. After inspecting some of these units, he noticed that the moulds used in chappal making were flat, horizontal and needed much modification for his purpose.

Having learnt about electrical wiring and repairing from his father since childhood, he had the necessary confidence in building an electric unit for treading. First he used a strip heater in the device and partially succeeded after spending four years in standardizing the operation. In 1989, he met P.S Esho, an officer in district industrial center, who asked him to exhibit this innovation in the local trade fair 'Index 89". He also helped him with making the very first write-up and taking product photographs. The machine was displayed in the exhibition and a press conference was also organized. The provisional patent was filed in 1989.

While marketing this new technology for retreading, he faced stiff opposition and false propaganda from manufacturers of conventional treaded systems, who felt threatened by this new entrant. Finding it difficult to market the technology in his home state, he tried hard and with the help of friends some units were sold in other parts of India. But after getting complaints regarding the tread failing and problems with strip heater, he realised that the product needed refinement.

The development saga continued but he had to struggle with various sub-systems in refining them and also faced financial constraints and ultimatum from the bank. By this time, he had already been forced to sell the ancestral property to repay the debt. But he hung on; since, he believed that he was in the right track with his innovation. Since, the major tyre retreading industries and skilled labor in making molds were located in Thrissur, he relocated to Thrissur in 1991 and purchased a plot in an industrial estate located away from town. Here, he built a temporary shed and continued his research.

By 1996, he dropped the idea of strip heater and introduced 18 gauge resistance wires, which were then bent over the mould. But the problem was not solved. The temperature variance in outer and inner side of mould

was not found acceptable. While the temperature in outer side of the mould reached 600 degree Celsius, the inner side was only having 300 degree Celsius. When heated, the mould expanded and the coil got tightened and it broke away and this resulted in short circuits.

He then changed the contouring; made a series of grooves over the mould, through which the coiled resistance wire was inserted. A ceramic insulation was given over the resistance wire. With this, the problems were controlled to a great extent. By 1998, he was able to develop the machine with trouble-free performance. He started marketing the machine with a three-year guarantee.

During that time, the mould making was outsourced to local workshops that were given the raw material (aluminium alloy). But they often missed delivery dates and wasted the materials. So he took a bank loan again of eleven lakhs and bought the mould-making machinery and built the facilities

in-house. With this, he had all parts of the manufacturing process under his control. However, he was still hampered by the fact that his unit was located far from town, his technology was not yet familiar among local customers and his detractors and business rivals were still discrediting his technology. While his business was slowly getting established, he also built the electrical control panels for his machine.

Now that his efforts were bearing fruit, he faced a new problem. Local workshops tried to copy his methods and while they succeeded in copying the vertical loading process of the moulds, they failed miserably in copying the horizontal loading process.

**Product application and dispersion**

The innovation is a much needed solution for thousands of small scale retreading units spread across highways and towns of India, working in tiny workshops with few helpers and narrow operational margins. The innovator has manufactured and sold more than 100 units across the country till date. He has been provided with micro venture funding to the tune of five lakh rupees by National Innovation Foundation in 2007. This first version of this innovation was granted an Indian patent in 1989. Subsequently, the specification for patenting the latest version of machine has been filed in January, 2009.

NIF facilitated the technology licensing to Eastern Threads, a group company of Eastern Masalas, hoping that the benefits will reach many more people; saving energy in the process and making vehicles go farther than ever before.

# Solar Mosquito Destroyer

## State Award
Kerala

**Mathews K Mathew**
Kottayam, Kerala

Scout: Peermade Development Society, Idukki

Mathews K Mathew (45) has come up with a very interesting device- the solar mosquito trapper cum destroyer. This device makes use of the smell from the septic tank to attract the mosquitoes. Once the mosquitoes get trapped inside the device, the heat built up inside the device, as a result of direct sunlight exposure, kills them.

Mathews K Mathew, alias Mathews Kaitholil, hails from Kalaketty in Kottayam district, Kerala. Since childhood and schooldays, he has been a keen lover of nature and built and spent many busy afternoons developing traps to capture rodents and small animals, making wooden toys for his friends and designing firecrackers fixed to arrows, which would explode on impact and drive away birds from picking on the harvest in farms.

After his final year of graduation, he spent more than a decade developing and refining an effective product for trapping and killing mosquitoes. Currently, he is the managing partner of the firm, Kine Technologies and Research India, based at Kanjirapally, Kottayam. Along with his two partners,

his firm is involved in design, production and sale of solar mosquito destroyer. It is apt that this innovation has been done in Kottayam as it is the first town in India selected by the Ministry of Environment and Forests, Government of India to be transformed as an Eco City. It is a town located in central Kerala and is an important trading center of spices and commercial crops, especially rubber. It is famous for its panoramic backwater stretches, lush paddy fields, and highlands.

Mathew's grandfather and uncles had migrated to Kottayam some 100 years ago and had started the cultivation of rubber, coffee, coconut, pepper and other cash crops. His father, K J Mathew was also a farmer. His family members believe that Mathew has inherited his innovative streak from his grandfather who was versatile and had built all his household furniture, agricultural implements and contraptions to collect honeybee and modified and serviced all equipment.

**Genesis of innovation**

The innovation of the solar mosquito destroyer started with Mathews making an observation during his college days. One day, while he was studying in his room, a mosquito tried to bite him, He lashed out and clapped to kill the mosquito, which was hurt and fell down on the table. After some time, it recovered and flew again and went up to the glass pane fixed on the roof, which was there to let in the light into the room. Mathews concluded that mosquito tried to escape through the glass sheet without knowing the transparent glass nature of glass sheet. Finally, the mosquito was successful in finding the exit through the gap between roof tile and glass plate and also triggering a thought in Mathew's mind.

A few months later, one evening, he noticed a large number of mosquitoes swarming around the waste tank constructed near the cow shed and entering through a small gap between the concrete slabs covering the tank. He observed that the mosquitoes found it difficult to survive in dry heat and sought out moist humid zones, as they were ideal for laying eggs and nurturing young mosquitoes.

Having developed interest and ability in trapping pests and rodents, he set about visualizing how he could trap the mosquitoes. He recalled the incident where the mosquito had flown into the transparent roof pane.

He then brought a glass to cover the gap between the slabs of the tank with a small gap at the edge for the entry of mosquitoes into the tank. Swarms of mosquitoes entered through the gap and started getting concentrated in the zone below the glass plate exposed to sunlight and were trying to escape. He then covered the glass plate with some non-transparent material and allowed only a trapezoid shaped part uncovered to enter sunlight in. He then mounted a transparent glass tube vertically above the trapezoid shaped part.

Now he reduced the size of the entry point of mosquitoes by covering the open space by a wooden plank having a small one-inch hole at its center. He found the mosquitoes were still managing to enter the tank through the small opening by simply sensing the gas coming out of the tank. He came to the conclusion that the gas coming out of tank attracts the mosquitoes. Having entered the tube, the mosquitoes reached the trapezoidal section and attracted by light shining from above, flew upwards and exited out of the tube. Convinced that the mosquitoes were following a certain path, Mathews devised a simple way to capture the swarm at outlet. He covered the top of the glass tube with a transparent polythene bag. .

'In the end I was happy to find hundreds of mosquitoes trapped in the polythene bag. I found that mosquitoes came up the tube into the polythene bag". It appeared that the mosquitoes kept on investigating the transparent wall of the polythene bag without trying to retrace the way they came in and escape. The next day he found all the mosquitoes lying dead at the bottom of the inverted bag. So he concluded that mosquitoes kept in direct sunlight in a transparent container for some time would be killed due to dehydration and heat generated by constant sunlight.

Testing the system over a month, he found that mosquitoes were getting trapped every evening. By this time he had replaced the glass tube with pet bottle and polythene bag with a suitable pet jar. The number of mosquitoes had reduced considerably around the cow shed in a month.

Next he set up the arrangement as a portable model and installed it in the tank of a rubber processing unit. This model had the same holes and trapezoid transparent patch in wooden plank (6 inch wide and 40 inch long) was able to trap not only a large number of mosquitoes but also of different types. He started concentrating on septic tanks as he considered them as the chief breeding ground of mosquitoes. While thinking of experimenting in the septic tank of his home; he faced discouragement from his father. Having come so far with his experimentation, he did not stop and whenever his father was away for three days from home, he decided to do his experiments.

He faced a problem as his earlier design was unsuitable for septic tanks as the cover slabs of the tanks cannot be kept apart or even partially open. He decided to modify his design and took 25 liter non-transparent colored jar and made three holes.- first hole at the back, the second trapezoid shaped hole at the top and he third (1') hole in line with the narrow end of the trapezoid hole. He erected the same pipe and jar trapping unit at the top. Then he made one inch hole on the slab and connected the device to hole in the slab.

He waited for an hour, and sensed that the gas from the tank had filled the device and had started began to flow out of the device. As in earlier models, here too, the mosquitoes entered the device through the hole and went upwards and got trapped inside.
In his own words 'Soon I found them getting trapped in the transparent pet jar at the top of the pet bottle. They didn't even go to the tank through the gas inlet but simply went up and got trapped. I said eureka!"

He then felt the necessity of some modification in the shape of the jar. The main problem in the existing design was the dead mosquitoes accumulated in the jar hindered the upward flight of new comers attracted by the sunlit tower. He solved this problem by creating an inverted 'U' shaped design , so that that it allows the dead mosquito bodies fall away at the wings instead of filling the top of the transparent tube and making the area crowded and dark.

Having fine tuned his design and convinced of its efficacy, he published an article in a daily on 13th May 2000. This generated attention, more newspaper articles were published and a lot of enquiries poured in. With the increased media attention, and neighbors starting to use similar contraptions to reduce mosquitoes, he got encouraged by one of his uncles to commercialize his innovation. Around this time, Father Mathew Vadakkemury, director of a local NGO visited him, appreciated his idea and asked him to file a patent for his innovation.

With the help of a local lawyer and his brother-in-law based at Chennai, he visited the patent office at Chennai and filed the provisional patent for his innovation. While staying in Chennai, he noticed several aspects of open drainage systems and drainage pits found in big cities, which created a specific pattern of mosquito habitation and swarm movement during evenings, which gave him ideas for further work on his design.

Since 2005, apart from commercializing this device, he has also built an indoor version and filed the patent for the two variants.

**The solar mosquito trapper and destroyer**

This product is an outdoor unit, measuring only 25 cm × 20 cm × 25 cm and weighing 1.5 kg. It is installed near septic tanks and traps and kills mosquitoes at the source itself, away from the homes. The product is placed so as to have direct sunlight hitting the dome of the device.

The basic components of the device include a polymer based base housing, a transparent dome shaped "solar furnace" with two side wings to lead and collect the dead mosquitoes at the bottom, inner fine mesh layers, a central

conical channel with trap hole, adapter system for the biogas inlet tube, control valve to calibrate the bio-gas and bio-gas exhaust tube.

Bio-gas from the septic tank flows through the metered gas inlet tube into the base of the housing from one end. This smell attracts the mosquitoes, which come into the base housing through the circular inlet provided in the base housing. They see the diffused sunlight coming out of the top dome and go upwards to investigate the source. The mosquitoes move up through the trap hole into the conical channel to reach the dome shaped roof area, which is actually the solar furnace.

Here the mosquitoes keep exploring the crevices. With the sunlight streaming in, the air gets heated up in this dome and they try to escape downward into the two side wings. The greenhouse effect inside the chamber due to constant heating by sunlight of trapped air dehydrates and finally kills the mosquitoes. The two wings of the reservoir inside the solar furnace are designed to collect the dead mosquitoes and this total unit can be taken out for emptying and cleaning.

The product has many unique features which make it universal, cost effective and a high quality solution which can be deployed anywhere. It is an eco-friendly self-sustaining device, which does not use any chemical or pesticide to destroy the mosquitoes. Once installed on site, this unit has no running cost or cost of consumable as applicable in conventional mosquito repellants. Also, requiring at least 30 minutes of direct sunlight a day (between 11.00 am to 4.00 pm), this outdoor unit is weather independent and requires no maintenance.

While the prior art[1] shows many ways of trapping and killing mosquitoes such as those using chemical based luring agents, cooled carbon dioxide, LED lights and killing by electric shocks, gasification or dehydration, combinations of solar rays and water, combination of solar powered light emitter with water tank, etc. Most of these units need electricity to drive the units and change of consumable material. These examples are not comparable with the superiority of this setup with zero running and consumable cost and which ingeniously uses the emitted gas and sunlight to trap and kill the mosquitoes.

**Applications**

Millions of homes try to manage the menace of mosquitoes & flies ineffectively at home, while they breed and multiply at will outside near tanks, drainage and sewage units. An average mosquito after one meal can lay up to 300 eggs and has the ability to lay thousands in its lifespan. It makes sense, as far as possible, to trap and kill them outside.

Most of the indoor units and devices are partly efficient, generate toxins such as Allethrin. For average consumer many of these indoor units become costly to own, replenish and operate. Basic solutions such as mosquito nets only stop the mosquitoes but do not kill them and they move to other rooms. This low-cost, eco-friendly solution with no running or consumable cost is a universal solution killing the pests at source effectively.

The product costing only Rs. 1400 can be fitted in place of the cowl at the top of the vent pipes of all septic tanks. Usually the cowl of vent pipe is covered with netting to prevent the inroad of mosquitoes. This net prevents them from going inside but they are free to fly elsewhere. With the solar mosquito destroyer now fitted in, the unit would trap and kill the mosquitoes there itself.

Partnering with his brother-in-law, Mathews has taken up a loan to commercialise the innovation. His preferred vendor is the industrial unit- Laxmi Plastic, located in SIDCO, Coimbatore who manufactures all the plastic components and sends them to their office in Kerala. He has started production since 2005. He plans to increase his sales and bring down the cost below Rs. 1000 to be able to sell to individuals on mass scale.

Mathews obtained a patent for this device in 2000. He has manufactured and supplied over 250 units under the trade name- “HAWKER” to private individuals, institutions, government schools and hospitals. Using the direct

marketing route, the firm is targeting hundreds of corporation bodies and thousands of hospitals to install this device to relieve people from mosquito menace.

Mathews has also developed an indoor version called “Sleeper trap for mosquito destruction” for which the patent was filed in 2007 (483/CHE/2007). It is more of a system solution with a way of trapping the mosquitoes and allowing the user to sleep comfortably. The system uses the user’s body heat to draw away the mosquitoes and uses a fluorescent bulb at top as a source instead of sunlight.

[1] US patent 6618984, US patent 730877, www.mosquitomagnet.com/how_it_works/demonstration/; , www.ecvv.com/product/vp903807/China-solar-mosquito-killing-lamp.html, www.duckol.com/Wholesale_m/Mosquito-Killing-System-226613.htm
l, www.tnau.ac.in/aecricbe/aetc/bio13.html www.mosquitosolutions.com/index.html, www.mosquitocontrol.ca/products/Traps/Can-mosquitocatcher.html

# Hand pump with modified plunger

**State Award**
Bihar

**Ramashankar Sharma**
Siwan, Bihar

*Jivan kathin hai aur samay-samay par hamari pariksha leta rahta hai lekin is imtihaan me khara utarane ke liye hame apane vichar, aadat, soch sabhi me badlao lana jaruri hai*
We have to face a lot of difficulties in our lives, to succeed we need to modify our thoughts and habits according to the changing times.

Women plodding wearily on the hand pump are a common site especially in rural areas. Not much improvement in the design of the pump has been done, which can reduce the effort in pumping water. Ramashankar Sharma (57) has modified the plunger of the existing hand pump improving its efficiency and hence, reducing the drudgery.

Ramashankar Sharma was born in 1952 in Hathoi, Siwan in a farmer's family. His family is steeped in blacksmithy and allied crafts. His mother expired when he was only three and in 1958, his paternal aunt took him to Burnpur in West Bengal where his uncle worked in a Steel Factory. There he grew up with his cousins and completed his education till matriculation.

His uncle was an expert in casting, forging and fabrication of iron components and had gained considerable experience working with leading engineering firms during the British period. In his formative years, Ramashankar worked with his uncle and developed the skills of metallurgy.

In 1966, he returned to Bindusar where he got married to Kailashi Devi in 1973. Seeking better opportunities, he traveled to Kolkata, and earned a living working at workshops and working part time as a driver. After spending four years, mainly in automobile work, he returned to Siwan in 1977 to start a machinery shop of his own.

He opened a factory for casting iron and manufactured hand pumps under the brand of "Kiran Chapakal" but suffered huge losses and had to close down very soon. Then he started a rice mill and worked hard for eight years. In 1985, he applied for a loan for seven and a half lakh rupees from Finance Corporation but received only three and a half lakh with which he started a workshop on the main road in Rasoolpur, his neighbouring village.

His village Bindusar Hamid is a small village, located five kilometers from the Siwan city. He owns one acre of irrigated land where he grows paddy, wheat, gram, maize etc. In a rented premise he runs his workshop RG enterprises, where the repairing work of threshers and house grills is done. His second workshop, 'Maa Kali Engineering Works' is located in Siwan city where four workers take care of fabrication and repair work. He has four sons and one daughter. His wife died in 2007. Daughter, who is the eldest, is married and settled in a neighboring village. His eldest son helps him in the workshop while the younger three are studying.

**Journey of innovations**

His journey of innovation started in the early 1980s without any conscious plan. His wife's maternal uncle, who had been working for 10 years to make a bullock operated pump, died suddenly leaving the work unfinished. Ramashankar brought the prototype home and started working on it to rectify various components to reduce the vibration and noise problems. He redesigned the lever system and installed a gear system.

It took him three months and expenditure of around Rs 10, 000 to do the modifications and get the model working. He exhibited the bullock operated pump at the famous *Sonpur mela* in Saran district, Bihar in 1994 where he was given the first prize by the then State Agriculture Minister.

His other works include redesigning the rotary furnace, remodeling a 25KVA generator and tagging it to a 10HP engine to run machines like lathe, grinder, welding machine in his work shop. He is able to run three welding machines simultaneously using this arrangement. This interesting work earned him a mention in the Economic Times, Patna edition also. In 2006, he focused on developing a battery operated bicycle for his convenience, which he demonstrated before the District Magistrate and got accolades. Using the car battery from a Maruti, he spent over Rs 10,000 in developing this electric bike, which could run at an average speed of 20 kilometers per hour. Since the mid 1990s onwards, his innovations started getting wide coverage regionally in newspapers such as Dainik Jagaran and Akshar Bharat and television channels such as ETV Bihar.

**Modifying the hand pump**

Ramashankar noticed the problems associated with the existing hand pumps. He observed that the cast iron body and components was prone to rusting and enhanced wear and tear due to repeated use. This affected the service life of the pump and also contaminated the water. Further, he noticed that the efficiency of the hand pump was less compared to the effort. He analyzed the problem and came to the conclusion that this was due to the pressure losses in the plunger and creation of the gap that lead to pressure dissipation.

He had earlier tried to modify the hand pump with a little success. In the year 1988, he started working on an improved hand pump design, with a guided plunger capable of higher water discharge. Then again in 1990,

considering the disadvantages and added weight of cast iron hand pumps, he had designed a pressure hand pump made of mild steel to pump water up to the height of thirty feet. He also developed another hybrid pump, which could pump water in both forward and reverse strokes.

Given his earlier experiences, he decided to redesign the hand pump using stronger but lighter mild steel components and incorporate a new plunger design, with reduced pressure losses and increasing the discharge and pumping efficiency. He started his work on this innovation in 1997 and developed the first prototype in 2000. He spent around Rs 10000 in developing this pump. The hand pump served the dual purpose of acting as a normal hand pump as well as a pressure pump.

**Innovation**

The innovation is a redesigned pressure hand pump, made of mild steel and fitted with a modified plunger system. The optimized plunger delivers higher efficiency by minimizing the pressure leakage compared to the conventional hand pumps.

The modified plunger has a guide rod in the center to reinforce the unit, provide smooth action and prevent the seals from bucking. The plunger has been made without the wavy grooves as in existing units, which eliminates the chances of slippage. The hand pump has a bore of 87 mm and a stroke of 127mm. With the unique and guided plunger design, it delivers 69 per cent more discharge with the same effort compared to plungers in conventional unit as per the tests facilitated by NIF and conducted at BIT Mesra, Ranchi.

Unlike four bolts used for fixing in conventional units, only one bolt is needed to tighten the valve in this design. Being equipped with an improved hand lever for the user, the unit also facilitates water transfer from 2.5 inch pipe to 2.5 inch pipe while conventional units allow the transfer to 0.5 inch pipe only.

This unit works as a pressure pump and uses a modified plunger that can deliver water upto a height of 30 feet. The use of mild steel makes it lighter yet more durable, when compared to the conventional cast iron based units. It weighs only 8 kg whereas the conventional ones weigh 25 kg. Also, at Rs 500, it costs half than the conventional models while delivering superior performance.

Similar concept of hand pump is not available in art. All the commercially available hand pumps are generally made of cast iron and weigh around 25 kg. Prior art discloses hand operated and power operated piston pumps with or without pressure chamber. NIF database has a record of *Balekuli* hand pump of VK Hegde of Karnataka where the pressure chamber is coupled with the piston pump to maintain uniform water delivery rate over long distances with less effort. For the pump, NIF has filed a patent in his name.

**Applications**

Millions of users across India are dependent on hand pumps. They use units that are often archaic, laborious to use and less efficient. This sturdy durable unit, delivering higher discharge, can be installed for public waterworks utilities.

As compared to the pumps available in the market, costing over Rs. 1000, this unit costs less than Rs 500 with a savings potential of 50 per cent. He also sells the plunger separately for Rs 25.

He has manufactured and sold more than five hundred hand pumps to customers in Siwan, Patna, Chapra, Hajipur, and neighbouring areas and some even in Mumbai and Kolkata. He has also had to face the problem of local manufacturers copying his designs. He tried to tie up with a firm in Delhi for the production of hand pumps and worked with them for three-four years but got a raw deal in the end. After this, he has concentrated his sale to the Siwan region.

**Looking ahead**

Though he has managed to earn a decent living but his love for innovations has dented a hole in the family savings. Within the family everybody admires him for the tremendous amount of hard work he puts everyday and has supported him all the way. However, they suggest him to be more careful while spending as he has to support a family and look after the children, whose needs have also increased with time.

Ramashankar feels that the lack of proper funding is a major deterrent in work of people like him who want to do something new and different. His desire is to take forward his innovation of the hand pump as he believes that this can capture good market but is waiting for the funds. Among other things he wishes to develop are a tractor without gear and differential, and improve the efficiency of the bullock driven pump so that it can be used in a variety of other tasks.

# Walnut Cracker and Tree cum Pole Climber

**State Award**
Jammu And Kashmir

**Mushtaq Ahmad Dar**
Anantnag, Jammu and Kashmir

"A problem triggers a thought for innovation
(*Dikkat wuchthi banavo innovation*)"

Manually cracking walnuts is a very tedious, low output and time consuming task. Mushtaq Ahmad Dar (28), a young innovator from Kashmir, has developed a machine that can crack walnuts and peel the green ones. He has also made a portable climber that can be used to climb trees and poles. Presently he is developing a machine for cracking almonds.

Situated in the southern valley region and surrounded by agricultural plots, plantations and forests, his native village Kreri is around 16 kilometers from the headquarter Anantnag and is well connected with it. Most of the villagers are engaged in agriculture and horticulture. A number of good educational institutions, both public and private, provide education in both English and Urdu medium. It is here where a simple and unassuming man, Mushtaq was born to Late Ghulam Nabi Dar and Raja Bano. Second eldest among four brothers, he has always been the pampered one. While his eldest brother, Manzoor, owns a medicine shop in Anantnag his younger

brother Shaukat takes care of the family's orchards of walnut and apples. His youngest brother, Hussain got married recently and has shifted to live with his in laws. Though Mushtaq has been a 'full-time' innovator for some years now, he also helps his brothers in running the family business and managing the house hold.

As a child Mushtaq was always quiet and reclusive. Apart from the mandatory studies, he invested his time in making wooden toys with which he used to decorate his house.. Sometimes, he used to run away to the walnuts and apples orchards or simply stroll in the nearby meadows. Fishes have always been his object of fascination and the expression of creativity. Most of his wooden toys were fishes, in various forms, shapes and sizes. Once a teacher of his saw one of his creations and asked him to make one for her also. Appreciated, he gained confidence and slowly used his skill to develop other things also. While in eight class he carved Gandhiji working on a *charkha*, which was an electro-mechanical sculpture. This won him a lot of admiration in the entire district. The same was displayed during the National Science Day celebrations at Achabal, Anantnag for which he was awarded Rs 1000 by a voluntary organisation. This money was promptly used by him to buy materials for his innovations.

Knowing Mushtaq's creative nature, in 2005, his friend, Zahoor Ahmed Shah brought him to Ahmedabad for NIF's Third National Innovation Award Function. Mushtaq was intrigued to see and meet so many people from different parts of the country who were not trained or aided but had solved various problems by their own effort and hard work. He was immediately reminded of his troubled home state, which had been plagued with the problems of unemployment and unrest. He started imagining about an innovation that, apart from solving a persistent technological social problem, would also help in generating employment.

**The Walnut Cracker**

Upon returning back to his village, Mushtaq resumed his daily routine but the thought of doing something useful kept on chasing him. Suddenly one day, while breaking walnuts manually through his hands, an idea struck him. Cracking walnuts manually is a plodding and tedious job with low output (maximum 10 kg/h). He thought of developing a machine that could mechanize this process relieving a person of his drudgery of doing it manually for hours. He discussed this with his friend Naseerul Haq who encouraged him and saying that if he was able to come up with such a machine, it would be wonderful for all those involved in this work. Motivated, he started working on various designs and finalized one in almost ten days. Then he started making the prototype, which took him about a month and an investment of Rs 3000 (which was later reimbursed by NIF) to develop. In retrospect, Mushtaq remarks that conceiving an idea is more difficult that actually translating it in reality.

*"Mabashiyo idea chu padagasan demagasmanz demag shuazan athan athchu banawan magar idea chu wariyah mushkil model banawah khota"*, translated which means that while the mind conjures up an idea, the brain commands the hands to work and build a model, conceiving the idea is more difficult than materializing it.

**The innovation**

The device is a walnut cracking machine that can process dry walnuts of various sizes, shapes and hardness and crack them open without damaging the fruit inside.

The major components of the unit consist of a feeding hopper at the top, twin rollers with specific geometries to grip the walnut and deliver impact action, bearing support, a motor with a belt and pulley drive arrangement, related electrical circuits, and a metal flap angled at 45 degree located at the bottom to slide out the cracked walnuts.

The walnuts are fed from the top through the feeding hopper made of plywood. They slide down to the two grooved rollers, one of which is powered and the other free to rotate. The gap between the rollers can be adjusted from 0.5 to 2.5 cm depending on the walnut size and shape. This setting can be adjusted by the operator anytime from outside the unit.

The shear action of the roller cracks the walnut, which is then channeled down by the angled flap. It then gets deposited in the gunny bag or basket positioned near the exit chute. The machine can process around 80 kg of walnut per hour and 20 kg of almond per hour. The efficiency of the machine calculated using nylon and aluminum rollers came to be 79.5 per cent and 75.2 per cent respectively.

The innovativeness of the device lies in its minimalist yet versatile design, with a smart set of drives, the use of two grooved rollers, which can be set to handle the various sizes, shapes and rigidities of walnuts and facilitate peeling of green fruit. The roller design and arrangement has also been customized. They have been provided with grooves in specific geometries, which grip the nuts securely when passing through the rollers. NIF filed a patent for the machine in Mushtaq's name in September, 2006 (2347/DEL/2006) and facilitated its the incubation at GIAN J&K in Kashmir University, Srinagar; supporting it with technical inputs and finances whenever necessary.

The machine was originally designed to crack walnuts but Mushtaq found it suitable for peeling green walnuts as well. Green walnuts are difficult to peel manually and in the process the skin also gets irritated and sometimes it even flakes off. An improved model of the machine has been developed recently using food grade aluminum rollers for smoother impacting action. The motor RPM has been reduced to increase the efficiency and reduce damage to walnuts of different sizes.

The prior art describes manual and mechanized methods and devices for cracking walnuts. In manual methods, the cracking is done using hands or hammers, which often destroys the fruit inside the walnut. Some of the available machines use hammers, levers, and switch trips to break the nuts. However, most of these machines cannot handle variations in shape and sizes. In many of them the fruit gets damaged during the grip and the impact. Also, most of the imported machines are complex units costing more than Rs 70,000 and not suited to meet the needs of small growers.

**Prospects of the machine**

Walnut is a big industry in Kashmir and roughly over one lakh metric tones of walnuts are produced every year. The Kashmiri walnuts are known for their superior quality and taste. As a result they are popular across the world and most of the produce is exported to different countries.

As an affordable local solution (estimated to cost around Rs. 6000), which eliminates drudgery and increases productivity in a safe and simple way, this innovation is of immediate relevance to thousands of households in the Kashmir valley who are engaged in the dry fruits trade. With this machine, the innovator is able to process ten fold of what he would have with a skilled labour on one man day.

Further work planned on the machine includes incorporating and optimising the grading system for walnuts, redesigning the rollers to enable them handle very small walnuts, facilitating guide pins and bushes for more efficient roller movement and making the machine portable.

**The tree cum pole climber**

It is a small portable device that makes climbing trees/poles simple and easy. What is remarkable about this innovation is that it uses body weight to lock the climbing steps and is very light, low cost and easy to maintain.

In his childhood once while climbing a tree Mushtaq fell down and hurt his leg. The injury healed but a thought remained in his heart to make a device to help people climb a tree. The success of the walnut cracker encouraged him to think of such a device. He had heard about Appachan's tree climber that is used to climb coconut trees but had not seen it. All he knew was that it was bulky and could not be carried easily. He thought about developing such a climber that was portable, light weight and could be easily carried in a bag..

In November 2006, he started designing the tree climber believing that the cold and snowy winters would give him ample time to ponder over the design and complete the work. It took him six days and Rs 100 to come up with a small wooden climber that used a barbwire to wrap around the tree. Not satisfied with the design, the use of wire and wood he again started work and redid the climber using iron frame and canvas belt. The entry was subsequently sent to NIF, which, assessing the importance of technology and the possible uses, got it licensed to an entrepreneur in Ahmedabad for which Mushtaq also received a fee.

Once while moving around in snow, he saw two electricity department workers carrying a ladder on their shoulders. They took it off near an electricity pole and while one worker held on to it, the other climbed it to reach the street lamp. This made him think to possibly use this climber to ascend poles also.

**The innovation**

The tree climbing device consists of a pair of supporting frames for each foot; Velcro based straps for anchoring the foot to each frame, a sturdy strap with locking system to fix around the tree and a flexible safety belt that can be wrapped around the body and the tree.

The two supporting frames are rectangular units made of thin MS channels with cross ribbing in the center to take the load of the feet. While in the first prototype, the foot was fastened to the frame using a shoelace like arrangement, the current design uses thick durable nylon straps to lock each foot to the individual support frame using Velcro straps.

Each of the two support frame is attached to the tree using a long thick belt, which is wrapped around the tree and then locked according the tree's girth. The user is also provided with a safety belt, which provides shoulder and torso support and anchorage to the tree as the user climbs upward.

For climbing, the user first locks each foot into the individual support frames. Then he maneuvers each foot and frame close to the tree and wraps the linking strap as per the tree's girth. The user can now climb the tree by raising and lowering each foot in sequence. The device uses the body weight of the climber to lock the feet and the supporting frame against the tree. Because of this, the user can take rest at any point during the climb. Also weighing at less than 4 kg, it weighs less than half when compared to the available tree climbers and can be put in a small bag and carried along.

Prior art search discloses different types of tree climbing apparatus in technological and patent literature. NIF database also has various tree climbing devices those developed by Appachan, TNAU Coimbatore, Joy Verghese and Sunil Mahamuni. However, the weight, portability, and convenience associated with this device make it novel. Accordingly, a patent (1230/DEL/2007) was filed in his name.

**Prospects of the device**

Compared to the widespread requirements across the country, skilled tree climbers are few in number for climbing tall trees like coconut. Also for climbing electricity poles no such device exists except for ladders, which require another person to hold it in place. This device, thus, fills this gap and allows a normal unskilled user to climb trees for harvesting or to climb electric poles to do maintenance work.

**Other Ideas**

Mushtaq has come up with a number of useful ideas and innovations. He has designed a device to restrict nicotine inhalation for smokers, magnetic leveler for fields, manual electricity generator, handy fruit plucker and a seed broadcasting machine apart from developing a

model for demonstration of lunar/solar eclipses. In 2008 he developed an almond cracking machine, which helps to reduce the drudgery involved in cracking almonds manually and prevent fingers from being hurt. This machine is in the process of being improved and standardized. For this machine, he has also been supported under the Micro Venture Innovation Fund (MVIF) scheme of NIF.

Considering his inventive bent of mind, Mushtaq was invited for the Third Workshop on Inventors of India in October 2006 at IIM Ahmedabad. NIF also facilitated the grant of an Innovation Fellowship to him under the CSIR-NIF MoU in 2007-08, which provided him a monthly stipend to continue his work on the innovations. In all his pursuits he has always been supported by his family, which has tried to keep the burden of familial obligations away from him so that he could concentrate on his work. His father was especially appreciable of his work and never forced his opinion on him. It was him who gleefully provided him money to make his toys. His untimely death, while Mushtaq was in class ten, punctuated his studies and left him heart broken. He still fondly remembers the peppy talks and the gentle caresses of his father! Understanding his soft and introvert nature, his mother also always supported him. His friends and fellow villagers generously laud him for making their place famous and showing the creative side of the people. His innovations have been covered by a regional newspaper *Kashmir Images* and also an international Islamic website.

In context of the walnut cracker and the tree climbing device, when asked why he chose to work on two innovations simultaneously Mushtaq replied that the mind gets tired while working on one innovation and the idea flow reduces. The switch over from one innovation to other helps to clear the bottle necks in the thought process at the same time prevents unnecessary time wastage also. Apart from working on innovations, which take much of his time, Mushtaq is also a very active member of the Honey Bee Network in Kashmir and periodically sends innovations and traditional knowledge practices from the area scouted by him. He gratefully acknowledges the contributions made by NIF, TePP, GIAN North, and USIC in helping him and taking his technologies forward.

True to his name, Mushtaq (Mushtaq is a word of Arabic origin meaning longing or yearning or desirous) is hopeful for the commercial success of his innovations and of a prosperous and peaceful future for all.

# Multipurpose Food processing machine

**State Award**
Haryana

**Dharamveer Kamboj**
Yamunanagar, Haryana

*Sangharsh hi sabse badi kaamyaabi hai. Agar badhna hai to peeche mud kar nahi dekhna hai.*
(The capacity to struggle itself is a big effort. There is no looking back, if one has to keep on moving forward)

A multipurpose food processing machine that facilitates on-farm processing or herbs, flowers and fruits has been developed by Dharamveer Kamboj (45), a farmer, herbalist and an innovator.

The youngest among five siblings, Dharamveer was born on 15 May 1963 at village Damla to Ramswaroop Kamboj and Savitri Devi. His father was a farmer and, along with agriculture, also operated a small flour mill and jaggery processing plant. Dharamveer used to assist his father sometimes. His mother was herbalist, with whom he was extremely close. He would often accompany his mother for collecting *kesu* (*Butea monosperma*) flowers, watching how those flowers were taken care of and made into colours for Holi. Unfortunately he lost his mother in childhood, but inherited from her, curiosity for nature and its herbal wealth.



Restless and inquisitive as a child, he had a special liking for water and used to play near wells and lakes catching frogs and snails. Not much interested in studies, he used to spend time bullying other children or making something or the other. While in class 7th, he used to make small heaters from old tin cans and coils and sell them for 15 Rs. All the while, his interest in herbs never subsided. He also used to read the biographies of successful people as he found them quite inspiring. The one he specially recalls is that of Abraham Lincoln.

In 1980, a saint visited their village. During the discussions he told him about the medicinal values of various herbs. He got curious and asked him if anyone can earn a good living by cultivating herbs to which the saint replied in affirmative. The words encouraged him and whenever opportunity came, he dedicated himself to know more and more about the herbs, their plantation and business. He earned his livelihood by farming on two acres of land, held jointly with his brothers.

He got married to Shyamudevi in 1986. But just after three days of his daughter's birth in December, after an altercation with his father, he had to leave for Delhi in search of better means of income. He started earning working as a rickshaw puller. He used to ferry traders to Khari Baoli area of Old Delhi, where they used to pay hefty amount for herbs. This amazed him and he would often converse with the passengers and vendors to know about the herbs and the income they could fetch. His passion for herbs was revived. Unfortunately his stay at Delhi had to be cut short as he met with an accident in 1987. Severely injured, he was brought back to village and it took a year to nurse him back to health.

After his recovery, he joined the village development society and went for a training programme in improving agricultural practices and organic farming techniques. During the six months of the program, he interacted with different farmers and experts in the agricultural sector and gained much knowledge. Subsequently, he began his work as an organic farmer and started conducting various experiments.

In 1990, he became the first farmer in his area to cultivate hybrid tomatoes and generate record production. He also developed some innovative devices *viz.* battery operated spraying machine using a tape recorder motor and an insect trapping device. He also tried new cropping patterns by cultivating coriander, bottle gourd and sugarcane at the same time. For the same he also developed a farm implement customized for ploughing without disturbing the sugarcane crop. 1991 onwards he slowly diversified into growing mushrooms, strawberries and baby corn.

Once, while waiting for his train at Saharanpur railway station in UP, he observed a sweeper cleaning the platform with his broom. Same year plague had spread in Surat killing many, the reason for which was unhygienic conditions. He contemplated that while many manual systems had got efficient and user friendly over time with technological advancement (such as the pen being replaced by the typewriter and then the computer), but the broom remained unchanged. He then decided to build a machine to make the sweeper's job easier. After spending around a month in development, he built a device to automate the sweeping operation and fitted an old auto engine with components and brushes. This machine, costing less than Rs 8000 became so popular that people from nearby places started visiting him to see the demonstration. Irritated, he finally disassembled the machine.

Subsequently, with the machine that he built for processing *Aloe vera* and *amla*, he expanded his business manufacturing and supplying plant extracts gels, essence and herbal product mix.

**Genesis of innovation**

It was in the year 2002 a bank manager came to their village promoting *Aloe vera* farming. He also discussed with Dharamveer about the *Aloe vera* gel extractor machine. However, owing to the high cost of machine and the consultation charges, he decided to develop one on his own. In 2003 he started the initial work of designing the machine and in April 2004 handed over the final design to a local fabricator, Vijay Dhiman at Jagadhari who completed the first prototype in March 2005. During the process of

building the machine also, there were certain changes made by Dharamveer. The fabricator also did not have much idea about what he was making. When the machine finally completed and Dharamveer gave him a demonstration, he realised what he had fabricated.

In December 2004, Dharamveer also got an opportunity to visit various *Aloe vera* and *Amla* processing units in Rajasthan along with other farmers. This was facilitated by the Department of Horticulture, Haryana government. This experience made him understand the processing methodology better.

The first prototype had a problem of over heating when the material to be processed was less. He tried to improve but could not eliminate the problem in the second prototype. In the third one, he introduced castor oil bath, which could maintain the temperature till 200° C. This prototype was bought by GIAN North and send to Kenya on a pilot basis. Based on the feedback, GIAN asked him to modify it further incorporating provisions that would make it easily transportable, including making the legs foldable. In the fourth machine, he also incorporated a sieve to manage the flow of *amla*. In subsequent models he plans to add temperature and pressure gauzes.

**Innovation**

This machine is a multipurpose device capable of pulverizing and extracting oil/gel from various herbs.

The machine is a vertical free-standing cylindrical unit mounted on four legs. The raw material is fed from the top and the processed output can be collected at the bottom. The machine consists of an autoclave unit for sterilization, a boiler unit for boiling, the extractor unit for extracting juice or gel, a drive means for a source of power attached to the apparatus. The extractor unit comprises one frame, one condenser with flexible coolant, a set of blades connected o the frame and a grinding system. The main chamber is enclosed with an oil jacket to avoid direct heating of the herbs.

First the leaves of the *Aloe vera* are washed, then they are individually peeled and skin is removed. The peeled skin is kept separately for secondary processing to generate the essence and gel. The jelly portion inside is washed separately and put into the boiler. The motor is switched ON for running of grinder arranged inside boiler. The boiler is then heated with the help of burner/heater upto 50-60 deg. This is done for about 10 minutes to prepare the juice. Then the *Aloe vera* juice is extracted from the main outlet which is fitted with an inbuilt filter.

For the secondary process of extracting the essence, the removed skin along with some portion of the jelly is washed and put into the boiler along with equal amount of water and is stirred and boiled to over 100 deg. The steam produced during heating is condensed with the help of condenser for producing the essence. The essence collected is mixed with specific quantity of Gelatin powder to form the gel.

To produce juice from plants or fruits, the heating is not done and once material is fed into the shell, the grinder is turned ON and the pulverizing, crushing and mixing produces the juice. The grinding unit is utilized primarily when the processing of dry fruits or spices is required. The temperature and pressure can be set manually using the gauges based on the raw material and desired product outcome. It can also be used for ancillary functions including boiling, sterilization (autoclaving), pulverizing, mixing of produce such as *amla*, *saunf*, mushroom and orange.

The unit can process 100 kilograms of *Aloe vera* in an hour. About 1.25 kilograms of *Aloe vera* leaves are converted to 1 liter of gel in the unit.

**Innovativeness**

The prior art describes machines wherein the *Aloe vera* gel is extracted by way of squeezing the *Aloe vera* leaves, generally between roller pair or other pressing arrangements. There are dedicated machines which do

activities including washing, trimming, positioning, and peeling and squeezing of the leaves.

However, no single equipment could be found in prior art, which performed multipurpose activities such as extraction, pulverization, mixing and grinding the materials. This machine also acts as a boiler, sterilizer and cooker besides being used to extract the juice or essence from various plants or parts thereof. Interestingly, the machine also allows the operator to use heating as an option and not deploy it if only pulverizing and grinding is required for certain produce types. As compared to available options, this machine is cost effective, portable and suitable for on-farm processing. It can also be operated by an unskilled worker and be used to process a variety of herbs.

**Applications and Dispersion**

Being a versatile unit, the machine is used differently for various types of produce. The device effectively provides a method for sterilizing, boiling and extracting gel from within the fibrous husks of harvested *Aloe vera* leaves, flowers, herbs, fruits, vegetables, groundnut, spices and other materials.

The complete specification for patenting the design was filed in February, 2009 in Dharamveer's name. Funding to the tune of Rs 2.8 lakh under the HDFC revolving fund scheme was provided by GIAN-North in the year 2008 to him to manufacture and sell a few units. Costing Rs 1.20 lakh apiece, he has sold more than 7 units in Haryana and neighboring states under the brand name of Prince, which is his son's name. He has also been supported under the Micro Venture Innovation Fund (MVIF) for prototype development and test marketing. Having obtained the FPO license (A73) for the products obtained using the machine, he earns his livelihood by making and selling value added products from different herbs, fruits and vegetable. He has given employment to over two dozen ladies in his manufacturing setup.

His innovative work has been covered in many regional newspapers. Recently, *The Hindu* newspaper also carried an article on his multi-purpose machine.

**Future Aspirations**

Dharamveer wants to develop a farm where he will grow, process and sell the herbs. Presently, he lives with his wife and children on the outskirts of the village near his two acres of land. His family was a great support when he decided to start his own enterprise of agro foods and organic farming. His wife always supported and motivated him in difficult times. She single handedly looked after the family so that he could continue to pursue his innovations. She was apprehensive in the beginning, worrying about the expenses of education and innovation. But she gave up her worries to let him pursue his passion. Pooja, his daughter, doing her masters in business administration, recounts how their neighbours made fun of her father, calling him insane. But now they consider him a worthy example for all. She along with her brother, doing computer engineering, helps him with technical tasks.

Dharamveer gives the credit for his achievements to his mother who instilled in him the urge to know more about herbs and their uses. He is also very appreciable of the efforts of GIAN North and NIF in supporting him. The only thing that Dharamveer regrets is that his parents are not around to see his success. His mother had inculcated love for herbs in him; his father had listened with him the insults and had borne with him the rejections.

## Root wilt resistant pepper variety

**State Award**
Karnataka

**Ravishankar**
Dakshin Kannada, Karnataka

Scout: PRITVI, Karnataka

A marginal farmer, Ravishankar (46) has developed a root wilt resistant pepper variety simply by the way of grafting.

Ravishankar lives with his wife and two young children in Shilpi Amdal house 5 km from Madhyanthar in Dakshina Kannada district. The region has undulating topography with dense forest cover. To the west of the region is the Arabian Sea while to the east is the Western Ghats. The region experiences ample rainfall throughout the year. The major commercial crops grown are arecanut, cardamom, vanilla, pepper, rubber, sugarcane, and banana while paddy being the only cereal crop.

Having studied till class ten, Ravishankar had to start practicing agriculture, as his parents could not afford his further studies. As he had been helping his father in agriculture since childhood, he had gained much knowledge about the same. At the age of 23, he took complete charge of the farm where today he grows coconut, arecanut, pepper, banana and cashew. Apart from agriculture, his interests also lie in doing mechanical things. He is a tinkerer and likes keeping himself engaged.



**Identifying the disease**

In 1996-97, he grew three pepper varieties *viz. Panniyur*, *Karimunda* and *Vayanadu* in his farm. But, due to a certain disease, the entire crop failed and he had to incur heavy losses. He recalled the turn of events and noted that first the color of the leaves turned yellow and then they fell off. Then the roots dried up and the stem discolored, resulting in the death of the plant. Initially he thought it to be because of root worms but was later told that it was the wilt disease. He then decided to find out a remedy for wilt disease in pepper.

**Looking for a solution**

Ravishankar had known about the process of grafting. He had also tried grafting on different weeds and developed his own variation of the method. He thought of using grafting as the easiest method to introduce disease resistance in pepper.

*Hippali* is a local spice and medicinally used to treat ailments like cough, cold, fever, etc. He checked out the plant and learnt that the roots of *hippali* were very strong in nature. The growth of the plant was vigorous; it was pest free and showed no disease incidence. It had a smell similar to that of pepper, which made him conclude that it might be related to pepper and hence could be used for grafting. He also recalled that of the three varieties in his field, *Panniyur* variety had the best yield and disease tolerance. Finally, he decided to develop a new plant through grafting of *Hippali* as stock and *Panniyur* as scion.

**Developing the variety**

Ravishankar took both plants of the same age and grafted them. He then planted 6 -7 grafted plants in his field. All the plantlets showed resistance to root wilt and grew healthy. These new plants, apart from being perennial, showed less harvesting period. The yield per plant was also comparable to the *Panniyur* variety plants in his farm. He also observed that after grafting the plants needed shade in order to increase their chance of successful growth. Flowering in all the plants was seen in the month of June and harvesting was done once a year. For better root growth, he encourages the use of V-notch method for grafting, which has to be done carefully.

**The new variety**

The new pepper variety is wilt resistant with high phenolic content. The number of spikes per plant is between 30-40 with the number of berries being 100-165. The dry yield is 1.5 kg/year/vine. The variety takes eight months to fruit after flowering and yields economically after two years. The root depth is between 60-90 cm, with the root volume being very high. Profuse aerial roots are another special character.

Scientists and experts from University of Agricultural Sciences, Bangalore and Agriculture Research Station, Thirthahalli visited Ravishankar's farm to evaluate his variety. They compared the new variety with the locally popular *Panniyur* variety. It was found that the Phenolic content of the new variety was higher, which may be a reason for its wilt tolerance. The number of spikes (30-40 at the age of two years) was more than that in *Panniyur* (25-30 at the same age) as was the dry pepper yield (1.5kg./year/vine as compared to 1.0kg./year/vine in *Panniyur* variety). The time for first economic yield is lesser (two years) than the *Panniyur* variety (four years). The leaves are dark green in color and have high chlorophyll content (80 mg fresh wt.) as compared to *Panniyur* variety having moderately green colored leaves and low chlorophyll content (50 mg fresh wt.)

**Other pursuits**

Ravishankar, recently, has also made beehives from cement. During the rainy season, wooden hives get

damaged quickly. Traditional bee hives face attacks from hornets also. The cement bee hive solves these problems. The heavy weight of the cement hive saves it from theft. They are better adapted to vagaries of weather like rain and sunlight. Unlike wood, cement also provides protection from termites, bush fires, worms and pests.

He has a small workshop made of scrap and junk where all his innovations take place. He also has ideas about using petromax for cooking, LPG operated scooter, organic food grain storage, fuel saving stove and numerous other things. His wife, Jyothi, though a simple housewife is also an innovator. She developed a multipurpose energy efficient utility stove, which captures the wasted radiated heat in a wood fired stove to simultaneously cook as well as heat water in a tall drum to a temperature of 80 degrees. For this innovation, she won a consolation award in NIF's Third National Competition for Grassroots Innovations and Traditional Knowledge Practice in 2005. Same year, Ravishankar's work also got published in *Udayavani Kannada* daily and *Nirantara Pragati*.

Ravishankar's experiences, with his innovations, have been good but not with the people who have had a chance to look at them. He laments the fact that most people do not understand his work. The interest in such activities is negligible and there is little motivation and support available for people like him. But he is hopeful that with better work, the perceptions of people will change and many will come forward to support such creative initiatives.

# Herbal medication for Mastitis

**State Award**
Gujarat

**Ukhardiyabhai Raot**
Dang, Gujarat

Scout: Mahesh Parmar, SRISTI, Ahmedabad

Ukhardyabhai (67), a native of Gavdahaad village, lying in northern forest region of Dang district, Gujarat, is a farmer and an expert herbal healer. He has developed a very effective cure for Mastitis, a common health problem affecting cattle.

Gavdahaad is a small village where people mostly engage in agriculture. The main crops grown are rice, pigeon pea, black gram and soyabean. As irrigation facility is not available, the villagers cultivate one monsoonal crop a year only. Proposals to construct two wells are under consideration though. Three years ago, through the "*Paani Purwath*" program, the government has made a huge water storage tank, which provides potable water to Gavdahaad and two other nearby villages- Burthadi and Girma. Including Ukhradyabhai, there are four other Bhagats (traditional healers) and two trained *Dais* in the village. ANM also visits the village weekly.

His father was an industrious farmer and had a limited knowledge of herbs and their use in treating animals and humans. As a child, Ukhardyabhai

was keen to learn and study but could continue only up to class two. His whole family had to engage in agriculture due to financial and work related pressures. His initiation in herbal healing tradition was due to his father, and thereafter, his interest in herbal medicines grew. He then started learning more from his uncle Mangalbhai Janubhai Raot and other elders of the village.

His family comprises his wife Mangiben, three sons and two daughters, and grandchildren. His wife has always remained a constant support for him. She never complains about his erratic work and travel schedules while practicing herbal healing. More so, she took complete charge of the familial responsibilities to let him focus solely on his work. But, a paralytic attack in June 2009 left her bed ridden. Both, husband and wife, always believed strongly in the importance of education and made sure that their children studied well as a result of which all of them are well placed now.

Ukhardyabhai has been practicising herbal healing for the last fifty five years. People from his village and nearby regions visit him for consultations, especially for animals. He develops the medicine for curing wounds on body parts as well as on the udder of the cattle.

**The problem**

Mastitis is an infection of the tissue of the breast that causes pain, swelling, redness, and increased temperature of the breast. The primary cause of mastitis in cattle, goats and sheep are well-recognized groups of microorganisms, Streptococcus sp., Staphylococcus sp., Pasteurella sp. and coliforms, Escherichia coli, Enterobacter sp., and Klebsiella sp. Sometimes, due to the infection, visibly abnormal milk (eg, color, fibrin clots) is also produced. As the degree of the swelling increases, changes in the udder (swelling, heat, pain, redness) may also be evident. Apart from giving pain to the animal, it also affects the quality and quantity of milk.

**The solution**

Ukhardiyabhai simply grinds the bark of the local herb along with little water and applies the paste topically over the affected udder with encouraging results. This process has been practiced and perfected over many years.

The detailed prior art revels that the local herb possesses antibacterial properties. Its leaves are reported to cure inflammation of lymph gland. The stem bark is used as an anti-inflammatory agent for curing ophthalmic injuries. No patent literature was found on this medication for curing mastitis; hence NIF filed a patent (1985/MUM/2008) in the name of Ukhardiyabhai for the same.

The antibacterial activity tests were conducted in Sadbhav SRISTI Sanshodhan Laboratory, Ahmedabad, which indicated positive results against disease causing bacteria like *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa* and *Bacillus subtilis.* Clinical trials conducted over 10 experimental animals indicated the efficacy of the intramammary formulation over subclinical, clinical and chronic mastitis. An efficacy over heamorrhagic milk due to mechanical injury was also well established. The milk culture sensitivity testing was carried out on the affected animal population, which confirmed the bacterial infection *Staphylococcus aureus*. Overall, the formulation showed very positive results.

Karnataka Antibiotics, a national pharmaceutical company, has shown interest in this technology and is willing to take its non-exclusive right. This is being facilitated by NIF on the behalf of Ukhardiyabhai.

## Novel gear mechanism

**Consolation**
Transport

**Nishant Ray**
Khagaria, Bihar

Hailing from Khagaria, a small town in Bihar surrounded by seven rivers, Nishant Ray (27) is a passionate innovator with a fertile mind that has spawned several innovations. Undeterred by discouragement and the criticism faced, he has always pursued his proclivity. He has made a modified gear system for rickshaws/bicycles to reduce effort in pulling the load. The new gear mechanism enables a person to pedal backwards to move in higher gear. It also prevents the reverse motion of rickshaw on slopes.

NIF supported Nishant for prototype development and facilitated its testing at BIT, Mesra, Ranchi where the performance was found to be satisfactory. Nishant was also felicitated during the 22nd Shodh Yatra in Bihar in January 2009 for his creativity.

NIF has filed a patent (1714/KOL/2007) for the technology in the innovator's name.

# Bicycle that can be carried in a bag

**Consolation**
Transport

**Sandeep Kumar**
Muzzaffarpur, Bihar

A gritty and hard working graduate, Sandeep made this bicycle, which can be folded easily in a very little time. The portable bicycle can be put in a bag and carried along! This was developed by Sandeep when he was still a student.

Sandeep was felicitated during the 22nd Shodh Yatra in Bihar in January 2009.

## Electric generation from tap water, new breaking mechanism in bicycles and others

**Consolation**
Other

**Dhirendra Kumar**
Muzzaffarpur, Bihar

Among many other things, Dhirendra has made a small turbine system, which can be attached to a tap/overhead water supply pipe to generate electricity. He has also modified the brake system in bicycle. In his bicycle an accelerator like action is used, where by rotating the hand grip, the brakes are applied. The innovator has also modified a foot-operated water pump and a hand pump to make them more efficient and has numerous other ideas.

# Ceiling Cooler

## Consolation
Household

**Gopal Kumar Saluja**
Ambala, Haryana

While costly air conditioners and air coolers have been around for years, Gopal Saluja has developed a unique 'ceiling cooler' by upgrading the ubiquitous ceiling fan. The ceiling cooler comprises the ceiling fan, a submersible water-pump with motor, a cylindrical water container having arrangement for continuous water drip, as used in desert coolers.

Facilitated by GIAN North, Jaipur, the unit has been tested for functional validation and performance at the Electronic Test and Development Center, Haryana State Electronics Development Corporation Ltd. (HARTRON), which mentions that the output of the ceiling cooler was satisfactory. Another test of the same was done at MNIT whose test results show that the ceiling cooler was able to bring about a change of temperature between 2.5° to 5.25° C in varying conditions of temperature and humidity.

NIF has filed a patent (1025/DEL/2008) for the technology in the innovator's name.

# Heavy duty welding machine

**Consolation**
Electrical

**Sukhram Mistri**
Lohardaga, Jharkhand

Scout: Mukesh Pandey & Rajeev Ranjan Pandey

Sukhram Mistry (66) is an electrician from a relatively under developed district of Jharkhand. He has developed a robust singe phase welding machine suited for rural areas with their characteristically poor electric supply.

The single phase welding machine is an efficient machine, which tolerates wide fluctuation in voltage. It can work on a single phase or double phase power supply. NIF facilitated its testing at BIT Mesra, Ranchi. As per the report, the welding strength of the machine was found to be good.

Another testing was facilitated at IIT, Guwahati by NIF. The report mentioned that low insulation on secondary winding and the use of individual aluminium wires acting as a single solid conductor result in higher current carriage and effectively better welding.

They also found the capacity of the machine for continuous operation quite advantageous. The machine was also found to be rugged enough to withstand poor current characteristics that can facilitate its use in rural areas where current quality is often poor with low voltage, higher fluctuation.

# Power generation through sewage/slow moving water

**Consolation**
Energy

**K Balakrishna**
Bangalore, Karnataka

Scout:: Ravish, Asst. Prof. CRM Eng. College of Tech., Banglore

There is a worldwide search on for solutions that harness alternate energy sources to generate energy. Balakrishna has developed a system that generates energy from slow moving sewage or any other source of flowing water when it is passed through a cylindrical drum. The helical blades inside the cylindrical drum provide the spam for rotation in generating power. The capacity of the existing pilot unit is 30 KVA as claimed by the innovator.

This technology can have a tremendous impact on the generation of power from low velocity, high volume discharge of effluents from industries and civil sewage processing plants in cities and industrial estate. NIF has facilitated the preliminary assessment of the technology by interested agencies and entrepreneurs, from India and abroad.

NIF has filed a patent (1626/CHE/2007) for the technology in the innovator's name.


# Interlocking bricks

**Consolation**
General Utility

**Umesh Chandra Sharma**
North Lakhimpur, Assam

Umesh Chandra is a simple metric pass who makes a living by selling sand stone chips, cement etc., to villagers for constructing houses.

Using concrete, cement and sand of specific shape and size, taken in required proportion and mixed with water, he has developed interlocking bricks. The interlocking is achieved by projections and depressions in the blocks on the upper and lower faces of the brick.

The utility of the interlocking bricks is that it facilitates construction even by unskilled labor, reduces consumption of mortar, labor and construction time.

# Dry arecanut husking machine

**Consolation**
Mechanical

**Narasimha Bhandari**
Chickmagalur, Karnataka

The husking of dry areca nut is done manually, which is a very tedious process and requires a large number of skilled workers. Getting skilled workers during the peak season is a challenging task for the areca nut farmers. For better peeling of dry arecanuts, Narsimha modified his earlier arecanut husking machine using the relative motion between the high-speed rotating cushioned discs. A 1 hp motor powers the husking disc and a blower of 2 hp power is provided to blow away the husk. The capacity of the machine is 40 kg/h of dry arecanuts and the husking efficiency is estimated to be around 90 per cent.

A recipient of many awards and accolades like the Essel Karnataka's Best Entrepreneur/Innovator Award, he also won the National award by National Innovation Foundation in its First National Competition for Grassroots Innovations and Traditional Knowledge in 2001.

NIF has filed a patent (2912/CHE/2008) for the technology in the innovator's name.

# Rain water syringe: A novel approach of water conservation

**Consolation**
Other

**K J Antoji**
Cochin, Kerala

Scout: Peermade Development Society

Antoji lives in the coastal area of Cochin, where the ground water is saline. Once, while watering his garden the hose pipe fell down and pierced the soil up to 30 cm due to water pressure. This triggered the thought about developing a rain water harvesting technique using the pressure of water. In his system the roof top rainwater is stored in a pressure tank. With the help of PVC pipes,it is injected to a depth below sea water level. The injected fresh water recharges and dilutes the groundwater. When required, the water can be pumped out from a recharged well.

Antoji has installed over 160 rain water injecting systems in different areas of coastal Kerala.

## Don’t stop, if you have a floating soap.

**Consolation**
Household

**C A Vincent**
Thrissur, Kerala

Scout: Peermade Development Society

Vincent observed many people taking bath in rivers and ponds loosing grip of their soaps, which often sink in the water. He conducted experiments in his soap manufacturing unit for about 14 years to develop this unique process of manufacturing soap that floats in water. The soap has a density of 0.878, TFM (Total Fatty Matter) is around 73 per cent, foaming stability at 0.1 cm and foaming power at 0.2 cm. Now you will not lose soap too far away, swim with it, don’t stop, if you have a floating soap.

NIF has filed a patent (2988/CHE/2008) for the technology in the innovator’s name.

# Biogeyser: Harnessing heat of biodigestion

**Consolation**
Energy

**Arun Kumar Kamboj**
Udham Singh Nagar, Uttarakhand

Arun, a progressive farmer, while working on his farm, observed one evening that the heap containing cattle dung was releasing vapours. He realized after touching the heap that the decomposing bio- waste was capable of radiating enough heat making it worth capturing for heating water or some other thing.

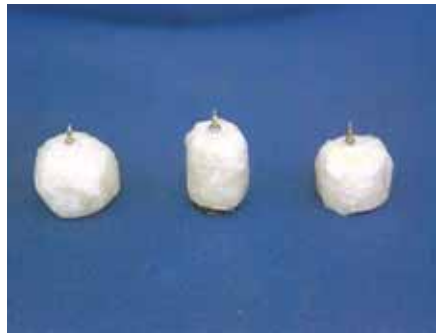
After numerous trials he came up with a system for getting warm water by utilizing heat generated through exothermal reactions during decomposition of organic wastes. Water in the pipe line passing through a heap of organic wastes can be heated up to 60-70° C after a day. The amount of water that can be warmed up depends on size of the heap. He dedicated this innovation to his father and called it 'Chandan-Biogeyser'.

NIF has filed a patent for the technology in the innovator's name.

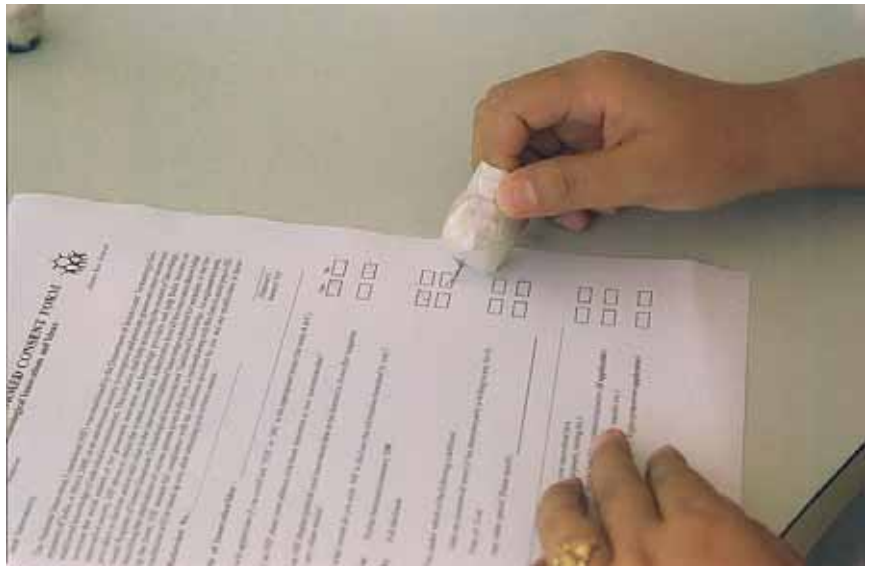
## Single Finger Pen: small ideas have a place too

**Consolation**
Household

**Arindam Chattopadhyay**
Bankura, West Bengal



In this simple innovation, a small refill-based pen is attached to a cap worn on a single finger. This innovation could be useful for physically challenged people who do not have a thumb or even abled persons for repetitive marking on any object or surface for which one need not use three fingers required to hold a normal pen. A small MVIF investment has been made to help him in test marketing.



# Temperature Regulated Fan Speed Control System, Ajooba Tube Light Frame and others

**Consolation**
Household

**Narayan Das Jethwani**
Darjeeling, West Bengal


Many times at night the temperature goes down, and one has to physically get up from sleep and reduce the fan speed, which is quite irritating. The innovator has come up with an electronic system that will automatically adjust the rotational speed of the room fan according to the room temperature enabling a person to sleep peacefully and comfortably.

Ajooba tube light frame: This is small improvisation to use fused tube lights without choke or starters. NIF has funded the innovator from its MVIF fund for aiding in commercialization of various innovations. Further with the assistance of NIF, technology licenses have been given to entrepreneurs based in Assam, W. Bengal and Rajasthan respectively.

## Sugarcane bud chipper and others

**Consolation**
Mechanical

**Roshan Lal Vishwakarma**
Morena, Madhya Pradesh

Challenged by an engineer to make a machine that can remove buds from the sugarcane for the plantation purpose so as to minimize losses as well as time, money and seeds, Roshanlal came up with this implement. By pressing the handle, the unit removes the bud from the node of the sugarcane, which is then used for planting. As per CIAE (Central Institute of Agricultural Engineering, Bhopal) the technique is considered novel though they have suggested some ergonomic feasibility study. Slightly different kinds of chippers are reported from Tamil Nadu but this one seems low cost and efficient.

He has also been supported under the Micro Venture Innovation Fund at NIF for test marketing and commercialization of his innovation. Roshanlal is a serial innovator and has improvised or innovated various devices and implements like sugarcane set cutter, sugarcane harvesting tool, traveling iron, automatic spray pump, timer for three-phase motor etc. NIF has filed a patent (1501/MUM/2008) for the technology in the innovator's name.

## Reaper windrower

**Consolation**
Transport

**Bhagwan Singh Dangi**
Vidisha, Madhya Pradesh


Many times, mature soybean pods shatter due to non-availability of labourers for harvesting the crop in time, leading to reduced yield and loss. To solve this problem Bhagwan Singh decided to develop a reaper windrower machine. This device has three different units namely, cutting unit, which consists of cutter bar, reel unit for pushing the standing crop towards the cutter bar and gathering unit to windrow the crop at centre of the machine thus making it easy to handle/transport to the threshing floor. It reduces manpower requirement and the drudgery involved in the harvesting process. Its testing could not be completed so far but efforts are underway to help him improve it. Would not it be great if labourers cooperative could be enabled to own such machines?

NIF has filed a patent (2091/MUM/2007) for the technology in the innovator's name.

## Effective sound speaker system

**Consolation**
Electronics

**Pakkyanathan**
Perambalure, Tamil Nadu

Pakkyanathan, who has been running the business of renting music sound systems, observed that the existing sound speakers did not have the same quality that he wanted. To overcome these problems and achieve a dramatic sound effect, he designed a circular speaker assembly in stainless steel. The speakers are artfully presented in subtle curves and stunning finesse. They give better dramatic sound effect and desired strong bass for extra punch.

The innovator has secured his IP rights for the technology.

# Battery operated tricycle customized for the lower limb physically challenged

**Consolation**
Transport

**Asjadbhai Dhucca**
Banaskantha, Gujarat

Understanding the transportation needs of his aged father, Asjadbhai came up with this battery operated tricycle. The motor powered by a 24 V battery gives it a reasonable speed and enough power to move through sandy terrains also. The vehicle has been customized with low height adjustable push back seats, newspaper and water bottle carrier, fan, and a safety lock to prevent backward motion on slopes. Additionally, the side arm support can be lifted up to enable the rider to climb up the seat easily. The vehicle offers a very comfortable ride to the traveller.

NIF has filed a patent for the technology in the innovator's name.

## Paddy planter

**Consolation**
Farm implement

**Photo Singh**
Meerut, Uttar Pradesh

Scout: SRISTI, 18th Shodh Yatra

Photo Singh has designed a manual paddy seedling planter. Honey Bee Network discovered him during the 18th Shodh Yatra from Gangagarh to Daula in western UP (2006-07). With the back and forth movement of the machine, mechanical fingers are actuated, which pick seedlings from the tray and transplant these into the puddled soil bed. The machine currently enables farmers to plant three rows of paddy at once, but design improvements could eventually increase this figure to five, nine, or even eleven rows at a time. SRISTI and NIF facilitated its on-farm testing in Gujarat and based on the farmers' suggestions, the machine is being modified to suit the local needs. It is important to note that almost entire paddy in the farmers' field in the country is transplanted by women in back-breaking posture.

## Multiple electronic gadgets

**Consolation**
Electronics

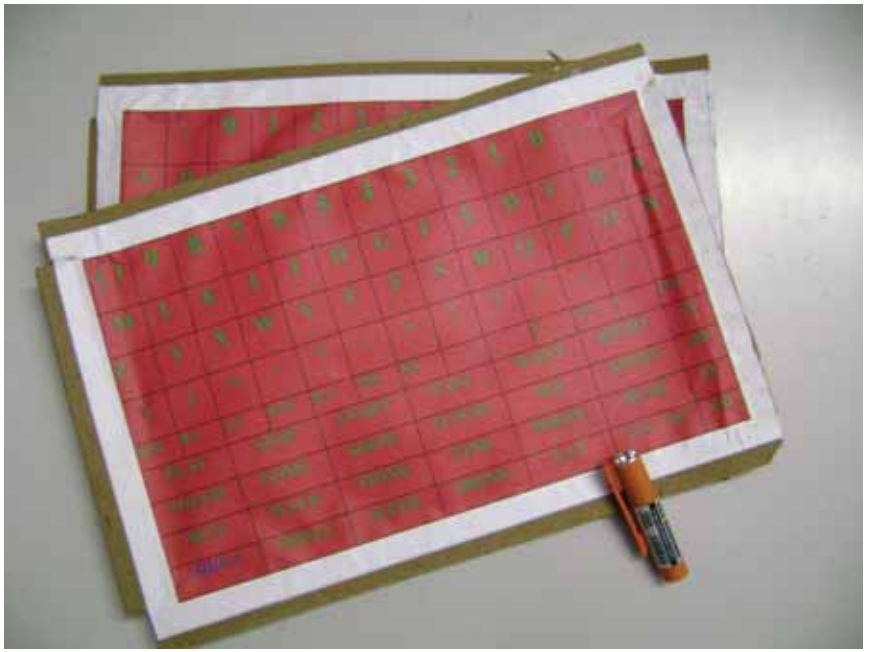
**M K Narang**
Jabalpur, Madhya Pradesh

M K Narang (38) is an electronics shop owner who believes in making innovative gadgets, which makes our day to day life easier. He has made a number of useful products for everyday use and also has numerous ideas for many others. Among other things, he has made a GSM based burglar alarm system for shops, hand operated mobile charger, pump protecting system for coolers, GSM based door breakage alarm system, Automatic dipper unit for vehicles and others.

## Student Idea: Communication board for the deaf and the dumb

### Consolation
Other

**Kundan Kumar**
Patna, Bihar



This thoughtful effort of a young student enables deaf and dumb people to communicate with others as well as among themselves easily. This board has alphabets, numbers and commonly used words written on it. The user has a torch, which is used to illuminate a specific word, alphabet or number sequentially such that the person or a group viewing the board can understand and correctly interpret the meaning.

NIF has filed a patent for the technology in the innovator's name.

## Student Idea: Innovative study table

**Consolation**
Energy

**Manibhushan Prasad**
Dhanbad, Jharkhand

Manibhushan is a young student. Facing problems studying in the night due to erratic electric supply, he has thought of developing a study table where the user can generate electricity at the same time along with the studies. He also wishes to incorporate a system wherein the light bulb will only glow till the time a book is on the table. NIF has supported him for the development of the prototype.

## Student Idea: Automatic bathroom cleaner

### Consolation
Other

**Adarsh B and Suresh**
Calicut, Kerala

Adarsh and Suresh noticed that the public bathrooms remain perpetually dirty because the users don't flush water after using the toilet. Sometimes it is also because of the reason that regular cleaning is not done properly. The idea of the system developed by Adarsh and Suresh can clean the urinal system automatically after use. It also wipes the surface with brushes incorporated in the system. Thus the device cleans the public lavatories automatically and without the involvement of much labour.

Once more students start engaging with the issue of hygiene and sanitation; will not India and the whole world become much cleaner than they are today?

NIF has filed a patent (2764/CHE/2007) for the technology in the innovators' name.


## Quick wilt resistant varieties of pepper

**Consolation**
Plant Variety

**A. Balakrishnan**
Wayanad, Kerala

Balakrishnan (59), an innovative farmer from Kerala, has developed two quick wilt resistant varieties of pepper. *Ashwati* and *Suvarna* pepper varieties were developed through crossing using the local varieties *Uthirankotta* and *Karimunda* as female parent respectively and *Cheruvally* as the male parent for both varieties.

Both these two varieties give higher dry pepper yield, are vigorous in growth and resistant to quick wilt.

# Herbal formulation to control maize stem borer

## Consolation
Plant Protection

**Somabhai Kanabhai Gamar (Solanki)**
Sabarkantha, Gujarat

Scout: Mahesh Parmar, SRISTI

Stem borers are the most serious maize pests that damage the crop and reduce the yield considerably. Somabhai (50), an illiterate but creative farmer from Sabarkantha, has developed an herbal formulation to control the stem borer.

He uses the leaves of a local plant along with the leaves of neem and onion to prepare the formulation, which is sprayed at noon from the top of the plant. The formulation was tested against maize stem borer in Sadbhav SRISTI Sanshodhan Laboratory, Ahmedabad. It was observed that the formulation was effective in controlling the problem upto 55-60 per cent. SRISTI also conducted on-farm experimentation in farmers' fields at Gandhinagar & Ahmedabad districts of Gujarat where also the formulation showed significant control over the problem.

NIF has filed a patent for the technology in the innovator's name.

# Herbal formulation for the control of white fly in crops

**Consolation**
Plant Protection

**Janki Devi**
Paschimi Champaran, Bihar

Scout: Brajkishore Kumar

The attacks by white flies have been a major problem for the farmers. The problem of white flies can be found in almost all the agricultural regions of India and the world. Fifty-seven years old Janki Devi, a house wife, using two local herbs, has developed a herbal formulation to control white flies in different crops.

Laboratory trials, conducted by Sadbhav SRISTI Sanshodhan Laboratory, Ahmedabad, have demonstrated that the formulation induced significant mortality within a short time application in nymphs. In addition, it appeared to be particularly effective against late instars and at the pupa stage. The preliminary trials also demonstrated that it could significantly reduce pest infestations over an extended period of time and that it performed better than other available products. Repellence increased with the increase in concentration of the formulation.

A patent (1699/KOL/2008) has been filed in her name.

# Herbal formulation to control pests in crops

## Consolation
Plant Protection

**Kanubharthi Mojbharathi Goswami**
Junagadh, Gujarat.

Scout: Rasik Bhesaniya, SRISTI

Kanubharthi (53), a resident of Jambuda village, has developed a herbal formulation to control pests in various crops.

Trials were conducted by Sadbhav SRISTI Sanshodhan Laboratory, Ahmedabad and encouraging results (70% protection) were obtained. Under the CSIR-NIF MOU, the practice was also sent for validation at the Institute of Himalayan Bioresource Technology, Palampur, Himachal Pradesh where it was tested in different ratios against Lepidopterons. The formulation was found to be effective against the larvae of *Helicoverpa armigera* and *Spodoptera litura*. A startling result was also obtained when HPLC for the formulation was performed. The ingredients of this formulation were found to provide stability to active compounds of neem, which otherwise disintegrates very quickly. This discovery may give the world its first herbal neem stabilizer!

# Herbal formulations for treating Coccidiosis and increasing immunity in poultry

**Consolation**
Veterinary

**Sudhakarbhai Kauchabhai Gauli, Jeevalbhai Mavajubhai Gauli**
Dang, Gujarat
&
**Jamunaben Patel**
Navsari, Gujarat

Scouts: Pravin H Rohit, Pravin Vankar, Sheila Patel, SRISTI



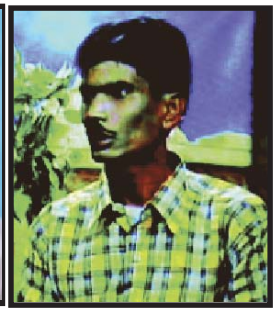
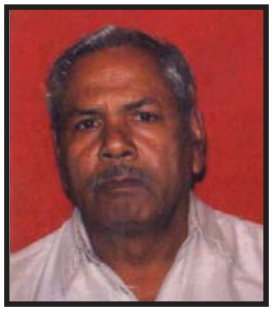
Caused by protozoan parasites, Coccidiosis is one of the most common and economically important diseases affecting poultry the world over. Sudhakarbhai and Jeevalbhai, two herbal healers from Dang and Jamunaben from Navsari, have developed herbal formulations using local herbs to address this problem.

The formulation was evaluated by Matrix Biosciences Pvt. Ltd., Hyderabad. The results were highly promising and the technology was licensed as “Coccicure” to Matrix Biosciences.

A patent (2387/MUM/2007) has been filed in their name. Jamunaben, Sudhakarbhai and Jeevalbhai use another local herb to reduce stress and boost immunity in poultry.

The testing of the formulation was done by Matrix Biosciences Pvt. Ltd., Hyderabad for evaluating the efficacy of crude herbal drug as a growth promoter and in the prevention and relief of stress in poultry. The results indicated that this specific formulation possessed both preventive and curative properties against stress. This technology has been transferred to Matrix Biosciences and is licensed under the trade name “Poultmax”.

# Compressed air engine technologies

**Ashok Kumar Singh**, Uttarakhand
**Hari Narayan Prajapati**, Rajasthan
**Rama Vishwakarma**, Uttar Pradesh

Compressed air engines use the energy of compressed air to do useful work. Various grassroots innovators from different parts of the country have approached the problem of non-renewable energy in their own way. They have independently conceived and worked on the concept of compressing air and using it to run engines. Some have operated scooters and motorcycles, some others four-wheelers while some only have a proof of concept. No matter what stage the technology may be in, it shows that the grassroots people do not suffer disadvantage when it comes to imagining the technologies of the future.

## Consolation
Energy



**Narendra Kumar Singh**, Uttar Pradesh
**Rashid Parvez Khan**, Uttar Pradesh
**Kanak Gogoi**, Assam


# Diffusion: DRK paddy variety

**Dadaji Ramaji Khobragade**
Chandrapur, Maharashtra

Dadaji Ramaji Khobragade hails from a small forest village Nanded in Naghbid taluka. Khobragade selected and bred the DRK rice variety from "*Deepak Ratna"* variety, which was developed by him. He initially recognised the special characters in 1998 and after 6 years of purification he was able to establish the variety. The selection was based on phenotypic characters viz. intermediate plant height and lengthy spike. The fact that they were free from biotic and abiotic stress was also considered.

*Deepak Ratna* was neither notified nor protected. The initial material has been acquired from his field of *Deepak Ratna* variety. He provided the seed of the variety to farmers of his locality and Bilaspur (Madhya Pradesh). The farmers have given good feedback to Dadaji Ramaji.

**Distinct characteristics of the variety:**

1. Higher yielder (60-80 Qtls/ha)
2. Number of earhead (6 to 10)
3. Intermediate plant height (130 cm.)
4. Lengthy spike with white colour (22 cm)
5. Maturity period is 140 days after sowing
6. Grains are medium long with slender shape
7. Grain have good cooking quality and taste
8. Resistance to biotic and abiotic stress
9. Synchronous maturity

**Distinct characteristics of the variety:**

1. Higher yielder (45 to 55 Qtls/ha)
2. Number of earhead 10 to 12
3. 400 spikelets per panicles
4. Good plant height (150 cm.)
5. Lengthy spike 9 to 10 inches
6. Maturity period is 130-135 days after sowing
7. Grains are short & thin
8. Grain have good cooking quality and taste
9. Resistance to biotic and abiotic stress
10. Synchronous maturity

## Diffusion: Jai Shri Ram paddy variety

**Sriram Govinda Lanjewar**
Chandrapur, Maharashtra

Sriram Govinda Lanjewar is a progressive farmer in his locality. One day he observed in his farm that some branches of a plant of HMT variety (developed by Dadaji Khobragade) in 1998 were bushier than the other branches. So he harvested them separately for growing the next year. He sowed the separately harvested seeds and observed that some plants were different in height, health, had more number of spikelets per panicle and matured early. He harvested these desirable plants separately for sowing in the next season. He repeated this till 2002 and by then had enough seeds to be cultivated on his 5 acre land. He cultivated his newly developed variety and named it “Jai Shri Ram” (after his staunch belief in Lord Ram).

Since 2003, he has been giving the seeds of this variety to farmers in his region and neighbouring districts.

## Conservation of traditional variety of *Tinda* (round gourd) by Kir community

**Gangaram Kir, Kir community representative**
Jaipur, Rajasthan

Scout: Sundaram Verma

Kir/Kher community lives in the outskirts of Med village of Viratnagar tehsil of Jaipur. Med is located at the bank of the Banganga river. The community raises traditional *tinda* (round gourd) variety for the past 35 years and has conserved it so far for good yield attributes. The women folk of the community play an important role in agriculture. The community inherited this variety from their ancestors. For conserving this variety they adopted selection criteria and selected the characters *viz.* big size of fruits and dark green colour with hairy skin.

The fruits of this traditional variety of *tinda* are tender, delicious in taste, flat round in shape and weighs around 100 to 200g at the time of harvesting. The variety is superior in terms of yield and quality as compared to other commercially cultivated varieties. Fruits of this variety are famous as “Sahapur tinda” in Jaipur and surrounding areas.

# Herbal formulation for against leaf curl, pest control and flowering enhancement in brinjal and chilly crops

## Appreciation

**Nagbhai Bachubhai Rathod**
Amreli, Gujarat

Scout: Dilipbhai Koradiya, SRISTI

Nagbhai knew the practice of spraying a local fruit extract in the field to control the leaf curl, insect pest and to enhance the flowering. This knowledge was traditionally handed by his grandfather to his father and then to him. Nagbhai could gather this knowledge as he got involved in farming early in his life.

He used the same formulation and did not change the ingredients of the formulation. But he experimented on standardizing the dose that could be most useful in his 1.6 hectare. This formulation also helps the crops to fight leaf curl and enhances flowering in them.

# Herbal formulation to control vegetable crop pests

## Appreciation

**Mahendrabhai Lallubhai Patel**
Kheda, Gujarat

Scout: Jalamsingh Jhala, SRISTI

Mahendrabhai faced serious problem of black caterpillars in his crop of radish and spinach. He observed that in a particular local plant, there was no attack of the caterpillar. Using the plant, he prepared a herbal formulation, which he used to very good affect in his field.

SRISTI, Ahmedabad made efforts to validate the practice to see its effect on common pests of vegetables and it was found that the formulation gave 60 per cent positive result. Further trials are being conducted in SRISTI on a larger scale to validate the practice.

NIF has filed a patent for the technology in the innovator's name.

# Herbal formulation for control of Grain Smut disease in Sorghum spp.

## Appreciation

**Bachubhai Lakshmanbhai Rathod**
Surendranagar, Gujarat

Scout: Mathurbhai Sarvaiya, SRISTI

Bachubhai Rathod, an agriculturist, has come up with a unique practice of combating smut disease in Sorghum spp. using leaves and flowers of two local herbs. The seeds are treated with this formulation before sowing.

Considering the uniqueness of the formulation, an *in-vitro* trial was conducted by Sadbhav SRISTI Sanshodhan Laboratory, Ahmedabad and it was found that extracts of the formulation gave affirmative results.

NIF has filed a patent for the technology in the innovator's name.

## Annexure 1 Entries received in the Fifth National Biennial Competition

| Sr.No. | States | Total No. of Entries |
|---|---|---|
| 1 | Andaman & Nicobar | 4 |
| 2 | Andhra Pradesh | 64 |
| 3 | Arunachal Pradesh | 219 |
| 4 | Assam | 592 |
| 5 | Bihar | 5882 |
| 6 | Chandigarh | 10 |
| 7 | Chhattisgarh | 183 |
| 8 | Dadra Nagar & Haveli | - |
| 9 | Delhi | 47 |
| 10 | Goa | 5 |
| 11 | Gujarat | 4301 |
| 12 | Haryana | 45 |
| 13 | Himachal Pradesh | 7 |
| 14 | Jammu & Kashmir | 109 |
| 15 | Jharkhand | 1122 |
| 16 | Karnataka | 271 |
| 17 | Kerala | 8978 |
| 18 | Lakshdweep | - |
| 19 | Madhya Pradesh | 95 |
| 20 | Maharastra | 376 |
| 21 | Manipur | 4 |
| 22 | Meghalaya | 391 |
| 23 | Mizoram | - |
| 24 | Nagaland | 5 |
| 25 | Orissa | 688 |
| 26 | Puducherry | 27 |
| 27 | Punjab | 91 |
| 28 | Rajasthan | 2080 |
| 29 | Sikkim | 1 |
| 30 | Tamil Nadu | 2140 |
| 31 | Tripura | 23 |
| 32 | Uttar Pradesh | 8567 |
| 33 | Uttarakhand | 483 |
| 34 | West Bengal | 252 |
| **Total** | | **37062** |

## Annexure 2
## Category wise break up of entries

| | |
|---|---|
| Energy | 178 |
| Engineering | 876 |
| Agriculture | 955 |
| Veterinary | 2823 |
| Herbal | 29785 |
| Household | 737 |
| Food & Nutrition | 777 |
| Ideas | 503 |
| Others | 428 |
| **TOTAL** | **37062** |

# ignite 10

National Competition
for
Technological Ideas and Innovations
by
children in school or out of it.

Last Date: August 31, 2010
Award to be announced on
October 15, 2010.
Children's Creativity & Innovation Day

Awards to be given by
Dr. A. P. J. Abdul Kalam




**The Seventh National Biennial Competition for Green Grassroots Unaided Technological Innovations and Traditional Knowledge has started on**
**1st February, 2009 and the entries will be accepted till 31st December, 2010. Every entry should include full postal address to facilitate further communications.**

**Where to send entries?**

**National Coordinator (Scouting & Documentation), National Innovation Foundation, Bungalow No. 1, Satellite Complex, Premchand Nagar Road, Ahmedabad - 380015, Gujarat.**
**Toll Free No 1800 233 5555, Fax: (079) - 2673 1903, campaign@nifindia.org; www.nifindia.org**


**National Innovation Foundation**
Bungalow No.1, Satellite Complex,
Premchand Nagar Road,
Jodhpur Tekra, Satellite,
Ahmedabad - 380 015
Phone: +91 79 26732456, 26732095
Fax: +91 79 26731903
www.nifindia.org, info@nifindia.org