



Honey Bee Network



National Innovation Foundation - India



9<sup>th</sup> National Biennial  
Grassroots Innovation and  
Outstanding Traditional  
Knowledge Awards 2017

*Making India Innovative...*

*Making India Innovative....*







R.A. Mashelkar, F.R.S  
Chairperson,  
National Innovation Foundation - India  
President, Global Research Alliance

## PREFACE

I am very happy that National Innovation Foundation (NIF) is bringing out a book compiling profiles of those grassroots innovators and outstanding traditional knowledge holders that are being honoured at the ninth biennial Presidential Grassroots Innovation Award function.

It is great privilege for us that some of the most innovative, creative and compassionate minds of the country are being honoured at the third Festival of innovation (March 4-10, 2017) hosted by the office of the President of India in Rashtrapati Bhavan

Around 33500 submissions were received or scouted from over 530 districts from all the States and Union Territories of the country for the 9th competition. It is now time for team NIF to reach out to every single district of the country, in an attempt to identify creative students, farmers, artisans, mechanics and the like. The low hanging fruits have all been plucked and it is going to be hard work from hereon.

The setting up of new offices of NIF at Bhubaneswar and Dehradun and strengthening of the office at Guwahati are steps in the right direction. Not only NIF will be able to build regional network but also bring service closer to the doors of the innovators. It is expected that both scouting and diffusion efforts would improve considerably.

The establishment of the technology business incubator, the NIFentreC is expected to pave way for setting up of a number of companies of grassroots innovators in an effort to scale up their production. The next few years will be quite exciting when these companies start realizing the dream of Honey Bee network of making grassroots to Global (g2G) impact of inclusive innova-

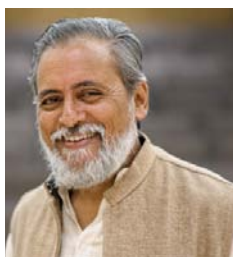
tions through a global journey of mind to the market. I am really hopeful that NIF will be able to mentor the grassroots innovator-entrepreneurs into building their businesses really well. This year, among the awarded innovations, I am happy to see a number of validated and value added technologies. This shows that considerable progress has been made by NIF in engaging with the stakeholders and accelerating the validation/ value addition processes. The contribution of public sector and some private sector scientists must be applauded. In most cases, they have not charged for their own time in the process extending the reach of limited resources of NIF to cover more ideas. For an institution that manages knowledge and innovation, this is most valuable, helping to keep improving the benchmarks, and keep the learning curve steep. I hope that NIF will continue to strive hard to achieve the ambitious goals that have been set forth.

I take this opportunity to congratulate all the awardees and wish them all the success in their future endeavours. I also thank all the colleagues, particularly volunteers of the Honey Bee Network, who have helped NIF to identify such creative people from different parts of the country and further helped in taking these initiatives forward.

My heartfelt gratitude to the Hon'ble President, Shri Pranab Mukherjee ji and his office for continued blessing and support for the cause of inclusive innovations and giving the grassroots innovators attention at the highest level. My compliments to NIF team for all the hard work they have been putting in in the service of the grassroots innovators.

RA Mashelkar





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

## INTRODUCTION

Many times, we have been asked a question as to how do we find so many innovators all over the country. Not many people realise that majority of ideas are scouted by volunteers of Honey Bee Network while a few reach us directly. Over a period of time, the proportion of direct entries is increasing slightly but still a very large majority is searched through village to village explorations. When we have award function, focus often shifts to those whom we discover and that's the way it should be. But let me step back a little and share a few insights from the scouting process so that readers will understand how difficult and strenuous the process of finding out innovators is.

Let me begin with the story of Late Parshottam Patel, a colleague in SRISTI who helped us prepare for 35 out of 38 shodhyatras organised by SRISTI and Honey Bee Network volunteers in different parts of the country. This time, we are paying a tribute to his contribution by recognizing him posthumously. But can any recognition do justice to his untiring efforts to locate creative people all over the country in most difficult terrains. He walked double or treble the distance I walked during last 20 years. Much before we walked in different parts of the country every summer or winter in search of innovators and outstanding tradition knowledge holders, he will go first, look at multiple routes and then decide the route we would take during our collective walk. This was not easy. He walked in some of the most interior and conflict prone regions. Many times, after

walking for many days, we may not find even one innovator though several traditional knowledge holders may exist in every village. He had scouted innovators even when he was not preparing for shodhyatras. National Innovation Foundation will not be able to do justice to its mandate without selfless service of such scouts and field researchers like Parshottam who go to any length in search of creative people. I recall once in Meghalaya shodhyatra, we descended 3000 steps and then climbed equal number of steps to meet a small community through broom grass and bay leaf plantations. He must have walked through many such valleys to choose this one. Finding traditional knowledge is easier but searching innovators is not. To all such scouts who remain less recognized and even less talked about, we must pay our sincerest tribute, for without them we will not be having this award function. The Honey Bee network runs on the hard shoulders of colleagues like Parshottam.

Of course, there are many other colleagues who do detailed documentation, do prior art search, validate the claims, and add value when needed, develop business plans and also help in commercial or social diffusion of innovations. In several cases, NIF works closely with leading private and public sector research labs to take the leads provided by creative communities forward. Likewise, it takes help of the Intellectual Property Right firms to seek protection on the novel claims of the innovators. In consonance with the spirit of Honey Bee Network, NIF does encourage people to people exchange



and adaptation of the innovations for household level use. But transfer of technology to private or public companies is mediated through fair and just process of benefit sharing through social contracts.

NIF's partnership with Indian Council of Medical Research, Council of scientific and Industrial Research, Indian Agricultural Research Institute, Institute of Pesticide Formulation Technology (for developing extremely affordable herbal pesticides) etc., has been very effective in taking idea of grassroots innovators forward. It must be put on record that public sector scientific community in India has been extremely generous with their time and resources towards the cause of value addition in grassroots innovations. Almost none of them charges us for their own time or even if they charge, it is generally a nominal amount, exceptions apart. Similarly, IP firms also don't charge for their human resource costs. If we calculate financial value of this generous support from collaborators of Honey Bee Network in formal sector, the total amount will be in scores of crores rupees.

Out of more than 33000 entries scouted and received by National Innovation Foundation, twenty-eight innovations are receiving National and State awards. One of the most distinguished scouts will be honoured posthumously. Thirty-seven awardees will receive twenty-nine awards at the hands of the Honourable President of India. Thirty-three innovators, outstanding tradition knowledge communities and individuals, partners, media colleagues and scouts will receive consolation and appreciation awards at the hand of NIF Chair.

It is our earnest hope that the goal of inclusive development of our society will be achieved faster with the rapid diffusion of various green grassroots innovations with or without value addition by the institutional science and technology experts.

I congratulate all the awardees and assure our moral support to all those who did not get formally recognized. It is obvious that those ideas and practices which are neither novel nor effective in solving societal problems cannot be supported materially or institutionally. Mandate of NIF requires recognizing novel innovations and outstanding valid traditional knowledge (not found in prior art) from informal sector and by children only.

NIF has been entrusted by The Department of Science and Technology to steer INSPIRE-MANAK program in which about a million novel ideas will be mobilized from half a million schools of India. Through various screening processes, top sixty will be taken to market and also showcased along with IGNITE awards at Rashtrapati Bhavan.

I thank Dr. Vipin Kumar and his team besides all the collaborators in scouting or value addition, protecting intellectual property or other fields of development and diffusion of green grassroots innovations for taking the grassroots innovation movement to current heights. It has already become a global point of reference in the field of inclusive innovations. May be it can share its experience with other similar foundations to create synergy and spread the message of Honey Bee Network.

We look forward to hear from volunteers who wish to join hand with us in making India a global leader in the field of extremely affordable and inclusive sustainable technological innovations.



Anil K Gupta







Dr. Vipin Kumar  
Director and Chief Innovation Officer  
National Innovation Foundation - India

## DIRECTOR'S MESSAGE

In the last few years, a number of new initiatives have been undertaken by NIF. A herbarium and crude drug repository facility has been established exclusively for selected non-codified plants under NIF-ICMR collaboration, Phase II of Micro Venture Innovation Fund (MVIF) has been operationalised with support from SIDBI, NIF Incubation and Entrepreneurship Council (NIF-ientreC) has been setup as technology business incubator at NIF, MHRD, Govt. of India has approved NIF as spoke of Design Innovation Center, IIT Bombay, NIF is partnering in DST's INSPIRE MANAK (Million Minds Augmenting National Aspiration and Knowledge) scheme for school students, NIF announced the Gandhian Inclusive Innovation Challenge Awards, NIF has been celebrating the Festival of Innovation, Rashtrapati Bhavan, New Delhi since 2015 etc. In order to expand its network and activities in various regions of the country, in 2016, NIF also started two new regional offices in Dehradun and Bhubaneshwar and strengthened the Guwahati and Srinagar (J&K) Cells.

For the Ninth National Biennial Competition (April 1, 2013 to March 31, 2015) NIF received about 33500 ideas, innovations and traditional knowledge practices (not all unique or distinc-

tive) from all the 36 States and Union territories of the country. A total of 54 awards will be given to 69 innovators and communities in the 9th National Biennial Award function at the President House, New Delhi on March 4, 2017. All the submissions received during the competition were subjected to detailed technical and patent prior art search to ascertain the novelty/distinction, social applicability and/or cost effectiveness. In many cases, market research/ benchmarking is also done and user feedback taken, if the innovation has already been commercialized. A short-list of promising innovations was made accordingly. Research Advisory Committee(s) comprising the Heads of the top R&D institutions, experts from Engineering, Agricultural and Veterinary Colleges, Vice Chancellors of various Universities from all parts of India and Innovator experts at the grassroots screened the short-list of potential awardees.

I wish to thank all the experts of the Research Advisory Committees, Project Review Committees and Principal Investigators of validation and value addition projects for their support to us. There are a large number of other institutions, companies, organizations and individuals that NIF works with simultaneously to fulfill its objectives and I greatly appreciate their assis-



tance to us. I wish to specially thank the Indian Institute of Management, Ahmedabad, Council of Scientific and Industrial Research (CSIR), Indian Council of Medical research (ICMR), Indian Council of Agricultural Research (ICAR), IIT Guwahati, University of Kashmir, Srinagar, State Councils of Science and Technologies of respective states, Meghalaya Basin Development Authority, KIIT University, State Agricultural Universities and Research Stations and other institutions, partners from industries, IP firms, Patent Attorneys among others who have proactively helped to test, validate, value add, safeguard IPRs, commercialise innovations and also supported us in many other ways.


The Honey Bee Network and its volunteers and collaborators deserve special appreciation for their continued commitment to the cause along with the colleagues at NIF, SRISTI and GIANS, who have at many times worked beyond the call of office with passion and purpose.

I take this opportunity to put on record my heartfelt gratitude and deep regards for Prof Anil K Gupta, Dr. R A Mashelkar and Governing Board members for their continued guid-

ance and deep engagement in all our work. I must also acknowledge the kind support of Prof Ashutosh Sharma, Secretary, Department of Science and Technology and all the officials of the Department, for facilitating our work in the best possible way.

Last but not the least, my deepest regards for all the innovators, traditional knowledge holders, and local communities who continue to share their work with us and trust us. I must reassure them that the team NIF will diligently continue to work and serve them in the most appropriate manner.

With my good wishes

A handwritten signature in black ink, appearing to read 'Vipin Kumar', with a stylized flourish at the end.

Vipin Kumar

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## LIFE TIME ACHIEVEMENT AWARD

Bhanjibhai Mathukiya  
Gujarat

Bhanjibhai (82 years), has been a tinkerer since his childhood. Among the many things he had developed over the years, the most important ones are a low cost check dam, 10/12 HP three and fur wheel tractor and bullock operated sprayer.

His son has inherited his innovative nature and has worked with him on a number of innovations. Bhanjibhai has always had the support of his wife and other family members in all his endeavours however, his family believes if his innovations would have brought more prosperity to them, it would have been really nice. Bhanjibhai, however, remains unfazed even to this date. Bhanjibhai is also innovative farmer and active leader in his village and community.

He has been also served as “Deputy Sarpanch” for five years in his village and was also an active member of Kisan Sangh for many years. Soft spoken, man of few words, he had been a regular in most shodhyatras and has inspired thousands of farmers, artisans and young people met during these yatras. Bhanjibhai also tried developing a number of other innovations like a ground nut sprayer, low cost storage for grains at home, an air borne agricultural sprayer, etc.

### Low cost Check Dam

Due to insufficient rainfall and poor water harvesting in past, the underground level water has been going down. He was deeply concerned with the problem of widespread water scarcity in Saurashtra. The first idea to solve this problem came to him in April 2002 after his participation in eighth ‘shodhyatra’ in Alwar district of Rajasthan. The efforts made by ‘Tarun Bharat Sangh’ to conserve water made him think about his commitment to the future generations. Another inspiring factor was Government’s 60x40 check dam scheme, which made him think that if a dam was built at low cost, more dams could be built and more water could be conserved.

Bhanjibhai has built check dam with series of semi-circular bunds on the river Dhrafad flowing through the innovator’s village. For constructing the dam he took stones of the size of 11x15 inches and placed the stones in the flowing water keeping a little distance between two stones. Later on this gap was filled up using river sand, stones and cement. The cost for this came up to Rs.10, 000 including the labour cost (then). He constructed this dam without any help from the government agencies. The dam was built with the help of one mason and

four labourers within four days. Due to this innovation, the surrounding region has been green for far longer time compared to other years. The wells in the neighbouring regions have also been charged. After this dam was meaningfully completed, villages requested him to build another check dam downstream. He then build second check dam in collaboration with neighbouring farmers. Similar check dams were constructed in many areas of Saurashtra region thereafter.

“

10/12 H.P. Tractor

In the late 1980s Bhanjibhai felt that a much smaller machine could perform most of the operations carried out by a tractor. He developed a small three-wheel tractor powered by a 10 HP engine. It was cost effective and provides improved manoeuvrability making it ideal for small farmers. The design was kept simple making it possible for the farmer himself to do the repairs. The various advantages include innovative transmission unit, improved performance with reduced cost and adjustable wheel base to meet the requirement of inter-culturing operation in different crops. A unique feature of the mini-tractor was that it was a “convertible”. The front-axle was designed in such a fashion that the tractor can be made into a 3-wheeled or a 4-wheeled vehicle.

He struggled a lot when the idea of building a three-wheel tractor came to his mind. Using a diesel engine of 10 HP and chassis of jeep, his first model drew a lot of attention. His extended family members also wanted similar tractor and he and his son with a nephew built

about nine such tractors of three/four wheel. Once Regional Transport Officer challenged him when he was taking tractor on road to his village. He was asked to sign an affidavit declaring not to ever bring his tractor again on the road. His crime was that he had dreamt and solved a problem at a low cost.

GIAN West had been instrumental in helping Bhanjibhai for standardizing the design and parts mandatory for the testing and certification by Central Farm Machinery Training and Testing Institute (CFMT&TI), Budni, Madhya Pradesh. After the approval from CFMT&TI, GIAN facilitated technology transfer of his tractor to a firm in Anand, however, the firm could not commercialise the tractor due to certain reasons. The efforts of Bhanjibhai in development of small and low cost tractor suitable for small farmers significantly contributed to agricultural industries. Many small fabricators of Saurashtra region of Gujarat inspired for replicating the technologies and later large scale industries who started offering small tractor to small and marginal farmers of the country.

Bhanjibhai was part of the delegation which went to South Africa at the invitation of Commonwealth Science Council and South African government to transfer technologies and help build capacity of counterpart small farmer and artisans. He was honoured by SRISTI and has been part of many National and International Conferences organised by SRISTI and NIF. He has also been a member of Research Advisory Committee of NIF, which also gave a National Award to him in its 2<sup>nd</sup> National Award function in 2002.



## POSTHUMOUS AWARD

A valiant effort to know and delve into the unknown

Late Shri Purshottambhai Patel  
Gujarat

A Shodhyatri till the very end

Parshottambhai began his association with SRISTI in 1998 when he worked to finalise the second Shodhyatra route from Amirgadh to Tundia (Gujarat). He continued to work in planning the Shodhyatra route till the 35<sup>th</sup> Shodhyatra conducted at Tripura in the year 2015.

He would walk from one village to another, trying to estimate the distance between two villages, ascertain the Gram Sabha and infrastructural facilities in each village, think of ways to reach the maximum number of people in the shortest time and collecting as well as disseminating knowledge. He would keep all these principles and objectives in mind while planning the Shodhyatra routes.

*It was the year 1998, when a puny, thin young man approached the then secretary of SRISTI in his office and said, "Sir, I need a job. I am ready to do whatever job you assign me."*

*Parshottambhai Patel started his association with SRISTI as a field researcher collecting field data in Banaskantha, Gujarat. His confidence and strong grasp on aspects of rural life was there for all to see.*

*Since then and till his last breath, Parshottambhai served the cause of the Honey Bee Network relentlessly without so much as a whimper of protest. In the seventeen years of his tireless service, he planned, walked and collected critical data from 35 Shodhyatras in 25 different states across India treading on foot more than 5000 kilometres, often through extreme conditions, arduous terrains and regions of conflict.*

*It is with great difficulty that we accept the untimely demise of Parshottambhai. This is a loss not only to SRISTI and HBN but also to thousands of innovators and many researchers who gained national and international recognition due to his unmitigated efforts.*

Parshottambhai would meet the locals and gather information about examples of local creative practices and its implementation in agriculture, animal husbandry, livestock, traditional medicine. He would meet up with innovative people and document their original ideas so that they could be felicitated during the Shodhyatra also mobilise the local youth who would help us in planning logistics and post shodhyatra followup.

There were many such instances where his presence of mind saved the day for the Shodhyatris. He had an uncanny ability to think on his feet. Despite meticulous planning, it is not every uncommon to have last minute changes and surprise challenges in the Shodhyatra. During the third Shodhyatra from Gol Gamadi to Ninghat, Parshottambhai and Devshibhai had reached there before the Shodhyatris. They reached the house



of the farmer who was supposed to make food arrangements for the Shodhyatris. To their utter astonishment, the farmer had completely forgot about the arrangements. Parshottambhai calmly drove on a motorcycle to the adjoining large village, bought some lentils and rice, returned and prepared the food. When the shodhyatris reached there, he had already prepared *khichdi*. Being the onset of summer, the region had an abundance on semi-ripe mangoes dangling from the trees. Parshottambhai collected, cut and served the yatris these mangoes alongside the hot *khichdi*.

Many Shodhyatris would recall the Chattisgarh Shodhyatra. This was a walk in the region marred by years of conflict and Naxalite insurgency. Near Bastar region, Parshottambhai, encountered a Naxalite youth in the dense forest during the Shodhyatra who took him to a valley and made all sorts of enquiries. A brave and composed Parshottambhai unflinchingly answered all his questions and conveyed the yatra's objectives to the rebel. The youth was convinced and was so impressed by Parshottambhai and his work

that throughout the Shodhyatra there were no problems from the rebels.

#### Parshottambhai's social capital

With tears in her eyes, Yashodaben Srirambhai Chaudhary, a herbal practitioner from Vikarya village, Dang district narrated an incident related to her association with Parshottambhai. While reevaluating a practice in Vikarya, he visited Yashodaben at her home. At that time, she confided in him that she did not have enough money to treat her husband who had suddenly fallen ill. Parshottambhai immediately gave her Rs 1000 from the money granted to him for his field work. With time, Yashodaben returned the money and he formed a deep and lasting bond with this tribal family. Whenever he visited Dang, this family would be eager to help in SRISTI's work. "I have experienced first-hand this bonding with this Adivasi family during my visit to Dang," recalls Hemaben.

Many friends and connections he formed during his field research often looked up to him for advice and mediation even in domestic matters.



Kodarji Kaluji Paghi and his family were shocked when they heard the news of Parshottam bhai's sudden demise. Kodarji from Lunawada Taluka in Panchmahal would regularly get in touch with him to provide direction to his grandson. He was to meet Kodarji at Kolwan after his field visit to Faizabad. Unfortunately, he could never visit him as he started showing signs of severe ailment right after his visit to Faizabad.

A meticulous researcher

He has played a pivotal role in re-evaluation of practices brought by SRISTI's field workers and compiling the detailed practices. He effortlessly conducted the important task of training the field workers of SRISTI and assisting other members of the National Innovation Foundation in their tasks. His way of approaching a task with self-driven efforts and his methodology of work was unique.

Parshottambhai assisted in the research of scholars connected with SRISTI like Kirit Patel, Shailesh Shukla, Riya Sinha, Anamika Dey and a German scholar Marianne Esders.

He did excellent groundwork the study of conservation of diversity in millets for the doctoral research of Kirit Patel, the former secretary of SRISTI. During this study, he made lasting connections with most families of Dhabudi and Sarjumi village in the Panchmahal district.

Parshottambhai has deeply contributed in the research study conducted in about 72 villages of Banaskantha for the Project regarding biodiversity and Organic diversity.

Parshottam bhai has conducted research regarding the change brought about after the innovation, development and research conducted by farmers themselves such as *Reshampatti* variety of red chilly and Bullet Santi i.e *Chakdo Handiyo*. He

had also made a presentation of this work in China. As an outcome of his research on the skilled rural workers working on the Bullet Santi, in the year 2013, 10 fabricators from Gujarat got an opportunity to present their work at the innovation exhibition at FOIN at the Rashtrapati Bhavan in New Delhi.

Parshottambhai's contribution to the Sattvik -Traditional Food Festival

In Sattvik, Parshottambhai did well to bring forward the traditional food from Panchmahal and Dahod. The first Sattvik Traditional Food Festival was organized in 2004. In this festival, the picture of villagers from Dhabudi and Sarjumi villages with their Bavta laddoo was published in the front page of a newspaper. Today Sattvik is one of the most awaited and well attended festivals in Ahmedabad.

A key aide of the National Innovation Foundation Parshottambhai has played an important role in NIF's biennial National awards for Grassroots innovations and outstanding traditional knowledge. He would patiently explain the importance of the awards to the family members of the innovators and dutifully bear the responsibility of ensuring they reach their homes safely after the festival. Many of these innovators are reluctant to travel so far. Without his persuasion many of these innovators would never have reached New Delhi. He has also played a significant role in bringing such innovators to the SRISTI Samman awards stage.

The eternal journey

We feel as if SRISTI and Honey Bee Network are awaiting his return from this journey as if he would return from one of his several journeys! He may not be with us in person but his inspirational work and fond memories will continue to live in our hearts forever.

## COMMUNITY FIRST

The Living Root Bridges of Meghalaya- a community developed, community nurtured grassroots innovation

Khasi and Jaintia tribes  
Meghalaya

The Living Root Bridges are incredible feats of engineering built by the indigenous people of Meghalaya, a state located in the North East India. These bridges are built using the living roots of ficus trees (*Ficus elastica*) planted on both sides of a stream and then made to span the width of the river until they meet at the middle. These bridges are built by the Khasi and Jaintia tribes that live in the state and can

be found mostly along the southern edges of Meghalaya including the villages of Nohwet (Riwai, Mawlynnong), Nongriat, Nongthymmai, Mawkyrnot, Nongblai, Khonglah, Padu, Kudeng Rim, Shnongpdeng and others.

An interesting highlight about the people of Meghalaya is that they follow a matrilineal system i.e. lineage is passed down through the mother.



The culture of the people of Meghalaya is also deeply intertwined with nature. People rely on nature for their daily needs and because of this, conservation of nature is crucial to them. The Khasi and Jaintia people who reside in the southern parts of the state along the international border with Bangladesh are called the “War” people. Their main occupation is agriculture. The War villages are nestled on the hill-sides while their agricultural lands are located in the valleys below. Most of their villages are only accessible by traversing huge cliffs, valleys, waterfalls, streams and rivers.

In the past, during monsoons, it was difficult for people to cross the many waterways without bridges. Attempts to use bamboo or wooden bridges across these waterways proved futile as

these bridges could not last long in the heavy rains and strong waters. Living root bridges are an innovative and indigenous solution to solve this age old problem.

The bridges are constructed by planting ficus trees on both sides of the waterways. Hollowed out a betel nut (Areca catechu) trunk are used to propagate the aerial roots from one side of the river to the other. When they reach the other side, they’re allowed to take root into the soil. The roots are woven and nurtured until they mature and are able to bear the weight of people walking on them. This entire process can take 15 to 25 years to complete and the bridges formed can last for hundreds of years. Some bridges are as long as 100 feet and can take loads of more than 50 people.





## NATIONAL FIRST - AGRICULTURAL MACHINERY

Modified Combine Harvester

Surendra Prasad  
Sant Kabir Nagar, Uttar Pradesh

**S**urendra Prasad (55), who is in the profession of agriculture machinery manufacture and repair, has developed a harvesting machine, which can be used for simultaneous harvesting, threshing and collection of straw.

Prasad's father had expired when he was still in primary school due to acute tuberculosis infection. As his family struggled to make ends meet, he left his studies and began helping his elder brother to earn livelihood for their family of seven. The meagre income from agriculture proved to be insufficient for his family,

which prompted him to start a cycle-repairing shop near the village. However, he had to close the shop after a couple of years as its income brought no substantial difference to his family's pitiable economic condition. He then moved out and undertook odd jobs for two- three years in Punjab and West Uttar Pradesh before finally returning to his village in 1985. He then started a tractor repairing workshop Surendra Agro Works, about four kilometers from his village. He lives with his wife and three sons, who help him in his workshop.



## Genesis

Prasad recalls the introduction of a combine machine from Punjab in his region in 2007 for harvesting crops. Though quite useful, it was unable to thresh and also left behind straws of crops. Farmers, in a bid to get rid of the straws, used to set them on fire, causing harm not only to the environment, but also to their agricultural land as burning leftover stalks reduces the fertility of land. This led Surendra to think about a machine, which he started developing in August 2010 and completed in April 2011. With many trials, experiments and subsequent modifications, he was able to finalise the design in April 2014.

## The modified combine harvester

It is a tractor operated modified combine harvester with the provision of collecting chaff.

The machine has been manufactured to enable farmers perform both the tasks viz. harvesting and threshing simultaneously. It can be operated using tractor of 65 hp and above.

The combine harvester, having two separate chambers for storing fodder and wheat grains, cuts stalk of wheat in a manner, which minimizes the loss of grains and fodder during harvesting. The chances of wheat grains getting cut or damaged is considerably low due to the mechanism used in the machine, which separates fine-quality grains from wheat straws very quickly. This machine harvests one acre (2.5 bigha) of standing crop in an hour. The crop storage chamber of the machine can store wheat up to eight quintals whereas the straw collecting chamber can collect and store about six to eight quintals of straw. Prasad has also filed a patent application for his innovative technology.



## NATIONAL FIRST - GENERAL UTILITY

BamHum – a bamboo wind musical instrument

Moa Subong  
Dimapur, Nagaland

**M**oa Subong (56) is a musician who has developed a musical instrument called BamHum, which is a new wind musical instrument made out of a bamboo. The name BamHum is derived from the two words, bamboo and humming. Playing the BamHum is simple, which is to simply hum a tune into the hum hole, which produces a melodic tune.

Moa composes originals, he sings and plays the guitar, the harmonica, the BamHum and the Tikzik (also invented by him). He has tried his hands as an actor, sportsman, audio and video editor and is an inventor of two versatile musical instruments. He along with his wife Arenla M. Subong founded the band Abiogenesis and developed a new world music genre called Howey, which is a fusion of modern rhythm with Naga folk tunes. Guru Arenla M. Subong is a well-known singer, musician, dramatist, script writer, composer and choreographer in Nagaland. Arenla is the vocalist and the lead BamHum player in Abiogenesis.

The seeds of Abiogenesis got sowed decades ago when Arenla and Moa met for the first time in Mokokchung. As teenagers involved in a rock band, they very soon fell in love, got married and by 23 years of age, were a family of 5 with 3 sons. Music remained an integral part of their lives and many years later, they decided to as-

semble their own band, the Abiogenesis, which is a folk-fusion act from Nagaland that creates indigenous and tribal music in the most exotic way. They do both vocals and instruments with the lyrics being in English. Every song has a meaning and Arenla, the lead narrates and explains the untold stories from Nagaland. Comprising talented Naga musicians, Abiogen-



esis mines the essence of oral narratives passed down through generations. In a time where western story telling is dominant, Abiogenesis retells Naga folklores. Their act is not only entertaining but also a learning experience.

The term 'Abiogenesis' means to reactivate dead cells and the evolution of life from lifeless matter. During the early 90s northeast was crippled by drug exploitation by youth. Abiogenesis wanted to preserve the tribal ethos and rescue such youth through their soulful music. The youth are more inclined towards western music and Abiogenesis wanted to bridge a gap between modern music and Naga folklores. Initially a rock band, Abiogenesis was assigned to create an album on HIV by Nagaland State AIDS Control Society (NSACS) in 2002. This was followed by a feature film ('Big Time Buddies') on the same issue, which was written and directed by Arenla in 2003. They were also assigned to create an album for health awareness by the State Department of Health and Family Welfare in 2004.

The journey of innovation: Creating revolutionary music became a trademark of Abiogenesis. With time as their music matured, they realized the need to move forward. This made them explore and experiment with their music. A new form of music bloomed from their experimentation called Howey. Forming a new genre of music, Abiogenesis became the first Naga Folk Fusion Band and Howey music became their signature identity.

The word Howey signifies solidarity. The term is a historical form of expression that is used to relieve exertion during work. To enhance team work, 'Howey' is chanted that provides energy and is healing. The chant 'Howey' is also uttered during folk dances at local festivals. Common-

ly uttered chant, 'Howey' unifies all Naga tribes and acts as a bonding force which brings different tribes together. For Abiogenesis Howey became a blend of Naga folklore and folk tunes married to various forms of western music. The Howey genre was largely appreciated as it boosts the cultural wealth of Nagaland.

In 2005, Arenla was appointed as Guru by North East Zone Cultural Centre, Ministry of Culture, Government of India to impart the knowledge of Howey music. She staged two Howey Musicals titled 'Lichaba's Daughter' and 'Sojourn of the Ahom Prince in Naga Hills'. Arenla directed and was involved in the playwright. The feature films were stitched together by old Naga stories that Arenla recalled were told to her by her grandmother. The film showcases the rich history of Naga culture. Their album 'Aeon Spell' released by Saregama India Ltd. was listed for nominations in the 50th Grammy Awards under the category of Contemporary World Music. Being a vocalist, Arenla faced problems while making music, the traditional instruments were beat or percussion based, playing various notes was not possible to suit her style and genre of singing. Moa made the BamHum to help her wife in 2005. He could develop this musical instrument within a year.

The instrument - BamHum: Looking like a flute, BamHum is a medium sized bamboo instrument that works when the player hums into the hum hole. Unlike the flute which works when air





is blown into the opening, the BamHum works when the player hums any tune into the hum hole at its side.

The musical instrument is hand made by Moa Subong. The bamboo used for making the BamHum is the one used for fencing, as it is sturdy and durable. Bamboo piece with a node (closed internal partition) at one side is taken and treated over heat for 10-15 minutes or more. There is a rattle at one end of the instrument (for amplifying notes) and a hole in the bamboo node (closed internal partition) for passing of the air at the opposite end. It has only one opening (hole) through which the user has to hum, which then gets musically amplified through the instrument. The user can moderate the tone of his/her to get desired musical notes and pitch from the instrument, which takes some practice. Thus effectively, the range and tone of the user becomes the tone and range of BamHum, which makes it so versatile.

The simplicity of playing the BamHum is an added advantage, since all it takes for the player is to simply hum any tune. Unlike other instruments where one is required to undertake formal lessons to master the technicalities, the BamHum only requires controlled breathing and practice to acquire proficiency. It can be played as a solo instrument, as a backup or as supportive role in a band/orchestra or played in an ensemble with multiple BamHum players playing various parts of a routine. The BamHum can be a part of various kinds of music be it classical, folk, rock, jazz, blues, pop, gospel etc.

The Music Task Force of Government of Nagaland opines that “the resulting sound that emanates through the rattles has a buzz like effect that melds with the tonal notes hummed into

the instrument in which gives its unique ‘mixed’ sound. This mixed sound cannot be duplicated vocally and hence it deserves its space as an ‘instrument’ that helps broaden the vocal capabilities as alternative accompaniment in melodies.” Moa Subong has sold over 5000 BamHums in the last ten years. Music bands like Parikrama and singers like Papun have also purchased the instrument. The couple has performed widely in India and abroad and their performance has been much appreciated.

Insatiable by nature, Moa Subong never stops experimenting with musical instruments. He has invented a new Bamboo percussion instrument called Tikzik. Tikzik is played by holding it with one hand and striking it with the other hand. The fingers can also simultaneously tap single notes and repeated beats on the Tikzik stick or the small tok pad on one end of the Tikzik, and the zik sound can be produced with an additional stick, while the shaking sound is also heard. According to Moa Tikzik can be classified as unpitched percussion instrument, which produces notes without an identifiable pitch.

Moa Subong considers their band as representatives of the Naga Culture. Their genre along with his innovations stems from their rich culture. Northeast is often looked at as an untamable region or a conflict ridden area, what goes missing is the myriad culture worth showcasing. Through Howey music Abiogenesis tries to sketch the image of Northeast with colors where communities live in harmony where the modernity is welcomed and what is indigenous is celebrated. According to Moa, culture can be a great way to represent social causes. Through their music, they wish to promote social betterment as well as aid people in need.



## NATIONAL FIRST - PLANT VARIETY

Improved varieties of Crossandra and Casuarina

T. Vengadapathy Reddiar  
Puducherry

**E**ducated up to only class fourth, Vengadapathy Reddiar (70), an agriculturist, has developed various new varieties of Casuarina spp. and Crossandra spp. by cross breeding, optimized gamma radiation treatment and subsequent mass selection method. Improved varieties of Casuarina spp. MIQ and Modi - 1 have been accepted by many farmers for cropping as they have fast and uniform growth habits, whereas Crossandra spp. having many varieties such as Modi-1-3 and Kalam-1-3 which have unique pattern and colour.

Given his inquisitive nature, Vengadapathy Reddiar gathered a lot of knowledge in agriculture and floriculture though he is a school dropout. He explains that flowers have a lot of role to play in a person's life from birth till death hence he has dedicated his life for the cultivation of flowers and their improvement. He owns a nursery (agriculture) and tissue culture laboratory. He lives with his wife and a daughter who helps him in managing the accounts. He has ten acres of land where he plants Casuarina and so far he has developed 14 varieties of Casuarina by



cross breeding, gamma irradiation induction and mass selection and about 100 varieties of Crossandra of different colors by mutation and pollen crossing methods. He is also working on other crops such as neem, amaranthus, lemon and chili.

#### Genesis:

His family had been mainly working on Crossandra varieties. Hence, since childhood, he had been watching and working on floriculture crop multiplication by normal propagation methods. Before 1960, the scientific technology for propagation of Crossandra was not much known. He first started a tissue culture technique to propagate the plant through micro propagation. In 1972 he started work on Crossandra local variety, which got affected by Fusarium wilt. Initially he collected wild Crossandra species from the forest area and crossed wild Crossandra pollen with the cultivated local variety and developed 3 types of lines viz. a) lines which had seed setting ability (Diploid) b) seedless sterile lines (Triploid) and c) lines with partially developed seeds, which could not germinate. Later he actively involved himself in developing new varieties of Crossandra in different colours including red, yellow, pink and violet through indigenous tissue culture and induced mutation techniques.

In 1975 he started research on traditional Casuarina equisetifolia and Thailand variety Casuarina junghuhniana by comparing seed and vegetation propagation methods. He exhibited that shoot tip method for propagation was best for uniform and effective growth. He tried through many sources for permission to use irradiation technique for induced mutation. However, in 1999, Indira Gandhi Centre for Atomic Research, Kalpakkam agreed to provide



support for his research, which he has been using since. He prepared an innovative mist chamber to facilitate early growth of plants. He then standardized the technique of nodal stem cuttings in mist chamber and distributed several lakhs of Delhi Crossandra saplings to farmers, widows and below poverty line people of south India free of cost through Indian bank.

#### The innovation

Vengadapathi Reddiar uses optimized Gamma radiation protocol to facilitate variety development in Crossandra spp. and Casuarina spp. The special features of Crossandra spp. developed by him are variation in colour, from dark red to yellow, good shelf life and disease tolerance. In Casuarina spp., high wood yield (200 ton/acre after 5 year) with 90 per cent uniform growth and tolerance to insect pests, are the special features.

Crossandra spp. has been taken by various research institutes as a treatment for comparing their varieties such as by DR. YSR Horticultural University and the germplasm has been submitted to NBPGR, New Delhi. DNA fingerprinting analysis was undertaken by Indian Institute of Horticultural Research,



Bangalore, where similar DNA banding in his varieties of *Crossandra* spp. were found. Feedback from forest officers and famers from Tamil Nadu and Andhra Pradesh confirms that MIQ and Modi variety of *Casuarina* spp. are very effective in higher and quality yield as compared to the local varieties available in the area.

In an on-farm validation study in Tamil Nadu and Andhra Pradesh performed by NIF in 2016, it was found that in comparison with local *Casuarina* variety (Nattu), the variety of Reddiar (MIQ) recorded 44.4 per cent more height (65 feet in 4<sup>th</sup> year) and 33.3 per cent more yield (80 tons in 4<sup>th</sup> year). The variety also produced more qualitative wood in form of better stem straightness and lesser sub branches.

The varieties have diffused in surrounding villages of Pondicherry, Tamil Nadu and Andhra Pradesh. In 2012 he was awarded Padma Shri by the Government of India for his outstanding efforts in the field of variety development especially for *Crossandra* spp. He was also conferred upon an Honorary Doctorate of The International Tamil University, Maryland,



USA and Periyar Maniammai University, Thanjavur, Tamil Nadu in 2011 and 2014 respectively. In 2016-2017, he was selected as a member of State Government Committee for Implementation of National Agricultural Development Program. He has receives other accolades and recognition as well.



## NATIONAL FIRST - VETERINARY

Herbal medication for treating anestrus in bovines

Laduben Somabhai Bhambhi  
Sabarkantha, Gujarat

**L**aduben (80) is a traditional knowledge holder who has a lot of herbal medications for treating animal diseases in her repertoire. She has been practicing a herbal medication for treating anestrus, which is a period of sexual inactivity in animals, between two heat periods.

Living with her daughter and son-in-law after her husband's demise, Laduben has been keeping herself busy by undertaking daily household chores as her health permits. Despite her age and related ailments, Laduben always finds strength to help the needy villagers through her knowledge of herbal medicines. Her husband late Somabhai Danabhai had always supported her to help others as a result of which, it has been now fifty years that she has been treating animals for various diseases using her herbal knowledge. She credits her mother and husband for the knowledge she has, some of which has also been acquired through her own experimentations. She is not only knowledgeable about herbal medications for animals is also a dai (Midwife) and helps in deliveries, whenever called upon to do so.

Anestrus is defined as the period of sexual dormancy between two periods of sexual activity in cyclically breeding mammals. It is not a disease and may be caused due to nutritional deficiency, seasonal change in physical envi-

ronment, lactation stress and/or ageing. This situation is mainly found in cattle like buffalo or cow. Laduben uses the fresh roots of a local plant (name withheld due to Intellectual Property reasons), grinds them and feeds them to the animal with water. The Prior Art Search results revealed the novelty in the practice, which subsequently was taken up for validation at Nagpur Veterinary College, Maharashtra Animal and Fisheries Sciences University [MAFSU] Maharashtra. During the validation trials, about sixty percent of cows being treated for clinical condition of anestrus responded in less than seven days whereas in the case of buffaloes, forty percent of them responded to the medication within six and a half days. The medication, thereby, confirmed its role in the development of follicle. Also, after treatment with the herbal medication, the conception rate among the responded cows was found to be 33.33 per cent whereas 75.00 per cent in case of responded buffaloes.

In order to verify whether the said herbal practice was known only to Laduben or others as well in her village and surrounding villages, meetings were organized in her and other villages. However, no villager or a herbal healer reported using the same plant for treating the same disease. Hence the use of this plant for this particular practice was found to be unique based on field verification among different communities

in different villages of Sabarkantha region. Understanding the importance of her knowledge in solving people's problems, Laduben is willing to provide all support for further investigation and research.



## NATIONAL SECOND - GENERAL UTILITY

Improved wheelchair for the physically challenged and silk reeling cum spinning machine

Nabajit Bharali  
Dhemaji, Assam

Navajit Bharali (23) is a young innovator from Assam who has come up with two useful innovations namely a spinning cum reeling machine and an electronic chair bike for the specially abled. Troubled by the tedious process of reeling and spinning, Navajit developed an automatic machine which is time efficient and can process different types of silk. Affected by the plight of differently abled, Navajit also developed a hands free electronic chair bike, which works on the simple principle of body pressure.

Being the youngest of three sons, Navajit's had a pampered childhood. He recalls having a radio as their pride possession then. The radio was the new big thing in the village and it brought the community together on countless events. Navajit's father was particularly fond of their radio. He would take it everywhere and after a tiring day in the field, he could be found relaxing in the courtyard while listening to the radio. Navajit recalls that when he was quite young, once his elder brother had switched off the radio when their father was humming along with a song being played on it. This had angered him much and in a fit of rage he had broken the radio. His brother who had a knack for tinkering with things somehow managed to fix the radio but the broken side panel could not be completely repaired.

Every time someone visited Navajit's they would always notice the broken radio and inquire about it. Soon, many in the village started consulting Navajit's brother to fix their radios whenever a problem arose. The village did not have electricity then and a radio, being an object for entertainment and also listening to the news, mattered a lot. His brother soon mastered the art of fixing the radio and while he worked on the radios, Navajit keenly watched his brother from a distance as he was not allowed to touch anything. Later his brother left home to join his duty in CRPF but not before warning Navajit not to meddle around in his workshop. However, the first thing that Navajit did was to enter the workshop and dismantle everything in his eyesight. Curious by nature, he would open electronic parts and try to configure different mechanisms. Playing





around in the workshop soon turned out to be his hobby and he started mastering the art of fixing things just like his older brother.

The villagers being unaware of his brother's job would still bring broken radios to their house. Many returned disappointed, however Navajit's first customer trusted him. Navajit fondly recalls the first radio he ever fixed and when asked the fee he took five rupees and bought a big packet of snacks for himself. Soon Navajit became the new radio mechanic in the village. Initially he made mistakes, which he corrected eventually as his experience grew. Through numerous trials and errors, Navajit with time excelled in fixing TVs, Tape recorders, Inverters etc.

**Reeling cum Spinning Machine:** This is a compact machine for simultaneous spinning and reeling of different types of silk including muga silk and eri silk.

Navajit hails from a remote region in Assam where silk weaving is a traditional practice and every household has looms. His first innovation was in standard 6 when he developed a reeling and spinning machine. His innovation was triggered by his mother who is primarily involved in weaving along with her daily household chores and farming activities. Navajit noticed that the process of reeling silk is time consuming which gave her minimum time to work on other household activities. Being attentive he realized that during the reeling process, winding one bobbin manually took one hour. To simplify this tedious process, he tried replacing the DC motor from his tape recorder. A simple experiment resulted in a remarkable output where winding one bobbin only took 4 to 5 minutes. In about 40 minutes a dozen of bobbins could be prepared. His first modification was to make it automatic, so that the reeling process becomes independent. He imitated the rotating mechanism of the fan to make the reeling machine hands free. He first made different versions of spinning and reeling machine for muga silk, eri silk and the normal silk. His simple machine helped in reducing the work load and time of women in the village.

By the time he was in standard 12, he made 5 machines which included 2 spinning machine, 1 reeling machine and electricity disconnecting machine. Slowly his reeling machine started getting media coverage where his innovation was celebrated by various media outlets. However, popularity only started to irk him. Envious of success, people in the villages started ridiculing him and insulted him and mocked him as the scientist who copied everything. When, his own village who he wanted to help started attacking him, Navajit was disheartened and



he stopped working on any new innovations. Users at Sualkuchi (Kamrup, Assam), famous for silk work, have also found his machine useful in trials. Presently, the machine is being value added at IIIT Manipur with support from IIT Guwahati and National Innovation Foundation.

**Electronic Chair Bike:** After a long struggle, Navajit finally felt motivated when he came in contact with Honey Bee Network. He received the encouragement that was missing from his life and very soon he started working on his next innovation; Electronic Chair Bike.

Navajit is a social innovator, whose innovations are mainly to aid people in need. Once while visiting the local market in his district, he spotted a differently abled man who was trying to cross a road with the help of a wooden plank attached to wooden wheels. The sloppy road obstructed his movement and the wooden wheels got trapped in a pit. He noticed the man was in distress as he was blocking the traffic and was being taunted by impatient passersby. This incident was followed by a charity event on disability where tricycles were gifted to the differently abled people. Here, Navajit observed that people with disability had makeshift arrangements to move around such as rolling on the ground to travel, use of rubber tubes as bandages to avoid accidents, wearing sandals in their hands to travel etc. Not all could use the tricycles and seeing them leave empty handed deeply troubled Navajit. That is when he came up with the idea of an Electronic Chair Bike which can help people with disability travel. He made his first prototype for rupees 5000 using parts from kid's bicycle. His first prototype was built with 3 wheels which obstructed smooth turning. With

support from NIF, he developed an improved version with four wheels and only a slight body movement of the user (front, back, on either side) can control the movement of the chair. The maximum speed is up to 40 km/hour. Some parts of the chair are detachable, after which it can easily packed and carried. NIF has engaged IIIT Manipur to develop an improved version of the same.

**The Social Innovator:** Navajit Bharali, who has been quite innovative since a very young age, is currently pursuing his postgraduate studies in philosophy (his submission to NIF was received when he was in his first year of bachelors in arts). He mentions that when it comes to machinery, he can capture the functioning with a photographic memory. Always inquisitive, he cannot rest until he finds out solutions of any problem. Navajit considers his family to be the biggest support. He owes everything to his mother who has always supported him emotionally and financially through her small savings. She realized his passion at a very young age and no matter what always encouraged his creativity.

Modest by nature, Navajit believes that everyone should have a decent standard of living.





According to him, people in the peripheries of the society need to be uplifted and everyone should progress equally. He is a compassionate human being, who thinks in depth and tries

to perceive any situation from another's point of view. He cannot tolerate other's misery and wants to find ways through his creativity to help the economically weaker section.



## NATIONAL SECOND - AGRICULTURAL MACHINERY

### Onion Harvester and Motorcycle Operated Salt Turning Device

Shrawan Kumar Bajya  
Sikar, Rajasthan

Shrawan Kumar (41), a motorcycle mechanic, has developed a number of useful devices to reduce dependence on manual labour, which is getting scarce by day. One of them is an onion harvester, which is a combination of a machine for cutting leaves/topping and a tractor operated digger. He has also developed a motorcycle operated salt turning device for operation in salt farm for a task, which is otherwise done manually.

Having studied till only class ten, Shrawan was earlier engaged in farming, like most members of his community in the region. His father was a mason while mother a housewife. Shrawan got married in 1996 and has a young son. His wife does not have much formal education but understands the requirements of the family well. She has been supporting Shrawan in all his endeavours.

He slowly got disinterested in farming as many operations, especially hoeing and weeding, had to be done manually. He then started undertaking job work for digging tube wells, which he had to leave due to the accidental death of one of his fellow workers. Though by this time, he had worked in this field for about ten years or so. He then joined a workshop as a casual labour and worked for a year. During this period, Shrawan learned most of the work

related to machineries including usage of tools and devices like welding machine, lathe machine, fitting and other machining work. In 2010, he started repairing and servicing of motor bikes and bicycles. Later, in 2014, he set up a small workshop for developing agricultural machinery along with his regular work of servicing of motor bikes. As he had to discontinue farming due to lack of machines/tools, he used the workshop for his research





and development during lean time. First he developed a mechanized weeder and later went on to develop a number of machines like salt turning device, cable pipe installation machine, device for nursery plantation of onion, onion and garlic leaf cutting device and digger among others.

### **Onion Harvester**

The harvester is a set of two machines first for cutting the leaves of onion and then digging and picking them up without causing any damage to the bulbs.

While harvesting onion, separation of the leaf/stalk from the bulbs is a tedious task and involves a lot of manpower. If leaf/stalk is not removed properly the onion fetches less price. Also if the onion is picked up along with



the leaves, separation of soil from the onion becomes a difficult job. In order to mechanize the process, Shrawan developed two machines; one for cutting leaves and another for digging, picking up and cleaning soil from the bulbs. Presently, he is trying to combine both the machines together as a unit i.e. as onion leaf cutter cum digger.

Initially for testing, he had developed motorcycle rear mounted leaf cutting device as well as onion digging device (2013). This was able to dig and pick onion along with soil and drop on the field. Having achieved success with the motorcycle, he implemented it in a tractor by developing tractor front mounted digging unit with conveying and collection unit (2013 - 2014).

### **The leaf cutting machine**

This is an attachment to a motorcycle after removing its rear wheel and has two wheels each on the front and rear. Lifting (of leaves) and cutting mechanism have been incorporated on this attachment, powered by the motorcycle. The cutting width of the machine is 4.5 ft (1.3725 m) with the field capacity being 0.2 ha/h (=1.2 beegha/hour) at a speed between 1.5-2 kmph. This process of leaf cutting is followed by digging the bulbs using tractor operated machine.

### **Tractor operated onion digger**

The tractor front mounted PTO operated machine consists of self-designed frame for supporting power transmission system from tractor PTO and cutting blade and conveyor mechanism. The dug onion along with soil travels on the conveyor along the length of tractor where the soil gets separated due to gap between the slats. The gap is optimized

according to normal size of onion. The onion bulbs get collected without damage in the collector box mounted at the rear of the tractor, which needs to be emptied periodically. The cutting width of the digger is 670 inch (1.778 m) and cutting depth is up to 3 inch (0.076 m) at a speed between 1-1.5 kmph. The machine requires a 50 hp tractor along with which, its field capacity is 0.166 ha/h (1 beegha/h) consuming 2 litre per hour fuel. It is to be noted here that 40 labours are required to do the same job in one day and at Rs 300 per labour.

Shrawan also developed different versions of weeders. Initially, he made a single tine manual weeder where used an old rim of the motorcycle and attached the hoeing and weeding attachments to it with a frame. The whole assembly needed to be pushed for hoeing/weeding, which was cumbersome. In order to increase productivity and reduce the efforts required, he developed a tool bar, which could be attached to a motorcycle by removing the rear wheel and got power from its engine. The weeder is claimed to cover 2.5-3 beegha/h with

the attachment cost being Rs 55,000/-. Later he further modified the motorcycle operated weeder into an engine operated weeder.

Shrawan then developed a motorcycle operated salt farming unit. Earlier, while undertaking well digging work he used to visit salt farming areas and see the manual operation of turning saline water used for making salt. The task is very tedious as the worker needs to stand in saline water, which results in skin irritation/infection. After noticing that motorcycle based weeder, one his relative also reminded him about the problem of the salt farmers, which he himself had seen. He worked on his weeder and modified the weeding attachment to enable it to turn the saline water during salt farming (2013). He claims that machine can do the job of six persons. For covering a plot of 100x100ft it needs only 100 ml of petrol, hence the operational expenses are also less.

Presently, Shrawan is trying to develop a simple device to open tire nuts from vehicles and an onion transplanting device.



## NATIONAL SECOND - MECHANICAL

### Wrapper picker

**Diptanshu Malviya and Mukul Malviya**  
Sirohi, Rajasthan

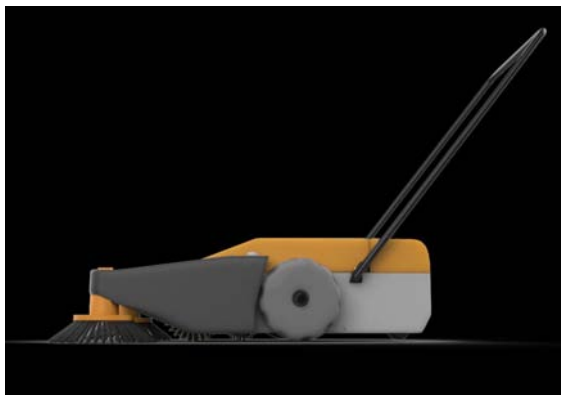
The two young brothers have developed a motorized device, which picks up littered pieces of wrappers, papers, pouches, etc and collects them in a storage bin.

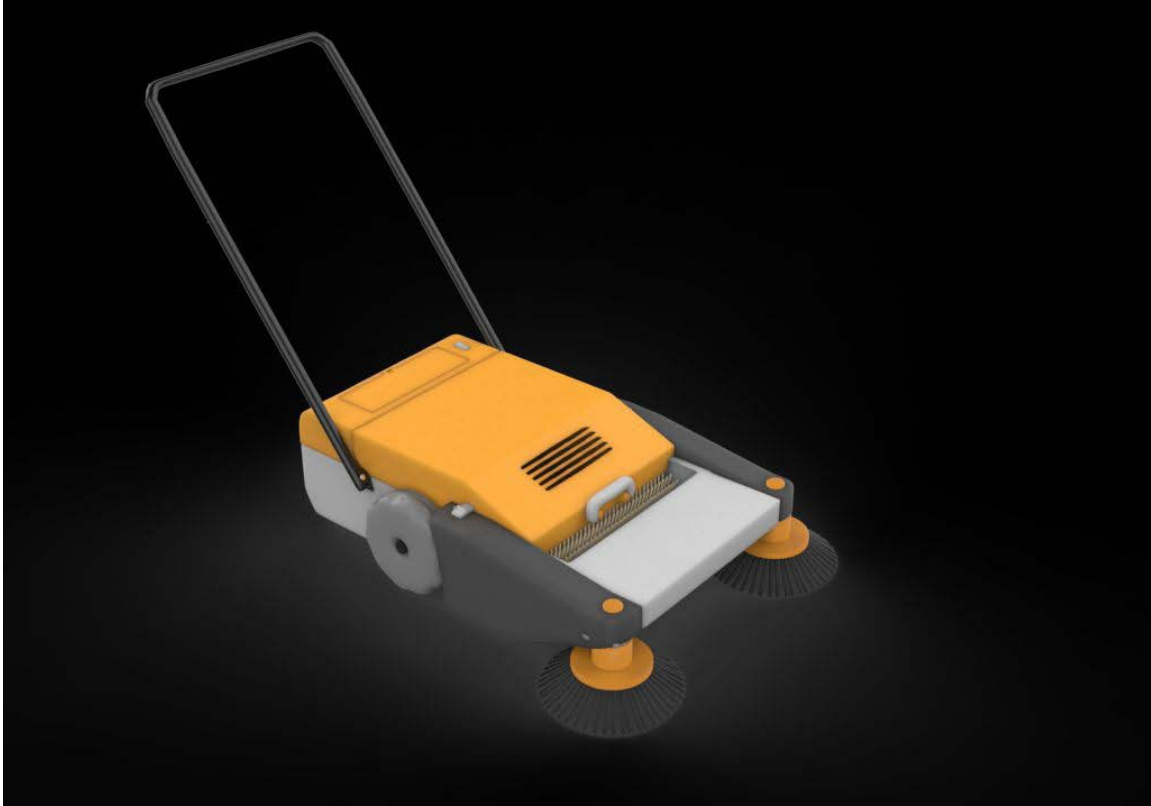
Snacking is something, which most of us like to indulge in. Wafers, chocolates, biscuits, fruit cake, water pouches, etc. are consumed and their wrappers strewed around. These have to be later picked up manually, which is laborious and time consuming. Presently there are no machines available in the market to do this task automatically. Mukul and Diptanshu thought about this device when they saw a sweeper picking up waste pouches, pieces of paper, and empty wafer packets littered across a bus station. They realised how difficult it must be for him to bend every time to pick up such

pieces and came up with this device.

The machine is very simple, easy to operate and maintain and is very useful for sanitation workers. It has great potential for diffusion by Municipalities, Municipal Corporations, Town area Committees *etc.* and is an ideal technology for adoption to fulfill the objectives of the “Swatchh Bharat Abhiyaan”. NIF got developed an improved model of the same with the help of designers.

With keen interest in science, both the brothers participate in a lot of science competitions and exhibitions. Diptanshu likes reading biographies of scientists and inventors and wants to serve ISRO when he grows up. His brother, Mukul also has similar interests and wants to become an engineer. They were also





selected for Rashtrapati Bhavan's Innovation Scholar in Residence program in 2015 for their wrapper picker.



## NATIONAL SECOND - PLANT VARIETY

**HRMN-99: New apple variety for tropical, sub-tropical and plain areas.**

Hariman Sharma  
Bilaspur, Himachal Pradesh

**H**ariman Sharma (60) is a well-known progressive farmer. He has developed an innovative variety of apple that can be successfully grown in plains, tropical and subtropical areas where the temperature can be as high as up to 40 to 45 °C during summers. This variety does not require chilling hours for flowering and fruit setting.

Having lost his mother at the age of three, Hariman was adopted and taken care of by his uncle. He studied till class ten and thereafter took to farming. Presently, he lives with his wife, children and grandchildren. His two daughters are married and his two sons are also well settled. His elder son lives with him and helps in his farm. The main source of income for Hariman is agriculture, he owns about 1.75 hectare land. He has a great interest in horticulture and grows different fruit plants like apple, mango, pomegranate, kiwi, plum, apricot (*khumani*) and peach (*aadoo*), along with the fruit crops he also grows coffee. The most interesting part of his farming practice is that he can grow apple along with mango in the same field. He strongly feels that farmers in the state can easily get out of poverty if they start raising apple orchards in the lower valleys. He feels very happy when the plants distributed by him at different locations bear fruits.

### Genesis

In 1998 Hariman purchased some apples from a village in Bilaspur. After eating the fruit he disposed the seeds in his backyard. A year later he noticed that the seeds had started germinating. In 2001 he got some fruits on that tree. As a farmer he could sense that this apple tree bearing fruits at a warm area like his village situated at 1,800 feet above mean sea level was extraordinary. Therefore he preserved this plant and the next year he took some branches and grafted them on a plum tree as no apple tree was available. The grafting was successful and the fruit quality was good. Durign 2003-05, he brought some crab apple seedlings from Shimla and grafted the same. He created a mini orchard of apple trees, which continue to bear fruits till today. Now





he gets crab apple seedlings every year from Kashmir and raises the graft on those plants.

### **The apple variety**

Usually apple can be grown at altitudes 5,000-8,500 feet above mean sea level in the Himalayan range, which experience 1,000-1,500 hours of chilling but the variety developed by Hariman can be grown at low hill/plain area, which are about 1,800 feet above mean sea level or lesser. The variety does not require chilling hours.

The common characteristics of this scab disease resistant apple variety are that it can be grown in high temperature areas, the plant height is up to 12-15 feet, fruiting starts after third year of plantation, flowering starts in early January and harvesting can be done after six months (June). Pruning of grown plant is needed at the end of November or early December. The ripe fruit color is yellow-red with normal fruit size and sweet in taste. The only disadvantage of the fruit is that it has short shelf life (about 10-12 days at room temperature). The average yield of a well grown plant (10-12 years old) is about 1.0 quintal/plant. These days Hariman Sharma is working on improving its fruit shelf life. So far this variety is having promising results in plain areas.

Hariman has distributed thousands of plants to hundreds of farmers throughout the country. NIF has extended the support to him for conducting multi-locations trials in tropical and subtropical regions. NIF started transplantation of HRMN-99 saplings from 2014-2015 for introduction and evaluation trial in different areas the country. Total 7572 saplings were transplanted by NIF in two years with the objective of adoption and fruiting study in



three year plants. Interestingly, fruiting has been reported in one year plants in seven states such as Delhi, Uttar Pradesh, Uttarakhand, Karnataka, Haryana, Himachal Pradesh and Manipur.

The fruit quality report of Indian Agricultural Research Institute confirms the better value of HRMN-99 fruits. Morphological and SSR DNA finger printing study by NIF and Gujarat State Biotechnology Mission confirms its diversity and superiority over other low chilling varieties Anna and Dorsett golden. NIF has filed the application on behalf of Hariman Sharma for the registration of HRMN 99 variety under PPV & FR Act- 2001.

Hariman has received various regional, state and national awards and recognition as well. A large number of newspapers and magazines have written about his apple variety, with a local newspaper calling him the 'Apple Man of Bilaspur'. He has become a source of inspiration for thousands of farmers and agriculturists of Bilaspur and other lower hill districts of the state, the areas which earlier could never dream of growing the apple fruits. Now his farming practices are recognized nationally and internationally.



## NATIONAL SECOND - VETERINARY

Herbal medication for curing Ephemeral fever

Sheik Hebazat Hussain  
East Champaran, Bihar

Sheik Hebazat Hussain (62), an agriculturist and a herbal healer, has been practicing a novel herbal treatment for curing ephemeral fever in cattle.

A school dropout, Hebazat, has his wife, three sons and two daughters in his family.

The family has been practicing agriculture for sustenance. However, most of the time cultivation gets affected due to heavy floods in his area. They also own a few livestock for domestic purposes. To supplement his income, he also tried to sell fruits but had to discontinue due to his health.



The source of his herbal knowledge was his guru, late Ustad Md. Sheikh Hazi Munshi with whom he used to spend a lot of time about four decades ago. With time he grasped the knowledge shared by his ustad and also understood medicinal properties of various plants through his own experimentation. Today, people from many nearby villages come to seek his advice on animal health related problems. He never seeks any financial remuneration as he believes in sharing knowledge for the society. He administers herbal medication for respiratory distress, ephemeral fever, fracture, otitis, diarrhea, abdominal pain and retention of placenta.

After he shared his practices with NIF, prior art search (patent and non-patent) was undertaken after plant identification. The herbal practice for ephemeral fever was found to be novel. This is a short term vector borne viral disease characterized by sudden onset of fever, stiffness, lameness and nasal and ocular

discharges. However, if not treated properly may be fatal as well. This unique medication was tested at GC Negi College of Veterinary and Animal Sciences, CSKHPKV, Palampur, Himachal Pradesh involving several veterinary institutions in districts of Mandi and Kangra. It was found that his medication was effective in minimizing respiratory distress and lameness on the third day of the clinical infection. The temperature of affected animal was also found to be steady the second day onward after the administration of medication. The medication also restored the average milk yield sixth day onward.

To ascertain whether the knowledge about the particular herb for treating ephemeral fever was common or not, community meetings were held among herbal healers and villagers in many villages of East Champaran and nearby four other districts. During the meetings no one was reported to use the said herbal plant for treating ephemeral fever.



### NATIONAL THIRD - MECHANICAL

Modified fixture of dozer blade with tractor

Madan Lal Kumawat  
Sikar, Rajasthan

**M**adan Lal (52) owns an agricultural machinery repairing and manufacturing workshop. He has modified the design of fixture/frame of the dozer in tractors, which has resulted in easy repairs, transportation and maneuverability.

His father was a carpenter and earned his livelihood by working on daily wages in the village. Madan Lal had his initial education at home till he was about ten years old and then was admitted to the village school in class one. Though he was good in studies but discontinued his studies after class two after a major accident, which left him quite weak physically. He decided to learn tailoring and also carpentry from his father. Slowly as he gained physical strength, he switched over full time to carpentry, which he worked for a few years.

Later, he got inclined towards metal engineering work and associated himself with a workshop in a nearby village to learn necessary skills. Spending about nine years in the workshop, he learnt all the technicalities and intricacies involved in metal work and especially agricultural machineries/ implements. He setup his workshop at Danta in 1997, where he repairs agricultural and constructional machineries

and sometimes does modifications according to requirement of the customers. In his work, he is assisted by his younger brother and lives with his wife and three children. Madan Lal is habitual of working about 15-18 hours a day to which his family has somewhat adjusted now.

#### Multicrop thresher

During nineteen hundred eighties and early nineties, the manufacturers and dealers of agriculture implements in Rajasthan use to bring threshers from Punjab for selling in the state. The workshop owners mainly undertook repair work as per demand. Madan Lal realized that this could be an opportunity and started thinking about manufacturing them. He started developing the first thresher at the workshop where he had been working. After about 20-30 days of efforts he could develop a thresher whose performance was comparable with the







existing ones. During its development phase he identified the scope of improvement in the design of the thresher so as to improve its performance. He then started working on the ideas generated during the development. He incorporated blowers and cutting mechanism (1991) at the first stage to simplify the threshing mechanism. Later he modified the beaters and optimized speed of blower to make it suitable for many crops (1993). In 1997 he optimized the size of the drum and the beater, and increased the length of the thresher to reduce the load on the prime mover. He again optimized the design to reduce the changeover time of the fitments. The change over from one crop to another in his machine takes only 15-20 minutes as compared to 2-3 hours in other alternatives. He received an award from National Innovation Foundation in 2001 for his improved thresher. Indian patent has also been granted for his thresher (patent no. 253863). NIF has supported him under Micro Venture

Innovation Fund (MVIF) for expanding his business. He has also been awarded by the State Government for the same innovation in November 2004. In year 2010, he was chosen by Forbes Magazine as one of the seven most powerful innovators of Rural India.

Unlike other multi-crop threshers it has a differently designed threshing cylinder (blade edged spike tooth instead of normal spike tooth) and an additional blower. It has multiple drive options to change the speed of threshing cylinder (400-500 rpm) and varying air flow according to crop and can thresh all the crops including groundnut and cumin. It can be operated by tractor of size 35 hp or above through PTO. In addition to threshing drum there is a primary cutter that cuts straw before threshing, thus reduces power consumption. The average threshing efficiency, cleaning efficiency, grain damage, grain blown, spilled grain, total loss are much less than the permissible

limit 99.60%, 99.07 %, 0.25%, 0.36%, 0.30 %, 0.91%, and 5%, respectively. He has sold over 150 modified threshers.

#### The dozing attachment

In 2013, a farmer got dozer attachment fitted in his tractor from Kota, Rajasthan at the cost of Rs. 90,000/-. The design was same as that of Bull India, which charged Rs. 150,000/- that time. There was need of a dead weight at the rear for proper balancing. Due to the lack of a hinge, the attachment was fixed. The chassis used to break down frequently due to the improper distribution of load. As the chassis was fitted taking support from sides of front wheels extended outward, maneuverability of tractor was difficult after attaching the dozing attachment. Also, in order to repair clutch plate, which wears fast due to half-clutch engagement in dozing operation; the whole unit was required to be detached. To solve

these problems, he decided to improve the attachment and successfully developed it in six months' time.

Initially, he made the chassis as one single unit but due to the difficulties in repairing the clutch, he remade it in two parts, so that the chassis can be split as and when needed for the repair of the clutch plate. The modifications include three supports from rear wheel mud guard bolts, tractor chassis and center of front part by attaching a plate.

The modification has resulted in no breakage of chassis and easy maneuverability. Further transport from one place to another has become easy due to reduction in width. He has made over 35 units in the last three and a half years for tractor owners from different states of country including Uttar Pradesh, Maharashtra, Gujarat, Madhya Pradesh and Rajasthan.



### NATIONAL THIRD - TRANSPORT

Natural Air Sealant/Tyre sealant

K Pandu Ranga Rao  
Medak, Telangana

A mechanic by profession, Pandu Ranga Rao (33) has developed a sealant for motorcycle and auto rickshaw tyres to make it puncture resistant. The novelty in his sealant is that it is prepared using natural products, helps tyres resist more punctures and works equally good in hot summers and cool winters.

Pandu Ranga Rao, who has studied till only class ten, has an inborn talent for innovations. Due to his interest in repairing works and machines, he started a mechanic workshop in his village. He lives with his wife, two daughters and a son.

It was sometime in 2008, the innovator was returning home at night on his motorcycle from a friend's place to his village, when his bike tyre got punctured. He was with his family and they had to walk 12km to reach home. It was then he started thinking of a solution. Conventionally to make a tyre puncture resistant, a sealant is filled in the tube along with some chemicals. However, heat patch is required to get the punctures repaired in these tubes. While the vehicle is being used, the chemicals keep moving inside the vehicle tyres, corroding it. Thus after 8-12 months of usage change of tubes is required. He started reviewing the different air sealants available in the market in order to understand the process

in detail. Finally, he came up with a natural air sealant in 2012, which can resist punctures without damaging the tubes.

#### Summary

The natural air sealant is a product that can seal punctures without harming the tubes and whose performance does not vary according to climate. The cost of the sealant is much lower than other similar available products.

The components of the sealant consists of mica powder, rubber powder, gum, and colour (natural orange). For filling the sealant in the tube he has also developed a pressure sealant filling machine, which fills about 250 ml of viscous sealant in the tube within 10 seconds. The sealant is filled in an empty tyre tube and rotated after mounting on self-developed manually rotary frame very speedily.

The sealant has been used in tyres of bikes and auto rickshaws. Presently, the sealant is being tried for car also. Ranga Rao has observed the usage of sealant in different seasons. Sometimes tyre burst in summer due to air expansion due to heat, while in winters, the sealant liquid gets frozen. However, no such adverse effect was observed during these seasons, because as per his view, mica has a typical characteristic of cooling, it keeps tube cool for long.

He has been manufacturing and selling the sealant locally and would have distributed about 3000 tubes for trial purposes for bikes, about 80 odd tubes to auto rickshaws and over 11000 tubes have already been sold through different tube and tyre manufacturing companies. NIF has filed patent application in the name of innovator (6147/CHE/2015).





## NATIONAL THIRD - PLANT VARIETY

Madhuvan Gajar- Improved Carrot Variety

Vallabhhai Vasrambhai Marvaniya  
Junagadh, Gujarat

Vallabhhai (92) developed carrot variety “Madhuvan Gajar” from a local variety through selection method. The variety is high yielding, has highest carotene content, and deep red color, long size and longer shelf life.

Farming has been the occupation of Vallabhhai for over seven decades. He has 1.6 ha irrigated land and cultivates carrot in an area of about 1.28 ha every year. His two sons help him in farming as well as carrot seed production and marketing. His whole family including his grandchildren helps in various activities of carrot farming and marketing.

### Genesis

In 1943 the innovator found that a local variety was exclusively used for fodder. However, he sold it for consumption in the market at a good price. This prompted an idea to develop this local variety for human consumption as it fetched good price in market.

During the early years he selected the best plants for seed production and grew carrot in a small area for domestic consumption as well as for marketing. Later as the demand increased, he started cultivation on large areas during 1950s - 60s. He also started distributing the seeds to other farmers in his village and adjoining areas during 1970s. In 1985, he started selling

the seeds to businessmen for distribution at a large scale at the rate of Rs. 100-200/20 kg. He also rented farmers’ fields exclusively for the purpose of seed multiplication. For the last 15 years, he has been cultivating carrot in around 1 ha for vegetable production and 1.33 ha exclusively for seed production.

### The carrot variety

This is a long size carrot variety, which has deep red colour and sweet taste. The average yield of this Maduvan Gajar is very high (40 – 50 t/ha) and the maximum yield reaches up to 65t/ha under good management practices.

In field trials at Gujarat, the performance of Madhuvan Gajar at 274.8 q/ha was found to be at par with local checks varieties. Mild



incidence of leaf blight disease was observed in the tested variety and forked roots percentage was also less as compared to national check. Biochemical analysis carried out at CALF Lab (National Dairy Development Board, Anand) showed high  $\beta$ -carotene content at 277.75 mg/kg and high iron content at 276.7 mg/kg. The field experiment for performance evaluation are being conducted by Rajasthan Agricultural Research Institute, Jaipur (SKN Agriculture University) during Rabi, 2016.

The final report shall be received by end of February, 2017 or early March 2017. In the field experiments at Gujarat and Maharashtra, the variety was found to be good in terms of sweet taste and its carrot production as well as green fodder. The maximum yield 468 q/ha was recorded at the innovator's field whereas average yield at farmers' field in Gujarat and Maharashtra was 368 q/ha.



## NATIONAL THIRD - PLANT VARIETY

Durga 4 - Improved Variety of Carrot

Madan Lal Devada  
Jodhpur, Rajasthan

**F**armer, Madan Lal Devada (50), has developed an improved carrot variety through selection method. The carrots are long, red in colour with sweet taste, high vitamin content and long leaves.

Madan Lal, who has studied up to class ten only, owns about 40-50 bighas of land where he cultivates carrot. He leases another 40-50 bighas for carrot cultivation. Apart from carrot he also cultivates radish, castor, cumin, bajra and wheat in his fields. His family comprises his wife and two sons. His three daughters are married and settled. The family sells carrot at a large scale to all parts of Rajasthan as well as to Delhi, UP, MP, Gujarat and Maharashtra. He also sells seeds of this variety to farmers living in neighboring villages and districts.

### Genesis

In 1998, he brought the seeds of a local carrot variety from a farmer living near his village. He planted the seeds and found some of the plants superior to others in terms of health and yield quality. He selected those plants and grew them for seed production through root-to-seed- method of propagation. The seeds thus produced were planted in the next season and selection undertaken. In this manner, he has been selecting the best plants for seed

production for the last 15-20 years. He sorts the seeds into various grades uses the best ones for planting.

The improved carrot variety

The special characteristics of the variety are long carrots (up to 60 cm), red colour with sweet taste, high vitamin content and long shelf life. The long leaves of this carrot variety can be used as green fodder for animals.

A field trial was carried out to test the



performance of the variety in farmers' fields where the performance of Durga - 4 (542.5 q/ha) was at par with national check (550.8 q/ha) and far superior than local check varieties. The variety was also found to be free from disease and pest incidence, very sweet in taste with less forked roots. In the biochemical analysis carried out at CALF Lab (National Dairy Development Board, Anand),  $\beta$ -carotene content in Durga 4 was found to be 72.08 mg/kg, the iron content at 95.8mg/kg and the vitamin E content was found to be 52.1 IU/

kg. The field experiments for performance evaluation under Jaipur conditions are being conducted by RARI, Jaipur during Rabi 2016 and report is expected by February end, 2017 or March 2017.

This variety is being grown by farmers of Mathaniya block of Jodhpur and adjoining districts also. The farmers cultivating this variety mention that the yield is good, the germination is early and the quality of produce is good. Leaves are broad hence the fodder is also good.







### NATIONAL THIRD - VETERINARY

Herbal medication for the retention of placenta in animals

Shrivak Karshanbhai Govindbhai  
Banaskantha, Gujarat

**K**arshanbhai (67), a farmer, animal care taker and an expert herbal healer, has developed a very effective cure for treating retention of placenta, a common health problem affecting cattle.

Born in a farming family, Karshanbhai could only study up to class second due to financial conditions at home. As a result of the members of the family had to contribute in farming activities. His father also had good knowledge of herbs and their use in treating animals. His initiation in herbal healing was thus due to his father, and with time his interest in herbal medicines grew. He now lives with his wife, Khemiben, three sons and their families. All the sons are engaged in agriculture and animal husbandry. The family jointly owns about nine acres of land and some cattle. Their region is a dry one and irrigation facility is not available for water intensive crops, and they are dependent on canal irrigation. For this reason, the farmers grow crops like *bajri*, *joar*, *raydo*, wheat and *arando* etc. Karshanbhai has been practising herbal healing for the last twenty years. People from his village and nearby regions visit him often for consultations, especially for animals. He has been leading the efforts to maintain the village *goshala* for the last nineteen years.

Retention of Placenta (ROP) is a condition

where all or part of the placenta (organ that connects the developing foetus to the uterine wall to allow gaseous, nutrient and faecal matter exchange) is left behind in the uterus after the calf's birth. The ROP has many associated medical problems hence its earliest cure is recommended. Normally, a cow's placenta gets expelled within 12 hours after calving, but if it does not get expelled then attention is needed. Karshanbhai has developed a unique preparation of herbal plants to deal with this problem.

Karshanbhai grinds two local plants (whole plants – name withheld due to intellectual property reasons) into very fine powder. He then adds a glass of water, boils the mixture for a couple of minutes and gives to the animal orally. After three to four hours, the placenta gets expelled from the animal's body. During the validation trials, the expulsion of placenta in cows was observed to be within  $2.43 \pm 0.12$  hours and within  $2.38 \pm 0.05$  hours in case of buffaloes after the administration of the medication.

In order ascertain whether the knowledge shared by Karshanbhai was known to anyone else in the village or nearby villages, a meeting was organized at his village where representatives/ herbal healers from nearby





eight – ten villages were also present. During the course of discussions, no body reported the use of the said plants for ROP. Hence, based on the detailed prior art search and the

community meeting, there is evidence that the knowledge possessed by Karshanbhai may be an individual knowledge and not a community knowledge.



STATE

Groundnut Digger and Disc Harrow Seed Drill

Mansaram Suthar and Malaram Suthar  
Churu, Rajasthan

**M**ansaram (54) and Malaram (63) are brothers engaged in farming and machinery repairs. They have developed a light weight groundnut digger with double beaters and a disc harrow based seed drill.

The two brothers live along with their other two brothers and their families in a joint family of forty individuals. While Mansaram completed his education till secondary, Malaram has no formal education. Carpentry and farming is the main and traditional occupation of the Suthar family. They own about 75 *beegha* of land and also have a workshop for the repair of machines used for tube well drilling and cleaning. They also develop machineries (wood/metal) as per customer's requirements and have been making various machines for farming operations like plough, harrow, fertilizer and pesticide mixing chamber, groundnut digger, disc harrow seed drill, disc plough seed drill, etc.

Developing the groundnut digger

Sometime in 1995, some farmers of their region bought blades for digging groundnuts. The brothers saw its performance and found that a significant per cent of nuts remained in the field after the digging using blade was done. They then thought to develop a ground nut digger, which could reduce this loss. As they did not have a tractor then, they hired

one for about seventeen days, so that they can try the machine they develop in the field. Initially, they developed a digger powered by a stationary Kirloskar engine with the tractor pulling the entire assembly. It was tested in about twenty *bighas* of land where they noticed that the engine broke down due to accumulation of dust. As a result of this, they removed the engine from the digger and attached it to the PTO of tractor, which they purchased in 1996. Later they also provided a pressure jack at the front of the wheels of groundnut digger. But this model did not succeed as its power and fuel consumption was high. The ground digger was further modified and in the next version, groundnuts were uprooted from the soil with the help of the harvesting blade of the machine. The uprooted groundnuts were then conveyed from ground level to a higher



level for collection using a conveyor belt. The belt kept vibrating as a result of which the pods got cleaned. But this model also could not succeed in their region.

Having not being able to finalise the design, the brothers went back to an earlier design, and decided to improve upon the tractor PTO operated groundnut digger. They modified the existing groundnut digger by providing horizontal rotary blade along with horizontal fixed blade. Through this modification uprooted groundnut from fixed blade got separated from soil clods. They tested it in about 25 *beegha* of land but the design got copied by other manufacturers from Ladnu and Bikaner. However, during testing, they had noticed that the power and fuel requirements of the digger were quite high. So they further modified it (sometime in 2012) by providing another horizontal rotary blade rotating in opposite direction to the existing rotary blade.

### The groundnut digger

The machine is a tractor mounted, PTO powered groundnut digger, which is lighter with better weight distribution and has double beaters to reduce load on the engine.

The digger has a self-made frame, a telescopic propeller shaft, gear box, belt and pulleys for speed reduction, rotary shafts having blades, vibratory sieves, etc. The machine can be fitted with standard 540 rpm PTO. The main rotor which digs the land rotates at a speed of 500 rpm, while the secondary rotor shaft rotates at 250 rpm in opposite direction. It helps in breaking the soil lumps easily and prevents foreign material and lumps to enter towards the main roller. The other performance parameters of the digger are as follows: cutting width: 5 feet 1 inch (1.55 m); working depth: 4 inch (0.1 m); field capacity: 1 *beegha* per 2 to 2.5 hours; digging capacity: 500 kg per *beegha*; fuel consumption: 2 to 2.5 lit per hour. The weight





of the digger is about 550 kg and minimum 35 hp tractor is required for operation, with negligible extra maintenance cost.

#### Developing the disc harrow seed drill

While using cultivator based seed drill (shovel type furrow opener), seeds get stuck or are placed incorrectly due to the presence of weeds. In 2013, they came up with seed cum fertilizer drill with single disc. They then developed disc plough and disc harrow based seed drills and found their performance to be better than cultivator based seed drills, preferring to use disc plough based seed drill with gram and mixed cropping.

#### Tractor Mounted Disc Harrow Seed Drill

The brothers have developed a seed drill/seed cum fertilizer drill using a single gang of disc harrow as the furrow opener.

This tractor mounted harrow seed drill consists of a gang of discs (11 in the present prototype), ground wheel, seed box, agitator for preventing bulging, vertical disc type seed metering mechanism, chain and sprocket for transmitting power from ground wheel to seed metering mechanism, seed box, fertilizer box, etc. The row to row spacing is maintained at 20 cm (average) while plant to plant spacing can be adjusted by the change in the speed of operation. For changing the depth of seed placement, angle of pipe can be changed. A covering has been attached to cover the seed, which otherwise get eaten by birds, rats or insects. The other performance parameters of the digger are as follows: cutting width: 6 feet (1.83 m); working depth: up to 3 to 4 inch (0.07 to 0.1 m); field capacity: 2 *beegha* per hour, fuel consumption: 2 lit per hour. Minimum 35 hp tractor is required for operation, with negligible extra maintenance cost.



STATE

Robotic Sprayer

Ganesh Shetty  
Chikamangalur, Karnataka

**G**anesh Shetty (59) undertakes electrical repairing works. He has developed a remote controlled engine operated areca-nut/coconut tree climber along with a spraying attachment.

As he did not have any agricultural land, Ganesh started servicing televisions. But unfortunately due to some problem in his eyes, he had to discontinue this. Hence for the last six years, he has been engaged in servicing and installation of solar power equipment. In his free time, he helps children in the preparation of their science projects.

#### Genesis

The labour charges for spraying pesticide in areca-nut crop is Rs. 1000 to 1200 per 200 liters of spray. Seeing his interest in developing science based projects, a few farmer friends approached him and discussed their areca-nut spraying problem and requested to develop a solution. After some detailed discussion with his friends and assessing their requirements, he could come up with a prototype that addressed most of their needs.

#### The robotic sprayer

It is an engine operated robotic climber using chain with rubber grippers (like caterpillar legs), which can climb up to height of 50-70 feet and spray pesticide while climbing up an

arecanut tree. The device runs on a 54cc petrol engine and along with the spraying attachment can climb up to 60 feet in approximate 7 min including setting up time of the device. The







spraying attachment consists of pump and nozzle with pipe used to spray liquid pesticide on areca-nut tree. This device can be controlled through remote within a radius of 200m and needs two persons for installation.

A functional prototype has been developed at a cost about Rs. 60,000. However the device is under development stage. The device, which has been converted from an electric model to petrol engine operated model, is being used by many local people. It has great potential in areas where areca-nut, coconut and palm are major growing trees. The machine will not only reduce the dependence on labours/workers but also prevent accidents. It can be used for applying pesticides, growth promoters and sometimes also used for applying water for short relief of plants in areca-nut plantation as well as coconut plantation.



STATE (JOINT)

PCB repairing device for mobiles

Mohammad Shafi Ahanger  
Anantnag, Jammu and Kashmir

**M**ohammad Shafi (32), a mobile phone technician and an innovator has developed a semi-automatic device for repairing of the Printed Circuit Boards (PCBs) of mobile phones or any other small gadget.

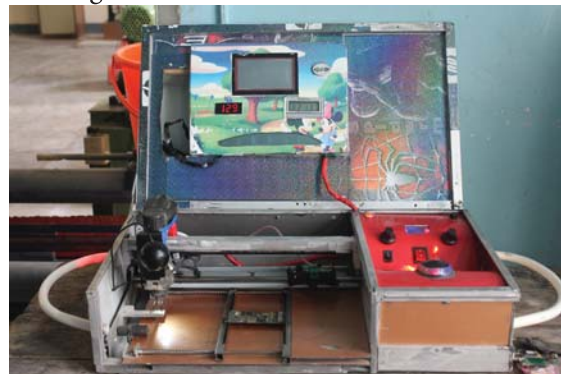
Shafiq was born in a small rural hamlet in Anantnag district of Jammu and Kashmir. Since there was no school in the vicinity, his basic education was imparted by his mother in native language till he was eight. Later, his father, a blacksmith by profession, got him enrolled in a government school. But due to severe financial constraints in his home, he had to discontinue after class twelve and start working to supplement family income. He then started a mobile repairing shop. His father mentions that Shafiq has always been bright since childhood and has had a keen interest in electronics and machines however due to their financial conditions, he has not been able to convert many of his ideas into practice. Despite all hardships, Shafiq says his family has remained a great pillar of strength for him.

#### Genesis

One day while repairing a mobile phone, he realised that while removing faulty Integrated Circuits (ICs) from the PCB of a mobile, it becomes quite difficult to hold the heat gun

and tweezers at the same time. He then felt a need to develop a device, which can help remove and place ICs on mobile phone PCBs easily. He had earlier also made a multi-meter kind of a device for himself to help in repairing work. He did not have any technical issues while developing the machine however finances were a problem hence he could not purchase and use new components. He scouted for old and used components from old and damaged printers, cameras and other damaged electronic gadgets. Thus it took him quite some time to develop the machine.

He got in touch with GIAN/NIF Cell Jammu and Kashmir and NIF through his cousin. Thereafter things eased a bit and he could get support from NIF for prototype development. A patent (201611022233) was also filed by NIF in Shafiq's name by NIF. The innovation is being incubated at GIAN/NIF Cell.





### The PCB repairing device

The device is a semi-automatic set-up which has a PCB holding bed movable along Y-axis and a desoldering heat gun attached to a movable X-axis controlled with a joy stick. A camera is attached to the gun to capture the zoomed-in view of the PCB/ICs kept below, which is displayed on a small LCD screen. The heat gun is turned on and off with a switch. Tweezers are attached besides the heat gun, which moves down and grips the IC when controlled with a mouse. The X-axis can be locked for proper positioning of the tweezers. It also has a multimeter to show the voltage

current and other electrical parameters. The machine is operated by DC power supply while the heat gun can be operated by AC or DC power supply. The machine has cost Shafiq about Rs. 10000 to develop.

Shafiq has also come up with a number of other useful innovations. He has designed a lantern using salt water as a fuel and portable walnut huller, which helps reduce the drudgery involved in hulling manually. He wants to develop technological solutions for people to use in their everyday life to make their life easy and comfortable.



STATE (JOINT)

Multipurpose tool - Axe cum chisel cum hammer

Mohd Rafiq Ahanger  
Anantnag, Jammu and Kashmir

**M**ohd Rafiq Ahanger (42), a blacksmith by profession, and an innovator, has developed a multipurpose tool, which can be used as an axe, hammer, chisel, blade, screw driver for domestic or other carpentry tasks. Born in the family of blacksmiths, Rafiq did not have an easy childhood due to financial problems. It was tough for his father to raise eight children, two sons and six daughters. He mentions that though they come from lower income background, he never felt poor due to the many sacrifices his parents made for their children, in an attempt to give the best possible upbringing. Since childhood he had access to blacksmith tools, iron and steel, with which he liked to play a lot. He tried repairing old gadgets, making toys from iron, or simply making small replicas. His parents never stopped him from doing anything he wanted. He studied till class ten and then took up odd jobs before finally settling into his father's workshop.

In 1995, at the age of 20 years, he started his own workshop where he started making grill gates, different iron structures for household use along with the motor repairing work. Born and brought up in a rural area, Rafiq identifies with the problems people have to face and that reflects in the kind of products/ innovations he comes up with. Given the pathetic condition of electricity in the region, for his workshop, he was in

dire need of an electricity generator but he could not afford it. He thought of designing a pressure generator for producing electricity by pressing it continuously. Rafiq claims to have developed a generator, which could produce 40W electricity by pressing it continuously. This won him a lot of admiration in the district and he got invited to the Islamic University of Science and Technology to demonstrate his device. For there he got linked to the GIAN Cell J&K, regional office of NIF established in partnership with the University of Kashmir, at Srinagar.

Rafiq devotes most of his time working on his innovations and developing new prototypes. His wife has been very considerate and supportive of his efforts and has offloaded much of the family responsibilities from his shoulders so that he can continue his work. She hopes one day the persistence of her husband gets recognised. '*Mehmatas Chu fal*', she says meaning hard work secures reward.







### Genesis

Rafiq lives in a village and frequently faces problems using the many available agricultural tools for different works like carpentry work, agricultural work, wood cutting etc. He realized that if there could be a multipurpose tool, not only cost but carriage and storage will also be easy. The multipurpose tool has been designed in such a way that it can be beneficial for both domestic and agricultural purposes.

### The multipurpose tool

The multipurpose tool is an implement combining the three basic tools required by a worker/ farmer viz. hammer, chisel and axe, costing about Rs. 1500.

The multipurpose device is made from high carbon steel and can be used as one of the three tools as per the requirements. This tool can replace or combine various tools into a single product rather than having them separately, for example, as an axe for cutting wood, hammer for fencing, chisel for carpentry, nail remover for removing nails. This tool reduces human

effort by combining multiple tools and benefits the user by monetary terms. NIF has filed patent application (280083) and design registration in his name.

### Other works

Rafiq has come up with a number of other useful ideas and innovations. He has developed an implement for easy digging, which is a hand tool, and can be used for digging as well as collection of the dug mud/soil. He has also developed an ergonomic spade, automatic sieve, safety jacket for walnut harvesting, modified iron sheet cutter, automatic sickle, and improved cloth iron among others.

He has participated in a number of exhibitions and events like Regional Science Congress (2009), Indian Science Congress (2014), at NIT, Hamirpur (2014) where his work has been quite appreciated.

Entrepreneurship goes hand-in-hand with innovation, in 2015, Rafiq was given the non-exclusive manufacturing and marketing license of walnut cracker and walnut peeling machine of Mushtaq Ahmad Dar. The two technologies required considerable modifications to get the acceptability of farmers/ end users. Rafiq had to work on the technologies and refine them. The new products are improved versions of the original technologies, and have been much appreciated by users and experts. However, some refinement is still going on based on specific inputs. To help him in scaling up his innovations, NIF is planning to register a company, "Rafiq Innovations Private Limited", under the NIF Incubation and Entrepreneurship Council (NIFentreC), a technology business incubator.





STATE

Cooking cum drying stove

Maibam Deben Singh  
Imphal West, Manipur

**M**Deben Singh (65) is a fabricator and an innovator who has designed and developed a cooking cum drying stove, in accordance with the food preference of people in Manipur where dried fish, meat and vegetables are also consumed and much liked.

Deben Singh is the eldest of twelve siblings. His father was government jeep driver while his mother was a housewife. As a child he had a lot of interest in making toys and models of aeroplanes. He was quite athletic as well and actively participated in various sports events like football, volleyball etc. Since he had a large family, his parents could not support all of the siblings properly, finance was a big concern for them. As a result, he could study till class seven only. Initially he started his career as a jeep driver, like his father but due to frequent long distance travel, he settled down as a blacksmith making biomass stoves, dryers and other household use items. He has been in this business for over thirty five years now. In his family he has his wife, his son, his wife and a grandchild.

#### Genesis

In his long career as a blacksmith, Deben Singh has made a number of biomass stoves and dryers, of different sizes and capacities. The idea developing Cooking cum Drying Biomass

Stove struck him while he was participating in the Innovation Exhibition at the Rashtrapati Bhavan in 2013 where he was awarded for his Emoinu stove. During the demonstration of his biomass stove on top of a table, he noticed the area beneath the stove slightly charred due to the heat emanating from the bottom of the stove. It then struck him that he could tap this heat and use for drying food material. After the exhibition he started working on the Cooking cum Drying Biomass stove and took about six months to develop an operational prototype where both cooking and drying of fish, meat, vegetables etc. was possible simultaneously.

The stove was designed in accordance to the traditional food preference of Manipur, Nagaland etc. where people dry various items like fish, meat, certain vegetables etc. over the hearth. The dried items get the flavor of smoke. However, with introduction of LPG based stoves, cooking pattern has changed, now people use separate biomass/charcoal dryers. Drying fish/meat over the LPG stove is not preferred as the dried items neither have the flavour nor the taste as in the traditional process.

The cooking cum drying stove

This is a wood charcoal fuelled cooking stove with a number of drying trays below the gas



top, to dry various food items. The stove is a self-standing one, which also serves as doubling as a work place having a work platform at a height of 75 cm from ground and measures around 60 cm x 90 cm. Two cooking stoves have been provided at the top and a third one for drying purpose at the bottom in the centre.

The stove emits very less smoke and also dries the food items effectively. As the entire system is made in galvanized sheet metal/aluminum, upon use it gets warm and dissipates the heat to the surrounding, keeping the room warm as well.

The stove has been tested at IIIT, Manipur, Imphal where the system was found to be more efficient than available charcoal burning chulha. This possible because the air used to burn the charcoal comes through the enclosed box, where it gets preheated. So some part of waste heat gets recovered and hence the efficiency of the cooking stove cum dryer

is about 10 % more than the conventional system. The air intake to the stove is regulated through proper vent system and depending upon the type of food cooked can enhance the fire or reduce the burning of the fuel. For ease of circulation, a small fan has also been incorporated in the system. IIT Manipur has suggested modifications in the cooking stove cum dryer to make it more efficient and user friendly.

Over the years Deben Singh has participated and displayed his stoves and dryers in a number of exhibitions and fairs at state, regional and national level. He has also received a number of awards for his contribution in development of useful technologies and skill development. Recently, Department of Commerce and Industries, Govt. of Manipur has allotted him a permanent work shed at an Industrial Area in Imphal where he would now get uninterrupted power supply, which will help him scale up his production. NIF has also supported him through its business development grant and recently through the Micro Venture Innovation Fund (MVIF) for scaling up his business. The rights of his for Innovative fish dryer and Emoinu stove have also been acquired under Grassroots Technological Innovation Acquisition Fund (GTIAF) by NIF for wider diffusion. Deben Singh is also planning to impart skill development training to interested local youth so that they can work with him or start their own enterprise.



STATE

Step-lock system in bus

R Santhosh, J Rajasekar, A Nivashini, K Rathna  
Tiruvarur, Tamil Nadu

After reading about accidents occurring when people stand at the stairs of the bus or run to catch the bus, the four young students independently thought of a system in the bus, which would not allow the bus to move if people are standing on its stairs, thereby preventing accidents.

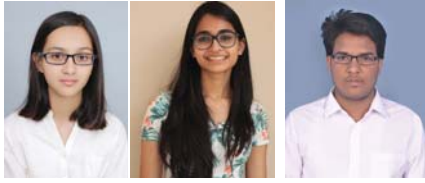


Santhosh thought about this idea while commuting from his village to his school

daily. He finds physics quite easy and wants to pursue aeronautical engineering and take up space research. Nivashini likes reading story books and wants to become a doctor. Rajasekar likes outdoor sports, participates in NCC and would like to become an IPS officer while Rathna, who also likes reading books, wants to become a teacher.

Presently, Santhosh is doing his Diploma from Paavai Engineering College Namakkal. Rajasekar is currently pursuing Diploma in Mechanical Engineering at Annai College, Kumbakonam.

Rathna is currently undergoing teacher training in Mannargudi teacher training college while Nivashini is studying BSc Maths at Prist University, Thanjavur. All of them had submitted their idea while in school and had won NIF's IGNITE award for the same as well.



STATE

Posture correcting chair

Kulsoom Rizavi, Tarun Anand, Sunvi Agarwal  
Lucknow, Uttar Pradesh; Ghaziabad, Uttar Pradesh;  
Chandigarh

Three students have independently conceived the idea to have a chair with sensors at appropriate places, which will alert the user if s/he is sitting in a wrong posture.



Young Kulsoom thought that while it may not be possible to be reminded again and again by someone for not sitting properly, this task can be done by the chair itself. She likes gardening, arts and crafts, writing stories and poems. Infact she plans to get her own book published soon and grow up to become an entrepreneur selling hi-tech machines in an automated shop. She has an elder sister who loves her much and a younger sister whom she loves the most. Kulsoom is now studying in class eight and likes participating in many science and art contest.

Tarun wants to have such a chair to escape his mother's scolding. He has an interest in electronics and likes to know about new and emerging technologies apart from playing cricket in his free time. Both of them conceived this idea after being regularly scolded by their mothers for using a bad posture while sitting. Tarun has been preparing for engineering entrance examinations after completing his class 12.

Sunvi felt the need for such a chair realising that she often reclined or assumed bad posture while watching television. She

adds that when the viewer would bend forward or take ergonomically bad posture, the sensors will detect the motion and put the TV on standby. Hence until one sits properly, TV would not switch on. Sunvi loves to write- articles, stories and poems. She participates in debates, panel discussions, plays badminton and is now learning photography. She wants to take up such a job when she grows up which does not restrict her to a table and a chair; Indian armed services is one of her choices. Sunvi is presently pursuing Bachelor in Management Studies from St. Xavier College, Mumbai. She had submitted this idea for NIF's IGNITE competition while she was in school and won an award as well along with the other two children.

STMicroelectronics, a leading manufacturer of semiconductors globally, has engaged with Honey Bee Network and NIF to help develop improved prototypes of grassroots technologies. Engineers of this firm worked on two technologies (Posture correcting chair and Helmet controlled ignition system in two wheelers). A prototype of Posture correcting chair, was developed by the STMicroelectronics team for which



suitable modifications are being discussed to explore the possibility of integrating this chair in tractors with the help of John Deere, leading agricultural, construction, forestry machinery manufacturing company in the world.





STATE

***Chingjin Thabi Selection*** – Improved cucumber variety

Sapam Lukhoi Singh  
Thoubal, Manipur

Sapam Lukhoi Singh (43), a farmer from Thoubal, has developed an improved cucumber variety through selection from a local variety *Chingjin Thabi*. The specific characteristics of the variety are high yield, dark green colour, tolerance to leaf curl and

long storage life.

Lukhoi Singh (43) is a school dropout. Being the eldest son and due to financial constraints, he had to start assisting his parents in farming, which he took up as a profession later. He



lives with his wife, three children, all of whom are school students, and a differently abled brother. His wife assists him in all the farming activities and marketing of the farm produce in the nearby markets. The main crops grown by him in his field are cucumber, cabbage, pea, potato, pumpkin, french bean, cauliflower, tomato, paddy. The farmer has developed various other crop varieties through selection such as pea, potato, pumpkin, french bean. Now he is recognized as a model farmer in his district.

#### Genesis

In 2001, Lukhoi Singh sowed the seeds of a local cucumber variety *Chingjin Thabi*, which was procured from a fellow farmer in Thoubal District. At the time of harvesting he found the matured fruits to be of varying size and colour. Being an innovative farmer he selected the seeds from the biggest fruits which were dark green in colour and sowed them in the next season. The same process was continued every season till 2005. The desirable characteristics of dark green color and big sized fruits were found to be stable in the year 2006. Subsequently, the seed was distributed to other farmers for cultivation and named as *Chingjin Thabi Selection*.

#### The variety

This dark green coloured high yielding variety is suitable for sandy loam soil and sown in March-July. It has tolerance to leaf curl and has long storage life (10-15days). Diseases like yellowish patches, downy mildew and powdery mildew are observed but can be controlled by using fungicides.

In trials, the farmer's variety *Chingjin Thabi Selection* (25.87t/ha) was found to be good and high yielding next to *Alimgir CT 380* (30.63t/ha) a very high yielding variety from Thailand

which is grown commonly in Manipur. The longest fruit (24.42cm) was also recorded from *Chingjin Thabi Selection*. The average number of fruits/plant (17), fruit weight/plant (1.08kg) and yield (25.87t/ha) of the farmer's variety were also found to be higher than the other three check varieties taken up for the trials. The application for registration of the variety has been submitted to PPV&FRA, New Delhi.

Apart from scientists, Lukhoi Singh has given the variety's seeds to approximately 200 farmers for cultivation purpose. In the villages, farmers normally do not purchase planting materials instead they exchange their planting materials with each other. Many farmers, who have used the seeds were happy with the performance and added that they could earn good income every season.

For his efforts, Lukhoi Singh has been awarded and recognized at many events in Manipur and outside the state. He has also developed other crop varieties through selection such as pea, potato, pumpkin and french bean. The experimental trial for these varieties is ongoing at *Central Agricultural University, Imphal, Manipur*



## STATE

Improved variety of Soybean: Pandrinath-1

Kashinath N. Lokhande  
Betul, Madhya Pradesh

An agriculturist, Kashinath (59), has developed an improved bi-seasonal variety of Soybean, which has high yield and uniform pod size. The variety is tolerant to Yellow Mosaic Disease.

Kashinath owns five acres of land where he cultivates soybean, wheat, gram and orange as major crops. Agriculture is the major source of livelihood for his family, with a major contribution coming from the sale of oranges. Though he has studied only up to class ten but has been motivating his two daughters and son to complete their studies properly. With active



support of his wife in agricultural activities, he has been able to undertake all tasks properly. Presently, he is working on the development of an improved variety of soybean.

He is a well-known farmer in the region for soybean variety development. He developed interest in farming due to his elder brother, whom he considers as his role model. Prior to being a farmer, he was a truck driver. His family supports him in his all research work, his nephew now actively works with him.

### Genesis

Soybean is an important pulse crop in India. In Kharif 2008, Kashinath observed some healthy plants of JS 9752 variety with early maturation (10-12 days early). He selectively harvested about 300g of seeds from the plants. In 2009, he cultivated the seeds in a separate lane and harvested 15kg of seed. He repeated the practice year after year and in 2012 he had about 75q of seeds of this variety. He has been cultivating and distributing the variety since 2012.

### Pandrinath-1 Soybean variety

Soybean Pandrinath-1 is a bi-seasonal variety of 90-95 days where the plants have comprehensive growth habit with more number of pods and bold sized seeds. The variety is tolerant to Yellow Mosaic disease, has bold seeds, high yield of 12-15 q/acre and is suitable for heavy and low rain areas. Also no fertilizer is required for the crop.





The field trials on soybean variety *Pandrinath-1* was conducted in Madhya Pradesh, Gujarat and Karnataka where it was found to be early maturing (95-100 days), having high yield and had a disease free performance. Many farmers of Madhya Pradesh and Maharashtra are cultivating his variety and appreciate its performance. In 2015, due to low rains in soybean growing areas of Madhya Pradesh and Maharashtra, six varieties failed but the performance of *Pandrinath-1* soybean has been constant in the last two years. For this soybean variety, *Kashinath* has been felicitated at the regional level and a few articles have also been published in local newsletters about the variety.



STATE

Improved traditional variety of Brinjal: Niranjan Bhata

Leela Ram Sahu  
Dhamtari, Chhattisgarh

A progressive farmer, Leela Ram (55), has improved and conserved a good quality traditional brinjal variety and has been maintaining the purity by mass selection. The variety, known for its fruit quality, is resistance to major pests and diseases.

Leela Ram lives with his wife and two sons, who are pursuing higher education. His three daughters are married and settled in their respective families. He owns about 7.5 acres of land where he cultivates paddy, gram, black gram, vegetables and traditional local crops like *lakhodi*, *bhains-teti*, and *dang kanda*. Prior to taking up agriculture he worked as a tailor briefly. Aware of the water scarcity problem in his area, he started making check dams, which helped in irrigation of the fields, for which he was much appreciated by the villagers. He thereafter took to farming full time and started devoting his time in his own farm experiments.



Leela Ram is also a social worker and guides villagers on the problems shared with him. He hopes one day, his variety gets diffused to all parts of the country.

#### Genesis

Niranjan Bhata is a traditional variety conserved by his forefathers. He has been conserving and cultivating the variety for the last 28 years because of its fruit length, yield and resistance to major insect-pests and diseases. He adopts mass selection method to get improved seeds for the next season. The criteria of selection are fruits length, spine on stem & calyx, resistance to pests and disease and more fruits per plant.

#### The variety

The Niranjan Bhata variety has long sweet purple fruit with spine on stem and calyx. The number of fruits per plant are more than other commonly available varieties. The variety is resistant to major diseases and pests. The report received from Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya (IGKV) Raipur, Chhattisgarh during 2016-2017 confirmed that the variety Niranjan Bhata possesses longer (45-60 cm) and good quality fruits. Report also confirmed that the variety has lower instance of insect pest & disease and is a valuable traditional cultivar for research purpose.

NIF facilitated the trials of this variety for dissemination in farmers' fields in Bihar, Kerala,





Manipur and Gujarat. The results revealed that this traditional variety of brinjal is also cultivable in Kerala, Manipur and Gujarat giving higher number and longer fruits.

A number of local editions of newspapers have written articles on this variety and Leela Ram has been felicitated at the local and regional level for his efforts to conserve the variety.



STATE

Improved varieties of *Anthurium* and its planting method

D. Vasini Bai  
Thiruvananthapuram, Kerala

Vasini Bai (64) has developed ten varieties of *Anthurium* by cross pollination. Large and medium flowers with rare color combination (light and dark orange, magenta, green and rose color combination, dark red and white colors) are uniqueness of these varieties. She has also developed new method for raising the seedlings in limited space using corrugated asbestos sheet and for transplanting grown up seedlings she used concrete troughs instead of pots.

Farming is her main occupation in which she has been involved for more than forty years. She lives with her husband who worked as a draughtsman earlier. Their three children are professionally qualified and settled with their families. Vasini Bai's father was a farmer and she was inclined towards farming since childhood.

She helped her father in all the activities of farming. She got married at the age of 20 and moved to her in laws place, where she started growing vegetables and raising chicken in her farm. Presently, she owns a small piece of land near her house and cultivates *Anthurium* and many exotic flowers including several types of orchids. She also cultivates pepper, turmeric, banana, various types of vegetables and fruits. She sells the *Anthurium* flowers and plants to local florists as well as florists from Pune and Mumbai through an agency at an average price of rupees 60-75 per flower.

Genesis

About 35 years ago, in late 1970s her son brought two plants of *Anthurium* from a friend's house and she liked the flowers very much and wanted to raise more such plants. She got



interested in floriculture and started growing various kinds of flowers in her backyard and farm. She learned through trial and error kept experimenting with various techniques. Her interest in *Anthurium* kept her motivated for further experiments.

In 1980 she manually cross pollinated for the first time and after years of experiments she developed her first variety of *Anthurium*- Dora (single plant with 8-10 leaves and multiple flowers i.e. orange colored spathe) in 1985. She continued her work and during 1985–2000 developed another five varieties viz. Dora- I, Dora –II, Dora –III, Dora –IV and Dora – V. The other five varieties Akash, George, Giant Pink, JV Red and JV Pink were developed later through manual cross pollination.

Cultivation method: The seeds are sown in trays over the soaked cotton covered with glass plates. Seedlings are formed in 8-10 days. When the plants are four months old, they are replanted on the beds of corrugated asbestos sheets. The beds are formed by using river sand, chopped dry leaves and small chops of coconut husk. In 12- 15 months the plants begin to flower. Again the plants are replanted in flower pots or in bulky huge RCC molded troughs.

The salient features of all the varieties are large beautiful flowers, different colors of spathe and spandex, long stalks and longer shelf life.

The details of all the ten varieties are as below

1. Dora I: Medium plant, large flowers, orange spathe, white and yellow spandix.
2. Dora II: Large plant, large flowers, light orange spathe, spandix light and dark orange.
3. Dora III: Medium plant and flowers, dark

orange spathe, light yellow spandix with dark yellow tip.

4. Dora IV: Large plant, medium flowers, light orange spathe, white and yellow spandix.
5. Dora V: Medium plants, large flowers, light orange spathe, white and orange spandix.
6. JV Red: Large plants and flowers, hard pink and yellow spathe, pink and yellow spandix.
7. Giant Pink: Extra-large plants and flowers, pink and green spathe, white and yellow spandix.
8. George: Medium plants and flowers, red spathe, yellow and orange spandix.
9. Akash: Medium plants and flowers, white spathe, orange and yellow spandix.
10. JV Pink: Large plants and flowers, pink spathe, white and light yellow spandix.

Vasini Bai has received a number of awards and recognition for developing these *Anthurium* varieties. She has provided Dora, George, JV Pink, JV Red for tissue culture at Tropical Botanic Garden and Research Institute, Palode for mass multiplication.

Facilitated by NIF, four hybrids and six parents are being evaluated under the varietal testing programme of TNAU, Coimbatore. Six parents of these four hybrids are looking healthy, vigorous with colourful spathes ranging from light pink, pink, red, white, violet and orange. The leaves are shiny, medium large and heart shaped. The flower spathes are bright coloured and has short spadix. These parameters are comparable with existing commercial varieties. It is expected that the hybrids from these parents will also produce prominent and distinguishable characters of parents, comparable to commercial varieties.



STATE

Herbal medication for treating bloat in animals

Sitanath Munda  
Ranchi, Jharkhand

Sitanath Munda (48) is an agriculturist who is also quite known for providing herbal treatments for various human and animal related ailments. His herbal practice for bloat, a condition where excessive gas gets accumulated in stomach, has been found to be novel and promising.

Having studied only up to class fifth, Sitanath, got inducted early into agriculture to support his family. From his father, he not only learned how to practice agriculture but also a lot of herbal practices for treating various diseases of humans and animals. His father was also very well known in the region for his herbal knowledge. Sitanath lives with his mother, his wife and their two sons and their family. One son has moved to Gujarat to undertake various vocations while daughter is married and settled.

He has been practicing various herbal medications for animal ailments since the age of 15 years. He is famous for providing herbal medication for human ailments like epilepsy and tuberculosis and animal diseases such as bloat and mastitis. People from adjoining villages

come to him for the treatment of their livestock whereas for human health related medications people come from as far as north Bihar. Apart from giving medicines at his home, he also goes to different villages to treat livestock, if required. He himself does not charge any fees, those who may be capable and willing, pay for his services as per their discretion. In the last so many years, he claims to have treated more than 500 animals for various clinical ailments.

His medication for the treatment of bloat was found to be unique and clinical evaluation was conducted. The medication was found effective by improvising digestive function of rumen in livestock. Community meetings were held among herbal healers and villagers in many villages of five districts to ascertain whether the knowledge was or not. During the interaction, no body reported the use of the particular plant for treating bloat in animals. He has shared all his knowledge with his wife Savani Devi also. His wife and younger son, Tribhuvan, help him in the collection of herbs and the preparation of medications. He wants his son to learn whatever knowledge he has so that the tradition of serving society continues.





## CONSOLATION

Groundnut nut digger with vibration pads

Ratanram Dudhval  
Sikar, Rajasthan

Facing problem of frequent wear and tear and maneuverability of commercial tractor operated groundnut digger especially at the corners, Ratanram Dudhval (52) modified the groundnut digger by adding a vibration pad/shock absorber spring and two pivoted wheels to its rear.

Ratanram, who only studied till class nine, is a mechanic and runs his own small scale industry named Jay Kishan Krishi Yantra Udyog with his younger brother, and their sons. Due to his family conditions, he could not continue his studies further and had to engage himself in farming activities. Six years back,





he shifted to a nearby place to set up a small scale industry for manufacturing agricultural machinery like plough, harrow, seed drill, groundnut digger, trolley, chaff cutter, tractor operated bull dozer etc.

#### Genesis

Ratanram had observed the difficulties faced by farmers in getting labourers and also incurring losses due to inefficient digging. He himself had purchased a groundnut digger in 1998 (manufactured in Elanabad, Punjab) and later another digger manufactured in Ladnu. In both the diggers, he faced frequent wear and tear, and maneuverability issues. As he had been repairing the machines used by other farmers and was aware of the issues due to wear and tear, he modified the groundnut digger and developed two different variants. One variant he developed had a loaded spring at the front of ground nut digger and wheels for supporting the machine. The other one had towed wheels, which help in steering the

machine in desired direction along with leather belt as vibration pad.

#### The groundnut digger

In the conventional groundnut digger the innovator has added vibration pad/shock absorber spring and two pivoted wheels in the rear of groundnut digger. It is claimed to reduce load on the tractor's three point linkages and increase maneuverability due to wheels, reduction in breakages (mainly bearings) due to vibration pad, approach of machine in corners and easy driving on bunds and channels in the field.

The machine, which can be fitted to standard 540 rpm PTO, can cover 4 ha in 8 hours, consuming 6 lit diesel. He has sold over 350 machines in the last 5 years at a price of Rs 120,000-140,000/-. The customers who purchase machine in 2011 are still using the machine and the sale is mainly based on word of mouth, which confirms the acceptability of machine among the farmers.



## CONSOLATION

Tractor Mounted Combine Harvester with Straw Collector

Sunil Kumar  
Ara, Bihar

Facing acute shortage of workers, Sunil Kumar (40), an agriculturist hailing from a small village in Ara district, has come up with a tractor mounted combine harvester, which can collect straw as well.

Like his father, most people in Sunil's village undertake farming as a profession. Choosing agriculture as a profession came naturally to him and he joined his father after completing his higher secondary. He lives with his mother, wife and three young daughters. His spouse is a housewife and helps him in his work

occasionally. During summers, in addition to farming, he makes ice candies and sells them in his village and nearby areas. Since childhood, he had been interested in machinery and wanted to study further but family circumstances forced him to start helping his father in their farm.

### Genesis

About six-seven years ago, farmers of his village had to face a lot of problems due to non-availability of workers for harvesting standing crops. He started thinking about the possible solutions and taking about a year



or so conceptualizing the design, he started working on the prototype in early 2012. His first prototype was short of his own expectations but he analysed the problems and learning from his mistakes, developed an improved prototype in 2013. His first trial on paddy crop was successful however, there were still certain areas, which needed improvement. Hence, in an attempt to make the machine more efficient, he kept on redesigning and rebuilding, developing about 4-5 prototypes in the process. He also filed a patent for the same. Being a determined and self motivated man, he could take all the problems in their stride. However, recalls the support of his three close friends, who not only supported him emotionally but also helped with some finances whenever required. He also acknowledges the support of spare part sellers from Haryana and Punjab, who helped him. He was ably supported by his wife and other family members as well in his attempt to make a good machine.

#### Tractor Mounted Combine Harvester with Straw Collector

It is a tractor mounted combine harvester with the provision of collecting chaff. The machine is combination of vertical conveyer reaper, crop conveying mechanism, thresher and sheet metal tank/bin for chaff and straw collection.

It can be operated using tractor of 45 hp and above. Front mounting on tractor and collection of straw with less height of left over

straw after harvesting are unique features of this combine harvester. A vertical conveyer reaper is mounted in front of the tractor which can be lifted up to 9 inch from the ground. A commercially available thresher is attached in between the reaper and the tractor front. Both harvesting and threshing unit are connected through two self-made conveyer units. Cereal crops are gathered in by the header in the front, the cutter bar runs the entire length of the header to cut off the crops at their base and convey vertically to one end and windrow the crops on one conveyer. The cut crop travels up through conveyer to the processing mechanism inside the threshing unit. A threshing drum beats the cut crop and separates the grains from their stalks, which are separately collected. The straw chaff, after being cut into small pieces, gets collected in a separate tank.

It can cut and process 12 quintals of grains straw in one hour. It has been successfully used for harvesting wheat and paddy and may also be suitable for soyabean, mustard and all other crops for which the traditional harvesters are suitable. The speed of operation was found to be 4 km per hour with fuel consumption of 12 litres per acre. This harvester eliminates the dependence on labor while increasing the productivity. Since straw is cut close to the ground, there is no requirement for burning it hence it helps in retaining soil micro flora and prevents pollution too.





## CONSOLATION

Tractor mounted combine harvester with straw collector

Rajpal Singh Narwariya  
Ashoknagar, Madhya Pradesh

**R**ajpal (38), a farmer and a passionate innovator working on the development of farm machineries, has developed a tractor mounted, power take off (PTO) powered combine harvester, which also has the provision of collecting the straw. His machine is a low cost one as compared to available alternatives.

Born in a farming family, Rajpal is the eldest of seven siblings. He did not continue studies after higher secondary and took up farming

to help his father. With the main occupation of the people in his village being farming, his interest naturally grew in farming and in the machines used for various farming operations. His other interests include sculpture making and painting for which he has won many awards as well. He is married and settled with his wife and five children.

His life's journey has been a mix of ups and downs. Since the family had financial problems,



he used to make his own toys and for his siblings using the waste material available. Rajpal recalls having made a wind mill and fan arrangement which could bring outside fresh air inside the house. He liked studying but could not continue due to financial problems, then again in many of his technical projects, arranging finance was difficult, and many of his ideas, remained at the idea level only. Notwithstanding problems, with time his interest in solving problems of farmers and for women farm workers by developing low cost technologies increased. His family has been always supportive of all his endeavours, which he greatly appreciates. He says his journey has been tough but at the same time very exciting and great learning experience for him.

#### Genesis

Most farmers in his region burn the leftover in their fields after harvesting. One year this led to a huge fire, which burn down many farms and a village. This made him think to develop a machine, which could harvest and store straw as well. He wanted it to be easily assembled and which could be attached to a tractor. While he was working on the harvester, he also noticed the drudgery involved in carrying a knapsack sprayer and worked on a wheeled sprayer, which was easy to manoeuvre in the field and also useful for small trees in addition to the field crops.

He started by having discussions with the famers about their requirements and whether the possibility of putting the tractor in front and combining all the three operation viz. reaping, threshing and winnowing, were desirable by them. He also planned the arrangement of the collection of straw at the storage space at the back of the machine. He went through

a number of iterations, where he invested considerable savings and personal loans without much success. In 2013, he was able to come up with one such design, which could perform the desired actions of reaping, threshing and winnowing. However, the machine had stability and vibration issues due to which it was not tested in the field. He further worked on the machine to arrive at the present design.

#### The machine

This is a combine harvester cum thresher with straw collector, which can be used with a tractor of minimum 45 hp. The machine consists of three main units: harvesting unit, conveying unit and threshing unit. The machine can also collect straw separately. One acre of land can be harvested in 1 hour with fuel consumption of 4 lit per hour. It has been found suitable for wheat, soybeans, sorghum and maize crops.

This machine consists of harvesting unit, conveying unit and threshing unit together which can do three separate operations viz. reaping, threshing and winnowing as a single process. A simple reaper with folding mechanism has been used as harvesting unit and a conventional thresher as threshing unit. The crop gets cut and conveyed to the threshing unit where grains are separated from stalks and stored in a collecting tank. The straw chaff, after being cut into small pieces, falls from the thresher at back of the machine and gets collected into a separate tank. This is then used as animal feed. The leftover on the field is mainly the remaining dried stems and leaves of the crop with limited nutrients which is either cut and spread on the field or baled for feed/bedding for livestock.





## CONSOLATION

Tractor operated blowing orchard sprayer

Rajendra Chhabulal Jadhav  
Nasik, Maharashtra

**R**ajendra Jadhav (56), a fabricator, realised while discussing with farmers that the sprayers used by them do not perform efficiently and most of the liquid pesticide gets dispersed into the air and thus wasted. This triggered him to develop a device, which can overcome this problem and work efficiently with proper spraying of pesticide on the plants.

His father was also a fabricator and had a workshop at a rented place where he worked with both his sons, Rajendra and his brother. Due to the poor financial conditions both brothers had to join their father early in the fabrication workshop after discontinuing their studies, where they did repairing and fabrication work of steel. With time the number of orders

increased, they expanded their workshop and also started the repairing work of agricultural water pumps along with domestic fabrication work like grills, iron roof, shade etc. In 1985, he started his own shop, Raju Engineering Works, where he started repairing of agricultural machineries and tractor. He now lives with his wife and two sons and their families. Both his sons joined him in his workshop after their graduation. Later, with increasing demand in the market for agricultural machineries, he started manufacturing agricultural equipment like mould board plough, cultivator, disc plough, etc. In 2001, he started another workshop named C. K. Enterprises where they started undertaking manufacturing of agricultural equipment.



### Genesis

In 2000, while interacting with farmers in Satana and nearby areas, Rajendra came to know that the sprayers used by them do not perform efficiently and most of the liquid pesticide gets dispersed into the air and thus wasted. This triggered him to develop a tractor mounted sprayer, which can overcome this problem and work efficiently with proper spraying of pesticide on the plants. He modified an earlier version of sprayer by making it tractor pulled type sprayer with 600 l storage capacity and eight nozzles. About seven units of the same were sold to farmers at a cost of Rs. 40,000 to 50,000. Later, while sprayer was used, issues related to efficiency and rusting came up, which led him to further work on the sprayer. They then modified the sprayer by using steel body of blower (instead of aluminium earlier) and by increasing the size of the air duct.

### The orchard sprayer

This is a blowing sprayer, which can be used in orchard crops with a tractor of 18hp and higher. There are two radial fans mounted on both the sides to ensure effective spraying of pesticides on the orchard crops. It also has

provision of rotating blower (fan) along with nozzles to spray pesticides in all directions.

The sprayer has been modified so as to spray pesticides effectively in orchards with less consumption of fuel and also less wastage of liquid containing pesticides. The pesticides are mixed inside the tank as per the requirement of crop and its age. A mixing chamber has been provided so that fine particles of pesticide get suspended in the carrying fluid due to the creation of high pressure inside the tank. The radial fans rotate in opposite directions to generate high air pressure. The pesticide gets blown out up to 10-12 feet. The sprayer takes power from tractor through PTO shaft by a V-belt which is directly connected to the gear box.

The sprayer can be used for spraying pesticides in crops like grapes, mango, sapota, pomegranate, etc. The sprayer requires 100-125 ltr of liquid containing pesticides for one acre land. Rajendra has sold twenty two units of this sprayer to farmers at a cost of Rs. 1,35,000 to 2,00,000 depending on the customers requirement.



## CONSOLATION

Rice grain sorting machine

Mohan Sharma  
Birbhum, West Bengal

**M**ohan Sharma (50) is a fabricator and is in the business of making doors, windows, and furniture items. He developed a rice grain sorting machine about three decades back and has sold about 2400 units of the same over the years. This machine separates husk, stones, etc from rice and also segregates rice grains with the help of an automatic/ manually driven wooden fan.

Second eldest among six siblings, he had to drop out in class tenth to help his father in their carpentry work. As orders were limited and not too many to come by, his childhood was spent in poverty though he mastered carpentry while working with his father. It was sometime when he was 22 years old that he thought of making a rice grain sorting machine and after two three unsuccessful attempts was able to develop one. Post marriage he shifted to a nearby place to open an independent workshop. In his endeavours, he was ably supported by his wife, who took care of her house and two sons really well. His elder son also joined him in his workshop after his class tenth while the younger opted out of studies during his graduation and became a civic volunteer. In their workshop they make different items like doors, windows, household/ office furniture and also the rice sorting machine. When he made the rice grain sorting machine, none

in the family realised he had done something innovative. However they were happy that he had developed something that would help in



business. Her wife helped him to introduce the machine in her native village.

#### Genesis

Normally people separate husk, stones etc. from rice by wind winnowing using handmade or woven winnowing basket or pedestal fans. One has to drop the grains by shaking the basket held above head height in front of that the fan so that air blows out the lighter chaff from among the falling grains. This is a tedious, drudgery prone and time consuming process. One day while working, he got this idea to develop a rice grain sorting machine. He thought instead of holding the grain basket in hand, if he could use a container on stand from where the grains could be dropped in front of the fan, it would then take less physical work. Then he added four separate compartments with separate outlets to deliver sorted grains. The whole machine looked like a big box with an uncleaned grain container on top of it.

#### The rice grain sorter

This is wooden hand driven cum motorized rice grain sorting device. Blower fan is provided to perform winnowing operation, which can separate husk from grains. Separate compartments with outlets are given to sort grains in different grades. The device has ability to sort 400 to 450 kg of rice per hour into different grades like clean grains, broken grains, and separate small stones and husk. The fan speed is set to be about 280 rpm.

Not only rice or paddy also other cereals, grains and seeds can also be winnowed using this machine easily. These days, he is selling the hand driven machine at a price tag of Rs 7000 and the motored one at Rs. 10000. He mostly makes these machines once a confirmed order has been placed. These orders not only come from individuals but also from rice mills, atta mills, near his place, in the district, surrounding areas and even some from Jharkhand. The machine is being used to separate husk from rice, mustard, sesame, wheat, etc. NIF also got in touch with about three dozen purchasers/users as well to ascertain its usefulness.

The first buyer of the machine happily informed that he had purchased it about twenty eight years ago and used it for over twenty years satisfactorily. Most people mentioned that the machine helped them increase their output and thereby improve business. They also mentioned that the maintenance cost of the machine was almost negligible.

It appears that most villages around the innovators place in Birbhum and in Dumka have this machine hence the demand for the machine has reduced due to saturation. Mohan hopes that his business (of selling rice sorting machine) can pick up if demand comes from farther places. Hoping for a bright future, he says that every problem can be solved innovatively if only one thinks differently and creatively.





## CONSOLATION

Wrist/Hand Band with visual indicator for vehicle sound for hearing impaired mechanics

Navkumar Awasthi  
Lucknow, Uttar Pradesh

Navkumar (50) is a motor mechanic and himself a hearing and speech impaired person. Being a mechanic he had a lot of problem understanding the sound of the vehicle, hence he has thought of a hand band with visual indicators for the sound and is in the process of developing it. This would be attached to a six channel electronic stethoscope.

His father was a freedom fighter and had the same impairment. He completed his studies as a motor mechanic in an ITI and started working as a motor mechanic in a local service centre. Initially he faced a lot of problems in communicating with people and understanding the sounds of the motor vehicle, so he had to come up with innovative ideas to help himself. In due course, he conceived ideas for a vibration horn, sign to text converter, and speech to text converter as well. He has wife and a son in his family.

Being hearing and speech impaired Navkumar had to face a lot of problem trying to understand and deciphering the problem in vehicle's engine. To help him with this, he embedded a Digital Storage Oscilloscope (DSO)\* with a six channel electronic stethoscope\*\*, which displays the sound coming from the vehicle in form of graphs, which was easy for him to understand. However, the setup was quite bulky for him

to carry around whenever needed. Hence, he started thinking of a compact wrist/hand band, which would have a LED & a small screen for graphical display.

### The idea

The idea is to have a hand worn device with LED, whose intensity would change with the intensity of sound, along with a graphical display. The output of the six channel electronic stethoscope will be intercepted by the device and translated into the LED and visual input on the hand worn device. Thus, it will be helpful for any hearing impaired motor mechanic.

Six channel electronic stethoscopes for differentiating sounds of automobiles are available but not for the hearing impaired persons. They are used along with oscilloscopes for visual displays. However, the setup is not compact and portable or that can be worn easily on the wrist/ hand.

Navkumar is working on his idea, which when completed will be very helpful for the hearing impaired to recognise sound in form of light intensity, vibration and which will be easy to carry along as well.

\*Oscilloscopes are electronic test instruments that display varying voltages against time

elapsed in a 2-Dimension graph like form. Other signals (such as sound or vibration) can also be converted to voltages and displayed. Digital Storage Oscilloscopes (DSOs) are a kind of oscilloscopes, which store and analyse the analog input digitally and then reconvert the same to analog for display on a Cathode Ray Tube (CRT- old bulky TV type screens) or a Liquid Crystal Display (LCD- thin new TV type screens).

\*\*Six channel electronic stethoscopes are designed to listen up to six different under-chassis locations of a vehicle respectively at a time. These can be used to listen to noises that cannot be duplicated in a workshop. The stethoscope comprises, in addition to other components and sensors/super sensitive microphones, a headphone to shut out the ambient sound.



## CONSOLATION

Manual page turning machine for upper limb physically challenged

Swapnanil Talukdar  
Kamrup, Assam

Wondering how an upper limb physically challenged person would be able to turn pages of a book, Swapnanil Talukdar (20) developed a food operated manual page turning machine to facilitate the same. The machine is a lower limb operated manual device to assist people suffering from partial hand paralysis or people missing upper limb parts. He developed the machine when he was in the 11<sup>th</sup> standard and describes it as a 'simple user interface approach backed by a clever mechanism.'

Claiming to be just an average student, Swapnanil considers himself unconventional. He finds studying without any aim as baseless. A good observer, Swapnanil was always different in his approaches of understanding things. He looks up to his father who has spent



countless moments with him brainstorming on innovative ideas, social issues and collecting stamps. He reveres her mother as she has tirelessly supported him despite all hardships. Currently pursuing B. Tech in Electronics and Communication, Swapnanil is interested in IPR, Rural Development and Entrepreneurship (his submission to NIF was received when he was still a school student). He possesses leadership qualities and aspires to be a leader who creates many leaders and not many followers.

The Eureka moment: Necessity is the mother of invention; however for Swapnanil it was laziness that inspired his innovation. When he was assigned to submit an innovative idea for a science exhibition, he was competing with a fellow student. Never good at losing and only focused on winning, he started thinking about new ideas he could work on. He recalls how one evening, sometime in September 2013, coming late from tuitions, he felt tired and lazy, and disinterested to even get up and turn the page of his NCERT Physics book to revise a chapter he had been taught that day. Suddenly a thought struck his mind and he started pondering about ways to turn a page without using hands.

The journey of innovation: While developing his device for a inter school science exhibition,

Swapnanil noted that people use hands for multiple tasks, one among which is use of the fingers to turn pages from a book. Some unfortunate people are unable to use their fingers due to any specific kind of disability, partial paralysis, injury etc. Such people have access to pitiable alternatives i.e. they use their legs (foot), tongue, chin or request external help. While reading a 300 page novel, such alternatives become painful and tiresome.

While designing the first prototype, Swapnanil was unable to figure out a way to grip and turn pages using the same handle. Also, being in 11<sup>th</sup> standard, he had issues with the technical design and was unable to find a workshop that could help incorporate his idea into the machine. During his search, either the workshop was low on expertise or required high fee. He recalls episodes when everyday post his school hours, on his way home he made a detour to the workshop, and taught himself how to weld and fabricate. After several episodes of trial and error, he finally developed a turning mechanism for his machine. Availability of materials was another problem he had to face. Swapnanil recalls toiling several days searching for materials and parts in numerous local electrical shops. Developing the machine, Swapnanil experimented with numerous materials ranging from springs of Volvo bus, nylon ropes to bowden cables from bicycle brakes, printer rubbers to normal erasers, ply boards to carbon fiber etc. He had to develop four prototypes to arrive at the device he has now. Missing encouragement from his teachers and peers, and facing financial problems, Swapnanil had to be self-motivated. He constantly challenged himself to design and develop this useful innovative device.

**Manual page turning machine:** The device is an ordinary table with an integrated foot operated page turning mechanism designed to mimic the process of manually turning a page.

The book being read has to be kept on the table at the designated place and the rollers of the page turning fingers are to be placed at the top corners of the two pages. Depending upon which foot lever (left or right) is pressed; the pages can be turned from right to left or left to right. Swapnanil's page turning machine is manually operated which allows the user full control thus limiting chances of errors and also eliminates noisy electronic motors. The mechanisms of the page turning machine are simple and it allows common people without any technical knowhow to use it. Swapnanil had earlier received NIF's IGNITE award in 2014 for this machine at the hands of late Dr APJ Abdul Kalam, former President of India and was also selected as Innovation Scholar-in-residence by the President House in the year 2016.

**The journey of 'self':** His journey with the innovation has been very personal where he has matured as a person, and also realized his aptitude towards addressing technical problems. His mind instinctively tends to pursue simple yet effective solutions to a problem. After the completion of the fourth version following numerous errors and alterations, Swapnanil feels inspired and has acquired a new zest to continue his journey of innovation. While developing the many versions of his foot operated manual page turning machine, he felt a change within himself, an improvement in his self-confidence.



Always in the quest for alternatives, Swapnanil's current interest is social engineering through which he aspires to bridge the gap between disciplines such as engineering and social entrepreneurship. He aspires to carry forward his concept of social engineering where technologies can benefit the marginal peripheries of our society. Possessing a flair for leadership, Swapnanil is also working towards promoting skill based entrepreneurship, Innovation and Space Education under the GrNinnovare (Generating New Innovation) Initiative. The GrNinnovare Campaign is a platform to discuss Environmental and Climatic issues and ways to tackle pollution by technology intervention. Swapnanil has successfully contributed in

endorsing the start-up culture in the northeast region. He is actively associated with start-ups such as NE8 start-up, Axel Start, Work Garage, Sparkbee, Inogination, Travel and Explorer, Young Stream and Tech variable. He has mentored students, youth, service officials regarding rural entrepreneurship and start-ups. He has guided teams for World Robotics Olympiad, National Children's Science Congress, and Start-up showcasing. He wishes to see a future where every profession irrespective of qualification is given the same respect and value. One of his desires is to gift an automatic page turner to globally acclaimed scientist Sir Stephen Hawkings.



## CONSOLATION

Shower for elderly and physically challenged

KP Gopalakrishnan  
Namakkal, Tamil Nadu

**G**opalakrishnan (43) is a serial innovator from Namakkal. He has developed a setup, which aids the elderly and temporarily or permanently bed ridden patients to take bath easily without having the need to go to the bathroom.

Youngest among seven siblings, Gopala had always been fascinated with electronics. His father was a railway employee and his mother a housewife. As a child, Gopala was always looking at electronic items with keenness, trying to understand their construction and mechanism of working. He was a bright student and had started innovating while in school itself. His first innovation was geometry box based torchlight.

He went on to complete his ITI and thereafter worked at a water pumping setup. During this time, he worked on a number of projects related to motors like transforming an ordinary motor to work as a jet motor and a GSM mobile based device for switching on/off a motor. To work on his ideas, Gopala used to save money from his meager Rs 350 per month salary. Some of his other projects include a mixer operated millet husk remover, an inbuilt amplifier in receiver, bike headlight turned an emergency light, which can last for over eight hours, fumigation dhoop, electric buttermilk

churner and coconut grater. Currently, he is working on a project to use solar energy efficiently as a source of electricity. He had displayed his innovations in the National Level i3 Expo in Coimbatore a couple of years back.



He also has two acre of farmland wherein he cultivates sugarcane and tuber crops.

#### Genesis

Gopala's mother had been paralyzed for six years hence was bed ridden. He used to take care of her and assist her in bathing. It required a lot of power to hold her safely while taking her to the bathroom and bathe her. As he had worked on a lot of water pumps for agricultural purposes, he thought of developing a system using which he could give his mother proper bathing in her room itself.

#### The shower

The shower apparatus consists of a chair to which a support for shower head is attached, which is in turn attached to a water container and a battery operated pump.

The user can be made to sit comfortably on

the chair, after which s/he can take bath on her/his own. The setup is cost effective and portable and can be taken anywhere. No assistant is required for helping in bathing. In available alternatives, requirement of an assistant is there. The present shower system eliminates the problem of transferring the patients from bed to bathroom. Also, the user is not required to stand while taking bath and mugs are not required.

Due to his own requirements, Gopala did not make it for indoor use, hence presently, it does not have a water drain and splash guard. However, this system has the scope for value addition and can be taken forward for further development. This can be used by/for senior citizens and bed ridden patients. This setup will reduce the effort of the caretakers and have a positive emotional impact over them and the user.



## CONSOLATION

Carbon dioxide level indicator in cars

Pratyush Kumar Sahoo, Bikash Kumar Mallick, S R Valava  
Khurda, Odisha and Kalapakkam, Tamil Nadu

The idea of the three students is to have a system to detect level of carbon dioxide in a closed car and then open the car windows automatically if the carbon dioxide level rises beyond a preset level. This will help fresh air to come in and circulate, thereby preventing accidental deaths of children or pets locked inside the car.

Pratyush (18) and Bikash (19), and SR Valava (20) were studying in class 10 and 12 respectively when they suggested this idea. All the students thought about this idea after reading/ hearing news about accidental deaths in cars due to suffocation.



Valava, who plays football, has interest in junk art i.e. making useful items from waste and wants to become an entrepreneur so that

he can give job to others. He believes that one should apply knowledge of science in daily life and should not be too dependent on technology especially those which are for comfort. He is presently pursuing BE Metallurgy from Coimbatore.

Pratyush plays basketball and computer games. He also reads story books, paints and plays keyboard and wants to become an IAS officer. Both his parents are government officers. As a child he participated and won in a number of science competition and sports. He is currently pursuing his bachelor's in engineering. Meeting Dr APJ Abdul Kalam at NIF's IGNITE award function has been his most unforgettable moment in life thus far.

Bikash, who also plays basketball, believes that he has the capacity to break a bigger problem into small ones and then solve them. His father is in government service while his mother is a housewife. His other two siblings are students like him. As a child, he invested a lot of time in extracurricular activities and won many prizes in elocution contests at school level, represented state in basketball, won an award in an international science exhibition at Visakhapatnam. He has also been the East zone cluster gold medalist in basketball. He also aspires to be an IAS officer and feels





that, 'success is not something one is born with, rather it is something one has to strive for.' He is currently preparing for engineering entrance exam after completing class twelve.



## CONSOLATION

Remote controlled valve for diverting water flow in furrow irrigation

Surendra Singh Sudda  
Hanumangarh, Rajasthan

Surendra (21) is a young innovator, who discontinued his studies after class twelve to continue working on his innovation. He has developed a remote controlled system to regulate flow of water in irrigation channels/furrows in fields. This eliminates the need for a farmer to go to the field and close/ open the gates manually.

Born in farming family, Surendra has four siblings. His family wanted him to continue his studies however, innovation has been his passion since childhood and did not want himself to be distracted by anything else. He loves playing with junk material especially related with electronics and make something or the other. At a young age, he had made many small electric-powered machines such as threshing machine, remote controlled switches,



security bracelet, robotic hand, powerhouse and others. Due to his indulgence in his projects, he failed in class eighth and one of his teachers came home inquiring for the reason. He showed him his projects and then told him and his family that his love lies in doing things with hands and not reading books and giving exams. The teacher appreciated his efforts but also suggested him to focus on studies as well.

Surendra kept on working on his various ideas and slowly his family started supporting him as well. His father helped him to set up a small lab in his house. After class twelve, he did not take admission in any college and started his work on innovations though his family wanted him to start a business. He claims to have developed over fifty different kinds of innovative projects and machines. He gets inspired by the problems he sees around or people around him face and uses that inspiration to conceive new ideas and develop new machines/ devices. He has participated in a number of events and won prizes many times. He wants to serve the nation and farmers with his innovations.

The remote operated valve  
Being a farmer's son, Surendra is aware of the problems a farmer faces in farming especially

those related to irrigation. For releasing/stopping water flow in different furrows/ channels in the field, a farmer has to physically go and open/close the water gates manually. This becomes cumbersome especially during nights and in winters. Surendra has developed a remote operated system, using which a farmer can open/close the water gates from a distance

of half a kilometre without physically going to the field. An upgraded version of this remote operated system has been developed by Surendra in NIF's Fab Lab (Fabrication Laboratory) where the opening and closing of gate is automatic depending upon the amount of moisture present in the soil. The prototype is being tested presently.



## CONSOLATION

Sulkhaniya Bajra- Improved Traditional Pearl Millet (*Bajra*) Variety

Hanumanaram Jhuriya  
Churu, Rajasthan

**H**anumanaram (62) has been growing this Bajra for the last 40-45 years and conserving the seeds through selection. The Sulkhaniya bajra, named after his village name, is sweet, has very long and compact earheads, high yield, is drought tolerant and has high fodder yield.

Farming is the main occupation of Hanumanram and his family, which comprises his wife and five children. Out of the four hectare land the family owns, Sulkhaniya bajra is cultivated on about two hectares for seeds and rest for his household consumption. Hanumanaram's forefathers have conserved this variety for the

last 250-300 years. The seeds were originally provided by a spiritual guru from Bikaner some 300 years ago to his forefathers. Hanumanaram has been meticulously growing this bajra for the last four-five decades for his consumption and seed conservation. Every year at the time of harvesting, he carefully selects the best earheads for seeds to be grown next year. The grains when separated from the earheads are mixed with neem leaves and can be kept in gunny bags up to 5 years.

Sulkhaniya bajra

It is an early sowing variety sown during the pre-monsoon rains and is suitable for sandy





loam soil of the dry and semi-arid climates. The variety is drought tolerant and can withstand long gaps of dry season. The productivity is good even in dry period as compared to commonly cultivated varieties.

The variety is high yielding (20 to 25q/ha) with extra-large earheads with compact seeding. The fodder is sweet and of good quality. The total number of tillers per plant range between 6-10 and the percentage of productive tillers ranged between 90-100%. The crop matures in around 90 days and the total biological yield range is around 40q/ha.

Experts have opined that the innovator's variety has good potential for increasing productivity in comparison to the other varieties of pearl millet under rain fed conditions. It also possess tolerance to the prevailing disease of pearl millet under field condition. Looking at its performance under arid condition, it holds good promise for the market and it may serves as a basic breeding material for further research and development. In trials at farmers' fields in Gujarat and Rajasthan, the variety Sulkhaniya bajra was found to be superior as compared to the check varieties and local variety in majority of yield attributing traits.

To obtain feedback of farmers on the performance of improved traditional variety of pearl millet, a meeting was organized in village Sulkhaniya where over forty farmers and experts from KVK and Central Integrated



Pest Management Centre were present. The villagers confirmed the claims of innovator Hanumanaram that there has been no change in the quality and characteristics of the variety for the past three decades. High yield, long compact earheads, better fodder quality and drought tolerance are the major characteristics of the variety.

The seeds of the variety have diffused in the periphery of 100-120 kilometers in Churu district as well as in the neighbouring districts of Jhunjhunu, Sikar, Nagor, Bikaner and Jaipur. The response to the variety has been very good and farmers have preferred this variety over hybrids due its high productivity, taste, fodder quality and drought tolerance. The villagers also unanimously agreed that Hanumanaram Jhuriya was the only farmer working on the conservation of this variety for last thirty years and anyone who needed the seeds of this variety, approached him.



## CONSOLATION

***Sanayambi Phou*** - improved paddy variety

Chanambam Sanayamba Meitei  
Bishnupur, Manipur

A farmer, Chanambam Sanayamba Meitei (55) has developed a paddy variety *Sanayambi* from a local variety through selection. The salient features of the variety are long panicle, high number of tillers, short to medium awn and tolerance to biotic & abiotic condition.

Eldest among six siblings, Sanayambi studied up to graduation in Manipuri. He has four children all of them are married. Presently, he stays with his wife, younger son, daughter-in-law and grandson. When he was younger, he was involved in sugarcane farming but due to



health related issues, he switched over to paddy. He also cultivates green pea, tomato, cucumber, bitter gourd, spine gourd and mustard crops on leased land. His field is also used for Front Line Demonstration program for the last two years under KVK, Bishnupur.

#### Genesis

In 1997, Sanayamba saw a paddy plant with 14-15 long panicles and high tillering capacity among the plants of a local paddy variety (Huikup) in his field. At maturity he collected those seeds separately and sowed in 1/10th acre area in the next season. It was also found to be tolerant to submerged condition and pests like stem borer. The seeds were then harvested and in 1999 sowed in an area of about 0.5 hectare where the yield obtained was approximately 85.5 q/ha. After repeated sowing consecutively till 2000-2003, the characteristics were found to be stable. The seeds were then distributed to farmers in different areas of Bishnupur District, Imphal West district, Thoubal district, Tamenglong district and Senapati District.

#### The variety

This variety is suitable for alluvial soil and is sown in June-July. The salient features of the

variety include reddish colour grain, medium long panicle, high number of tillers (14), tolerance to submerged conditions, tolerance to stem borer, short to medium awn, sweet taste and less grain breakage percentage. Also, comparatively less fertilizer is required. The farmers follow mechanical control by shaking the plant for controlling the insect Marek at tillering stage.

The experimental trial was conducted during Kharif 2016 at Central Agricultural University, CAU, Imphal, Manipur. The desirable characteristics such as average number of tillers per plant (21.67) and yield (76.96q/ha) were found higher than the check variety (62.76q/ha). It is also reported to be moderately tolerant to stem borer and short plant height (89.33cm). The application for registration of the variety has been submitted to PPV&FRA, New Delhi.

The farmer started diffusion attempts for the variety in 2003. It has now covered an area of about 200 hectare in different places of Manipur. Normally poor farmers of Manipur cannot spend money for purchasing seeds and thereby follow the system of exchanging the seed. Therefore much of the innovator's variety has been diffused through seed exchange.





## CONSOLATION

***Kesho Phou*** – improved paddy variety

Wahengbam Kesho Singh  
Bishnupur, Manipur

Farmer Wahengbam Kesho Singh (68) has developed a high yielding paddy variety through selection method.

The eldest among eight siblings Kesho Singh did not have much interest in studies. The

family's financial condition also required more earning hands hence he discontinued studies after class ten. As a child, carving toys from bamboo and wood was his favorite past time. As a student playing games like Kangjei (traditional form of Hockey made from





bamboo) and Yubi lakpi (traditional form of Rugby using greased unpeeled coconut) were his passions.

Many years back, he undertook work contracts but due to irregular payments, he settled down to become an agriculturist. Kisho Singh and his son are the main bread earners of the family. He lives with his wife and son's family. His daughter is married and settled elsewhere. Kesho's wife gives full support in his work. He believes that advancement in science and technology has resulted in improvement in agriculture, which has in turn resulted in more income for the farmers. In addition to paddy, he cultivates bottle gourd, pumpkin, tomato, bean, french bean, potato, cucumber, maize, carrot and onion and runs a fish farm in his own 3/4th hectare land.

#### Genesis

In 2010, while passing by his pond Kesho Singh saw three paddy plants growing near it. Nearby, four different paddy varieties Ayanleima (East), Darum phou (North), RI 64 (South) and Tampha phou (West) were growing at the adjacent fields. Initially, he thought that the plants were of other local popular variety (RCM-9). Therefore he took extra care till harvesting and at maturity, saved the seeds (approx. 180g) for sowing in the next season. In 2011, the saved seeds were sowed following SRI method. But the characteristics of the plants were found superior to that of RCM-9 in terms of tillering habit, flowering time, yield and taste. Then he saved some seeds and sowed them again in 2012 to check the inheritance of the superior traits. As the characteristics were found to be retained, he saved the seeds and sowed subsequently in the

years 2013 and 2014. Since all the desirable characteristics were found to be stable, the variety was named as Kesho Phou after his name Kesho (Phou means paddy).

#### The variety

The salient features of the variety are high yield (80-95q/ha), non-lodging, with long panicle, high number of seeds /panicle (310-320), broad leaves and semi-erect culms, spreading tillers and high number of tillers/plant and good taste. The variety is also tolerant to stem borer. It is suitable for summer crop in alluvial soil and sub-tropical climate and has high grain recovery % (86-87) as well.

The experimental trial was conducted during *Kharif, 2016* at *Central Agricultural University, CAU, Imphal, Manipur*. The report revealed that *Kesho Phou* possesses high yield contributing characteristics like high number of tillers per hill and number of filled grains per panicle. Thus the average yield (79.76q/ha) was found to be higher than the check variety (62.76q/ha) under rainfed conditions. It was also found to be moderately tolerant to stem borer and neck blast. The application for registration of the variety has been submitted to PPV&FRA, New Delhi.

The variety has been distributed to several farmers of Bishnupur district and other nearby districts. He has won many awards for his work at district and state level. Kesho Singh wants to convey a message to his fellow farmers as "We should gain endless knowledge about different crops from concerned experts to get good produce for the betterment of self and the society".



## CONSOLATION

Herbal pesticide for fruits and vegetables

Ganesh Dutt Sharma  
Kullu, Himachal Pradesh

**G**anesh Datta Sharma (43), a farmer and a well-known herbal healer of the area has developed a herbal formulation containing the extracts of five local plants, which is used to control *Gahali*, *Fundiya*, *Hara kida*, *Kala kida* in vegetable and fruits crop.

Living atop a hill with his wife and son, Ganesh Dutt cultivates vegetable and fruit crops using organic practices in his one acre land as well as on leased land. He believes in sustainable agriculture and promotes chemical free agriculture. He has been using the herbal formulation for the past eight years. He also has good knowledge of local herbs and their uses in medicinal purposes like for wound healing, fracture, epilepsy etc.

### The formulation

Ganesh uses the extract of five local plants (name withheld due to intellectual property reasons), essential oil from one of the five plants, and cow urine to prepare the formulation. For use 200ml of the mixture is diluted in 10l water, which is sufficient for one bigha of land. Spraying has to be done on vegetable and fruits crop in the evening to prevent evaporation. The herbal formulation is used to control *Gahali* (White

grub), *Fundiya*, *Hara kida* (Cut worm), *Kala kida* (*Heliothis*) in vegetable and fruits crop and can be stored for one year.

In an experiment on okra, the formulation of Ganesh Dutta @40ml/L showed significantly lower green fly counts as compared to other treatment including chemical control. It was found that the formulation of Ganesh Dutta @ 10ml/l controlled fruit borer (50%) and reduced fruit damage (20.7%) which was at par with other check herbal preparations and chemical control. The formulation of Ganesh Dutta @ 40ml/l showed 21.75% better yield than control.

A research trial was performed at NIF's research farm during 2015-2016, to study the effect of fourteen different herbal preparations and a chemical control on yield in Okra crop. It was found that formulation of Ganesh Datta @40 ml/l showed the highest per cent reduction of white fly at 92.2 % after 5 days of treatment. Also, during Kharif 2016, farmers in Chhattisgarh used this formulation on a trial basis in Brinjal crop and found it to be effective for insect control.



## CONSOLATION

Herbal treatment of bloat in cattle

Debeswar Rabha  
Goalpara, Assam

An unskilled labourer, Debeswar Rabha (65), knows and practices a herbal medication for treating bloat in cattle.

Goalpara and Kamrup are the two districts where most members of his tribal community reside in Assam, typically engaging in agriculture or forest related activities mostly. Debeswar was the eldest among six brothers and two sisters and hence did not have the opportunity to go to school at all. His father was a daily wage labourer hence life was not easy for him and his family. He had to start working early to support his family. His father also had very good knowledge of local plants and herbs and their use in medication. He was well known for his herbal knowledge in his village and surrounding areas. Many a times Debeswar used to accompany his father in plant collection expeditions in nearby forest area or treatment sessions. It is during such sessions, his interest in herbs and their uses arose and started learning from his father's knowledge and experience.

Debeswar is married with two sons and a daughter. His wife, Tipeswari Rabha has been a constant source of support for him in all his endeavours. After the demise of his father, he started administering herbal medicines on his own whenever such a need arose. He has now been giving such medicines for the last thirty five years without any financial return and just for the benefit of the people. His herbal practice for bloat was found to be novel after prior art search and subsequently was taken up for validation, whose results appear to be promising. The accumulation of extra gases in the stomach of the cattle leads to a condition called bloat, which may sometime lead to the death of the animal if not handled properly. The symptoms of bloat include stomach swelling, loss of appetite, frequent release of saliva etc. Debeswar takes required quantity of rhizome, leaves and fruits of three local plants (name withheld due to Intellectual Property reasons), grinds them together and adds a pinch of salt. The medicine is given to affected cattle orally once or a maximum of twice a day.



## CONSOLATION

Herbal medication for treating anestrus in animals

Bhurabhai Jethabhai Rabari  
Kutch, Gujarat

**B**hurabhai (70), an agriculturist and livestock keeper, has been practicing a herbal medication for treating anestrus in animals, which is the period of sexual inactivity between two periods of heat.

Living in a joint family with his wife, Smt. Jadiben Bhurabhai Rabari, their two sons and their families, Bhurabhai is an expert animal care taker and a herbal healer. Like many other people in their village, his sons work as agricultural labourers. As they do not own any land, they take land on lease and do farming. Bhurabhai was born in a family of livestock farmers, when they owned more than 200 farm animals including camels, cows, buffaloes, sheep and goat. As he had been taking care of animals since his childhood, he has good knowledge about traditional herbal veterinary practices. His herbal practice for anestrus was found to be unique after detailed prior art search and subsequently taken up for validation. The results of which have been quite promising. The animals responded to the medication by coming in estrus (sexual) cycle in 8.25 days in case of cows and 8 days in case of buffaloes. The conception percentage among the responded cows was encouraging

at forty two per cent.

Anestrus is defined as the period of sexual dormancy between two periods of sexual activity in cyclically breeding mammals. It is not a disease and may be caused due to nutritional deficiency, seasonal change in physical environment, lactation stress and/or ageing. This situation is mainly found in cattle like buffalo or cow. Bhurabhai takes approximately 200g of a local whole plant (name withheld due to Intellectual Property reasons), crushes and boils in 500ml of water till it remains about 250ml. The decoction is then fed orally to the affected animal. Though, this medication is to be given once, if needed, this can be repeated after one week once.

To ascertain whether this knowledge is known widely or only available with Bhurabhai, a number of village meetings were organized in his village and nearby areas, where the uses of the plant used by Bhurabhai and the local plants used in treating anestrus, were inquired upon. In none of the meetings, people reported to have used the same plant for treating anestrus, proving that Bhurabhai was the only knowledge holder for this particular practice.





## CONSOLATION

### Herbal Practice for Cataract

Muthulakshmi  
Virudhnagar, Tamil Nadu

**M**uthulakshmi (63), a woman herbal practitioner, has been practicing a herbal medication for treating cataract, which has been found to be quite promising in the validation trials undertaken thus far.

Though she has studied only up to class sixth but has had keen interest in herbs since her childhood. After her marriage, she started learning herbal practices from her mother-in-law and has been practicing them from the last thirty seven years now. She is basically an agricultural worker and helps her husband in the fields as well. Muthulakshmi also rears goats and collects herbal plants for herself and anyone else who needs it. Among the various medications she knows, her herbal practice for treating cataract was found to be unique after patent and non-patent literature review. More research is being undertaken as per statutory regulations. For cataract, she only treats patients above thirty five years of

age. She identifies the symptoms by physical examination or through description given by patients over telephone. In some cases, she also suggests her patients to visit a doctor and have his opinion as well. She claims she has cured about ten patients for cataract among her family and friends itself. For preparing the medication she takes flowers of a local plant (name withheld due to intellectual property reasons), peels off the petals, which are softly crushed in water, which is then filtered drop by drop (1-2 ml) directly into the eyes. This is to be repeated twice a day for fifteen days. The formulation for anti-cataract activity was tested at BV Patel PERD Centre, Ahmedabad where it was evaluated in wistar rat's pups. A dose of 3 drops (100 mg/ml) of extract was applied to eye ball once a day for 15 days. Decrease in lens opacity was observed thereby indicating at the efficacy of the formulation.



## CONSOLATION

Herbal Medication for Epilepsy

Sabzar Ahmad Wani

Kulgam, Jammu & Kashmir

Sabzar Ahmad Wani (50) a herbal practitioner by profession, has been practicing herbal medication since an early age. One of the herbal practices, he has knowledge of, pertains to the treatment of epilepsy, which has been found to be unique and promising after some validation trials.

His father was a well known and renowned herbal healer of the area for many human health ailments like fever, male and female infertility, diabetes, etc. Patients from surrounding villages as well as from various nearby towns used to visit him looking for cure and getting his medications. Sabzar was quite attached to his father and as a child used to accompany him on his visits to nearby forests to collect herbs. He also used to observe and sometimes help his father in preparation and administration of medications. This helped him to understand and learn the uses of various plants/ herbs for medicinal purposes.

Among the three brothers, Sabzar was the only one to show interest and opt for the profession of his father. He claims to have knowledge of about two hundred herbal formulations, both for human and veterinary health, for curing various ailments/diseases like liver problems, obesity, constipation, diabetes, frost bite and post-delivery problems in both human and

in animals. He lives with his wife and three young children.

Sabzar has a small medicine shop at Anantnag market area where he sells the medications prepared by him. In the local market, he has introduced medicines like “Darmain 201” for frost bite and other skin diseases, “Shafi-e-Qabaz” for constipation, “Shafi-e-Sang” for kidney stone, etc. He claims to have sold more than one thousand products till date. His medicine shop is registered as one of the Micro Small and Middle Enterprise. His herbal practice for treating epilepsy was found to be novel after patent and non-patent prior art search and accordingly taken up for validation, the results of which have been quite promising. More research is being undertaken as per statutory requirements.

The formulation was tested at Anand Pharmacy College, Anand where the test plant demonstrated significant antiepileptic activity in Maxium electroconvulsive shock (MES) and Pentylenetetrazole (PTZ) induced epilepsy models. The herbal formulation was effective in reducing extension/flexion ratio. Treatment with the herbal drug resulted in reduction in seizure score value indicating the efficacy of the practice.



## CONSOLATION

Herbal Medication for Wound Healing

Hakeem Naseer Ahmed

Anantnag, Jammu and Kashmir

**H**akeem Naseer Ahmad (45) is a well known herbal practitioner of city and has the knowledge of a unique practice for treating wounds.

Naseer was born in a widely respected herbal practitioner's family based at Anantnag. His father was a renowned herbal practitioner of the state. Second son of his parents, Naseer took up the profession of his father and became a herbal practitioner. During his teenage, by working closely with his father, he learnt the knowledge about herbs, their uses, preparation and administration of medicines. He has been practicing for about thirty years now and specializes in treating diseases like arthritis, chronic wound, neurological problems, and menorrhagia among others. He practices at his home and also at a Unani hospital in Kulgam but only charges for his medicines, there are no consultation charges. His wife

is a school teacher and the couple lives with their four children.

Hakeem Naseer is quite a famous doctor in the state. He claims to have treated lakhs of patients over so many years for different ailments. He also mentions that he would have treated thousands of people suffering from chronic wounds or unhealed wounds using the herbal formulation, which was found to be unique after patent and non-patent literature review. More research is being undertaken as per statutory regulations.

In the validation tests conducted at Anand Pharmacy College, Anand, significant wound healing activity was demonstrated by the formulation. It was found that the wound healing activity was better than standard ointment, Soframycin.



## CONSOLATION

### Herbal Treatment for Wound Healing

Hakeem Irshad Hussain and Abdul Razak Wani  
Shopain and Pulwama, Jammu & Kashmir

**H**akeem Irshad Hussain (38) is an imaam and hakeem by profession and Abdul Razak Wani (65) is also a well known herbal healer in the region. Both independently practice a herbal formulation for wound healing, which has been found to be unique and having potential to be taken forward for further validation.

Hakeem Irshad Hussain learnt the treatment from his late father who was a well-known imaam and herbal healer of the area. His village has low literacy rate and the people are mostly engaged in fruit business. He learnt from his father, the use of herbs for treating various ailments. He had to discontinue studies after class tenth to support his family. He was much attached to his father and was quite disturbed at his death. Irshad Hussain now lives with wife and three children. He also learnt a lot of practices from another Hakeem from Kulgam district for about nine years. He continued to treat patients at his village and claims to have treated many thousand patients by now. Irshad Hussain has the knowledge to treat

chest infection, asthma, arthritis, leucorrhoea, vomiting and digestion related problems.

Abdul Razzak Wani's village is in a picturesque setting surrounded by apple plantations. The people are mostly fruit growers or labourers. Razzak Wani learnt the treatment from his father and with time improved his knowledge about herbs and their uses. He also claims to have treated thousands of patients for with different kinds of diseases. He lives with his wife and two sons.

Their herbal practice for wound healing was found to be unique when looked up in patent and non-patent literature. Thereafter it was taken up for verification and validation where the results have been promising and further research would be undertaken on it. In the validation tests conducted at Anand Pharmacy College, Anand, significant wound healing activity was demonstrated by the formulation. It was found that the wound healing activity was better than standard ointment, Soframycin.





## CONSOLATION

### Herbal Medication for Obesity

Hakeem Syed Amanullah Andrabi  
Pulwama, Jammu & Kashmir

Syed Amaanullah Andrabi (55), born in an agrarian middle class family, grew up to be a famous herbal practitioner in Pulwama. He learnt a number of herbal practices from his father, who was also a hakeem, one of the medications, he practices successfully, is related to treating obesity.

His father was a famous Hakeem of Lahore who relocated to India after the partition and continued his practice in Lajoura village, where mostly people engage in farming and small businesses. Amanullah learned herbal treatments for various diseases from his father as in absence of medical facilities, they had to rely on herbal medicines. Over time, he learnt the herbal treatment of many diseases like arthritis, cholesterol, hypertension, prostate, etc and claims to have treated lakhs of patients in his over two decade career as a healer. Syed Amanullah continued the tradition of herbal

medication while his elder brother took up teaching as profession. His spouse, who is a house wife, supports him in his work. His two sons are still in school.

As a student Amanullah had been good at studies, however, due to the untimely demise of his father, he had to discontinue studies and replace his father in his profession (*Hikmat*). Among the various medications he knows, his herbal practice for obesity was found to be unique after patent and non-patent literature review. More research is being undertaken as per statutory regulations. In the validation tests at Anand Pharmacy College, Anand, the herbal medication significantly reduced total cholesterol level, serum triglycerides level and Low density lipoproteins (LDL) level. The High density lipoproteins (HDL) increased after test drugs treatment as well as treatment with standard drugs.



## CONSOLATION

Herbal medication for obesity

Abdul Gani Hajam

Budgam, Jammu & Kashmir

Abdul Gani Hajam (45), a barber by profession, is a resident of central Kashmir's Budgam district. He has good knowledge of herbal practices and gives medications for skin ailments, piles and other diseases. His practice on obesity has been found to be novel and taken up for validation, where the results have been encouraging.

Though he has been running a barber's shop but his customers also know him for his knowledge about herbal medications. He learnt most practices from his father who had learnt it from his father, who was a herbal healer. Gani could not study due to poverty and worked as a mason when he grew up. However, due to an accident he had to undergo a long duration treatment. His eldest son had to discontinue

studies to support his family- three siblings and his parents. Now Gani and Adil both work to earn a decent livelihood for the family, which still remains insufficient. Gani laments the situation he finds himself and his family and hopes for a better future for his family.

In the validation tests at Anand Pharmacy College, Anand, the herbal medication significantly reduced total cholesterol level, serum triglycerides level and Low density lipoproteins (LDL) level. The High density lipoproteins (HDL) increased after test drugs treatment as well as treatment with standard drugs. His herbal medicine against obesity has shown promise in validation trials however, more research needs to be done, which is being pursued.



## CONSOLATION

Tractor mounted rotary weeder

Ratanlal Yadav  
Ajmer, Rajasthan

**R**atanlal Yadav (61) is farmer by profession and also undertakes repairing and fabrication of agricultural machineries. The novelty in his weeder lies in the shape of the blade, which is at a certain angle to the drum resulting in easy weed removal and proper pulverisation of the soil.

Having no formal education himself, Ratanlal tried to make available whatever educational opportunities were possible in or near his village to his son and daughters. He took to farming early in his life and later also to the repair and manufacturing of agriculture machineries. He lives with his wife, children, his brothers and their families. All of them support their farm activities and the fabrication workshop.

### Genesis

In his farm, Ratanlal used to do weeding manually, which he felt was the most tiring and time consuming job even after improved



level of mechanization and usage of tractors in farm operations. Sometime in 2012, he started thinking about developing some implement, which could be attached to a tractor. After five unsuccessful attempts over two years, he finally completed the successful prototype in 2014. His friends supported him in getting parts procured, machining done and his late uncle supported him financially.

### Tractor mounted rotary weeder

This multi-row rotary weeder consists of a set of cutting blades, which penetrate into the soil and remove the weeds in the crop rows. In this weeder, an 'I' shaped blade is used at an angle to the drum to remove weeds easily, to elevate and pulverize the soil properly.

This weeder can be used for weeding in cotton, paddy, pulses, tomato, sugarcane, etc. as the width of inter-row rotary weeder can be changed according to the crop row spacing. The machine is suitable for both line sowing by the seed drill as well as broadcasted scattered sowing. Ratanlal extends the service of weeding on rent, as due to lack of fabrication facility in his town and nearby areas, fabrication is difficult. However, he has made one unit, which he sold about a year ago.



## CONSOLATION

### Portable Wooden Handloom

Anup Ram and Gulab Dass  
Kullu, Himachal Pradesh

Anup Ram (43) and Gulab Dass (59) both are carpenters by profession. They have developed a portable wooden handloom, which is easy use, store and carry. Most kinds of handloom weaving done in the Kullu region can be undertaken on these handlooms.

Living with his wife and three daughters, Anup Ram also engages in farming. He learnt carpentry observing other local carpenters in his village. Gulab Dass lives with his wife, two sons and their families in a joint family.

The Kullu caps are weaved on a big handloom, which occupies a lot of space. Although this big weaving loom can produce 5 stripes for hats in 45minutes, it needs skilled worker to operate. To address this issue, Anup Ram developed his first mini loom about eighteen years ago. His mini loom could produce 2 stripes of caps in 30 minutes. Using this mini loom, one can spin handloom anywhere anytime ever with lesser skills. He claims to have sold about thirty looms in the Kullu district.

Being a carpenter, Gulab Dass used to make big handloom machines for making shawls and pattu etc. This developed interest in the art of weaving, which he learnt in sometime. While weaving on his big handloom, he thought about making a portable one so that it is easier to

us, even for the women and disabled persons. His machine is made of wood and can weave







woollen borders for caps, clothes etc. Gulab Dass claims to have sold over four hundred portable looms in the last many years.

Their portable loom is made out of wood and has a locking mechanism for tightening the woollen material. The movable shaft facilitates easy weaving. The loom is of small size and hence can be used anywhere. It is easy to carry and keep safely as well. On an average, minimum one meter of border can be woven

on the portable loom in one day. The loom is quite durable as both Anup Ram and Gulab Dass have been using the same loom for about two decades now.

With this mini loom, an ordinary person without specialised skills can also spin handloom anywhere any time after some practice. This loom has all the components of a regular loom but is compact and completely hand operated as compared to the hand & leg operated huge weaving looms.



## CONSOLATION

Modified hand-cart with steering mechanism and brakes

Md. Usman Hanif Patel, Nidhi Kumari Gupta, Pavithra R, Vidya Ramesh  
Jalgaon, Maharashtra; Muzaffarpur, Bihar; Erode, Tamil Nadu; Bangalore, Karnataka

The students have suggested incorporating easy steering mechanism and brakes to make turning hand-carts easy and arrest slide on inclines respectively.

Young Usman, an IGNITE winner earlier for his idea to run ceiling fan through a roof top windmill, saw a street vendor struggling with his hand cart while negotiating a turn on an incline, which led to this idea. He also thought of adding a folding seat to the cart. Drawing is one of his favourite hobbies though it has little to do with his ambition to become a fighter pilot and serve the country. Usman was selected for National Child Award for Exceptional Achievement and was awarded on Children's Day by the Hon'ble President in 2013. Usman is studying in class sixth now and is a regular participant in various science exhibition organised in the city.

Nidhi dropped out of school after passing class 8 to return to her village, though she wished to continue her studies for a few more years. Her father moves around from place to place selling 'petha' (a kind of sweet made of ash gourd) on his hand cart. He often faced problem turning it especially at acute turns. To do this, the loaded cart has to be lifted and rotated resting on the front wheels, which is

quite cumbersome. She saw her father having trouble doing this and thought of a steering kind of a mechanism, which could solve his problem.

Trained *Bharatanatyam* dancer, Pavithra, aspires to become a doctor and serve the society. She likes to keep abreast of all the happenings around her. She thus reads news papers a lot, collects coins and even writes in a local daily. She has won a number of awards in essay writing and speeches and plans to make a library of her own with more than 1000 books. Along with her younger sister Elakkiya, Pavithra also designed a looms for lower limb physically challenged. In their loom they have replaced the pedal operated system with a motor and a gearbox attached to a pulley mechanism so that it can be operated by hands only. Pavithra, who is currently studying in class 11, has been recognised by many Government and Non-Government institutions and schools for her work in the field of innovations.

The two sisters have come up with loom for lower limbed physically challenged. In their loom they have replaced the pedal operated system with a motor and a gearbox attached to a pulley mechanism

Vidya suggested incorporating gears and bicycle styled steering mechanism in hand-carts. She likes reading books, engaging herself in outdoor activities and is still looking for a challenging ambition to chase. Another of her idea, 'hilly terrain cart', finds mention in subsequent pages.

## CONSOLATION

Sadabahar- Improved mango variety

Kishan Suman  
Kota, Rajasthan

**K**ishan Suman (52), a farmer from Kota, has developed a mango variety by adopting selection method followed by grafting, which bears fruits throughout the year beginning from the 2<sup>nd</sup> year of grafting.

The eldest among four siblings, Kishan lives in a joint family with his father, wife, children, four brothers, their wives and children. All the brothers are engaged in agriculture except one who is working in a private firm. Due to poor financial conditions at home, Kishan

had to drop out of school after class two and take up family profession of a gardener. He also had a great interest in floriculture and orchard management. His family was engaged in agriculture, growing wheat and paddy, crop success of which depended on factors like rainfall, animal attack, etc. but they could not get good profit from their produce. He then thought of growing flowers, which will help his family get regular income. He started growing different rose and selling in the market. In parallel he also started growing mango,







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