Gujarat Innovates

National Innovation Foundation

An eye for detail, diverse designs and development through people's knowledge, wisdom and creativity

Honey Bee Network

GUJARAT INNOVATES

HONEY BEE NETWORK
www.honeybee.org www.sristi.org

Regional Collaborators
SRISTI, Ahmedabad
GIAN West, Ahmedabad

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GUJARAT INNOVATES

PREFACE

June 2009

National Innovation Foundation (NIF) has been pursuing the mission of making India innovative and a creative society since 2000 with the active support of Department of Science and Technology, Government of India. Till date NIF has been able to scout innovations and traditional knowledge practices from over 545 districts across India.

Thanks to the support of volunteers from Honey Bee Network, we have been able to discover many unsung heroes of our society who have solved local problems without any outside help.

Despite various constraints, NIF has put together a small book celebrating creativity, innovation and traditional knowledge from Gujarat. I am conscious of its limitation in terms of coverage and outreach. But if we could uncover at least a few examples of the ability of local communities and individuals to solve problems on their own without outside help, how much more can be done if state and private sector agencies join hands with NIF actively.

I invite the state government and its various organs to actively support our quest to uncover many more creative communities and individuals in rural and urban areas. NIF will then help in building value chain around them.

The book is divided in three parts. The mechanical innovations developed by innovators from Gujarat are covered in part one. Selected examples of herbal traditional knowledge are given in part two. The innovations from other parts of the country suitable for the development of Gujarat are given in part three.

By no stretch of imagination, could we claim that we have achieved a great deal. We have merely made a simple point. There are a large number of knowledge rich people who

may not have been educated much, may in fact be economically poor also, but still have the ability to solve a few problems so well.

The challenge really is to work out a synergy so that no creative voice remains unheard, and no solution remains localized and unrecognized. By adapting public policy in support of grassroots innovators and traditional knowledge holders, we can make economic development process more inclusive and sustainable.

This book on innovations has been compiled at the request of Dr. Vijay Kelkar, Chairman, Finance Commission and the Member, Governing Council of the National Innovation Foundation as a tribute to the creativity and innovation at grassroots. This presentation is part of a series of innovation compendium prepared for every State of India. We hope this will be followed up in the form of concrete policy and institutional initiatives in each State to empower creative people to improve the quality of life of common people and thus promote inclusive growth.

It is my belief that such examples will act as spur for other State government departments to look for creative efforts of their staff and users at ground level. I hope that NIF will have the opportunity to work closely with the State government in future and expand knowledge base, add value to selected technologies and help them diffuse through commercial and non-commercial social channels for improving the livelihood of the majority of the people.

R. A. Mashelkar, FRS
Chairperson, Governing Council
National Innovation Foundation, Ahmedabad
mashelkar@nifindia.org

Building a Bridge with Grassroots Innovators in Informal Sector

June 2009

To make the Indian development process more inclusive, there is no escape from building upon creative and innovative experiments pursued by common people at village or semi-urban level. Many of these experiments lead to development of innovations, which can improve productivity and generate employment. However, the purpose of a particular innovator may often be to solve just his/her problem. There is no mechanism available for him to share the knowledge, innovation or practice with other people in different regions. Sometimes, ideas and innovations get diffused through word of mouth. But many times, these ideas remain localized. In the process, potential growth and social development gets constrained. To overcome this constraint, Honey Bee Network with a handful of volunteers triggered a movement, twenty years ago to scout, spawn and sustain the unaided innovations and outstanding traditional knowledge from the informal sector of our country.

Drawing upon this experience, National Innovation Foundation (NIF) was set up in 2000 with the help of Department of Science and Technology, Government of India to scale up the idea of learning from grassroots innovators.

Under the inspiring leadership of Dr. R. A. Mashelkar, Chairperson NIF and former Director General, Council of Scientific and Industrial Research (CSIR), NIF has taken major initiatives to serve the knowledge-rich, economically poor people of the country. It is committed to make India innovative by documenting, adding value, protecting the intellectual property rights of the contemporary unaided technological innovators, as well as of outstanding traditional knowledge holders. It aims at promoting lateral learning among local communities to generate low cost affordable solutions of the persistent and emerging problems, and enhance the diffusion of innovations on a commercial as well as non-commercial basis.

How does NIF work?

Primarily, NIF has five functions: (a) Scouting and documentation, (b) Value addition and research and development, (c) Business development and Micro Venture, (d) Intellectual Property Rights protection and (e) Dissemination, database development and IT applications.

NIF has been entrusted with the responsibility of building a National Register of Grassroots Innovations and Traditional

[1] The Honeybee collects pollen from the flowers but they are not impoverished, in the process links one flower to another enabling cross-pollination. Similarly, the Honey Bee Network strengthens people-to-people contacts, learning and networking by pooling the solutions developed by individuals across the world in different sectors. The network acknowledges the innovators, traditional knowledge producers and communicators so that they do not remain anonymous.

Knowledge. It is not enough to document or disseminate the innovations or outstanding traditional knowledge. Value addition is very important for harnessing the full potential of the idea. NIF has entered into MOU with CSIR and Indian Council of Medical Research (ICMR) besides other organizations. CSIR has allocated funds to support research on grassroots innovations in CSIR labs. Similarly, ICMR supports research on such herbal healing knowledge, which has not been documented in the classical texts and formal institutional literature. NIF also helps in generating a very large pool of open source / public domain technologies. A small number of innovations are also protected by patents and other IPRs.

For most innovators, attracting risk capital for converting innovations into enterprise is very difficult. They neither can offer much collateral nor are they able to develop a business plan or deal with formal R&D system.

A Micro Venture Innovation Fund (MVIF) has been set up with the help of SIDBI to provide risk capital for technologies at different stages of incubation. Under single signature, innovators are trusted and investments are made to help them commercialise their innovations. Most innovators do not make good entrepreneurs. For entrepreneurship, one has to make consistent batch by batch production of products. Innovators are often incorrigible improvisers. They seldom make two things alike. NIF has helped such innovators to license their technologies to third party entrepreneurs. Most of the licenses have been given to small entrepreneurs and in a few cases, to medium enterprises.

A very elaborate benefit sharing system has been developed, governed by the Prior Informed Consent (PIC) of the knowledge providers. Attempt is made to share benefits not only with the innovators but also with their communities and for nature conservation. In addition, a small part is kept for contingency support to needy innovators, for R&D stakeholders, promoting women's innovations and meeting overhead costs.

It is remarkable that grassroots innovations are generating global demand, as evident from inquiries from around fifty-five countries for various technologies, NIF has succeeded in commercializing

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The Honey Bee Network strongly believes in sharing knowledge among the providers of innovations in their own language, which is achieved by publishing local language versions of Honey Bee newsletter. It also ensures that a fair share of benefits arising from commercial exploitation of local knowledge and innovations reaches the innovators and knowledge providers.

products across countries in six continents apart from being successful in materialising thirty cases of technology licensing with the help of partner agencies.

What has it done?

With major contribution from the Honey Bee Network, NIF has been able to build up a database of more than 1,00,000 ideas, innovations and traditional knowledge practices (not all unique, not all distinctive) from over 545 districts of the country.

NIF has filed 202 patents in India and seven in US and one PCT application. Out of these, 35 patents have been granted to grassroots innovations in India and four in US. NIF has funded 113 projects under MVIF to the extent of Rs.1.3 crores. Hundreds of technologies have diffused through farmer to farmer social network.

NIF has proved that Indian innovators can match anyone in the world when it comes to solving problems creatively. Where they perform better than rest is in generating more affordable sustainable solutions by using local resources frugally.

Those who see poor only as the consumer of cheap goods, miss the knowledge richness at the grassroots level. The Poor can be the Providers also.

The Grassroots to Global (G2G) model that NIF is propagating is all set to change the way the world looks at the creativity and innovations at grassroots.

How can state government join hands with NIF?

a. NIF has no field extension unit nor does it want to have one. However, state government has several field functionaries in the area of agriculture, education, industry, rural development, women and child care, forestry, etc. There can be a very fruitful partnership between NIF as a source of innovative ideas and technologies and state government as partner in dissemination, value addition and even commercialization through incentives, promotion, subsidies, etc. Gujarat state has a dynamic program to reach the farmers, these innovations could be a regular part of these exhibitions and outreach programes.
b. State government can join the national campaign for scouting innovations and traditional knowledge and

motivate its grassroots functionaries to join hands with NIF in uncovering the talent at the community level.

c. Students in schools and colleges can be motivated to scout creative and innovative people in their neighbourhoods and send the entries to NIF (Post Box No.15051, Ambavadi, Ahmedabad 380 015, campaign@nifindia.org). Examples of innovations can also be included in the curriculum for the school and college education.

d. Demonstrations and trials can be organized at various regional research stations, agricultural and general universities and KVKs (Krishi Vigyan Kendras) so as to create awareness about the creative potential of common people. A MOU can be signed between various universities and NIF to have a time bound validation program.

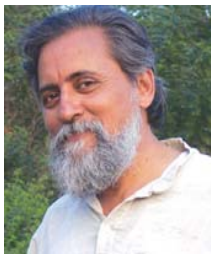
e. The research institutions can be mandated to add value to the knowledge of innovative people and help in protecting their knowledge rights.

f. On the state's website, link to NIF can be given and the innovations from the region can be displayed to put forward the creative face of the state before the people.

g. Some of the innovative people identified by NIF and/or state government could be awarded at district and state level besides giving them support for further work. In some cases, it has already happened. But much more can be done and more regularly. The CM may like to spend an evening with innovators every quarter.

h. A nodal officer could be appointed to keep a dynamic touch with NIF to ensure that all the areas of possible cooperation are explored.

I hope that NIF would be able to develop a functional, fruitful and fulfilling relationship with the State of Gujarat. Tremendously rich knowledge of biodiversity and environment besides numerous grassroots innovations can be leveraged through the proposed collaboration.



Anil K Gupta
Executive Vice Chairperson, NIF, Ahmedabad
Professor, Indian Institute of Management, Ahmedabad
anilg@nifindia.org

PART I

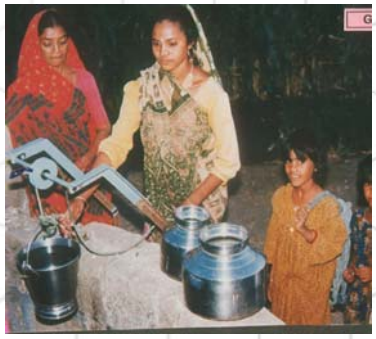
INNOVATIONS
from GUJARAT

This section contains grassroots innovations originating from ignited minds of Gujarat

Amrutbhai Agrawat
Junagadh

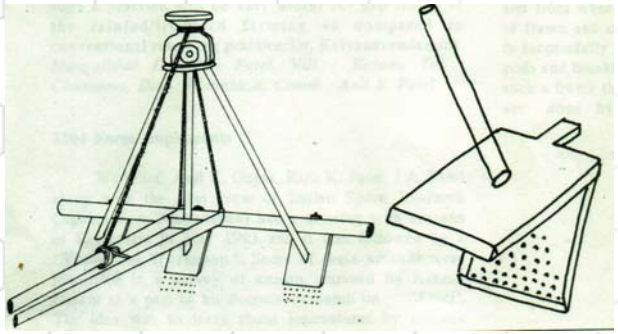
Aaruni- The Tilting Bullock Cart

In a traditional two-wheel bullock cart, part of the load is borne by the draft animals on their shoulders and neck. Moreover, the harness makes it difficult to negotiate sharp bends or turns in the road. This causes galls on the neck of the bullocks, which affect not only the efficiency of the animals but also their stamina. This cart overcame this shortcoming by having four wheels to balance the load. More importantly, the cart has a tilting mechanism that was based on the rope and pulley system originally, but was replaced with jack system and later gear system. The cart can be tilted by a lever located alongside the cart driver. The purpose of tilting is to distribute manure or *Taas* (powder of semi- weathered rocks found in Saurashtra and very rich in minerals) directly into the furrows rather than doing the same manually. Since this activity is generally done in summer, the tilting mechanism reduces the drudgery a great deal. This feature was later incorporated in two-wheel cart also for those who could not afford four-wheel cart. GEDA (Gujarat Energy Development Agency) had provided subsidy for initial promotion of 32 carts. This was the first grassroots technology licensed in Honey Bee network to three different entrepreneurs for five districts and the entire license fee was shared with the innovator. SRISTI/GIAN filed a patent for the same in 1998.



Pulley With Stopper

With water table going down and length of rope to pull water increasing, women (who have to often perform this arduous task) have to face a lot of drudgery while pulling water through conventional pulley. Many times while pulling water, women/men feel tired and have to pause to catch their breath. Bucket some times fall into the well. Indian civilization developed a bunch of hooks to get such a bucket out of the well but could not devise any mechanism so that bucket does not fall into the well. Honey Bee network had posed this problem to a network of innovators and then Amrutbhai came out with this innovation more than a decade ago. He attached a stopper over the pulley so that by the backward movement of rope, lever will press it automatically and would not let it slip. Now the person can take the rest as long as one wishes, without having to keep holding the rope. The innovation is available in three models - Ganga, Narmada and Saraswati. For this innovation he won Asian Innovation Award in 2000 and a National Award in NIF's First National Competition for Grassroots Innovations and Traditional Knowledge in 2001. An attempt was made to diffuse this pulley with the help of SEWA in a few hundred cases. Much more remains to be done. Apart from these two, Amrutbhai has made numerous other devices like Bund maker (bumper) to make bunds in the field for facilitating irrigation, Santi-multipurpose agricultural attachment, Groundnut digger (mini kaliyu), blades for the kaliyu, wheat sowing box among other things.



Bhanjibhai Mathukiya
Junagadh

Semi-circular Check Dam

The innovator from Saurashtra, a semi-arid region, prone to water scarcity had often been asked by villagers to do some thing about conserving water in a seasonal rivulet nearby. This led him to build a semi-circular dam using local materials, labour, and at minimal cost.

His path breaking innovation consists of a modular check dam built using the arch shaped bunds in sequence. The innovator was inspired by the strength and durability of arches used vertically in constructing railway bridges during British times. He used locally available materials such as stones, river sand and deployed one mason and four labourers to build the dam. The low cost dam was built in 4 days and at a total cost of Rs 10,000. This dam has made the area a green haven. This design is also being successfully replicated in a few regions in Maharashtra as well as Gujarat. Innovators like Premji Bhai, Vriksha Mitra have replicated this design in many villages.

Vanraj- 10 HP Tractor

His next major innovation, developed over 15 years was a compact yet powerful 12HP "convertible" tractor. The front axle is so designed that it can work as both three wheel as well as four-wheel tractor. One can change the front assembly quite easily depending upon the need. The three-wheel option helps in maneuvering turns as well as navigating undulating surfaces with ease while four wheel is much better for transportation. The tractor is built with an adjustable wheel base for various inter-culturing operations. The farmer can repair the unit with minimal effort or skills. With the help of NIF, GIAN West and SRISTI, Bhanjibhai has obtained a patent for this tractor in India. Patent for front assembly has also been granted in USA. GIAN West and NIF facilitated its testing and certification at CFMT&TI, Budni. He was also supported under the Micro Venture Innovation Fund scheme of NIF. Technology was also licensed to two entrepreneurs but some how their enterprise did not succeed much.

In addition, he has also developed a bullock operated sprayer and tried to build vertical axis windmill in vain. He won a National Award in NIF's Second National Competition for Grassroots Innovations and Traditional Knowledge in 2002 for both of his innovations.

Arvindbhai Patel
Gujarat

Auto Air Kick Pump

This innovation is a low cost, portable, compact aid to inflate tyre tubes/punctures of any vehicle, particularly two-wheelers, having kick start or auto start mechanism. One can fix the problem on the spot so that the vehicle can reach the nearby gas station or repair shop.

This device converts the compressor of two-wheeler into an air pump. A pinch of polymer granules is also inserted in the tube to seal the leakage. The user can kick and fill air in the tube. This may last for a few kilometers to reach a puncture repairing shop. An entrepreneur from Mumbai has taken non-exclusive license for this technology and has sold more than 2500 pieces so far, mainly in North Eastern India. Another technology licensing has been initiated by NIF North East cell, IIT Guwahati. Recently, with the help of GIAN West, another technology transfer to a different entrepreneur in Mumbai has been facilitated.

For this device, he won a National Award in NIF's Second National Competition for Grassroots Innovations and Traditional Knowledge in 2002.

The Natural Water Cooler, Auto-compression Sprayer and Handy Tongs

We already have refrigerators that operate on the principle of heat transfer and earthen pots that work on the principle of evaporation to cool water today. Arvindbhai has combined both features. In his natural water cooler, water is passed through cotton string covered copper coils, which are continuously being moistened by a dripper. Evaporation of water from lining on the coil cools the water inside. He has obtained a patent for this cooler, which was facilitated by SRISTI/GIAN West. He was also supported under the Micro Venture Innovation Fund scheme of NIF for commercialisation of this technology. GIAN West also facilitated the technology transfer of this cooler to entrepreneurs.

He has also made an auto compression sprayer, which utilizes the jerk produced while walking to create air pressure for spraying pesticides. He won a Consolation Award in NIF's Third National Competition for Grassroots Innovations and Traditional Knowledge in 2005 for this prototype. The innovator has received the patent for his device, which was facilitated by GIAN/NIF. Under the NIF-CSIR JIC, further development of this technology was also attempted.

He has also made simplified and efficient tong for lifting heavy vessels. He was also supported under the Micro Venture Innovation Fund scheme of NIF. He got an Appreciation award in NIF's Fourth National Competition for Grassroots Innovations and Traditional Knowledge in 2007.

Bachubhai Thesia
'Khopdi'
Jamnagar

Tractor That Goes Round!

Ever seen a four wheeler rotating on its axis? Well, Bachubhai has made a tractor to do so. His innovative tractor, which can do all the normal functions of any other tractor, can do something that no other tractor or even any four wheeled machine can do i.e. to rotate at 360 degrees on its axis. With a unique steering mechanism, the innovator has been able to give the tractor very small turning radius that enables it to rotate easily. Bachubhai is a maverick innovator who has made so many innovations that villagers call him 'khopdi' or a brainy fellow.

Herbal Rust Remover/Joint Loosener

A herbal extract that can remove rust from the joints and loosen them in seconds. Very useful to unscrew rusted nuts and bolts.

‘Signed’ Bulb That Lasts Longer

Inserting a small circuit in a commonly available bulb, has increased its life since it can now tolerate wider voltage fluctuations. This bulb also a chit, which has the owner’s name in the inner glass tube having filament on its edge. So now the bulb is ready, which lasts longer and nobody can run away with it. His may be the world’s first signed bulb.

In addition he has developed many more innovations such as multipurpose machine which has a cutter, water pump, flourmill, grinder etc. He has also attached *santi* to his two wheeler. And why not use an iron comb for separating gram pods from the plant after harvest. He had made radio transmitter as a student for which he was hauled up. His wife mainly runs the show as far as farming is concerned leaving him to dabble with many of his creative pursuits, though both manage the things together.

He has been short listed for recognition in NIF’s Fifth National Competition for Grassroots Innovations and Traditional Knowledge. For more about Bachubhai and his innovations please see Honey Bee 19(1) 8-11, 2008.

Dhanjibhai Laljibhai Kerai
Kutch

Modified Scooter For The Handicapped

Not content being dependent on others for his transportation, Dhanjibhai, a lower limb physically challenged person, decided to move ahead and do something for himself and people like him. He modified a scooter to suit his needs. The front seat has been removed to accommodate him, the rear brake has been extended in form of a lever so that he can operate it with his hand and two extra wheels have been used at the back for maintaining the balance of the vehicle. Despite his physical limitations he has proved that where there is a will there is a way.

He runs an electrical repairing workshop and extends the range of cordless telephones also. He won a National Award in NIF's Third National Competition for Grassroots Innovations and Traditional Knowledge in 2005.

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Hand Driven Pump Sprayer

Gopalbhai Suratiya
Vadodara

When family did not appreciate his tinkering with farm implements to modify them, Gopalbhai started working on his ideas in the night when family was asleep. He has designed and built a manual sprayer powered by the motion of cycle wheels of the pulling cart. One can adjust the distance between nozzles on the boom as well as the height of the spray boom as per the orientation of the crop. It is easy to maintain and repair. The unit can spray an acre of land in six hours of operation. He has obtained a patent for this sprayer, which was facilitated by GIAN West and NIF. He won a Consolation Award in NIF's Third National Competition for Grassroots Innovations and Traditional Knowledge in 2005.

In addition, he has recently built a cow dung cup which can be used to house the bouquets or seedlings. Experiments in SRISTI-Sadhbhav-Sanshodhan natural product lab have shown not only growth advantage for the seedling but have also shown economy in water use since it stores moisture longer. An entrepreneur from Tamil Nadu is exploring export options for the same.

Mansukhbhai Jagani
Amreli

Bullet Santi-Motocycle Based Multipurpose Plough

Like many other drought prone regions, this region also has a severe shortage of fodder leading to decline in the availability of bullocks for farming operations. One of Mansukhbhai's friend approached him to find some solution to scarcity of draft power. Looking at the motorcycle his friend was riding, Mansukhbhai thought of adapting it as a ploughing machine. That's how 'Bullet Santi' was born. Innovation is not in the tool bar which was developed much earlier but the attachment in the motorcycle which has diffused widely in the area.

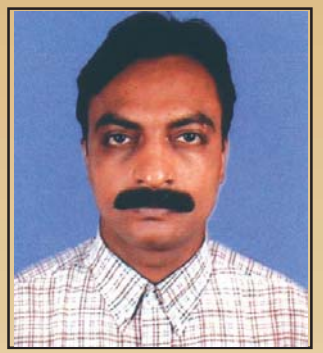
Using the chassis, drive and power of an Enfield Bullet motorcycle in front, the innovator has retrofitted an attachment with two wheels at the rear with a tool bar to fit various farm implements. This meets various needs such as ploughing, weeding and sowing seeds. Bullet Santi can plough an acre of land in half an hour consuming only two litres of fuel. Innovator got a patent in India and USA. Given the fact, many other users and innovators copied this technology, he has appreciated the concept of 'Technology Commons' implying no restrictions for other innovators to copy and adapt. But commercial firms will need license from members of the 'Technology Commons'.

He had visited South Africa as a part of a delegation led by SRISTI on the invitation of Commonwealth Science Council to share his skills with his counterparts in Limpopo province. He has also developed a bicycle based sprayer which he assembled in South Africa also.

He won a National Award in NIF's First National Competition for Grassroots Innovations and Traditional Knowledge in 2001. Also see Honey Bee, 11(4) & 12(1): 29; 2000-2001

08

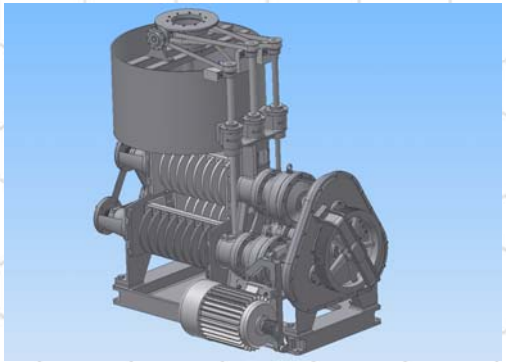
Energy efficient oil expeller

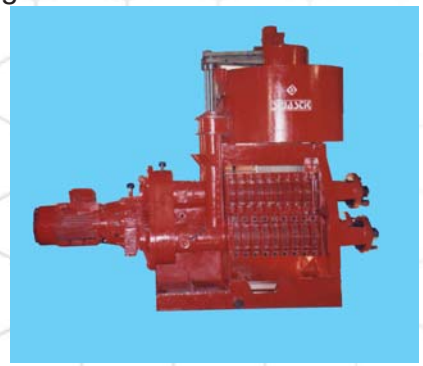


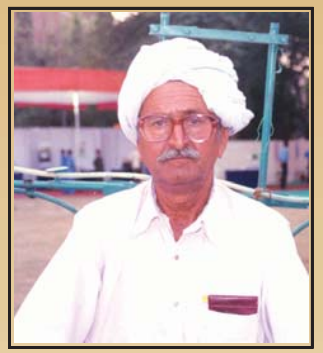
Kalpesh Gajjar
Mehsana

Conventional oil expeller machines using screw press mechanism require more maintenance, space and energy than the design that he has developed. This oil expeller, which can crush all kinds of seeds, uses planetary gear system coupled with screw press, saves power by 40 per cent when compared to the conventional oil expellers of the same capacity. It has higher production efficiency, which has been achieved by providing an improved and energy efficient transmission mechanism in a very compact design. Occupying just a third of the space of a conventional expeller, this machine is low on maintenance too. Having gone through a lot of struggle in life, he has come up a long way in his life. His technical knowledge deeply impressed a professor from MIT during a workshop of grassroots innovators at IIMA. Maximum international queries have been received for his technology at NIF and GIAN West. But being an incorrigible improviser, he is never satisfied and thus delays in delivery are a rule rather than exception. This affects the real demand of his technology. He has developed a lot of other machines for construction industry and other related industries.

He has obtained a patent for this machine. NIF also has filed a patent in USA for the same. He won a National Award in NIF's First National Competition for Grassroots Innovation and Traditional Knowledge in 2001.







Ganeshbhai Dodiya
Bhavnagar

Motor Cycle Mounted Sprayer

To overcome the problem of labour shortage the innovator has devised an insecticide sprayer mounted on a motorcycle. This sprayer is powered by the engine of the vehicle. As the motorcycle is driven between the crop rows, the pump sprays pesticides on the crop. A student of IIT Bombay tried to improve the design of the sprayer but by taking power from the wheel instead of engine, he disappointed the innovator. Further work needs to be done to improve it.

He won a Consolation Award in NIF's Third National Competition for Grassroots Innovation and Traditional Knowledge in 2005.

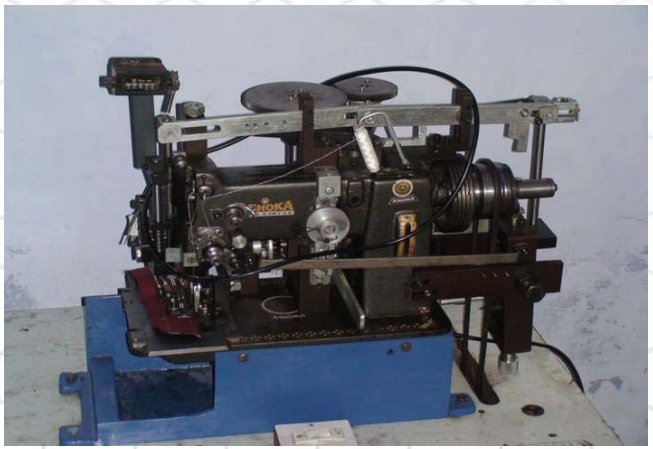
10

Buttonhole Stitching Machine

Anil Kamdar
Godhra

Normally, buttonhole stitching in shirts is one of the most tedious and time consuming tasks. This particular machine addresses this problem adequately. It has been modified from an old embroidery machine and can stitch buttonholes automatically relieving the tailor of the pains to do it manually. It has an automatic thread cutting mechanism also and can make buttonholes as per the required shape, size and design. Through NIF and GIAN West support, the machine has been considerably redesigned. Since original machine was fabricated using various old and junk parts, it did not perform in a consistent manner. Availability of old imported Japanese machines has affected the market of his machine adversely.

He won a Consolation Award in NIF's Third National Competition for Grassroots Innovation and Traditional Knowledge in 2005. He has obtained the patent for his machine through GIAN West.



Asjadbhai Dhukka
Banaskantha

Customised Tricycle For The Lower Limb Physically Challenged

Understanding the needs of his father for transportation, Asjadbhai came up with this battery operated tricycle. The motor operating on a 24 V battery gives it reasonable speed and enough power to move through sandy terrains also. The vehicle has been customised with low height adjustable push back seats, newspaper and water bottle carrier and a safety lock to prevent backward motion on slopes. Additionally, the side arm support can be lifted up to enable the rider to climb up the seat easily. The vehicle offers a very comfortable ride to the traveller.

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Chetak-The Cotton Stripper Machine

Mansukhbhai Patel
Ahmedabad

To ease the tedious manual process of separating cotton from the unopened and semi-opened shells of a rainfed cotton variety grown in Gujarat, Mansukhbhai developed a cost effective machine to remove cotton (indigenous varieties of cotton like V 797, Guj 21 and Vagad) from shell efficiently and make it ready for ginning. Processing by stripper also helps in improving the quality of cottonseed extracted and ensures higher returns to the farmers.. He is the first Indian Grassroots Innovator to have a US patent for his technology. SRISTI and GIAN West facilitated the patent process. He is one of the most successful innovator cum entrepreneur. With a small investment of about Rs six lacs under TePP eight years ago through GIAN West, he has now set up four different industrial units with combined turnover of more than Rs 2.5 crore annually. A student of NID worked also with him for six months. His innovation journey has been full of struggle but he succeeded in overcoming all the problems. He is currently a member of Board of Directors of SRISTI.

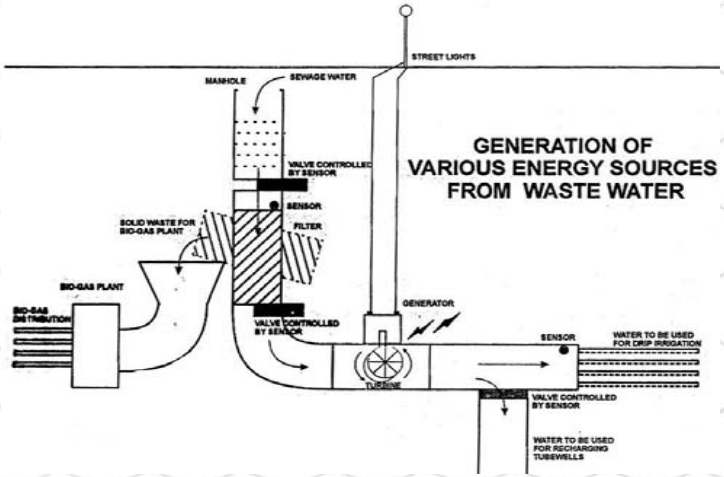
He won a National Award in NIF's Second National Competition for Grassroots Innovation and Traditional Knowledge in 2002. Also see Honey Bee, 8(2):3-4, 1997 and Honey Bee, 14(2):19, 2003.

Moxad Pinakin Thakar
Ahmedabad

Energy Generation Through Sewage Water

This is an interesting idea from a young student to use the flow of sewage water to run a turbine and generate electricity and light up the street lamps. The filtered water then can be used for drip irrigation or ground water recharging while the filtrate can be used for bio gas production.

He won an Award in Students' category NIF's Fourth National Competition for Grassroots Innovation and Traditional Knowledge in 2007.



14

Innovations in Plenty

Khimjibhai Kanadia*
Sabarkantha

The 65-year-old retired primary school teacher Khimjibhai Kanadia has more than 50 innovations to his credit, all of which reduce the drudgery in various mechanical tasks and improve work efficiency.

One of Kanadia's most famous innovations is Kittanal. It is a hollow cylindrical piece of PVC pipe with an elliptical opening at one end. Though it looks a very ordinary device, it is highly effective in filling plastic bags with soil, which are used for growing saplings. Kittanal has won widespread accolades from different quarters, like the forest department of Gujarat, the paper and pulp industry major Ballarpur Industries and the Ahmedabad-based non-governmental organisation Self-Employed Women's Association.

Some of his other important innovations include a gum scrapper for collecting gum from trees; paniharino visamo, an apparatus to ease burden of rural women who carry pots on their head, and a sprayer to reduce pesticide wastage. His innovations won him the State Award in NIF's Second National Competition for Grassroots Innovations and Traditional Knowledge in 2002. For more information on Khimjibhai Kanadia's innovations also see Honey Bee, 9(1):7, 1998.

* Though awarded earlier, the innovator is a professional as per the present rules of NIF, which were redefined 2003 onwards to specifically focus on innovations from the people of unorganised sector.

Paresh Panchal
Ahmedabad

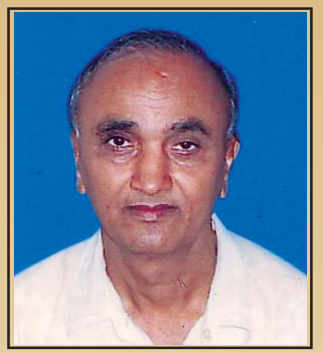
Motorised String Winder

All kite flying enthusiasts will accept that winding the string is a difficult process and takes time, after the kite is cut. Rightly identifying the need of kite flyers, Pareshbhai has made an automatic thread winder, which uses two small batteries. Easy and speedy operation, it winds 500 yards of thread in 30 seconds.

For this winder, he was supported under the Micro Venture Innovation Fund of NIF. A patent was also filed in his name. He got a Consolation Award in NIF's Fourth National Competition for Grassroots Innovation and Traditional Knowledge in 2007.

16

Ribbed Tawa/Pan And Others

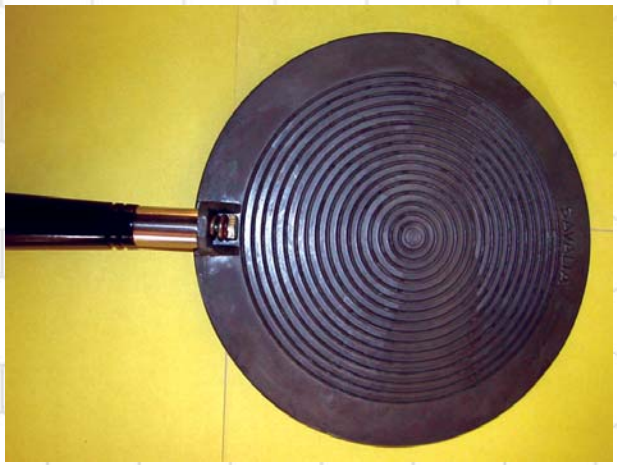


Late Ravjibhai Savaliya
Ahmedabad

Traditional iron tawas are much poor in thermal efficiency than many recent designs. With the increase in the LPG prices, reducing the energy consumption is quite a challenge while cooking. A product to overcome this challenge is the 'Ribbed Tawa', which is made of aluminum and has ribs on its bottom. This design allows the enhanced flow of heat from the bottom due to increased surface area, improving the baking capacity of the tawa thereby reducing energy use.

His innovation journey was full of twists and turns. He developed many more innovations such as a butter churning machine thirty years ago for which he got a President's Award. His innovations include wheat thresher, foot pump, electronic furnace type wood based crematorium, diamond polishing lathe, agate grinding mill among others.

He has been short listed for recognition in NIF's Fifth National Competition for Grassroots Innovations and Traditional Knowledge. Also see Honey Bee 19(4): 4-7, 2008.



Premjibhai Patel
Rajkot

Seed Broadcaster & Check Dam

Seed broadcaster

There are few people who may have done so much for tree plantation as Premji bhai has done. He began with his seed-broadcasting spree on motorcycles through which he scattered tonnes of seeds of trees on the roadside. When that became a constraint in speed and scale, his son suggested that he used a vehicle. It is then he conceived a seed broadcaster.

This is petrol-driven mechanical blower, which could be mounted on the back of a jeep and can broadcast seeds up to distance of 15 meters. If the winds are strong, the vehicle on which it is mounted has to be moved slowly and vice versa. This blower can also be used to broadcast seeds along the railway tracks. He has used this to broadcast millions of seeds in different areas. If just one in thousand seeds grew into a tree, he must have planted more than five crore trees already. It is for nothing that he is called Vriksha Mitra. Apart from SRISTI Samman, he also got several regional and national awards. He is an extraordinary role model for the youth.

Check dam

Premjibhai has replicated in hundreds, the semi-circular check dam design developed by Bhanjibhai of Junagadh, with some location specific improvements. He won a National Award in NIF's Third National Competition for Grassroots Innovation and Traditional Knowledge in 2005.

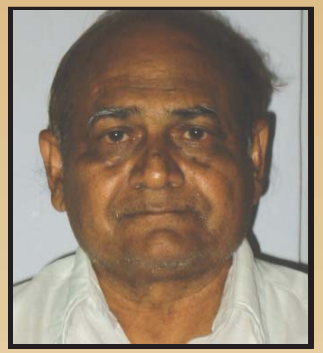
18

Maruti Jhoola- The Health Care Chair

Sakrabhai Prajapati
Gandhinagar

Modern life with its fast pace and sedentary lifestyle has created the need for solutions incorporating relaxation and invigoration. Maruti Jhoola is a unique health chair with multiple capabilities, functions and settings for various postures and seating dynamics.

It is ergonomically designed and serves the purpose of seating as well as exercising for a person weighing up to 120 kgs. It can double up as a hammock or a jhoola. The health chair has established itself as useful for people suffering from arthritis and joint ailments. For this chair, he was also supported under the Micro Venture Innovation Fund scheme of NIF. To facilitate marketing, an entrepreneur has been engaged. Lot of cost was spent on packaging and transportation of the chair. It is now being redesigned and the cost may come down.



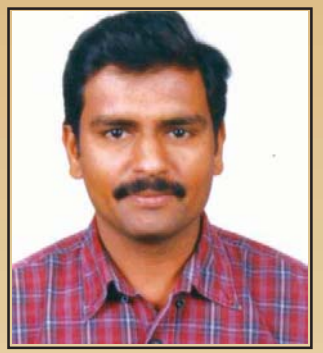
Shashikant Shukla
Ahmedabad

Silk-The Non-violent Way

Traditionally, Eri-culture, a non-violent production process of silk (where the silkworm is not killed but is allowed to escape alive), has remained confined to the north eastern states of India. Shashikant realised a need to promote eri silk in Gujarat to help people in the rural areas earn additional income. Unlike the traditional method of silk production where the pupa is killed before spinning yarn from the cocoon, the silk obtained from this process can be used by the Jain community also who constitute a sizeable number in the state. GIAN West had done experiments many years ago in Sabarmati jail to first demonstrate the viability of the idea with the help of some convicts who volunteered for this work.

20

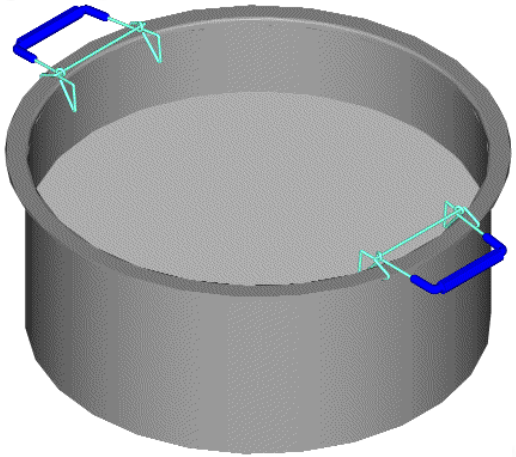
Vatsal Tong



Vinod Gajjar
Mehsana

The conventional household utensil-holding devices used in kitchen have not undergone much improvement in recent times. Very often accident occurs due to the lack of gripping capacity of conventional tong. When posed with this problem, Vinodbhai came out with an innovative design of the tong, which is more user friendly, low cost and can be widely used for utensils of various sizes. It sold very well in various Traditional Food Festivals-Satvik held at IIMA campus.

He won an Appreciation Award in NIF's Fourth National Competition for Grassroots Innovation and Traditional Knowledge in 2007.

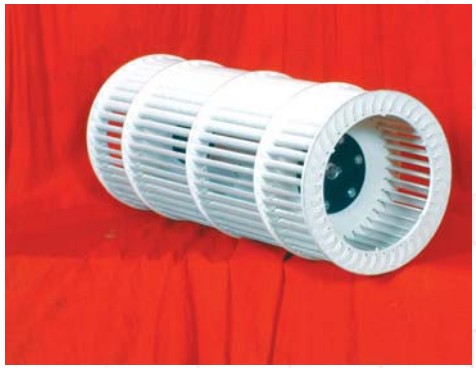


Yagnesh Mehta
Ahmedabad

Air Curtains

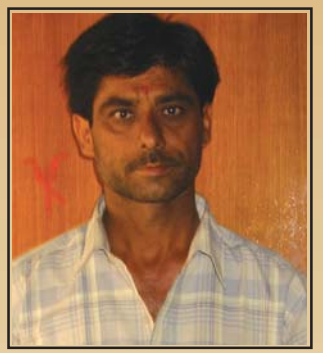
Using ABS plastic, Yagnesh has come up with an innovative design of the air curtains. The fins are aerodynamically arranged facilitating proper air flow at the same time effectively repelling flying insects, dust and pollutants. Unlike the aluminium made rolling drums, these curtains are cheaper, require less maintenance, are easy to manufacture and produce negligible noise and vibration.

He won a Consolation Award in NIF's Third National Competition for Grassroots Innovation and Traditional Knowledge in 2005.



22

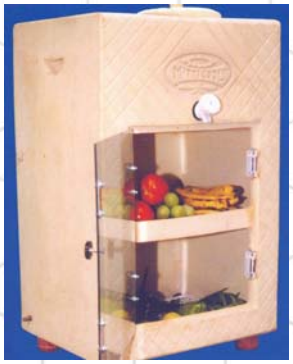
Earthen Kitchen Products



Mansukhbhai Prajapati
Rajkot

Tawa/pan: Non-stick tawas have become an essential part of our kitchens to prepare low oil food. But these non-stick pans made of metal are quite costly. Their non-stick coating also does not last long. Blending traditional and modern technology, Mansukhbhai has developed a clay tawa with a black non-stick food grade coating. Being non-metallic, the rotis, dosas and other items cooked on it give a different taste and feel much better. The paint gets into the clay pores and thus does not come off despite prolonged use. He was also supported under the Micro Venture Innovation Fund scheme of NIF.

Mitticool: It is a fridge for the common man that does not require electricity and keeps food fresh too. Mansukhbhai came up with Mitticool, a fridge made of clay, working on the principle of evaporation. Water from the upper chambers drips down the side, gets evaporated, leaving the chambers cool. This keeps food, vegetables and even milk fresh naturally for days. He has received national and international exposure and the recent issue of The Economist carried a story in which his innovation was mentioned. Lot of queries have come from around the world for his Mitticool, including from the world's third largest company in Germany.



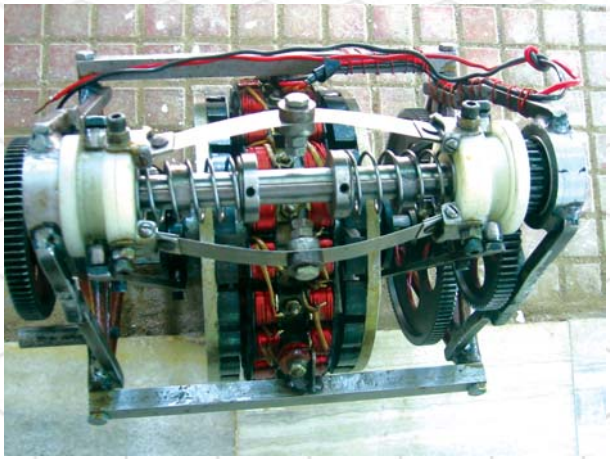
Cooker: It is a pressure cooker made from clay. Food cooked in clay vessel has different taste from the food cooked in the conventional vessels. He has been short listed for recognition in Fifth round of NIF's National Competition for Grassroots Innovations and Traditional Knowledge.

23

Dinesh Ashodiya
Rajkot

Generator With Centrifugal Governor

Wind mills generally are not helpful in generating electricity when the velocity of the air reduces below a certain level. A possible solution has been developed by Dineshbhai in his magneto type generator, which works particularly well in winds with low cutting speed. The output of the generator is also independent of the variations in the wind speed and is constant. He won a Consolation Award in NIF's Fourth National Competition for Grassroots Innovation and Traditional Knowledge in 2007. NIF also filed a patent for the technology in the innovator's name.



24

Whole Stalk Paddy Thresher

Late Dilip Sinh Rana
Surat

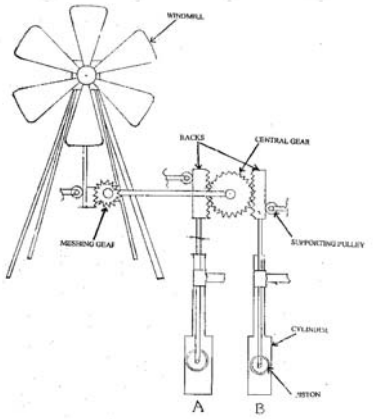
This innovation was developed by Late Dilip Sinh Rana where the stalks of the paddy are not broken during the threshing process. Paddy stalks are the main source of fodder for the animals in the region. He won a National Award in NIF's Fourth National Competition for Grassroots Innovation and Traditional Knowledge in 2007.

Bharatbhai Agrawat
Junagadh

Modified Wood Stove

Traditional wood stoves do not use the heat optimally and also emit much smoke and pollutants due to incomplete combustion. Bharatbhai fitted an exhaust chute to a wood stove and noticed that a lot of heat was still coming out, which made him infer that non-utilization of heat was the major fault in existing wood stoves. He decided to facilitate better heat utilization through sufficient air supply and a better channel for burning. To improve it further, he developed a mechanism for simultaneous heating of multiple vessels using the same heat source. Bharatbhai made the first model of this stove in 1999, then after a few modifications, he came up with this multi-purpose stove, which two multi-level burners and a single fuel feeding point.

He has built many devices. The list includes a lemon cutter, innovative windmill for lifting water from wells, 5 HP power tiller cum tractor, which can be rotated at 360 degrees and many more equipments besides the stove. He won a Consolation Award in NIF's Fourth National Competition for Grassroots Innovation and Traditional Knowledge in 2007.



26

Multiple Ideas

Vishan Popat
Vadodara

A young student, Vishan, has many creative ideas to his credit. He has conceived an idea to have wipers for side windows in cars to enable passengers have a clear view of the sides in rainy conditions and otherwise too.

His other ideas include a single push pizza cutter, cleaning brush with cleaning liquid dispenser, a dustbin that gives an alarm when it is completely filled and others. He won the first prize in the class 8-12 section of the IGNITE 08-the National Competition for students' ideas and innovation organized by NIF.

Ideas Sprout in Young Minds!

Seeds to generate electricity

Pranav Singh, Ahmedabad

Seeds exert a lot of pressure while germinating. If kept inside a container along with some water for a few weeks, they can generate force that can break a thin glass container. If thousands and thousands of seeds are left to germinate in a large glass container, it will exert a huge amount of pressure on the walls of the container eventually leading to its breakage. The mechanical energy generated in the process can then be converted into electrical energy. The seeds can later be then given to farmers and water can be used for various purposes so that nothing goes waste.

Road bumps to light houses

There are many bumps or speed breakers on the roads. We can design speed breakers that would get pressed under a vehicle's pressure. The mechanical energy thus generated can be converted into electrical energy and supplied to homes.

Apply breaks without using your leg

Jay A Patel, Ahmedabad

Jay thinks of making a device in bikes by which breaks can be applied without putting down our leg. It would have a button connected to a spring on pressing which, the side stand would come down and the vehicle would come to a halt. On leaving the brake, the supporters would come up and the person can move further.

Insect repellent floors

Shalini Pal, Ahmedabad

A permanent layer of bacteria and insect resistant material should be placed on the floors in houses so that we do not have to clean the floors everyday with repellents. Such floors will also be preferred by mothers because kids often end up carrying infection playing on the floors.

28

Resham Patto- New Chilly Variety

Alibhai Abhvani
Jamnagar

Alibhai Abhvani, popularly known as Alidada, developed a new variety of chilli called '*Resham Patto*' (The Silk Leaf) with the help of Murubhai who made the initial selection from another chili variety. This variety is deep red in colour, has smooth thick skin that shines like silk and does not crack even after drying. This variety is ideally suitable for natural food colouring as it is non-pungent.

Alibhai won SRISTI Samman in 2002 for this variety and a Consolation Award in NIF's Second National Competition for Grassroots Innovations and Traditional Knowledge in 2002. Though the contribution of Murubhai was discovered much later and remains to be recognised. Also see Honey Bee, 12(3):2, 2001.

Rajnikantbhai Patel
Sabarkantha

* Though awarded earlier, the innovator is a professional as per the present rules of NIF, which were redefined 2003 onwards to specifically focus on innovations from the people of unorganised sector.

Controlling Worms/Pests in Crop

1) Cash crops like castor, cotton seed, tobacco and vegetables especially okra are infested with variegated worm i.e. *Spodoptera litura* while legumes like gram, pigeon pea and Indian beans are affected by the green worm i.e. *Heliothis armigera*. Various experiments have been taken up to overcome this problem but to no avail. Rajnikant Patel has a solution - a new herbal pesticide. Four kg of '*kuvarpathu'* (*Aloe vera*), 500 ml of neem oil and 500 g of tobacco powder are boiled in 20 litre of water for three to four hours to make a five litre solution. Then 50 g of '*aritha'* (*Sapindus emarginatus*) powder is added to the solution and mixed thoroughly. To control the worms, 100-150 ml of this filtrate is added to 15 litre of water and sprayed on the crop. Niranjanbhai of Pahadpur village is one of the many farmers who have tried this and obtained about 80 to 90 per cent control. Rajnikant is a reputed village level worker known for his sharp perceptions and is very devoted to organic farming.

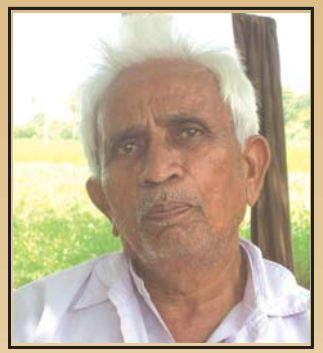
2) Maize is the main crop in monsoon season ('*kharif*') in Sabarkantha, Panchmahal and Banaskantha districts of Gujarat. In these districts, '*gabhmar'* (Stem borer) is the main pest that damages maize. It attacks the crop from the 20th day of sowing till maturity. Most farmers use pesticides to get rid of this pest. Rajnikantbhai mixes one kg of tobacco powder with five kg of sand from the riverbank. The mixture is made moist by sprinkling 200 to 250 ml water on it. This is done to prevent the light tobacco powder from getting scattered. Twenty days after sowing the crop, the mixture is slowly put in the crown of the crop. Six kg of this mixture is sufficient for one hectare of land. Similar treatment is given on the 40th day (from sowing) to control the pest. This practice has widely diffused all over North Gujarat. The cost of using this technique comes to about twenty-five rupees per hectare of land. He won a Consolation Award in NIF's First National Competition for Grassroots Innovations and Traditional Knowledge in 2001.

30

New Variety of Hyacinth Bean

Jitabhai Patel
Sabarkantha

Jitabhai Patel owns a sizeable farm in Vetla in the Vadali taluka of Sabarkantha district. In 1987, the area was hit by severe drought following the failure of the monsoons. All the grazing land had dried up and the stored fodder was exhausted. Fodder for cattle had to be bought from a distance of about 40 kilometres from Vetla. Once, Jitabhai chanced upon a healthy *valol* creeper in a load of vetch that arrived as fodder. The creeper, *val/ valol,* was a hyacinth bean known as *Dolichos lablab.* There were clusters of fully matured pods in some of the harvested creepers, while some of the vines had young pods of *valol*, which makes for a delicious vegetable and is a rage in most Patel households. Jitabhai was quite impressed by the size, appearance, flavour and taste of the *papdis (*young tender pods of *valol)*. Being a connoisseur of the vegetable, he immediately collected as many ripe pods of the legume as he could from the fodder consignment. He sun-dried them and carefully preserved the seeds. Over a period of four years of meticulous observation and selection, Jitabhai arrived at a variety that flowered early, had a good resistance against diseases and provided a good yield of large pods. The family had vast quantities of *valol shak* (a dish of the vegetable) that year and liked the taste. The rest of the crop was sent to the market. For having developed a superior variety of the vetch cultivar, Jitabhai was selected for the *Sardar Krishi* award in 1998 by the Gujarat government and for SRISTI Sanman in 2002. Also see Honey Bee, 13(3): 6-8, 2002.



Thakarshibhai Savaliya
Junagadh

Moralo- New Groundnut Variety

Now in his seventies, Thakarshi Savaliya has been farming since he discontinued his studies in class four. He runs a shop besides tending to his farm.

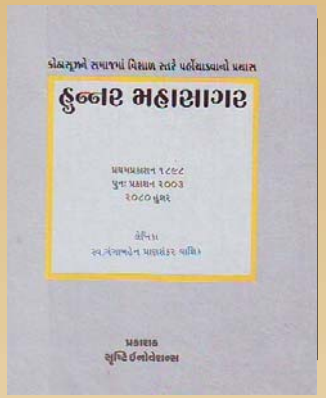
Thakershibhai is known throughout Junagadh as the father of the '*Moralo'* groundnut, popular for its sweetness, productivity and resistance against the 'Tikka' disease. In 1988, while weeding and interploughing, Thakarshibhai and his son, Nitin noticed two plants that stood out from the rest. They were greener, their leaves were thicker, and they bore more flowers and pods. These plants were marked and stored by Thakarshibhai for seeds. He propagated the seeds separately each year, noticing that the crop matured in only 90 days, a month before the regular variety. He named his groundnut variety "Moralo" because the pods resembled a peacock in shape. He attended 2nd International Crop Science Congress, November 17-14, 1996, Vigyan Bhavan, New Delhi along with other farmer breeders from Gujarat. During the presentation attended by Dr. Norman E. Borlaug, Noble laureate, he surprised the groundnut breeders about a character (ridges on the pod), which conventional breeding on groundnut had almost completely ignored. He stressed that in his variety having strong pegs and no ridges, soil did not get attached and thus taking pods out at the time of harvest was easier. He used the entry pass for this conference for many years after for gaining access to places and people who otherwise did not appreciate his contributions.

He won the State Award in NIF's Fourth National Competition for Grassroots Innovation and Traditional Knowledge in 2007. Also see Honey Bee, 7(3):15, 1996.

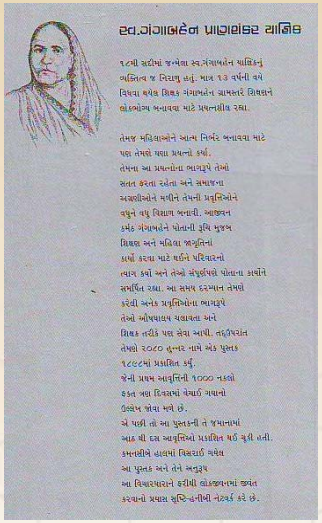
Gangaben:
A Nationalist, A Writer and A Visionary

More than a hundred years ago, Gangaben Pranshankar Yagnik wrote a book in Gujarati dealing with 2080 examples of local knowledge as well as practical recipes (collected from different sources) for setting up small scale, self-employment enterprises. She describes many ways of controlling household pests as well as crop pests, animal disorders, and solving day-to-day problems in agriculture as well as non-farm enterprises. Her efforts to collect all these ideas from within the country as well as to compare some of these ideas with the latest information from other countries, did not go waste. She found readers in the villages as well as cities. Gangaben recognised the importance of local knowledge and the need for learning from people. She compiled a whole range of ideas on improving livelihood opportunities for people. She had become a widow at the age of 14 but did not loose her spirit. She became a teacher in a girls' school and started inculcating among girls the spirit of self-reliance and swadeshi (i.e. need to buy things made in one's own country). Gandhiji visited Vizapur near her school in 1919, and made her take a vow to use things made within the country. She had already written a book in 1907 highlighting this idea.

SRISTI Innovations has reprinted the 1927 edition of this book for wider circulation and reflection. Most of these practices were aimed at acquainting rural folks, mainly women, to various avenues of self-employment available at that time. She had concentrated on those trades which could be started with little money and locally available material. One must add a cautious note here: though Gangaben's book was extremely popular – it had seen eight reprints by 1929 – a lot of research is needed to know how much money was generated by the people who followed her techniques of self-employment. Due to the efforts of SRISTI in getting her work acknowledged, an award was started by the Gujarat Government in her name for people/organizations doing exemplary work in the small scale industries sector. For review of the book please refer to Honey Bee, 14(1):16, 2003



Gangaben Yagnik



Bhavin Sinojiya

Groundnut Picker

The groundnut growing areas in Gujarat is spread over an area of 20 to 25 lakhs hectares, accounting for 25% of the total production of groundnut in India. The groundnut picking is currently done manually which takes around 50 man days per ha as compared to the machine that can cover the same are in a day.

Bhavin Sinojiya, an innovator from Saurashtra region realized the need to develop a machine, which can reduce the cost of collection of the 35% of the crop often left in the soil after the manual harvest. The mechanical method would not only help in increasing the per hectare yield but would also reduce the cost of extraction thus making farming of groundnut more attractive.

The machine made by the innovator is attached behind the tractor, which gives the required draft power to the machine and has been tested in his field. Presently, he is developing another prototype based on the field observations. Seasoned innovators Bhanjibhai Mathukia from Visavadar and Mansukhbai Jagani from Amreli are providing guidance and mentoring support to the innovator.

34

Dual purpose Sickle

Kisorbhai Bhardwa
Junagadh

A normal sickle has a long blade with wooden handle. One has to sharpen the whole blade when it gets blunt. Repeating this process several times erodes the the blade, making it thinner and weak. One has to then discard the sickle and buy a new one. To prevent this, Kisorbhai has developed three different types of sickles. In the first model, inspired by a barber's knife, Kishorbhai made an iron base, sort of a clamp with a wooden handle. The thin blade is held between the clamp with the help of bolts and nuts. So whenever there is a need to sharpen the blade, it can be removed and sharpened. In the second model, the sickle has been given a concave edge for harvesting crops. On its top, a projection is provided for removing weeds and also to break soil clods. The third model consists of a dual-blade arranged in opposite directions.

Mulubhai Senjaliya
Junagadh

Mini Tractor/Multi Utility Farming Machine

Mulubhai has assembled a mini-tractor unit, which is a compact contraption and uses the stationary 4.5 HP tractor engine, a four-speed and reverse gearbox and the transmission system of a Matador 307. The tractor can be used for shallow ploughing, inter-culture. One can attach cultivator, shallow blade harrow or a seed-cum-fertiliser drill. A unique feature of this machine is the spraying mechanism comprising a pressure pump and fabricated booms, attached with nozzles on both sides of the machine, which can be operated with the engine power to provide a uniform pesticide spray. Easy maneuverability, low maintenance cost, one tonne load carrying capacity and fuel economy (one litre of diesel per hectare of cultivation) add to the utility of the device.

36

Small Diesel Engine

Mansukhbhai Sanchaniya
Rajkot

The innovator has developed a unique 3.5 HP single cylinder, 4 stroke small diesel engine, which is two-third the size and half the weight of the conventional machine. The major components are made of an aluminium alloy, which offers a high strength–to–weight ratio and the use of an optimum nozzle plunger reduces air pollution due to exhaust. At the cost of Rs. 12, 000 per unit, it is easily affordable. Attached to a motorcycle, it gives a mileage of 100km/l and achieves a maximum speed of 55km/hr. Due to its compact size and light weight it can be used for various other applications such as pumps, mini flour mills, lawn-mowers, motor boats, portable diesel generators etc.

Shaikh Nazim
Ahmedabad

Multiple Innovations

Shaikh Nazim is a very creative person who keeps on churning ideas, some of which are mentioned below.

Solar Cooker: His solar cooker uses ordinary mirrors to reflect solar rays to cook the food. The difference between his and other solar cookers is that small square mirrors are placed at intersection points of an iron wire grid instead of a large single piece parabolic mirror (difficult to carry, install and maintain). The cooker costs Rs 2500 and saves the time of cooking.

Stencil cutting for embroidery design: Conventionally, stencil is prepared by punching small holes using needles manually. It is a very cumbersome and tedious task leading to pain in the palm. Nazim has developed a small innovative punching device to apply design on butter paper to facilitate the design on cloth. The device comprises a small a motor of DVD player, needle, crank and a connecting rod. Using this device, the time required to punch complex prints has been reduced considerably. It is similar in some sense to the device used for writing name on the metallic vessels.

Thread twisting device for embroidery design: "Marodi" is a traditional name which means twisting of threads. This is one of the most labourious and expensive work done on dresses. Conventionally it is being done manually by twisting the threads between palms. In order to simplify the operation, Nazim has developed a small electricity operated device. It comprises a motor of DVD player and a special hook made of wire, both assembled together in a PVC pipe. A variable adaptor helps in controlling the speed. The hook can be rotated in both clockwise and anti-clockwise direction using a switch.

Cost Effective Air Cooler With Compressor

The innovator has tried to develop a cooler combining features of both a evaporation based air cooler and an air conditioner. In this cooler, cooling is achieved partly by evaporation and partly by refrigeration.

GIAN West provided financial support to the innovator. As a result of which, he was able to develop a working prototype, which was tested at GIAN office. Experts are being consulted and the cooler is in the process of being refined further.

Raking Machine For Poultry Farms

Raking is necessary to keep poultry in good health. However, scarcity of labour makes manual raking difficult. To overcome this constraint, he developed a 1 hp single phase motor operated raking machine, which can cover 15,000 sq-ft per hour employing two persons.

38

Dharmendra Bhavsar
Gandhinagar

39

Sureshbhai Narotambhai Patel
Valsad

Sanjay Kumar D Tilwa
Rajkot

Tractor Operated Groundnut Digger

The innovator saw people facing labour scarcity during groundnut harvesting, which itself was a tedious job. He developed a tractor mounted groundnut digger. It also has a telescopic propeller shaft suitable for tractors of 35 HP and above, with a field capacity of 0.4 acre/ hour.

41

Cotton Boll Picking Machine

Nattubhai Vadher
Surendranagar

Nattubhai got an idea in 1982 for designing mechanical picking of dry land cotton variety 797 in which boll do not open naturally. It took him much longer to operationalize it. He wished to make a machine that would not only pluck cotton bolls but also separate the cotton later, so that the labour cost could be saved.

It cost him around Rs 30,000/- to prepare the first working model. The device is attached in the front of a tractor. The device (1576/MUM/2010) is run over the rows of cotton plants and the cotton balls are pulled off the plant and stored in a chamber having two rolling rubber belts. Lot of work remains to be done to make this more effective and GIAN and NIF have been supporting it. However, the concept has worked reasonably well in the existing version of the machine.

To Protect Against Insect Pest

Ayar Virabhai Sidabhai, Jamnagar

Seeds of groundnut are smeared with latex of Euphorbia spp to avoid infestation by 'talkdi' insect and 'ratada' disease. Ayar Virabhai has been using this practice for 10 years. Approximately 100 g of latex is required to smear 10 kg of seed. Farmers collect the fresh latex in vessels and treat the seeds on the eve of sowing. However, because of its stickiness, this treatment may not be popular with the farmers now. Honey Bee, 4(2&3):21, 1993

Control of Castor Semilooper

Arjanbhai Bhalabhai Darbar, Banaskantha

Normally semilooper (*Achaea janata*) attacks Castor crop after 40 to 50 days of sowing. The larvae consume most of the foliage leaving just the veins and petioles. To safe guard crop against semilooper attack, Arjanbhai Bhalabhai Darbar uses goat urine and leaves of neem. Two kg of neem leaves are soaked in two to three litre of goat urine. This mixture is then distilled. About 500 ml of the distillate is diluted with 15 litre of water and sprayed over the crops. The solution is sprayed again after five days for higher efficiency. Honey Bee, 11(4) & 12(1): 25; 2000-2001

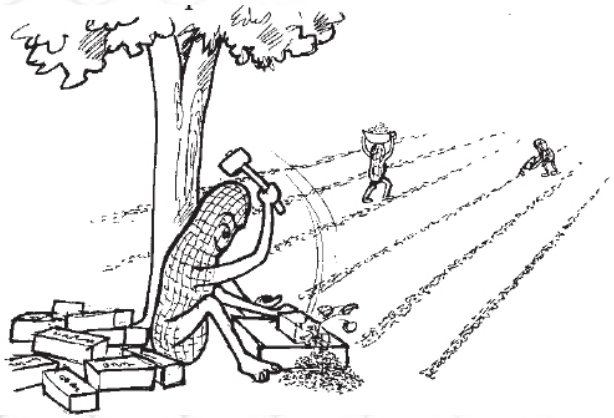
Conserving moisture through intercropping maize and groundnut

Babubhai Shivabhai Patel, Sabarkantha

Farmers sow two lines of maize after every four lines of groundnut in the 'Kharif' season. Maize is harvested earlier since it matures early. The furrows made after harvesting maize are used to collect the rainwater. It is sprinkled on the adjoining four lines of the groundnut. Farmers also assume that this practice facilitates the harvesting of the groundnut. Water harvesting and recycling is done in different ways according to the local situations. Honey Bee, 3(2):13, 1992

Hard bricks: soft soil, reduce toil

Farmers use various methods to ensure that their groundnut *(Arachis hypogaea)* plants give maximum output and the pegs do not break during plucking. Ghanshyambhai from Motakantharia village of the Amreli district of Saurashtra uses brick powder for his groundnut crop. The farmer collects brick powder and clay powder from brick makers and potters. He adds this powder (100 to 150 kilogramme per acre of land) to the soil before planting groundnut. He recommends putting brick powder between the rows of groundnut plants, if sowing is already done. Ghanshyambhai has been using this method for last 30 years. The plant gives more pods and they do not break during plucking.



Parsingbhai Mathurbhai Baria from Ankli village of the Dahod district adds brick powder to soil to protect *bavta* or *Nagli*

Honey Bee

(Eleusine coracana) from the *kohiwara* disease. It ensures that the plants grow well. Other farmers in the area also practice this method. Honey Bee, 14(3): 6, 2003

Fertilizing Date-palm originally

Vijaybhai Shah, Kutch

Vijaybhai Shah has developed a new method for fertilising date palms. For his 10 year old date-palm trees, he first fertilizers the 8 to10 feet active root area around the trunk with 1 to 1.5 kg mixture of sea algae and organic compost. After this, he waters the trees with cow-dung, cow-urine and water mixture. For the purpose, he collects 7 to 8 kg fresh cow-dung, 7 to 8 litres cow-urine and adds rest of the water in 200 litre capacity drum. Thereafter, he pours this mixture on the already fertilized root area of the trees. Occasionally; he adds butter milk in the mixture if available. Based on his experience so far, and keeping in mind the requirement of the date-palm trees, Vijaybhai employs this method during June, October and February. This ensures, according to him, an increase in the quality, growth and immunity against the diseases in the plants. He is also very particular about providing the shade to the trees, which helps in preserving the moisture and encouraging the growth of the beneficial micro organisms in the soil. Honey Bee, 16(1):22, 2005

Things Get Hot for Bedbugs

Absibhai Bhanabhai Vada, Junagadh

Absibhai Bhanabhai Vada of Junagadh uses chilli to get rid of bedbugs. He prepares a solution by boiling 100 grams of green chilli pods in a litre and a half of water for five to seven minutes. The solution is then poured into cracks that naturally get formed in the wood of the bed. He claims that during the day the bugs reside in these cracks. Besides, keeping the bed and the bedding in the sun for some time also kills the bugs. He first experimented with his unusual chilli technique ten years ago when bedbugs became a severe problem in his house. Absibhai says that till now there have been no side effects of this practice. Honey Bee, 13(1): 9, 2002

Goat's hair to control rat menace

Chinubhai Jiwabhai Bharwad, Rajkot

Rats eat away grass stored in farms, houses or godowns, causing huge loss and damage to crops in rural areas. They mostly live in the bunds of irrigated land and destroy maize, millet, paddy, and wheat. Chinubhai mixes goat's hair hidden in sweet meats. He makes *ladoos* from wheat or millet flour, jaggery, water and goat's hair. He places the *ladoos* in the farms frequented by rats. The rats eat them and subsequently die from choking as hair in the *ladoos* block their respiratory canal and intestinal organs. According to Chinubhai, this method controls rat menace and helps in reducing damage caused to the crops. Honey Bee, 14(3): 6, 2003

Honey Bee

Controlling Leaf Curl with *aritha*

Gitaben Manmohanbhai Indrodiya, Rajkot

Gitaben Manmohanbhai Indrodiya uses juice of '*aritha*' (*Sapindus emarginatus*) to control leaf curl disease in rose plant. Hundred gram fruits of '*aritha*' are soaked in one litre of water for two to three days. The water is filtered and the filtrate is sprayed on the crops every third day. She feels that this spray makes the leaves glisten and induces flowering.

See HB 6(4): 13,15-16 1995, 7(1): 13, 1996, 7(2): 3-4, 1996, 8(2): 14, 1997, 9(3): 14, 1998, 9(4): 17, 1998, 10 (1): 1999, 11 (3): 17-18, 2000 on other practices for controlling leaf curl disease.
Honey Bee, 11(4) & 12(1): 25; 2000-2001

Escaping from Water Shortage by Using High Seed Rate

The farmers of Junagadh have developed an understanding that using more seed rate of wheat (about 80/100 Kg per acre) enhances the negative growth of crop and reduces the duration of the crop atleast by 8/10 days. This has been ascribed to the factor that water level in the wells goes down towards the maturity of the wheat crop particularly at the beginnng of summer season and number of waterings due to the early maturity of wheat can be reduced.

Seed treatment to prevent *Puccinia* rust

Milk is particularly effective in preventing rust by the fungal pathogen *Puccinia graminis var. tritici* and farmers immerse the seeds of wheat in milk before sowing to avoid rust disease [Karmhanbhai Karamshibhai Desai, Banaskantha, Comm: Rathod Balvantsinh P., Honey Bee, 1991, 2(1):18]. The neutral to near alkaline pH of milk not only washes off the fungal spores from the surface but also the adhesive property of milk fat prevents any further invasion by spores and formation of pustules. The low pH of whey milk may prevent germination of fungal spores avoiding possible secondary infection.

A Journey of Shodh Yatra

Yatra

Documentation

Meeting

Poster Display

Felicitation

Multi Media Presentation

Recipe Contest

Traditional Knowledge Sharing

Felicitation during Biodiversity Contest

Biodiversity Contest

Felicitation during Recipe Contest

Shodh Yatra is a journey on foot in the search of knowledge, creativity and innovations at grassroots.

It is an attempt on the part of SRISTI, a Honey Bee Network partner based at Ahmedabad and NIF along with other network partners to reach out to the remotest part of the country with a firm belief that hardships and challenges of natural surroundings are many times important motivators of creativity and innovations.

Shodh yatra aims at unearthing such traditional knowledge and grassroots innovations that have not only simplified the lives of men, women and farm labourers but have also significantly contributed towards the conservation of bio-diversity.

The first ever Shodh yatra was organised in Gujarat in 1998 and since then the state has been the host to eleven such Shodh yatras till now. The yatris, during the Shodh yatra, over a period of seven-eight days, travel a distance of 120-150 kilometers honouring innovators, traditional knowledge holders, experimental farmers and centenarians on the way. Earlier these walks covered a distance of 250 km in ten days. Many bio-diversity and recipe contests are also organised in different villages. The Shodh yatra mobilizes the participation of people from all walks of life including scientists, students, innovators, farmers and traditional knowledge holders.

Shodhyatras in Gujarat

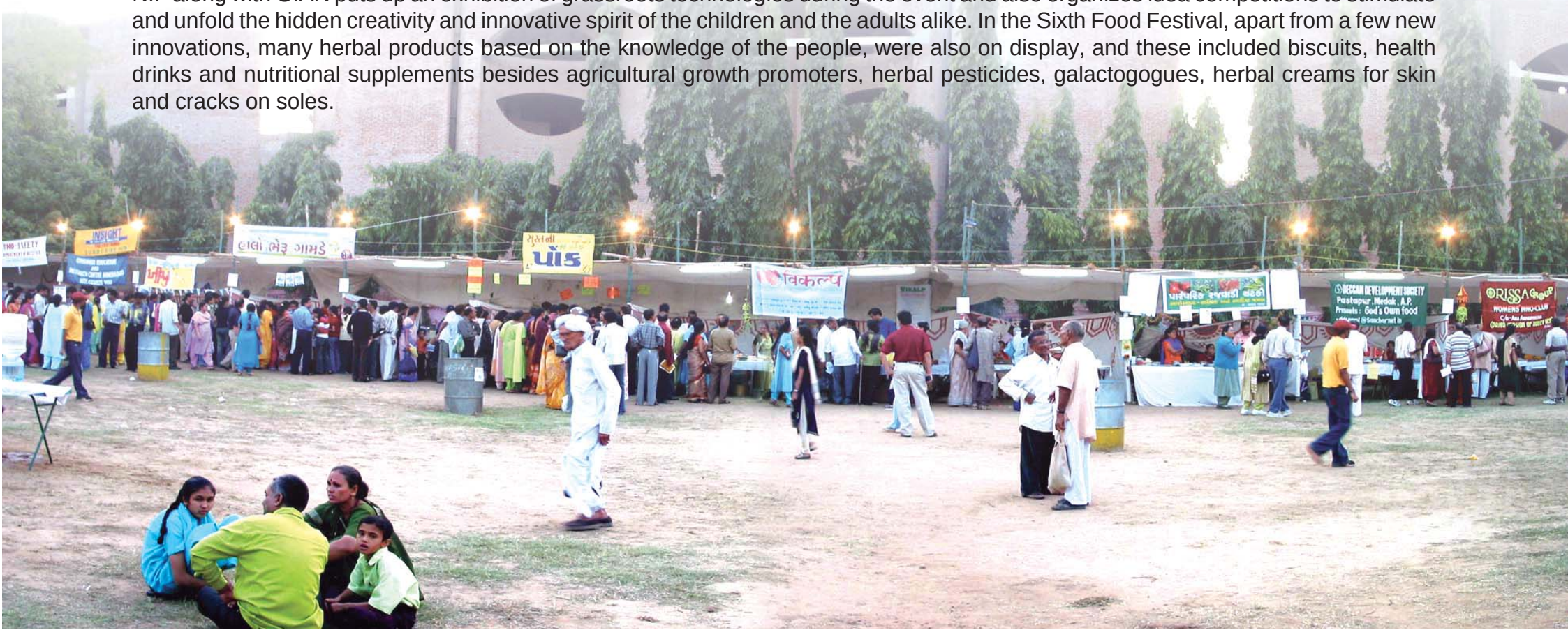
Shodhyatra

1. 1st Shodhyatra
   May 15-23, 1998
   Gir to Gadhada, Saurashtra
2. 2nd Shodhyatra
   December 31, 1998- January 6, 1999
   Amirgadh to Tundiya, North Gujarat
3. 3rd Shodhyatra
   May 15-23, 1999
   Gola Gamdi to Nighant, South Gujarat
4. 4th Shodhyatra
   December 26, 1999- January 2, 2000
   Nilpar to Nanikhakhar, Kutch
5. 5th Shodhyatra
   June 2-8, 2000
   Kasana to Koba North, Gujarat
6. 6th Shodhyatra
   December 23, 2000- January 1, 2001
   Mohandari to Dhulda, Dangs & Maharashtra
7. 7th Shodhyatra
   June 16-23, 2001
   Dabhuda to Sarsala, Kutch
8. 9th Shodhyatra
   June 2-8, 2002
   Samdara to Bhadarva, Kheda
9. 13th Shodhyatra
   May 1-8, 2004
   Nana Ambala to Bala Chhadi, Jamnagar
10. Mini Shodhyatra (Salt Region)
    May 11-14, 2009
    Vachharaj bet to Kharagoda, Surendranagar
11. 23rd Shodhyatra
    May 28 - June 2, 2009
    Faingiya to Puniavat, Dahod & MP

Traditional Food Festival- *Satvik*

Supported by NIF and the Honey Bee Network, the traditional food festival is organized by SRISTI to focus on the organically produced traditional food by farmers. The object of the fair is to promote conservation of agro-biodiversity by stimulating demand of unique preparations as well as grains of local varieties of different crops including minor millets and even uncultivated plants. In this event, stalls are set up by various organizations, farmers' collectives and individual farmers to display and sell less popular and/or organic foods. Recipe contests are also organized during the festival. The Traditional Food Festival is also used as a platform to reach out to as many people as possible to sensitize them about the implications of organic food and the attributes of local varieties. The First Food Festival held in February 2004 had forty stalls and was attended by 20,000 people. By the Sixth Food Festival in 2008 the number of stalls had gone up to sixty-two with more than 22,000 people attending the festival. The total sales also grew manifold, which shows the awareness and the impact the event has been able to generate.

NIF along with GIAN puts up an exhibition of grassroots technologies during the event and also organizes idea competitions to stimulate and unfold the hidden creativity and innovative spirit of the children and the adults alike. In the Sixth Food Festival, apart from a few new innovations, many herbal products based on the knowledge of the people, were also on display, and these included biscuits, health drinks and nutritional supplements besides agricultural growth promoters, herbal pesticides, galactogogues, herbal creams for skin and cracks on soles.



Shodh Sankal

To strengthen lateral learning among the grassroots innovators, the concept of Shodh Sankal-a chain of experimenting farmers, was initiated in mid 1990's by SRISTI. This platform provides scope for lateral learning among those who solve the problem and not only those who merely articulate them. Shodh Sankals make use of a solution augmenting approach rather a simple problem solving one. Meetings are organised in different talukas where the farmers participate in large numbers. The meetings, whose main focus is discussion on organic farming experimentation, are now being organised by the farmers themselves at their own cost. Information on herbal agricultural products based on people's knowledge is also disseminated during such meetings.

PART II

HERBAL SECTION

This section contains details of herbal healers, herbal preparations used traditionally for various ailments and products based on such traditional knowledge.

Harshadbhai Patel

Anand

Harshadbhai (41) lives in a large village in district Anand, famous for having the largest temple for Lord Swaminarayan in Gujarat. The village has about 11,000 people with most of the families having at least one of their relatives residing abroad. An agriculturist by profession, Harshadbhai also has some livestock from which he earns around Rs 50,000 per annum. Though his four brothers are all graduates, he studied only up to 10th standard. His father, was a herbal practitioner. It was mainly because of him that Harshadbhai developed interest in traditional medicines from the age of 16 years. Apart from this, he also had interest in making earthen idols, wall paintings and drawing during his leisure, which today he cannot pursue due to lack of spare time.

Many years ago, large worms affected most of the livestock in his village. Taking guidance from his father he fed the animals with a particular herb, which resulted in the worms being expelled. This small success went a long way to instill confidence in him about these herbal practices. Presently, he administers herbal medications for curing endoparasites, diarrhoea, retention of placenta in animals and curing stomach pain and fungal infestation in humans. Though he works selflessly, yet he has not received much appreciation in the society for providing these herbal medications to their animals.

He participated in the Inventors of India workshop at IIM, Ahmedabad in October 2006 where he suggested that such interaction between the herbal healers should be held more often so that the knowledge acquired by a healer is shared with other fellow healers facilitating its transfer and diffusion and subsequent utilization in the service of the society. He also participated in the Regional Workshop for Herbal Healers at Bhavnagar in December 2006 and at Dang in April 2008. His herbal formulations were much appreciated by the gathering and scientists commented upon the possibility of product development. He was given an appreciation certificate for his services to the community in NIF's Fourth National Award Function for Grassroots Innovations and Traditional Knowledge, 2007.

Herbal Practices

Medication for worms in animal

He uses leaves of *Kachka* (*Caesalpinia bonduc* (L.) Roxb.) to cure animals suffering from worms. A handful of leaves of the plant are ground and fed to the animal. This is orally administered till diarrhoea (symptom of worm infestation) stops. (confirmed by scientists since sixties, Indian Journal of Pharmacy, 1965, 27, 11, 307 indianmedicine.eldoc.ub.rug.nl/root/I/45285/).

Stomach pain in children

He uses the seeds (2-3) of *Caesalpinia bonduc* for curing stomach pain in children. He removes the outer cover of seeds and grinds them to form a powder, which is administered orally to the children.

Uses in Classical Codified Literature

Caesalpinia bonduc is known for curing pain[1] and has anthelmintic[2] properties. Nuts have been used for their anti-periodic, diuretic and anti-pyretic properties. They also possess adaptogenic, antimicrobial and muscle contractile properties[3]. The plant is used to prepare Himplasia[3], which relieves the symptoms of benign prostatic hyperplasia with a reduction in prostate weight.

Source: http://www.miamiblue.org/images/NickerbeanCrandon12-30-2004.JPG

Sudhakarbhai Kauchabhai Gauli

Dang

Living in a small tribal village, Sudhakarbhai (46) practices traditional herbal healing for various livestock ailments. His wife assists him in preparing various herbal therapies, eldest son works as a wireman, the younger one looks after eleven acres of their ancestral land in Maharashtra where the youngest son and daughter are studying. He has around six acres of land where he cultivates nagli, paddy, pigeon pea and groundnut. He also has some cattle head to take care of. He is quite famous for his herbal treatments in the area and is easily approachable. He even has visitors from nearby Surat district.

Realising the importance of traditional knowledge, he made extra effort to imbibe the maximum learning from his elders. Sudhakarbhai gives herbal medicines for poultry ailments, bloat in animals and diabetes in human. Sudhakarbhai was given an appreciation certificate in NIF's Fourth National Award Function for his knowledge of herbs and community service. He was also invited to participate in the herbal healers' workshop in Dang in April 2008. NIF facilitated filing of a patent on one of his technologies, which is now published.

Herbal Practices

Fever

He uses the bark (50g) of the tree *kumbi* (*Careya arborea* Roxb.), grinds it and mixes in water. This is administered twice daily to the animal for 1-2 days.

Promoting poultry health

He takes around 50g seeds of *behada* (*Terminalia bellirica* (Gaertu.) Roxb.), grinds them and mixes in water. The mixture is sufficient for administering to fifty birds. It is fed to poultry twice daily for 1-2 days.

Diabetes

He advises the use of one or two leaves of the plant *Dhuleti* (*Gymnema sylvestre* R. Br.) daily to control diabetes and keep the sugar level optimum (it is an age old remedy in traditional knowledge systems).

Uses in Classical Codified Literature

Careya arborea Roxb.

It is used for curing cough and cold[4]. One patent has been found for maintaining normal blood sugar levels[5].

Gymnema sylvestre R. Br.

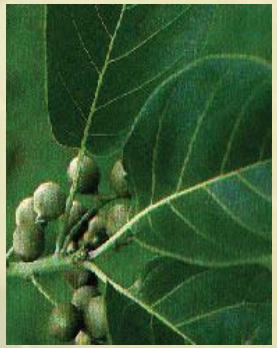
The plant is well known for its antidiabetic activities[6,7]. 'Diabecon'[3] is prepared from this plant in combination with other plants for diabetes control. Fifty five patents were found on medicinal application of *Gymnema* mainly on diabetes[8].

Source: http://farm1.static.flickr.com/232/468588962_3ba137233c.jpg?v=0

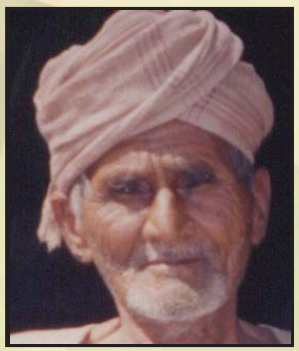
Terminalia bellirica (Gaertu.) Roxb.

Various protective phytochemicals were identified from the plant[9,10]. It is also well known ingredient of *Triphala*. In combination with other ingredients, it is also used in 'Mentat syrup'[3], which supports brain function in both normal and demanding situations. Three patents were found on medicinal application of this plant mainly as a fat reducing agent[11].

Source: http://www.motherherbs.com/pcat-gifs/products-small/gymnema-sylvestre1.jpeg



Source: http://secure-shopping-cart.com/niam/cart/terminaliabell.jpg



Sakarabhai Kallubhai Bhariya

Dahod

Sakrabhai (81) comes from a small village of Dahod. He is an illiterate farmer and grows rice and pulses in the 2.5 acres of land used for self-sustenance. His son who works as a daily wager in Ahmedabad economically supports the family. He also has a few cattle heads whose products are utilized for domestic consumption only.

As a child, he started to learn by observing his father practicing herbal medicines. His interest to develop medications for animals started to grow and by 18 years of age, he was already giving medicines. He distinctly remembers the very first case of curing prolapse, where he failed and the guilt of it made him work harder. This hard work over so many of years has paid dividends now in terms of social recognition, when even the elders in the village compliment him for his efforts. Since he does not charge any money for his services, people respect him more. Sakrabhai also feels that his social status has increased in the society due to this contribution.

Sakrabhai's formulation for bloat, for which patent has been filed, was tested in the College of Veterinary Science, Mumbai and a proposal to work on them was submitted for TePP funding from the Government of India. He participated in the Inventors of India workshop at IIM, Ahmedabad in October 2006 and the Regional Workshop for Herbal Healers at Bhavnagar in December 2006 where the healers interacted with scientists and discussed the possibilities of product development. He was felicitated for his herbal knowledge and community service in NIF's Fourth National Award Function.

Herbal practices

Lameness in animals

He takes the inner bark of *Khakhra* (*Butea monosperma* (Lamk.) Taub.) and the bark of *Neem* (*Azadirachta indica* A. Juss.) equally and grinds them together. This powder is then administered to the animal thrice orally for 3 continuous days.

Retention of placenta in animals

He uses handful of leaves of *Lajamani (Mimosa pudica* L.) to cure retention of placenta. He grinds these leaves and administers orally for 2-3 days.

Tonic for animals

He uses *Ragath Rayodu* (*Tecomella undulata* D. Don) for recumbent animal. The bark of the tree is ground to a powder and 100g of the same is administered daily till the animal recovers.

Uses in Classical Codified Literature

Butea monosperma (Lamk.) Taub.

The impact of *khakhra* in mitigating pain[12] and reducing muscular activity[13] is documented. 'Lukol'[3] has a stimulatory action on the endometrium and improves uterine circulation. 'Hair Loss Cream'[3] improves tensile strength of hair and increases hair density. Ten patents were found on its medicinal uses like for bone disorders[14], skin care[15] etc.

Source: http://164.100.52.111/images/pictures/Tecomella%20undulata-close%20up.jpg

Mimosa pudica L.

The use of plant to cure retention of placenta is well documented[16]. 'Styplon vet'[3] is prepared from this plant in combination with other ingredients and is used for providing calcium in highly assimilable form. It aids in conversion of prothrombin to thrombin in cattle. Ten patents were found on its medicinal applications like for treating psoriasis[17].

Tecomella undulata D. Don

It is used for liver ailments and possesses pain relieving properties[18]. Bark is used to treat skin disorder[19], jaundice, liver disorders, diabetes, cancer and obesity[20]. 'Ayurvedic brightening and fair complexion mask'[21] and 'Lower back massage oil'[21] is prepared from this plant in combination with other plants. One patent was found on its medicinal application for immuno-compromised conditions[22].

Source: http://farm3.static.flickr.com/2117/1616922862_80897169f6.jpg

Source: http://www.plantcreations.com/images/Butea_monosperma_amazing.jpg

Rehmatbhai Pirkhan Solanki

Junagadh

Rehmatbhai, (75 years) a veterinary healer who treats animals affected with various ailments like stoppage of urine, yoke gall, skin ailment, wound, retention of placenta, indigestion etc. Because of his selfless service for the care of cattle, he is widely known as 'Gopal Bapa'. He has two sons, the elder one works as a labourer while the younger one helps him in his activities. He was awarded SRISTI Samman in 1995 after which the gram panchayat of his village also felicitated him. He was awarded during Second Grassroots Technological Innovation and Traditional Knowledge Award in the year 2002.

The local community has contributed by conserving the biodiversity which Rehmatbhai draws upon while dispensing medicines. He has drawn upon the traditional knowledge reserve of animal healing practices and also modified a few treatments using his own ingenuity. In few cases his knowledge is found to be quite unique. He has attended several shodh yatras organized by Honey Bee network and shared his knowledge with people along the way during the journey.

He often writes the prescription for various ailments so that people can make medicines on their own and use this knowledge for future. In that way, he shares his knowledge freely. The fact that people still come to him indicates the respect he commands for diagnosis as well as dispensing medicines. There have been times when people took him on a vehicle to get their animal treated and he had to come back walking from the far off village. He does not grudge such behaviour and feels that his duty is to serve the animals.

Urinary blockage:

Roots of *Lajamani* (*Mimosa pudica* L.) are crushed and the juice is extracted. Sometimes the entire plant with root is used for the purpose. The juice is boiled and cooled and approximately 500ml of this Juice is administered to animal. The plant possesses seismonastic properties (folding of leaves on touch).

Skin disease in cattle:

About 150g pieces of roots of *desi boradi* (*Ziziphus mauritiana* Lamk.) is boiled in 500ml of water and filtered. The filtrate is allowed to cool down and applied thoroughly on the affected body part. The treatment is repeated twice a day for three or four days.

Yoke gall in cattle:

About 200g roots of *zipto* (*Triumfetta rhomboidea* Jacq.) are boiled in water and allowed to cool. The affected part is washed with lukewarm water followed by washing with the above solution. The treatment is repeated twice a day for two days. The wound begins to cure after two days.

Source: http://users.telenet.be/cr28796/TriuRhom.jpg

Uses in Classical Codified Literature

***Mimosa pudica* L.**

It is used in treatment of kidney ailments[23]. 'Styplon vet'[3] is prepared from this plant in combination with other ingredients and is used for providing calcium in highly assimilable form. It aids in conversion of prothrombin to thrombin in cattle. Ten patents were found on its medicinal applications like for treating psoariasis[17].

***Triumfetta rhomboidea* Jacq.**

The plant is used to cure inflammatory conditions[24]. One patent has been found on its antimicrobial activity[25].

***Ziziphus mauritiana* Lamk.**

Ziziphus sp. is used to cure wound and skin infections[26]. 'Dhanwantharam oil'[27] prepared from *Ziziphus* along with other plants is used for rejuvenating body and for skin care. More than ten patents have been found on its medicinal applications mainly for cancer and tumorous growth[28].

Source: http://farm3.static.flickr.com/2117/1616922862_80897169f6.jpg

Source: http://www.potomitan.info/phototheque/photos/ziziphus_mauritiana.jpg

Manubhai Parmarbhai Vankar

Panchmahal

Manubhai Parmarbhai Vankar is 40 years old and his family comprises two sons and a daughter all of whom are studying. His wife Leelaben assists him in farming activities apart from doing her regular house hold work. Manubhai, who has studied upto 10th standard only, has three acres of land where he cultivates crops like paddy, maize, jowar and oilseeds. He also has some cattle and gives medicines for curing bloat, wound, heat stress, anoestrus and ectoparasites.

The unique community medication for promoting enhanced milk yield was presented before the Research Advisory Committee meeting at Indian Veterinary Research Institute (IVRI) and was much appreciated.

Herbal Practices

Bloat in animals

The plant *Cucumis melo* L. is given for curing bloat in animals.

Wound

He grinds the leaves of *Khalibhel* (*Tridax procumbens* L.) along with a little quantity of castor oil. He applies the preparation over wound twice daily for a week.

Uses in Classical Codified Literature

***Cucumis melo* L.**

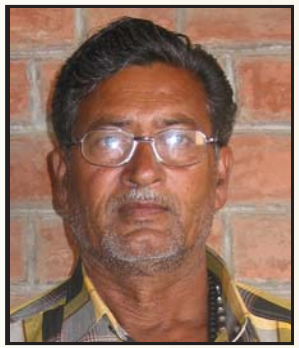
The plant has been reported to have digestive property[29]. The dried juice is largely used for the treatment of indigestion under various trade names. 'Papain,' a white powder, is administered in digestive disorders where albuminoid substances are excreted undigested[29]. Fruits, used as a light cleanser with a cooling effect or moisturiser for the skin, can also be used as for providing first aid in case of burns and abrasions; flowers are expectorant and emetic[30]. Forty five patents were found for its medicinal applications like treating gout[31], as an anti-aging[32] medication etc.

***Tridax procumbens* L.**

It is used to cure wounds[33]. Three patents were found on medicinal applications of *Tridax* mainly for treatment of general skin disorders[34].

Source: http://lh6.ggpht.com/luirig/R5sU9ZTdj4I/AAAAAAAAEzE/BYdqD5N4dq8/s800/cucumis_melo_1.jpg

Source: http://static.flickr.com/38/120816909_38c838b70b.jpg



Samadbhai Muljibhai Solanki

Junagadh

Samadbhai (56) is an illiterate farmer, having ten members in the family. He has two acres of land, where he cultivates medicinal and ornamental plants. The sale of ornamental plants and flowers in the market is the main source of his income. With the financial help of SRISTI, Samadbhai was able to establish the 'Gyan Van'- a medicinal plant garden- three years ago from where he usually takes the medicine for curing patients. 'Gyan Van' has more than 150 medicinal plants of the area. He has been practicing herbal healing for the last fifteen years and is reported to have cured hundreds of patients coming from the adjoining vicinity, free of cost, though in some cases he has charged money to cover the cost of the preparation of the medicines. He administers herbal medicines for various diseases like diabetes, arthritis, sciatica, burns, gastric troubles, skin disorders etc. He has received knowledge of the medicinal plants and their properties from some elderly people of his village. Though he is widely recognized and respected now but still he is very keen and eager to learn more through interactions with elderly people, visitors and others.

Herbal Practices

Burns

He takes some roots of *Bordi* (*Ziziphus mauritiana* Lamk.) and boils it in water for sometime. After cleaning the affected part with the solution, he then places leaves of *Samudrasosh* (*Argyria nervosa* (Burm.f.) Boj.) over it and covers with a bandage.

Constipation

He uses one spoonful of dried pulp of *Garmado* (*Cassia fistula* L.) for curing constipation.

Irregular menstruation

He dries white flowers of *Jasood* (*Hibiscus rosa-sinensis* L.) in shade and makes fine powder from it. The patient is given one teaspoon of powder with milk twice a day.

Sciatica

He gives one tea spoon powder of leaves *Parijat* (*Nyctanthes arbor-tristis* L.) orally.

Uses in Classical Codified Literature

Argyria nervosa (Burm.f.) Boj.

Leaves are reported for boils and sore[19]. Roots are used as astringent, emollient, thermogenic, wounds, ulcers, and anti-inflammatory[35].

Cassia fistula L.

The pulp has normal laxative property[19]. Pilex[3] (Vein care) helps support metabolic processes involved in maintaining the vascular system's integrity for optimum health and appearance; Purim[3] (Hemo care) is used for blood purification. Six patents have been found on the medicinal applications of *Cassia fistula* like as an antiviral[36].

Source: http://www.motherherbs.com/pcat-gifs/products-small/mother-herbs8.jpeg

Source: http://www.jungleseeds.com/images/CassiaFistula.jpg

Hibiscus rosa-sinensis L.

Flowers are given to treat menstrual complaints, menorrhagia and used as a contraceptive also[19,37].

Nyctanthes arbor-tristis L.

Bark is used to treat bone fracture. Leaves are given to treat rheumatism and sciatica[19]. 'Lupin'[38] is a medicine used for pain and inflammation associated with musculoskeletal and joint disorders. Six patents have been found on its medicinal uses such as for treating Leishmaniasis[39] and also for its natural property as a dye[40].

Ziziphus mauritiana Lamk.

Roots are given to treat wounds, sore and ulcer[19]. Plant is used to treat burns[30]. 'Dhanwantharam oil'[27] is prepared from *Ziziphus* along with other plants and used for rejuvenating body and skin care. More than ten patents have been found on its medicinal applications mainly on cancer and tumorous growth[28].

Source: http://www.potomitan.info/phototheque/photos/ziziphus_mauritiana.jpg

Source: http://psychoactiveherbs.com/catalog/images/hawaiian_baby_woodrose_seed.jpg

Source: http://www.ranger146.com/N_Leighton_Drive/pics/Hibiscus_rosa-sinensis.jpg

Karimbhai Sumara

Banaskantha

Karimbhai Sumara (58, Veerampur village, Banaskantha district, Gujarat) treats around 40 patients daily. Some of his patients even come from Rajasthan, Maharastra and far off places of Gujarat. Karimbhai's father was a potter and also an expert in herbal medicine. Karimbhai used to accompany his father on his frequent visits to the jungles to collect clay and on these trips his father imparted valuable knowledge about different herbs to him. Karimbhai recalls how his father would prepare the extracts and mixtures. He used to help his father in grinding, powdering and mixing medicines.

Till a few years ago, Karimbhai was a full time potter and used to take time off from routine chores to collect herbs and to treat patients in the village. But then he became a full-time practitioner of herbal medicine as he was not able to attend, on a part-time basis, to the swelling rank of patients. Karimbhai often leaves home just after midnight to walk about 15 km in hilly terrain through jungles to pick up the right herbs. The trip takes up to five hours and he is able to start treating his patients as the morning dawns. He is reported to have treatment for a gamut of diseases like heart ailments, arthritis, diabetes, skin disorders, cold and cough, asthma, fractures, genitourinary-tract infections, intestinal ulcers etc.

An ardent advocate of environmental conservation, Karimbhai's work in this field is three-pronged: a) monitoring the abundance or scarcity of the various herbs vis-à-vis their demand; b) cultivation of those plants that are becoming scarce as well as those needed in large quantities; and c) educating the youth about the importance of diversity and about ways of utilizing the bounty of nature without disturbing ecological balance. He tries to process the medicinal plants in such a manner that a stable supply position is maintained without losing the potency of their extracts.

In 1999, Karimbhai founded an NGO named Aravalli Vikas Mandal which has been rendering creditable service to the flora and fauna of the ranges. He has also featured in a documentary film commissioned and telecast by British Broadcasting Corporation (BBC) to honour experts in indigenous knowledge. He was felicitated by NIF in its Third National Award Function in 2005.

Herbal Practices

Dermatitis

Paste is made up of roots of *Chitrak* (*Plumbago zeylanica* L.) using water and this is applied on the infected area.

Eczema

Bark and wood of *Rohida* (*Tecomella undulata* D. Don) is soaked in water for two days. This is then distilled and the distillate collected is applied on the eczema.

Bark of *Kerda* (*Capparis decidua* (Forssk.) Edgew.) and leaves of *Mamejava* (*Enicostemma littorale* Blume) are taken in equal proportion and ground to paste using a little amount of water. This paste is then applied on the eczema affected part.

Arthritis

200g bark of *Saragva* (*Moringa oleifera* Lam.) is ground and boiled with water. The extract is then allowed to evaporate and the paste is collected and mixed with 100g *Amba Haldar* (*Curcuma amada* Roxb.) and 100g black pepper powder. This paste is applied on the joints.

Uses in Classical Codified Literature

Capparis decidua (Forssk.) Edgew.

Reported for skin diseases[41]; Bitter roots are used in the Indian and Farsi pharmacopoeia and the root bark is used to cure swollen joints[42].

Curcuma amada Roxb.

"Rhuma Oil"[43] is prepared from this plant in combination with *Withania somnifera* (L.)Dunal. and *Asparagus recemosus* Willd. for the treatment of spondylitis, arthritis, rheumatism, gout and lumbago. Six patents were found on its medicinal applications like as an anti-allergic[44], for diarrhoea[45] etc.

Moringa oleifera Lam.

Decoction is used for rheumatism[46]; Seed oil applied in gout and rheumatism[47]. 'Sanjeevani Moringa' capsules are prepared from *Moringa* to cure rheumatism, arthritis

and other joint afflictions and are cardiac and circulatory stimulants[48] also. Fifteen patents were found on its medicinal applications like fpr treating diabetes[49], piles[50] etc.

***Plumbago zeylanica* L.**

Root is used for eczema and skin disorder[19, 51]. Decoction of *chitraka* works well in skin diseases, associated with pain and itching[52]. 'Muscle & Joint Rub'[3] is prepared from roots useful for relieving the pain in muscle and joints. Six patents were found on its medicinal applications like as a mosquito repellent[53] etc.

***Tecomella undulata* D. Don**

Bark is used to treat skin disorder[19], jaundice, liver disorders, diabetes, cancer and obesity[20]. 'Ayurvedic brightening and fair complexion mask'[21] and 'Lower back massage oil'[21] is prepared from this plant in combination with other plants. One patent was found on its medicinal application for immuno-compromised conditions[22].

Source: NIF Database

Source: SRISTI Database

Source: http://www.ganeshvilla.com/gingers/images/curcuma_amada.jpg

Source: http://bp1.blogger.com/_EUlpjCHokcE/R-5OmqsvMpI/AAAAAAAADps/yvsBlWOAg6c/s1600-h/3.jpg

Source: http://164.100.52.111/images/pictures/Tecomella%20undulata-close%20up.jpg

Source: NIF Database

Uses of *Acacia nilotica* (L.) Del. (Baval)

Source: (httpwww.anbg.gov.aucpbrtaxonomyacacia-nilotica-cu-560.jpg)

NIF Database

Uses from Gujarat

Dental care
Brush teeth with the twig regularly
- *Gemarbhai Harjibhai, Mehsana, Gujarat*

Diarrhoea
Take gum (3g) along with water
- *Gemarbhai Harjibhai, Mehsana, Gujarat*

Diabetes
Take a spoonful bark powder orally
- *Prabhaben Nanjibhai Chavada, Junagadh, Gujarat*

Skin crack
Apply the leaf and bark paste topically
- *Dansingh Laxmansingh Parihar, Junagadh, Gujarat*

Uses from other states

Mouth sores
Take bark juice orally after adding a little sugar
- *Geeta Devi Kumawat, Jaipur, Rajasthan*

Pneumonia
Boil paste of bark with little sugar and water. After cooling, filter it and take orally
- *Chen Singh Charan, Nagor, Rajasthan*

Burn
Mix the bark of the plant with mustard oil and boil it in water till it completely evaporates. Apply the preparation on affected body parts.
- *Jagadish, Hissar, Haryana*

Dental care
Gargle the decoction of the bark to strengthen teeth and eliminate other dental problems
- *Geeta Devi Kumawat, Jaipur, Rajasthan*

Diarrhoea
Extract the juice of the leaves and take orally
- *Omkarmal G Maur, Nagor, Rajasthan*

Abscess
Burn the fresh wood on fire and collect the fluid oozing out while burning, apply it on affected area
- *Somesh Singala, Patiala, Punjab*

Uses in Classical Codified Literature

Paste made from fresh leaves is applied on the forehead for headache[54]; decoction of the bark is gargled to give relief from sore throat[55]; decoction of the bark is consumed to cure bronchitis[19]; and the dried bark powder is taken orally with water for diabetes[56]. Toothpaste is prepared from *Acacia* with the brand name 'Dental cream'[3]. Thirty patents have been found on its medicinal uses such as for dental plaque and gingivitis[57].

Uses of *Adhatoda vasica* (L.) Nees (Ardusi)

NIF Database

Uses from Gujarat

Asthma
Take the leaf decoction orally
- *Moyataji Karamshi Thakor, Patan, Gujarat*

Cough
Take the leaf juice orally
- *Revabhai Sivabhai Raval, Sabarkantha, Gujarat*

Fever
Take the leaf juice orally
- *Revabhai Sivabhai Raval, Sabarkantha, Gujarat*

Stomachache
Take the leaf decoction orally
- *Ramjibhai Nanabhai Brahmania, Panch Mahal, Gujarat*

Uses from other states

Asthma
Take the leaf juice orally
- *Jyothi Bhatta, Chikmagalur, Karnataka*

Inhale the smoke of dried leaves
- *Susanta Kumar Manjhi, Birbhum, West Bengal*

Tuberculosis
Take the leaf juice orally with a little honey
- *Mahesh Bijarania, Nagor, Rajasthan*

Cough
Take the leaf juice orally with a little sugar
- *Jyothi Bhatta, Chikmagalur, Karnataka*

Malaria
Take the leaf decoction orally with jaggery
- *Mahesh Kumar Khangar Purohit, Sirohi, Rajasthan*

Constipation
Take the leaf decoction orally with honey
- *Pradip Kumar, Bulandshahar, Uttar Pradesh*

Sprain
Ferment the leaf decoction and take it orally
- *Gopinath Pradhan, Nabarangpur, Orissa*

Uses in Classical Codified Literature

Decoction of the plant is taken orally to cure asthma[58]; leaves (500g) are decocted in water (5l) until a dark brown mass is obtained and two spoonful are taken with honey thrice a day for 2-4 days to cure fever[59]; rheumatic patients should warm the leaves and apply on the body[60]. Product 'Menstri Care'[61] prepared from the plant is an effective medicine for women's health problems. 'Diakof'[3], a herbal medicine uses *Adhatoda* along with other plants for treating cough. Ten patents have been found on its medicinal applications mainly for cough[62] and asthma[63].

Source: NIF database

Uses of *Balanites aegyptiaca* (L.) Delile (Agori)

Source: http://www.css.cornell.edu/ecf3/Web/new/AF/pics/alanitesFruit.jpg

NIF Database

Uses from Gujarat

Skin disease
Apply the watery sap on the infected part
- *Waliben Rumaji Thakore, Sabarkantha, Gujarat*

Abscess
Apply the fruit paste topically
- *Santokben Shanua, Banaskantha, Gujarat*

Uses from other states

Respiratory disorder
Prepare tablets from the mixture of the fruit powder and jaggery. Take one tablet orally every morning on an empty stomach for 40 days
- *Ramabandhu Mahajan, Jalgaon, Maharashtra*

Diarrhoea
Take the seed decoction orally
- *Chandra Devi, Nagor, Rajasthan*

Swelling
Apply the leaf paste over the affected part
- *P.D. Walikar, Bagalakot, Karnataka*

Poisonous bites
Apply the root paste topically
- *Ramabandhu Mahajan, Jalgaon, Maharashtra*

Neurological disorder
Take the fruit powder (5g) orally on an empty stomach till the ailment cures
- *Sanatan Bisoi, Nabarangapur, Orissa*

Uses in Classical & Codified Literature

Bark powder mixed with salt is given to treat cough[64]; fruit is used as an anthelmintic[65]; and extract of root bark is given orally to cure asthma[66]. Product 'Diosgenin'[67] is made from this plant along with other plants and acts as an antinflammatory agent. Three patents have been found on its medicinal applications mainly for treating HIV/AIDS, leukaemia[68] and jaundice[69].

Uses of *Bombax ceiba* L. (Semal)

NIF Database

Uses from Gujarat

Urinary disorder
Take orally the decoction (10ml) of the bark of *semal* and flowers of *palash* (*Butea monosperma* (Lamk.) Taub.) mixed in 2:1 ratio
- *Lakshmanbhai Ramaji Parmar, Banaskantha, Gujarat*

Gynaecological disorder
Take the root juice orally
- *Maganbhai Khimjibhai Patel, Sabarkantha, Gujarat*

Uses from other states

Pimples
Make a paste of thorn with milk. Apply on the pimples for seven days
- *Pravin Kumar Sharma, East Champaran, Bihar*

Wound
Apply the fresh bark paste topically
- *Pravin Kumar Sharma, East Champaran, Bihar*

Diarrhoea
Take a spoonful of leaf juice along with some sugar candy for four days
- *Neha Kumari, East Champaran, Bihar*

Gynaecological disorder
Take the gum powder (5g) with water for five days
- *Jugeshwar Ram, Hazaribag, Jharkhand*

Constipation
Take the bark powder (3g), coriander powder and jaggery with water
- *Devaram, Sirohi, Rajasthan*

Piles
Take the root paste (10g) with water for seven days
- *Antaryami Pradhan, Angul, Orissa*

Uses in Classical Codified Literature

Decoction of the bark is given orally to combat fever[70] decoction of the heartwood is given for controlling diabetes[71]; and bark juice is administered to reduce stomachache[72].

Product 'Acne-n-Pimple Cream'[73] is prepared from *Bombax* along with other plants to treat pimples and skin eruptions. 'Evecare'[3], a multi herb product made from this plant, has a regularizing influence on the menstrual cycle. Eight patents have been found on the medicinal applications of *Bombax* mainly for skincare[74], AIDS[75] etc.

Source: http://www.fine-arts.org/about/images/Bombax_ceiba_Orange_Glow_copy.jpg

Uses of *Calotropis procera* (Ait.) R. Br. (Aak)

Source: SRISTI Database

NIF Database

Uses from Gujarat

Headache
Put lukewarm leaf, boiled in saline water, on the forehead
- Danabhai Bavabhai Desai, Patan, Gujarat

Stomachache
Smear mustard oil on a leaf and apply it warm over the abdomen for immediate relief
- Chawda Chanduben Jawanji, Gandhinagar, Gujarat

Wound
Apply the fruit rind powder topically
- Kodarbhai Bhikhabhai Bhangi, Sabarkantha, Gujarat

Uses from other states

Knee pain
Take the leaf juice orally
- Jyothi Bhatta, Chikmagalur, Karnataka

Earache
Put the latex in the ear
- R. C. Chowdhary, Nagor, Rajasthan

Arthritis
Mix latex with turmeric powder, boil it with sesame oil and then apply this paste on the aching joint
- Sanjay Singh Uplana, Nagda, Madhya Pradesh

Skin disease
Apply the bark paste on the infected part
- Muralilal, Jaipur, Rajasthan

Migraine
Heat the leaf and extract the juice. Put two-three drops in the nostril in the opposite side of the head having pain
- Indiravati Rana, Udham Singh Nagar, Uttarakhand

Uses in Classical Codified Literature

Plant extract is used as bronchodilator[76]; flower buds of *Calotropis*, along with black pepper seeds and salt, are crushed to make pills the size of small peas. Two pills are taken twice daily for three days to cure malaria[54]; warmed leaves, smeared with oil, are applied on the aching part to alleviate rheumatic pain[77]. 'Muscle & Joint Rub'[3] is a highly effective ointment for backaches, muscular sprains and joint pains. 'Arkavaleha'[52], made from this plant, is given to cure irritation of the stomach, nausea, vomiting, diarrhoea etc. Eight patents were found on the medicinal uses mainly for anti-tumor and antidotal activity[78] and bronchial asthma[79].

Uses of *Capparis decidua* (Forssk.) Edgew. (Kerda)

NIF Database

Uses from Gujarat

Toothache
Put two drops of young shoot juice in the ear
- Bhavaji Dayaji Thakor, Patan, Gujarat

Rheumatism
Cook the chopped fruit (3kg) along with jaggery (500g) in ghee (500g).Take the preparation (30g) twice a day for a month
- Samuben Khodabhai Parmar, Patan, Gujarat

Eczema
Make a paste from the bark of *kerda* and leaves of *mamejava* (*Enicostema littorale* Bl.) taken in equal quantity. Apply the paste on the infected area
- Karimbhai Sumara, Banaskantha, Gujarat

Uses from other States

Stomachache
Soak fruits in saline water for 10 days, dry them and grind into a powder. Take one spoonful of the powder orally twice a day
- Mukesh Kumar Lora, Nagor, Rajasthan

Diabetes
Grind the fruit into a powder after removing the seeds. Take two spoonful of powder orally
- Nanuram Meghwal, Sri Ganganagar, Rajasthan

Constipation
Soak fruits overnight, dry them and grind into a fine powder. Take one spoonful of the powder orally every morning
- Kamla Devi, Nagor, Rajasthan

Uses in Classical Codified Literature

The fruit is taken orally to reduce blood sugar[80]; plant extract is applied topically on skin diseases[76]; decoction of the plant is taken orally to alleviate rheumatic pain[81]. Tablet 'Jyoti kalash'[82] a multi-herb drug acts as an antioxidant; 'Maharshi Amrit Kalash'[83] is used for vomiting, anorexia and improving general well being. One patent has been found on its cosmetic use[84].

Source: http://164.100.52.111/images/pictures_ecards/Capparis%20decidua.jpg

Source: http://www.alhsa.com/forum/imgcache2/51842.gif

Uses of *Ficus religiosa* L. (Pipalo)

NIF Database

Use from Gujarat

Ringworm
Apply the latex on the infected part topically
- *Mansukhbhai Parmar, Surendrangar, Gujarat*

Uses from other states

Asthma
Mix the powdered bark with rice pudding. Take it in the early morning.
- *Bhurasingh Pawar, Hoshangabad, Madhya Pradesh*

Diarrhoea
Take orally the curry of the buds
- *Pragas Uranav, Chaipur, Jharkhand*

Leucorrhoea
Mix equal proportions of pulp of fruit and sugar. Take it orally along with milk
- *Kailash Kumawat, Jaipur, Rajasthan*

Cuts & Wounds
Apply the bark powder on the affected part
- *Ratikanta Nayak, Jagatsinghpur, Orissa*

Uses in Classical Codified Literature

Bark juice acts as anti-venin[85]; fresh twig of the plant is used as toothbrush[86]; dried leaves are useful in heart disorder, tuberculosis and dysentery[87]. Product 'Chanderprabhavati'[88] is an ancient ayurvedic drug used to support weight management, diabetes, obesity etc. 'Lakshadi Guggul'[89] is another ayurvedic preparation helpful in cases of fractures and osteophytes. 'Squizee cream'[90] and 'Femina capsules'[91] is useful for gynaecological disorders. Five patents were found on its various applications mainly on anti-asthmatic[92]; anti-microbial and wound healing property[93].

Uses of *Kalanchoe pinnata* (Lam.) Pers. (Patharchatta)

NIF Database

Uses from Gujarat

Kidney stone
Chew two fresh leaves along with black pepper on an empty stomach
- *Hirasinh Kodarsinh Rathod, Gandhinagar, Gujarat*

Dysentery
Extract juice from equal amount of leaves of *patharchatta, jamun* (*Syzygium cuminii* (L.) Skeels) and *ber* (*Ziziphus mauritiana* Lamk.) and take it orally
- *Bhanabhai Gomabhai Dabhi, Sabarkantha, Gujarat*

Uses from other states

Injury
Put warmed leaves on the affected body part
- *Onom T. Doming, East Siang, Arunachal Pradesh*

Eye pain
Put two drops of the leaf juice in the eyes
- *Susanta Kumar Manjhi, Birbhum, West Bengal*

Stomach disorder
Take two spoonful of the leaf juice orally
- *Susanta Kumar Manjhi, Birbhum, West Bengal*

Diarrhoea
Take the leaf juice orally along with some sugar
- *Bikesh Kumar, Sitamarhi, Bihar*

Cuts & wounds
Apply the leaf paste topically
- *Arun Ghosh, Bankura, West Bengal*

Pain
Apply the leaf paste topically
- *Priyanka Pramanik, Purulia, West Bengal*

Jaundice
Take the leaf juice along with black pepper orally
- *Arun Kumar Pandey, Fatehpur, Uttar Pradesh*

Kidney stone
Grind the leaves of the plant with a piece of turmeric and extract the juice. Add some jaggery and take the preparation for ten days.
- *Dimbeswar Gogoi, Sibasagar, Assam*

Take the leaf juice for 10-15 days
- *Sukkhi Devi, Udham Singh Nagar, Uttarakhand*

Uses in Classical Codified Literature

Plant paste is applied on forehead to alleviate headache[94]; leaf paste is applied externally to cure cuts and wounds[95]; fresh sap of plant is used for eye diseases[96]. Product 'Regenerating Day Cream'[97], a multiherbal medicine enhances skin's tone and elasticity, helps to smooth wrinkles and fine lines. Five patents were found on the medicinal applications of *Kalanchoe* mainly as an antiobesity[98] medication.

Source: NIF database

Uses of *Myristica fragrans* L. (Jaiphal)

Source: http://www.rimbundahan.org/environment/plant_lists/taman_sari/Myristicafragrans.jpg

NIF database

Uses from Gujarat

Vomiting
Take the fruit extract orally
- *Chawda Chanduben Jawan, Gandhinagar, Gujarat*

Diarrhoea
Abrade the fruit on stone and take it orally
- *Rajuba Khodabhai Rabari, Gandhinagar, Gujarat*

Uses from other states

Pimples
Apply the fruit paste topically
- *Doli Kumari Chaudhari, East Champaran, Bihar*

Tooth cavity
Apply the fruit oil on tooth cavity
- *Mohd.Nasim Akhtar, East Champaran, Bihar*

Pneumonia
Take a spoonful of lukewarm paste orally
- *Tulsi Devi, Firozpur, Punjab*

Intestinal worms
Take the fruit powder orally
- *Shila Kumar, East Champaran, Bihar*

Uses in Classical Codified Literature

Decoction of dried flowers is given orally to combat diarrhoea[99]; fruit decoction acts as digestive[100]; to get rid of pimples apply the fruit paste along with milk[86]. '*Jatiphaladi curna*' and '*Jatiphaladi vati*'[52] are used effectively to increase appetite, improve digestion, alleviate *vata* and bestow a liver stimulant action. 'Diakof'[3] is beneficial in both productive and dry cough. Seven patents have been found on its various medicinal applications such as for treating gastrointestinal problem, nervous system[101].

Uses of *Phyllanthus emblica* L. (Amla)

NIF Database

Uses from Gujarat

Diabetes
Take the fruit juice regularly
- *Kanubhai Dahyabhai Chaudhari, Mehsana, Gujarat*

Gastrointestinal disorder
Take the juice of the fruit of *amla* and *bel* (*Aegle marmelos* (L.) Correa) orally
- *Sitaben Gayakwad, Dang, Gujarat*

Uses from other states

Jaundice
Take the plant powder (5g) along with milk
- *Kiran Batti, Dhamtari, Chhattisgarh*

Wound
Apply the leaf paste topically
- *Sevaram Bhaskar, Dhamtari, Chhattisgarh*

Gray hair
Wash the hair regularly with the fruit decoction
- *Sulekha Jabbar, Idukki, Kerala*

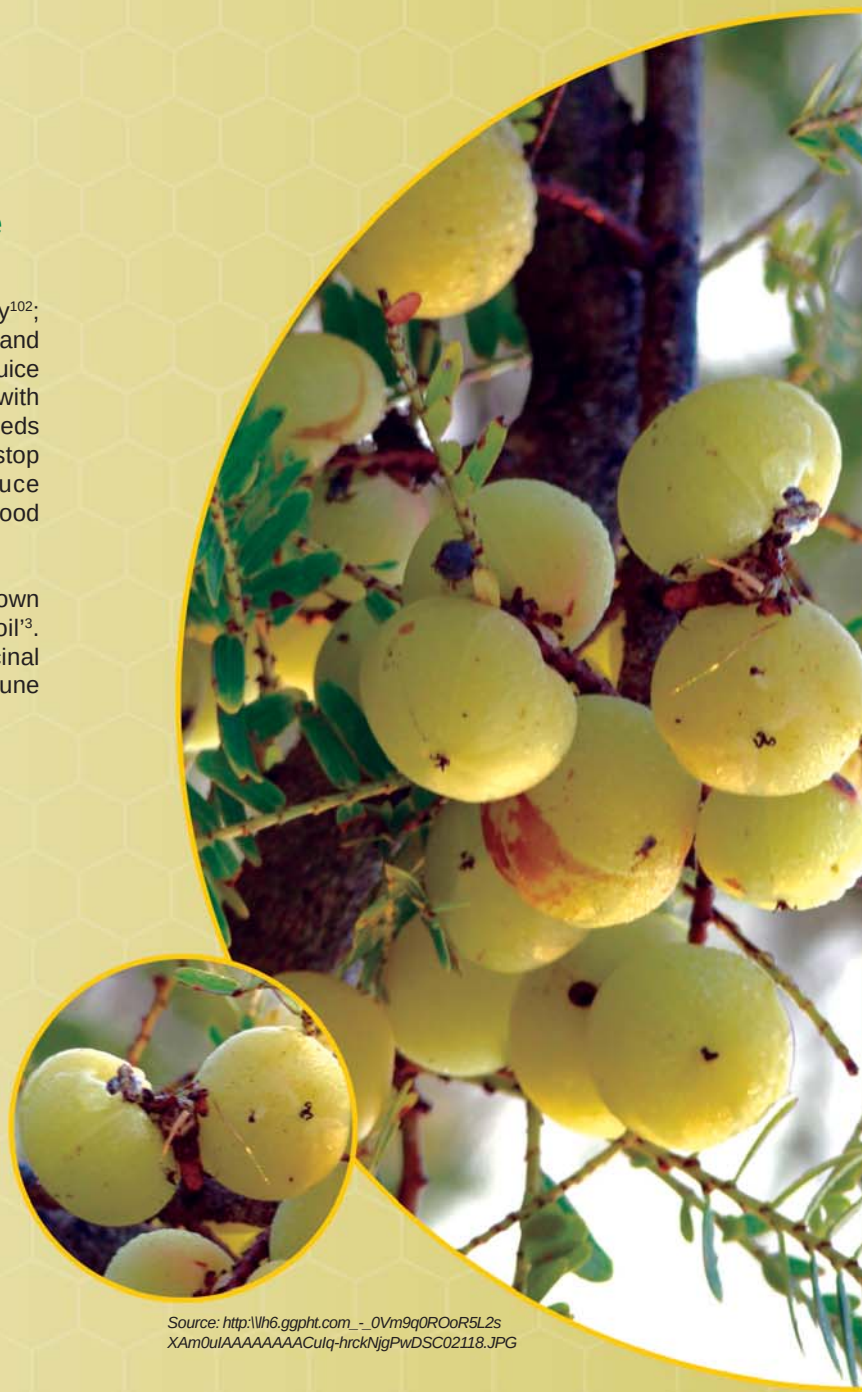
Headache
Make bark paste using the water in which rice has been washed. Apply the paste on the forehead
- *Sulekha Jabbar, Idukki, Kerala*

Diarrhoea
Take the juice of amla with an equal quantity of lemon juice orally
- *Bina Chaudhry, Kamrup, Assam*

Uses in Classical Codified Literature

Bark and fruits are used in diarrhoea and dysentery[102]; fresh juice of the fruit, mixed with pure cow's butter and honey, is administered to cure obstinate hiccough[102]; juice relieves pain in urine trouble[102]; pulp (2-3g) is eaten with warm milk to get rid of headache[103]; powder of seeds after mixing with ghee is applied on the head to stop nasal bleeding[104]; fruits are taken orally to reduce acidity[105]; decoction of the fruit is taken to increase blood count[106].

Phyllanthus is one of the main ingredients of well known medicines 'Triphala, Chavanprash and Amla hair oil'[3]. Seventy-six patents have been found on its medicinal uses such as for diabetes[107], liver disorders and immune deficiencies[108].



Source: http:\\lh6.ggpht.com_-_0Vm9q0ROoR5L2s XAm0uIAAAAAAAACuIq-hrckNjgPwDSC02118.JPG

Uses of *Plumbago zeylanica* L. (Chitrak)

Source: http://www.plantoftheweek.org/image/plumbago1.jpg

NIF Database

Use from Gujarat

Dermatitis
Apply the root paste topically
- *Karimbhai Sumara, Banaskantha, Gujarat*

Uses from other states

Eyesight
Take two spoonful of root powder with water to improve eyesight
- *Ramabandhu Mahajan, Jalgaon, Maharashtra*

Stomach disorder
Pound the roots and prepare tablets. Take three tablets orally with ripe banana
- *Rani B. Bhagat, Pune, Maharashtra*

Arthritis
Boil roots of *Plumbago* and *Rauvolfia serpentina* (L.) Benth. ex Kurz in mustard oil. Massage lukewarm oil over the aching part
- *Sukhal Manjhi, West Champaran, Bihar*

Scabies
Apply the paste of leaves and bark, after adding a spoonful of turmeric, over the infected part
- *Pratap Chandra Pradhan, Laxmipur, Orissa*

Uses in Classical & Codified Literature

The paste of the whole plant is applied externally on any kind of skin diseases[109]; extract of leaves and root is administered orally to alleviate arthritic pain[110]; and the plant acts as a good digestive[111]. Product 'Muscle & Joint Rub'[3] is highly effective for backaches, muscular sprains and joint pains. 'Citrakadi gutika'[52] is used to cure diarrhoea associated with abdominal pain and chronic colitis. Four patents have been found on its medicinal uses mainly for skin diseases[112] and gastrointestinal disorders[113].

Uses of *Pongamia pinnata* (L.) Pierre (Karanj)

NIF Database

Use from Gujarat

Eczema
Apply the seed extract topically
- *Sitaben Gayakwad, Dang, Gujarat*

Uses from other states

Hair care
Mix seed oil with pounded seeds of *Nyctanthes arbor-tristis* L. and apply on the head
- *Rani B. Bhagat, Pune, Maharashtra*

Asthma
Take orally two spoonful of the decoction of the leaves of *karanj*, *Adhatoda vasica* Nees. and roots of *Achyranthes aspera* L., *Solanum xanthocarpum* Schrad. & Wendl.
- *Tolabai Gameti, Udaipur, Rajasthan*

Wound
Mix the seed oil (100ml) with burnt leaves of *Phyllanthus fraternus* Webst. (250g) and apply on the wound
- *Davalal Gameti, Udaipur, Rajasthan*

Toothache
Brush the teeth with its stem
- *Rahul Kumar Gupta, Hazaribag, Jharkhand*

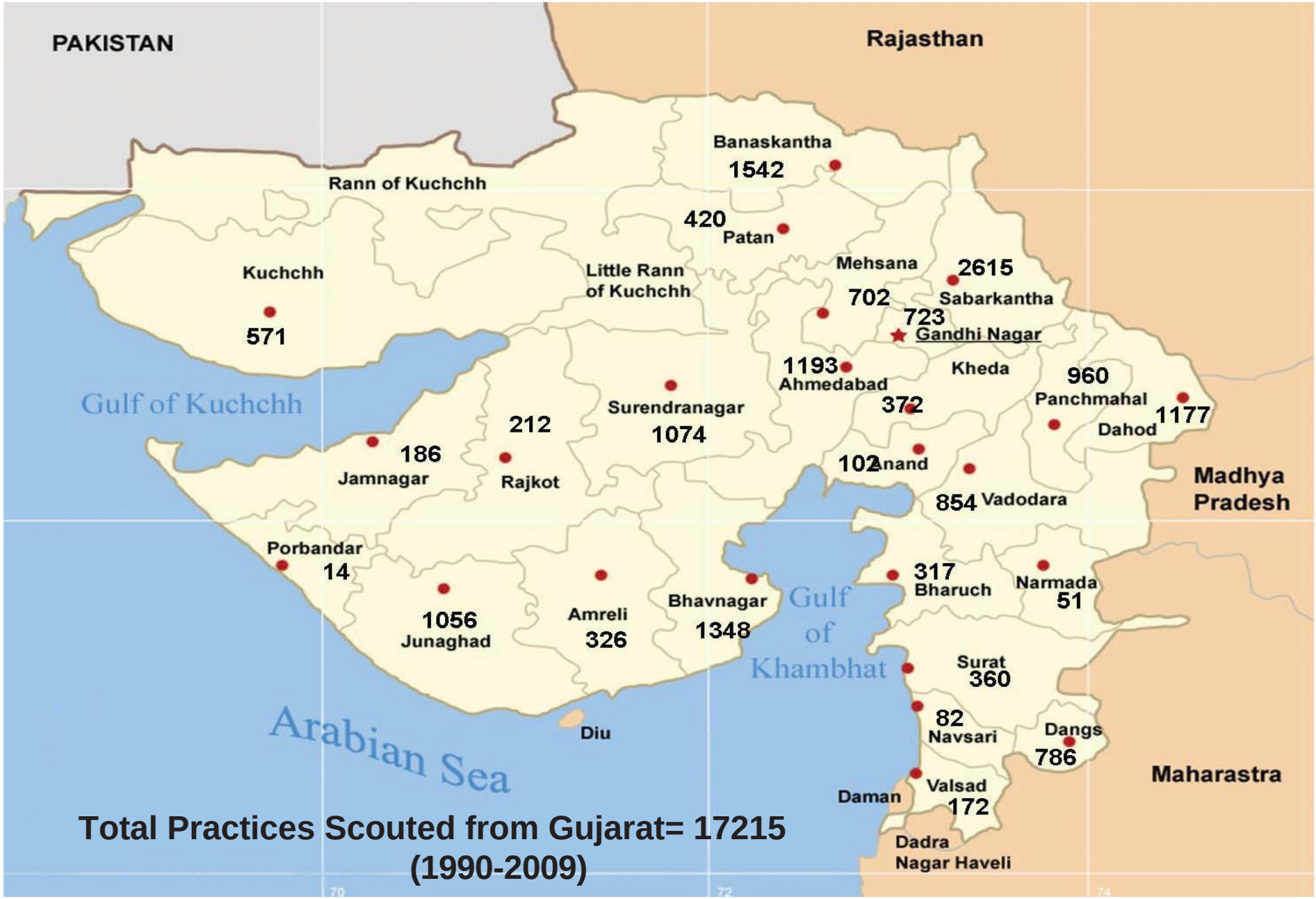
Fever
Grind the seeds (10g) and black pepper (2nos), make pellets of gram size and take orally
- *Devendra Kumar, Hazaribag, Jharkhand*

Uses in Classical Codified Literature

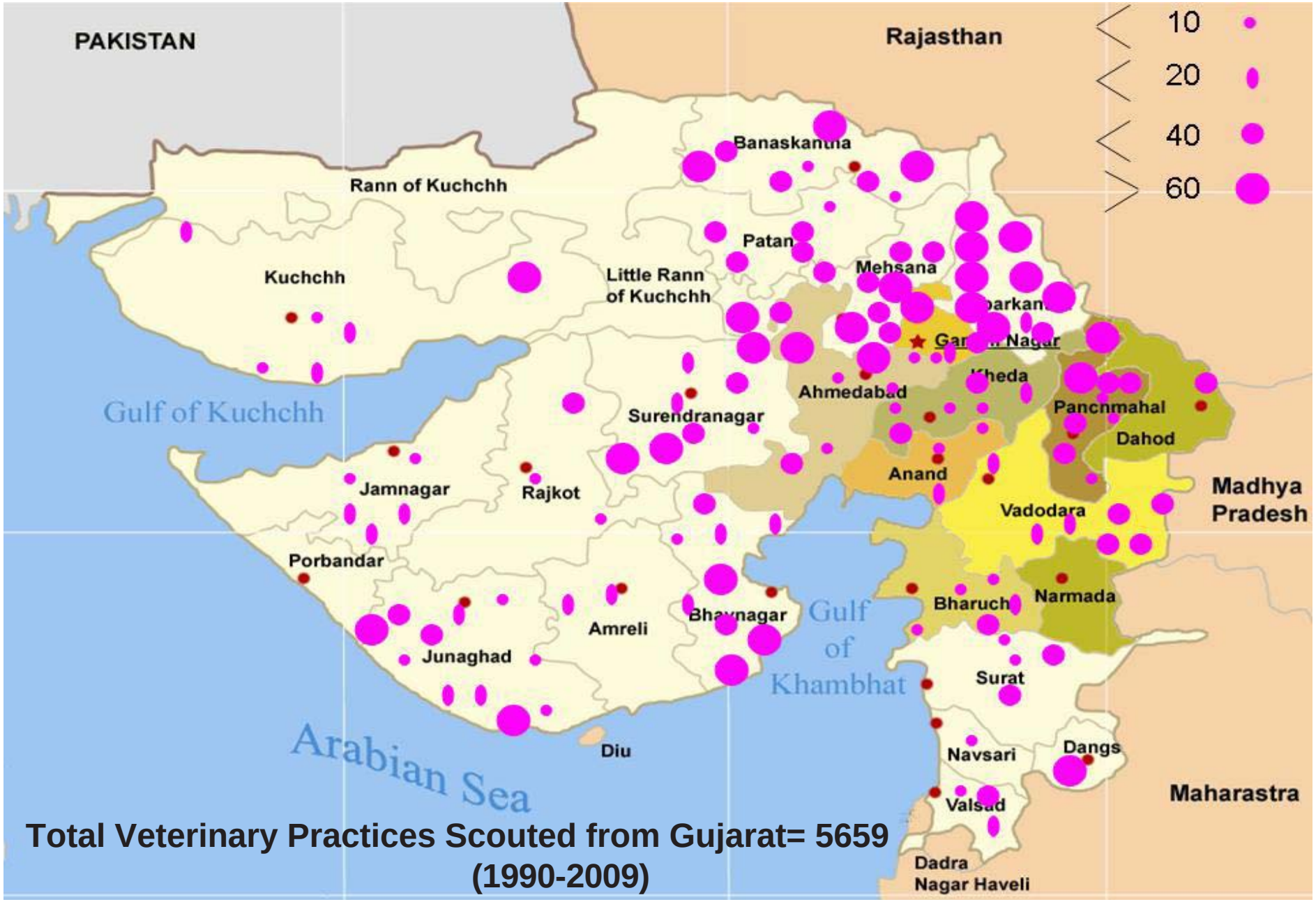
Dried flower powder is taken orally to reduce blood sugar[56]; juice extracted from green fruits is mixed with mustard oil and applied in case of rheumatic pain[114]; and fresh bark extract is administered orally to cure bleeding piles[115].

'Erina Plus gel'[3] acts as a stimulant and helps in increasing the blood supply to skin. It prevents hair loss and skin disorders. 'Face Treatment Cream'[116] acts as a revitalizer, moisturizer and anti-wrinkle skin cream, and also works on dark circles and puffiness around the eyes. Ten patents were found on its medicinal applications mainly for hair care[117], skin diseases[118].

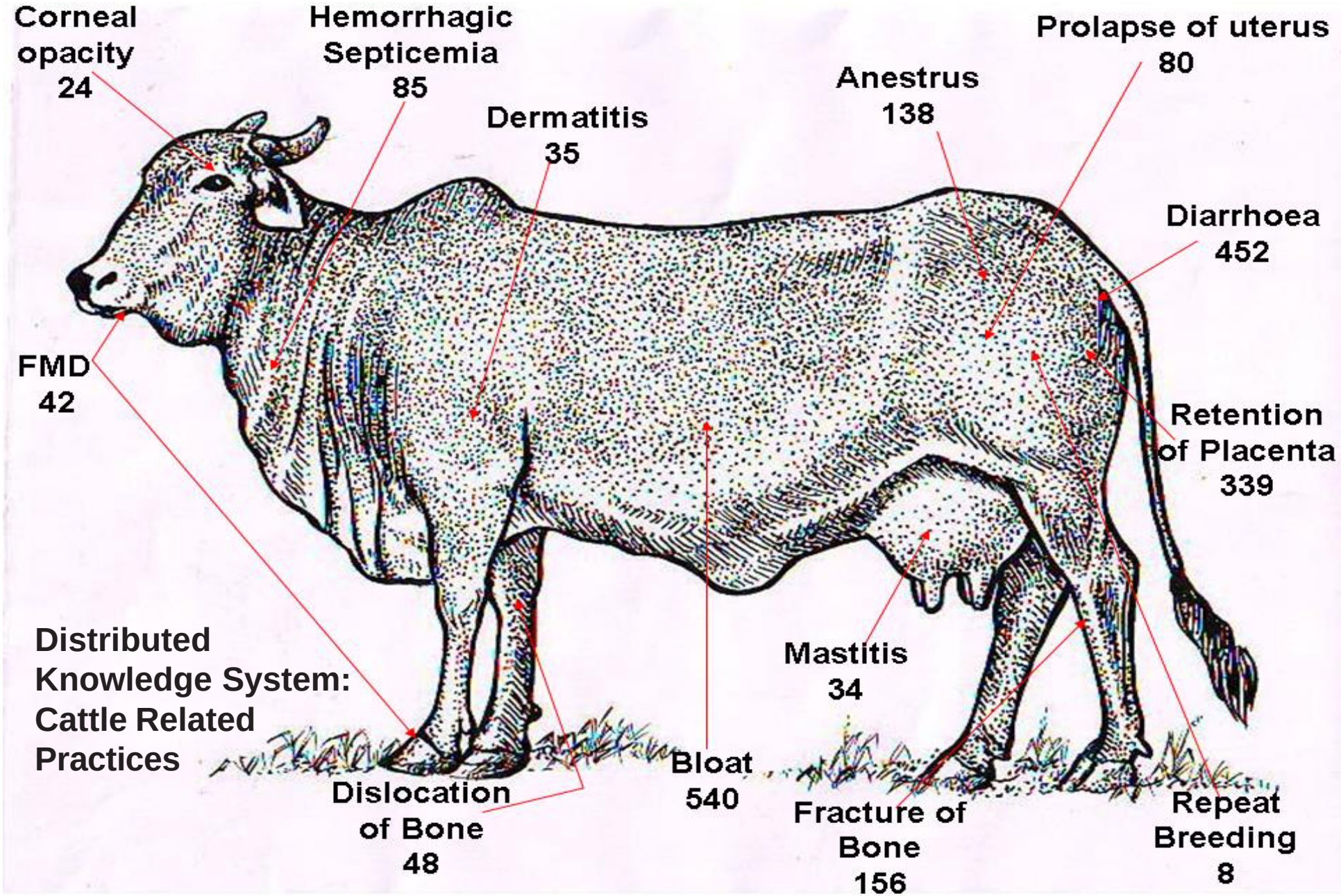
Source: http://ichip.ymes.tpc.edu.tw/~cgk001/images/DSCF1817.JPG

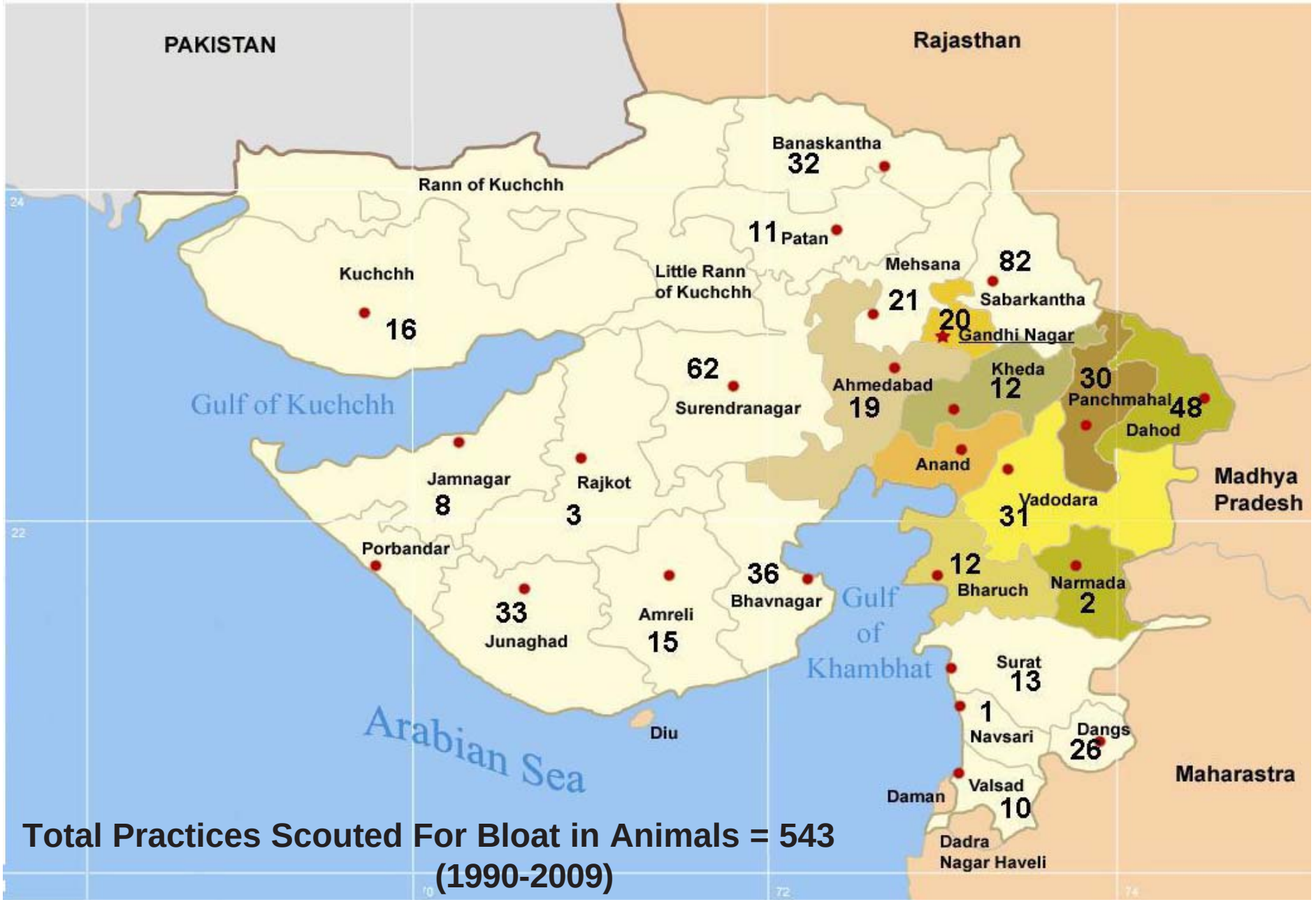


Total Practices Scouted from Gujarat= 17215
(1990-2009)



Total Veterinary Practices Scouted from Gujarat= 5659
(1990-2009)


Corneal opacity 24
Hemorrhagic Septicemia 85
Dermatitis 35
Anestrus 138
Prolapse of uterus 80
Diarrhoea 452
FMD 42
Retention of Placenta 339
Distributed Knowledge System: Cattle Related Practices
Mastitis 34
Bloat 540
Dislocation of Bone 48
Fracture of Bone 156
Repeat Breeding 8



Total Practices Scouted For Bloat in Animals = 543
(1990-2009)

Herbal Formulations for Healthy Crops~

SRISTI SHASTRA

Arkhiben Vankar, Ranabhai Kamaliya, Banidan Gadhvi, Gemal Rana, Rajnikant Patel, Ahmadbhai Kadivala, Gujarat.

It flourishes the growth of the plant by increasing flowering as well as fruiting. Besides overall vegetative growth, it is not harmful to nature and human beings. It also controls sucking pests like white fly, heliothis, aphid etc.

SRISTI KRUSHAK

Popatbhai Rupabhai Jambucha, Gujarat

It is an excellent remedy for leaf curl disease. Besides controlling the disease it increases the vigor of the plants by increasing overall growth.

SRISTI SURAKSHA

Community Knowledge, Gujarat

It is a very efficient treatment for termite and acts as a vitaliser to the affected crops. To control termites the herbal formulation is mixed with sand and spread in the field. Some times it is released in the field along with the flow of irrigation water. In some cases, it is also drenched in the affected part of the plant and sprayed on the vegetation to repel termites.

SRISTI PRAYAS

Community Knowledge, Gujarat

It is a highly effective formulation to act as a herbal growth promoter, which stops shedding of flowers as well as increases the overall growth of the plant. This formulation strengthens the plants internally and enables them to withstand extreme weather conditions. Constant use of this formulation increases the yield and reduces the toxic content in our daily diet.

SRISTI SHAKTI

Community Knowledge, Gujarat

A herbal growth promoter, which helps in production of excellent quality organic food grain. Constant use of this formulation not only increases the yield but also reduces the toxic contamination in our food and environment.

Herbal Formulations for Livestock and Poultry~

Coccicure

Sudakarbhai K. Gauli & Jeevalbhai M. Gauli, Dang, Gujarat

It is a unique herbal medication for prevention and curing of Coccidiosis (*Eimeria* sp infections) in Poultry. The primary function of the medication is to reduce the oocytes maturation and affects the life cycle of various *Eimeria* species.

Poultmax

Community knowledge, Valsad, Dang, Gujarat

It is a unique herbal medication for promoting poultry immunity. It cures symptoms like greenish diarrhoea, conjunctivitis, nasal sputum, drop in egg production and respiratory distress in poultry. About 30g/100 birds for 0-4 weeks & 60g/100 birds for 4-8 weeks may be administered for seven days in stress or for three days before and three days after expected stress.

Mastiherb

Ukhardiyabhai S. Raot, Dang, Gujarat

Mastiherb is a unique intramammary herbal medication for curing mastitis in animals. Clinical trials indicated efficacy of the medication over subclinical mastitis; clinical mastitis and chronic mastitis. It was also validated in case of mastitis due to *Staphylococcus aureus*. The dose rate was found to be single intra mammary infusion for minimum three days after adequate standardization.

~These formulations are based on traditional knowledge of farmers and developed by Sadbhav-SRISTI Sanshodhan Laboratory (www.sristi.org). These products are licensed to Matrix Biosciences Pvt. Ltd, Hyderabad, Andhra Pradesh. The benefits are shared with the knowledge providers, communities, nature, those who add value and other stakeholders in the knowledge and value chain.

NATIONAL INNOVATION FOUNDATION, INDIA

The Ninth National Biennial Competition for Green Grassroots Unaided Technological Innovations and Traditional Knowledge

The competition

The NIF, set up by Department of Science and Technology, GOI, seeks entries of unaided technological innovations and traditional knowledge developed by an individual or group comprising farmers, artisans, fishermen and women, slum dwellers, workshop mechanics, students, local communities etc., in managing natural and/or other resources. The innovations can be in machines, gadgets, implements, or processes for farm operations, household utility, transportation, energy conservation or generation, reduction in drudgery, creative use of biodiversity, development of plant varieties, generation of herbal remedies for human or animal health or developing new or any other low cost sustainable green technology related to various aspects of survival in urban and rural areas. Creative ideas for innovative technologies which have not yet been reduced to practice are also welcome. Communities developing People's Biodiversity Register (PBR) or People's Knowledge Register (PKR) are encouraged to register/link their knowledge base with the National Register at the NIF.

The awards

The best three innovations will be awarded Rs 500,000 (National First), Rs 300,000 (National Second) and Rs 100,000 (National Third) each in different categories. NIF may also give a Life Time Achievement Award of Rs 750,000 to an outstanding innovator with demonstrated lifelong creativity. 35% to 52% of the total prize money will be given in the form of monthly fellowship to the awardees of Lifetime achievement, National First, Second and Third. 15% of the total prize money in these cases would be given to the innovator(s) for their voluntary contribution towards community welfare and nature. There will be several consolation prizes of Rs 10,000 each in different categories depending upon the incremental inventiveness and potential social and environmental impact. Three most outstanding innovative ideas may be given prizes of Rs 50,000, 25,000 and 15,000 in addition to consolation prizes of Rs 5,000 each.

Students

Young inventors and innovators are invited to send their ideas or innovations for a special category of awards for them. These should be unsupervised, an outcome of their own creativity, without any support from their teachers or outsiders. There will be prizes worth Rs 30,000, 25,000 and Rs 20,000 for the best three entries and several consolation prizes of Rs 10,000 each in this category.

How to participate

Individuals or groups may send as many entries as they wish on plain paper providing a) genesis of the innovation and traditional knowledge b) its background and c) educational qualification and occupation, accompanied by photographs and/or videos if possible and any other information that may help in replicating the innovations/traditional knowledge. Herbal entries may be accompanied by dried plant samples to enable proper identification procedure. The **Ninth National Competition started on April 1, 2013 and entries would be accepted till March 31, 2015.** Every entry should include the **full postal address** to facilitate further communications.

Co-sponsors

Honey Bee Network

SRISTI

Where to send entries?

National Innovation Foundation - India

Satellite Complex, Premchand Nagar Road,
Ahmedabad 380015 Gujarat
Toll Free No 1800 233 5555 Fax: (079) - 2673 1903
email: campaign@nifindia.org; www.nif.org.in

PART III

INNOVATIONS
for GUJARAT

This section contains details of national innovations, which are deemed suitable for introduction in Gujarat

01

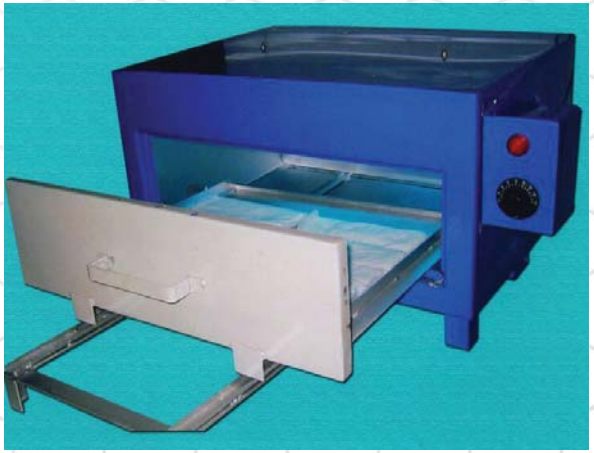
A Muruganandam
Tamil Nadu

Sanitary Napkin Making Machine

Sanitary napkins, a universally needed product, have a very low penetration in India due to high price and the traditional trend of using cheaper but unhygienic old cloth pieces. The innovator has developed a machine that produces quality sanitary napkins at a low cost.

One can prepare sanitary napkins with industry standard raw materials while cutting down the cost in production. It requires three to four persons to produce two pads per minute. Costing less than half of conventional options, this machine produces sanitary pads @ Rs.1 to Rs. 1.50 per pad approximately.

The innovator prefers to sell the napkin making machinery only to self-help groups of women. He has also designed a napkin vending machine such that one can put a coin and get a pad. With the support from the Micro Venture Innovation Fund scheme of NIF, the innovator has been able to install over fifty units in seven states.



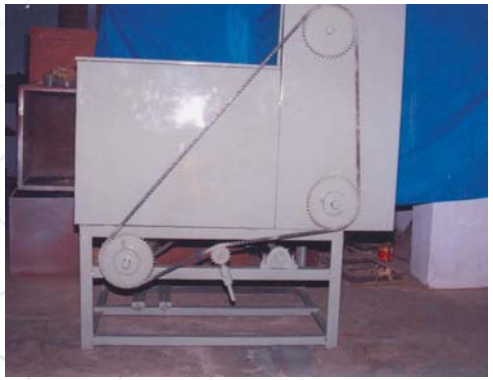
02

Garlic Peeling & Lemon Cutting Machine

M Nagrajan
Tamil Nadu

Faster peeling of garlic in an effective way is a major requirement in the pickle industry. This product is a food-grade, fully automated machinery designed for bulk quantity peeling of garlic. The machine ensures minimal damage and has wide application in making pickles and herbal medicines. The machine is energy efficient, saves labour, and has low capital and operating cost. It frees the industry from capacity constraints caused by shortage of labour in peak seasons.

The second product is also used in pickle industry, but for cutting lemons. It is a cost effective machine, having innovative design, with continuous feeding system. It performs precise and standard cutting of large quantity of lemons in uniform shape and size. It can be operated by one person and cuts lemon into eight equal pieces. The innovator has been able to run a good business with the financial support of Micro Venture Innovation Fund and marketing effort of NIF. He received a National award in NIF's Third National Competition for Grassroots Innovations and Traditional Knowledge Practices in 2005.



Raghav Gowda
Karnataka

Manual Milking Machine

Safe milking of cows/buffaloes is a requirement across rural India and this product is an efficient step in that direction. It is a low cost, manually operated device that helps farmers to milk the animal hygienically and also reduce drudgery in the process.

The machine has simple controls and can be easily operated by women as well. The creation of suction and low vacuum makes it suitable for other applications also. NIF has been giving marketing support to the innovator. As a result, this machine has also been sold to customers in Phillipines, Uganda and Ethiopia apart from India. Raghav was given State Award in NIF's Third National Competition for Grassroots Innovations and Traditional Knowledge Practices in 2005 for the machine (also see Honey Bee, 15(4):4-9, 2004).

04

Aloe vera Gel Extractor

Dharamveer
Haryana

The innovator has developed an effective multipurpose unit capable of pulverizing, steaming, and extraction of gel for herbal applications.

With this device, the innovator uses the specially designed pressure cooking chamber to extract the essence from *Aloe vera*. Being a compact portable unit, it can be quickly and easily transported and used anywhere even in the fields, to process herbs and deliver on demand. The present machine has a capacity to process 100 kg of *Aloe vera* per hour. The innovator was supported for production and commercialisation through GIAN North. One unit has been sent to Kenya on a pilot basis for application feasibility study in the country. Once the feasibility is confirmed, a contract order from the country is expected for more number of units. NIF has also filed a patent for the machine in the innovator's name.

N Sakthimainthan
Tamil Nadu

Hand Operated Water Lifting Device

An efficient way of pumping water to meet requirements in a cost effective way is always a challenge in rural India.

Developed from locally available materials, this hand operated water lifting device is simple in design, delivers high discharge and is low cost compared to conventional hand pump, bucket pump, and bicycle operated pumps.

He received a Consolation award in NIF's Fourth National Competition for Grassroots Innovations and Traditional Knowledge Practices in 2007. NIF also filed a patent for this device in the innovator's name. The Innovation has been taken up for value addition at CMERI Durgapur (WB) through the NIF-CSIR JIC Fellowship Scheme.

06

Mobile Operated Switch and Multi-media Poster

Prem Singh Saini
Haryana

Imagine a village where the farmer has the luxury of being able to stay at home and switch his irrigation pump in the faraway field on or off as required during the day or at night. This is made possible by this innovation, which uses the power of mobile telephony to trigger electrical control switches.

The farmer can remotely know the status of the pump in his cell phone and turn the motor on or off by calling the particular configured number. It activates the switching by certain number of rings and hence incurs no call charges. Patent was filed by NIF in the innovator's name for this technology, which also won him a National Award in NIF's Fourth National Competition for Grassroots Innovations and Traditional Knowledge Practices in 2007. Prem Singh has developed several other innovations, one of which is the viewer triggered multi-media poster. If any agency wants to communicate some graphic message with different language audios or videos, this multi-media poster can be very useful. NIF facilitated a Mumbai based company to purchase two hundred units of the talking poster worth around eight lakh rupees for diffusion in various states. These were made available in five local languages.

Mehtar Hussain
Assam

Low cost Windmill

Looking for a low-cost alternative to diesel or electric or manual way of pumping water into the fields for the winter crops, the two brothers from Assam devised a simple windmill made up of bamboo and tin sheets. The brothers found that continuous pumping by hand involved a lot of effort and drudgery. Using diesel pumps was a big drain on their economic resources. While the working principle of the windmill is similar to conventional ones, the use of low cost, locally available material like bamboo instead of costlier metals for the framework and the direct drive to do automatic pumping of water from the tube well is the innovator's contribution. NIF awarded the innovation in its Fourth National Award Function and also filed a provisional patent application in India.

From Assam to Gujarat: Transfer and Development of Technology by Gujarat Grassroots Innovation Augmentation Network-West

Mushtaq Ahmad
Assam

This innovative windmill found its use in the salt pans in the Little Rann of Kutchch. The salt farmers showed a lot of interest in the windmill and subsequently an experimental demonstration was made near Dhangadhra, Little Rann of Kutchh, in association with VIKAS & SAVE, Ahmedabad based NGOs working for empowerment of salt farmers in Gujarat, in January 2008. Based on the feedback received, GIAN W got the design improved and developed a multi-directional model, which it got installed at Little Rann of Kutchh with the help of VIKAS and at Sasan Gir through AKRASP for pumping water from tube well for irrigation in April 2008. With the help of an innovator, Banjibhai Mathukia, a static wind mill was also installed in the village Kalawad, Junagad district of Gujarat for trial by GIAN W in July 2008. Similar efforts to install such wind mills in other locations also have been made. Further work is going on and GEDA & MNRE, GoI have been approached with proposals seeking support for technology diffusion.

Yusuf Khan
Rajasthan

Groundnut Digging Machine

Rajasthan has predominantly sandy soil. Groundnut cultivation is affected during harvest, as upto 20% of the pods are left underground. Complete digging out of all the groundnut pods from the soil is not possible as manual labor is scarce, costly and other means are not available.

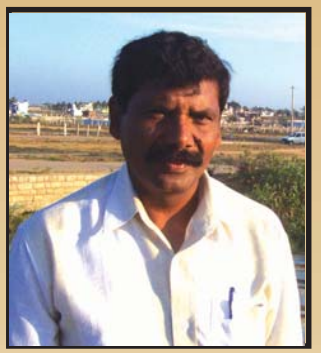
The innovator has revolutionized groundnut digging with this sturdy rugged desert unit which is retrofitted on a standard 35HP tractor. As the tractor moves forward, the vanes at the bottom of this unit rotate, digging and scooping out the soil-groundnut mixture and dropping them into a vibrating storage bin. The bin has fine sieves at the bottom which let out the soil while trapping the individual groundnut pods on the top. The hatch at the back of the unit is used to take out the groundnuts.

The unit consumes four litres of diesel per hour and completes digging out groundnuts from a hectare of field in one day. The unit can run on uneven terrain and can also be used to sift out small stones, solid residue and garbage from fields and country roads.

The innovator has been supported under the *'Micro Venture Innovation Fund'* of NIF for commercialising his innovation. In 2006, the technology was licensed to a Vizag based company called Ardee Hi-Tech Pvt. Ltd. This license was targeted for its application as a sea beach cleaner.

09

Power Generation through Sewage



K Balakrishna
Karnataka

There is a search going around the world for solutions that harness alternate energy sources to generate electricity. The innovator has developed a system that generates energy from slow moving sewage or any other source of flowing water.

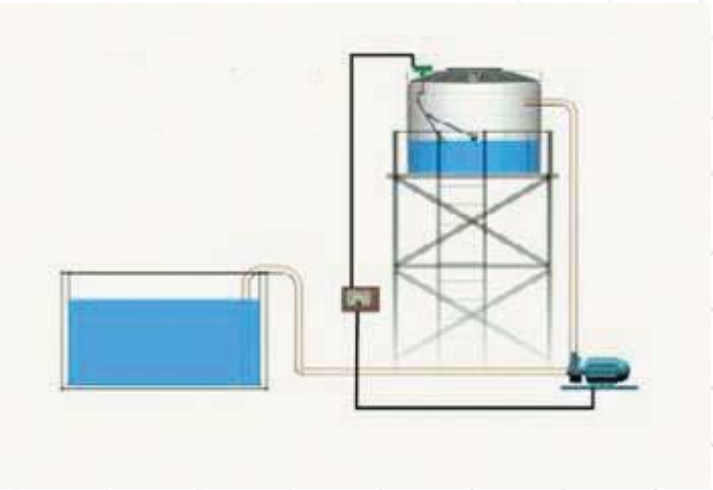
In this arrangement, electricity is generated when the slow moving sewage/water is passed through a cylindrical drum. The helical blades inside the cylindrical drum provide desired efficiency to the system in generating power. The capacity of the existing pilot unit is 30 kVA. This technology can have a tremendous impact on the generation of power from low velocity, high volume discharge of effluents from industries and civil sewage processing plants. NIF has been actively following up with national and international entities for partnership in taking this innovation forward and has also filed a patent for the technology in the innovator's name. Public agencies such as municipal authorities can particularly help in testing its utility.

M Manihar Sharma
Manipur

Automatic Pump Operator

M Manihar Sharma (62), a high school pass, has solved many local problems. After dropping out of high school he worked as a local mechanic in a workshop from where his fascination with mechanical world began. His journey is diverse; he was a founder general secretary of The All Manipur Auto Rickshaw Owner's and Driver's Association. He also ran a hotel, served as assistant to his doctor friend and is now a full time innovator.

He has come up with a Automatic Pump Operating system (APO) with seven variants, which allows hassle-free household water management. Using a central control panel, the pump switches on automatically as soon as the overhead reservoir goes below the threshold level and switches off as soon it gets full. The same principle follows for the ground reservoir as well.



11

Trench Digging Machine

Radhey Shyam Tailor
Nathulal Jangid
Yusuf Khan

Rajasthan

While on a trip, the innovators noticed laborers manually digging the ground to make long trenches to lay telephone cables, taking months to complete the work. This inspired the innovators to build a mechanized equipment to dig trenches rapidly.

The trench digging unit developed by the innovators can be fitted to any tractor. The modified unit has a hydraulic lever to adjust digging depth and to maneuver the running unit, a planetary gear system and motion converter unit to achieve speed reduction and deliver power from the tractor. Other components include a chain gear and roller system, a belt with trench digging blades and the chain gear system with helical blades fitted to a horizontal conveyor to shovel the earth and lay it flat on either side of the trench.

The compact machine can dig narrow and deep channels evenly, on hard and soft soil conditions. In one hour, it can dig a pit 65 meters long, 6 feet deep and 14 inches wide, while consuming only 2.5 liters of diesel per hour. The equipment costs less than half that of imported models. It is even used by the local telephone department to lay cables.

R Jayaseelan
Tamil Nadu

Coconut husker

Anybody involved in growing and selling coconuts would vouchsafe for the fact that husking them is certainly one of the more tedious parts of the job. Jayaseelan has developed a simple labour saving mechanical device for husking coconuts. This device runs on a 1.5 hp motor and has two sharp blades attached to a cylindrical metal rod, which is useful in husking more coconuts as compared to the manual effort. With this device the husk can be separated into four pieces still leaving some coir fibres in the nuts. He has developed several modified and scaled up versions later.

He received the State award in NIF's First National Competition for Grassroots Innovations and Traditional Knowledge Practices in 2001.

13

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

B Mohanlal
Kerala

Mohanlal has a small workshop for repairing fishing boat engines. He used to observe the inconvenience of the local fisherman while fishing with the existing petrol start kerosene run engine. These had inbuilt gearbox and the diesel engines had long tail propeller system without gearbox. The kerosene run engines consume high amount of fuel and pollute the water, which affects the reproductive capacity of fish. On the other hand the diesel engines powered systems do not have gear system for better maneuverability. Apart from this the beach landing was very difficult while using the conventional inboard marine diesel engines.

After rigorous research and development he could develop a gearbox and manually tiltable Z-drive system for small capacity diesel engine to overcome the above said problems. The state fisheries body, MATSYFED, is now partnering with the innovator for promoting the product among local fishermen.

Raisingh Dahiya
Rajasthan

Biomass Gasification System

There are lots of villages in the country which are still not electrified or are receiving power erratically. Crude oil is not a very likely solution as it is depleting and the price is also going higher day by day. Use of biomass as a fuel therefore appears to be a good solution!

People using the biomass gas (producer gas) as a fuel generally complain of choking in the engine after running for a certain period of time. The innovator has changed the conventional design of gasifiers especially the filters and cooling unit to get clean gas, ensuring smooth operation of engine at low operational cost. On an average the biomass requirement is one kg/kW-h and the costs of 10 kW, 25 kW, 30 kW and 35 kW biomass gasifier system are Rs. 1, 25,000, Rs. 2,00,000, Rs. 3,00,000 and Rs. 3,25,000, respectively.

Scientists from TERI (The Energy Research Institute) have confirmed its uniqueness and over fifty users have confirmed its operational practicability. The innovator has sold over fifty units after getting MVIF Support from NIF through GIAN North.

End Notes & References

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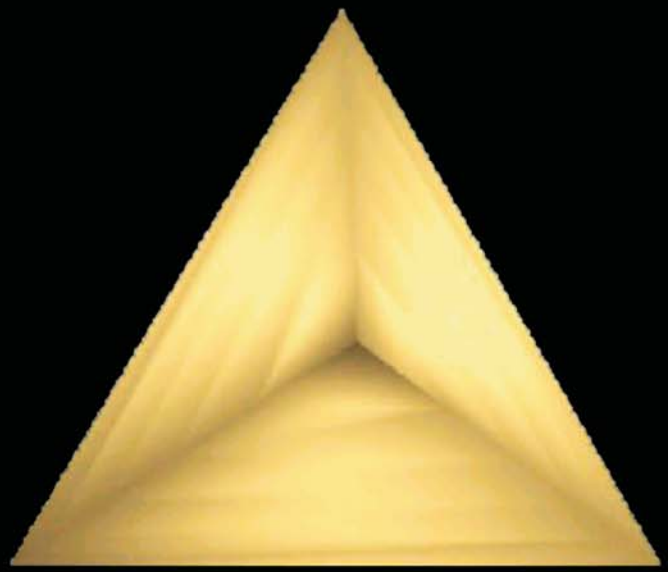

Honey Bee Network
SRISTI
P.O. Box : 15050, Ambawadi P.O.
Ahmedabad - 380 015, Gujarat, India
Phone: +91-79-27912792, 27913293
e-mail: honeybee@sristi.org
www.sristi.org/honeybee.html

National Innovation Foundation
Bungalow 1, Satellite Complex
Premchand Nagar Road
Vastrapur
Ahmedabad 380 015, Gujarat
Telephone: +91-79-2673 2456/2095
www.nifindia.org