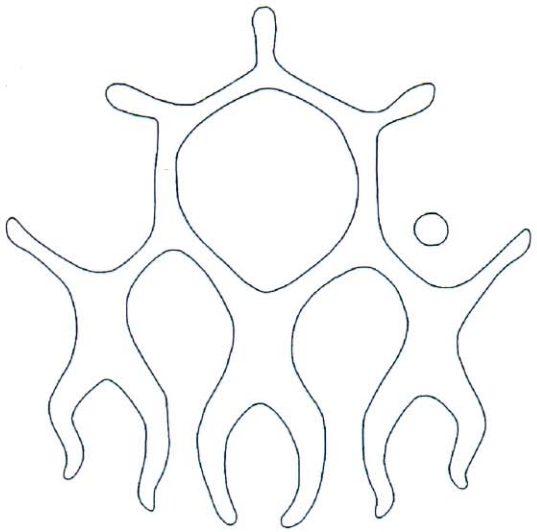

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INDIA INNOVATES

Third National Grassroots Technological Innovations
And Traditional Knowledge Awards January 5-6, 2005

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Uzi fly trap

CONSOLATION

Mohammad Wakeel Ahmed (42) lives in Kodipura, Channapattana taluka, Karnataka. A farmer by profession, he holds a BA degree from Kuvempu University, Chennapattana. His family consists of seven members. His wife stays in Bangalore with the children as they go to school there and Wakeel Ahmed stays back to supervise the activities in his farm. Wakeel Ahmed credits his parents with instilling the values of a righteous life in him and proudly claims that he is "a teetotaler and not slave to any addiction" and that his needs just extend to "three meals per day and a good night's sleep."

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Scouted by
PRITVI

Genesis

Mohammad has a farm of two acres in his village on which he grows mulberry leaves, the staple food for the growing silkworm caterpillars. But some time ago, he was facing financial difficulties due to the decline in the cocoon price and due to the decline in the yield due to the destructive Uzi fly. One of the major problems faced by sericulture farmers is a tachnid fly, popularly known as Uzi fly (*Exorista bombycis*) which is an endo-parasitoid of the delicate silk-worm and causes 15-20% crop loss annually. This led him to try and find a cost-effective method to prevent the menace of Uzi fly. He tried all the ways and means as advised by the local sericulture department but it was to no avail. A slew of such failures set Wakeel Ahmed experimenting with different methods such as using organic manure, cow dung and even fertile soil from the near by pond for his mulberry plants to reduce the attack of the Uzi fly.

Finally he came up with this idea for the fly-trap after he studied the life cycle of the female Uzi fly. While designing this device he says that he did not face any kind of technical difficulties.

The Innovation

The Uzi flytrap consists of a nylon mosquito mesh, a plastic bottle with perforation with a plastic cork attached to one end, a hollow metal pipe and PVC collars. The bottle used could be any ordinary disposable plastic one (soft-drink or any of the mineral water bottles) available in the market today. Firstly the windows of the room are secured with nylon nets. Two–three holes are made for the flies to enter. To this a nylon mesh measuring two feet by three inches with PVC collars inside is attached. This mesh is tied with a cotton thread to a hollow metal pipe 18 cm long with two cm diameter at the outer end and three cm diameter at the inner end. At the end of this pipe a fine nylon mesh is fixed and the pipe is slid into a plastic bottle and secured with a cork. Small holes are made in the plastic bottle and it is hung from the window or ventilator of the silk worm rearing room at a distance of 2ft. The pregnant female Uzi flies enter the fly-trap through the holes as they are attracted to the smell of the silk worm larvae. But they get trapped in the bottle and unable to come out, die.

Advantages

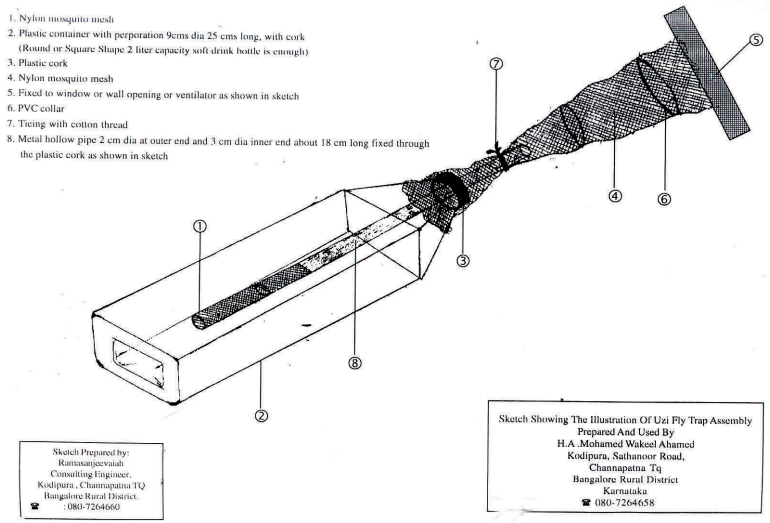
With this fly trap 100% control of the Uzi fly menace in silk worm rearing is possible. This unique fly-trap does not pinch the farmer's pocket as it costs only Rs.50 and by using this, the quality and yield of the cocoons is increased considerably. Furthermore it is simple and easy to use.

A progressive farmer

For his outstanding contributions to sericulture Mohammad has received certificates from the Dept. of Sericulture, Govt. of Karnataka as the Best Silkworm Grower, twice. His name also finds a mention in the bimonthly magazine brought out by the Central Sericultural Research and Training Institute, (CSRTI), Mysore. He wishes to continue with the process of innovation if proper financial aid is available. Mohammad believes that there is room for improvement in the device. He suggests that it is advisable to make provisions to install the trap at the time of constructing rooms for silkworm rearing as this would be more effective in the long run. He has also successfully formulated a powder for the treatment and control of the "sunnakattu roga" (*White Muscardine*), a fungal disease affecting the silkworms in the trays. He sells this powder at Rs.25 per kg and claims that this powder does not affect the growth of silk worms negatively. For all his experiments, Wakeel Ahmed is rightly called a "farmer scientist".

A generous innovator

Wakeel Ahmed generously shares his innovation with fellow sericulturists. Mohammad has been using this innovative trap for the last three years. About 250 farmers in the area who use this unique Uzi fly trap testify to its effectiveness and acknowledge that it is an excellent device to trap the flies. Mohammad firmly believes that the information regarding the availability of the flytrap must be disseminated to all silkworm rearers through proper channels as it provides a solution to the Uzi fly menace, which all farmers are terrified of and which seemed to defy all efforts to do away with them. Wakeel Ahmed hopes that if all the farmers in an area practice this method, Uzi flies could be eradicated from the entire locality. NIF has sanctioned an amount of Rs. 31, 250 from its Micro Venture Innovation Fund for the prototype development and market survey of the Uzi Fly Trap and another innovation- the modified silkworm rearing tray by S.M.Mangali.



Control of leaf curl disease in brinjal

CONSOLATION

Popatbhai Jambucha (42) is a native of Mathavada village in Bhavnagar in Gujarat. He is an assistant teacher of agriculture at Lokshala (secondary school), Kalasar. He takes up experiments in agriculture at his school and implements those which are successful on his own farms, though he has no formal training in agriculture. He is married and has two sons who are in school. His monthly income is Rs.11,000.

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Scouted by
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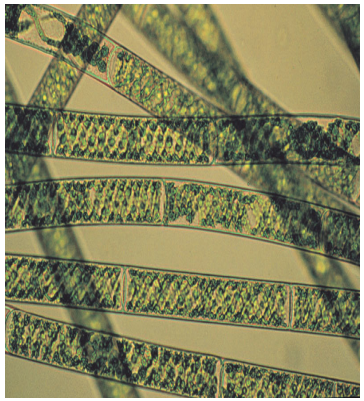


Method of preparation

Popatbhai uses marine algae for control of leaf curl disease in brinjal. According to him, the spirogyra obtained from the sea is dried, preserved and used when required. When required, a mixture of two kilograms of dried spirogyra,three kilograms of woodburnt ash, five litres of cow urine and forty litres of water are kept in a drum for 12 hours. The mixture is then filtered through muslin cloth and sprayed on the affected crop with the help of pressure sprayer pump. Time of spraying is in the morning and evening. Spraying is taken up at an interval of 10 days for as long as the crop is in the field. By spraying this, 30% leaf curl disease can be controlled. Spraying also results in better plant growth, colour and it helps to control the growth of aphids and cures withering of flowers. Better productivity can also be achieved by using the method. This method is successful in chilly plants also. Popatbhai got the idea for this practice in 1986-87 on the basis of knowledge he had collected from various sources and on experimenting with it he found it successful. He has also initiated this experiment on a small plot of land in his school for experimental and display purposes.

Field trials

To know the effect of this water extract of marine green algae on leaf curl disease, field trials were conducted by Sadbhav SRISTI Sansodhan Laboratory in Khodiyar village near Sarkhej Gandhinagar highway Ahmedabad. The filtrate was sprayed in the morning hours at 2.5 litres/ 10litres of water in three replications with hand operated knapsack sprayer using a recommended spray volume on both brinjal and chilli. The effect was observed in the field at different time intervals. Approximately 30% and 35% control of leaf curl disease was observed in brinjal and chilli respectively. Thus this method is low cost and partly useful for control of leaf curl disease in chilli. Trials with higher concentration are planned to improve efficiency.

An interest in farming

Popatbhai owns six bighas of land on which he grows millet (Bajri) hybrid variety, Jowar, cotton, lady's finger, cluster bean, cowpea, spinach, cabbage and gourd. In his farm there are 100 mango trees and 15 custard apple trees. Popatbhai inherited his interest in farming from his father whose occupation was farming and animal husbandry. His father also took up many experiments in farming and used to grow crops which were not traditionally cultivated in that area. His father initiated the cultivation of onion and lemon in that area as far back as 40 years ago. Popatbhai carries on the tradition.

Control of sucking pests in cotton

CONSOLATION

Takhatsinh Dalpatsinh Patel (31) hails from Dhamai, Panchmahal, Gujarat. He has passed his Higher Secondary. Takhat sinh earns his living through farming and animal rearing. His family consists of his parents, three brothers, his wife and his son. His father works as an electrician with the signal department of Western Railways. All the members of his family are educated upto the higher secondary. The family has five acres of land of which two are irrigated. Takhatsinh does a lot of experiments in farming and is passionate about his experiments.

Genesis Takhatsinh had learnt of the medicinal qualities of *karanj* from his forefathers. His forefathers used the leaves of 'karanj' for toothache and Takhatsinh observed that the plants of *'karanj'* and '*arni*' are never attacked by aphids and so the idea of using these plants for making this pesticide came to his mind. Other farmers in his village have also learnt this practice from him and are using it. But according to Takhatsinh due to irregular rainfall for the past three years, cotton farming has decreased in this area and hence the above pesticide is used less as compared to before.

Symptoms of the pest attack

Aphids that attack the cotton crop are one of the major sucking pests in cotton. These pests suck the liquid from the leaves and cotton boll of small plants and thus restrict the growth of the boll and the plant as well. Crop production decreases and there are chances of crop failure.

Method of preparation of the pesticide

Leaves of *karanj* **(***Pongamia pinnata*- 2kg) and leaves of *arni* (*Clerodendrum phlomides*-2kg) are chopped into small pieces and then boiled in five litres of water in a closed vessel until the decoction is reduced to two litres. After the decoction is cooled down it is filtered and used. For spraying on one acre crop of cotton, one litre decoction is mixed with nine litres of water and sprayed on the crop in the evening as spraying in the evening gives better results. In case of major pest infestation, the pesticide is sprayed at an interval of five days.

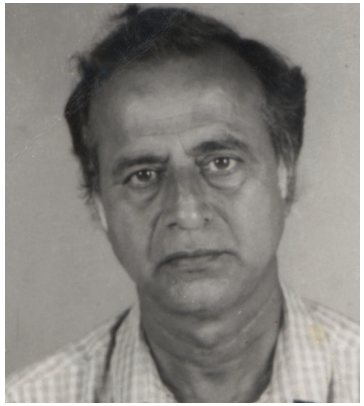
Due to the use of this pesticide, crop production increases and the quality of the cotton fibre also remains good. In addition, this pesticide has no side effects and it is a low cost alternative.

Field trials

Field trials were conducted in Khodiyar village near Sarkhej Gandhinagar highway, Ahmedabad by the Sadbhav SRISTI Sansodhan Laboratory to find the effect of the filtrate of *Clerodendrum phlomides* and *Pongamia pinnata* for control of pests in cotton. The filtrate was sprayed in the morning in three replications with a hand operated knapsack sprayer using a recommended spray volume on cotton. The effect was observed in the field at different time intervals. This trial was also done on bean crop. Approximately 50% control of aphids was observed in both the crops.

Address
Damai, Shhera
Panchmahals, Gujarat

Scouted by
Ramesh Kumar Patel



New groundnut sowing practice

CONSOLATION

P. B. Mukunthan, a BSc. graduate, and a farmer by profession, has been practising organic farming for the past 15 years in an attempt to preserve the delicate ecological balance. He lives in Chengalpattu with his wife and two sons. Before doing anything he always talks to various farmers and takes their suggestions and then finally decides what to do. But he feels that interaction with formal agencies is a waste of time and he avoids talking to 'qualified people' as he believes they have no flexibility. His motto *"Man should be like an empty cup -always ready to draw."* Being a self-proclaimed lover of nature, Mukunthan's opinions on the subject are strong and he proclaims that man is an intruder and has no right to poison soil or water. His faith in nature and the balance in which it always works is unshakeable and this motivated him to turn towards organic farming.

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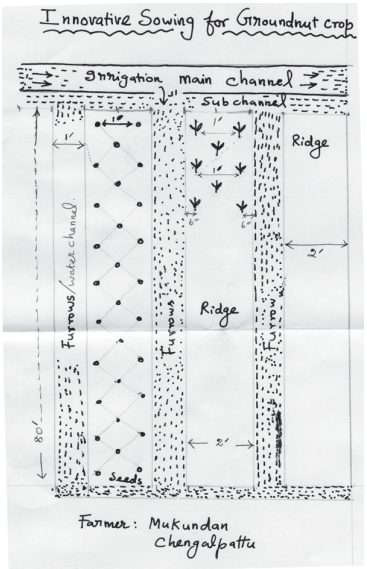
SEVA,Tamil Nadu



The Innovation

After the land is ploughed, a raised bed of two feet width to a required length of field plot or sub plot usually 80-100 feet is made. Furrows of half feet depth and one feet width (to the length of the raised bed) are formed on either side of the bed. Groundnut seeds are dibbled in the ridges at one feet interval and they are dibbled 5"-6" away from the edge of the ridge or from the furrow. Another row of seeds is dibbled in the centre. Thus the groundnut seeds are dibbled in a triangular fashion i.e. the centre of the square is planted with a seed (Refer Figure 1).

Advantages of this method

Saving of water requirement

Groundnut needs only limited water and this method provides ideal moisture. By using irrigation water in the furrows, he is able to reduce water requirement of the crop to the extent of 62%. i.e. by using this method four times the area can be covered with the same amount of water. This method also facilitates faster irrigation. This method also reduces the number of times the groundnut crop should be irrigated.

Saving in ploughing,weeding and earthing up

Groundnut is raised as a summer crop after the harvest of paddy or any other crop. Usually the seeds of groundnut are sown in the furrows formed by country plough or tractor plough. But, Mukunthan made ridges and furrows by using a country plough with palmyra leaves. He did not plough the field finely but left the clods as such and thereby minimized the cost of ploughing. In this method irrigation is done soon after making the ridges because in any dry area, when ridges are formed, they dry up soon. But this immediate irrigation favours the growth of weeds. So a thorough weeding is necessary within 25 days of sowing. Later on the crop covers the entire ridge canopy and weed growth is arrested due to the

shade effect. If weeds grow in the irrigation furrows they need not be attended to as this will not hinder crop growth. There is no need for a second weeding and it saves the cost of five labourers per acre. Similarly there is no need for earthing up as aeration and looseness of the soil exists in the ridges. Mukunthan uses organic liquid fertilizer (cow dung and jaggery mixed with water and fermented) in the channels.

Easy harvesting of groundnut crop and reduced seed rate

This method facilitates easy pulling of plants, without any difficulties as is not the case in the conventional sowing system. Even if there is not enough moisture it is possible to harvest. Each plant holds about 25-30 pods on an average and it extends to a maximum of 120 pods per plant. Thus the yield is similar to that using the conventional sowing system which is also between 20-35 pods per plant i.e. 20 bags per acre (each bag holds about 40 kg of pods). This method also reduces the seed rate of groundnut from the conventional 40 kg per acre to 30 kg/acre and this is valued at Rs.500 per acre. Thus less water, less seeds and less labour is required but the yield remains the same.

Formal recognition

"*Sowing of groundnut seed in a triangle fashion to give a maximum soil cover is innovative. Sowing on the ridge will definitely reduce weed growth, facilitate harvesting and reduce irrigation water requirement. The advantages claimed in this technology for reduced seed rate, reduced cost of weeding, easier harvesting and no need for earthing up operation have scientific basis.*"

This is what Mr. M.S. Basu, National Research Centre for Groundnut, (Indian Council of Agricultural Research), Junagadh has to say about the method developed by Mukunthan.

Other forays into innovations

Green manuring and mulching using Water Hyacinth

Mukunthan has developed a system of mulching by using commonly available weed plants found near his village. Sengalpattu district is known for lots of ponds and tanks useful for irrigation. But sometimes these water sources have weed problems due to the prolific growth of *Akasathamarai* (water hyacinth). So Mukunthan decided to make use of the water hyacinth, normally seen as a menace, and removed them from the ponds and transported them to his paddy fields using tractors. Usually 10 tractor loads i.e. about 15 tonnes are required for one acre. After decomposition in the field (for around 15 days) he puddles the field and plants paddy seedlings. He usually raises "*kullakar*" traditional variety of paddy. He has recorded more than 20 bags i.e. 75 kg more yield per acre by using this practice. By observing the good growth of paddy seedlings using this method he decided to try this in other vegetable crops like brinjal. This method also saves irrigation water to a large extent. Mukunthan is also attempting to raise vegetables on a fully (12") mulched field using water hyacinth and many other agricultural waste materials using the jogger system for irrigation.

Using weed plant as Green manure

*Kattupudina (*Mentha spicata) is a roadside weed plant found abundantly in many villages. His friend Dr. Solaiappan, an agricultural scientist working in a co-operative sugar factory told Mukunthan that during his experiments he had found that Kattupudina has growth promoting substances. This knowledge motivated Mukunthan to try it in his own field and he found it very useful. Mukunthan uses 200 bundles (each bundle weighs 15 kg) of these weed plants per acre. They decompose quickly and result in vigorous growth of paddy seedlings. Using these weeds as manure also ensures that the seedlings are free from disease and pest attack to a great extent.

Country seed drill

Mukunthan has designed a country seed drill, which delivers four seeds with a spacing of 9". For *Soyabean*

he uses 9" spacing and alternate rows are plugged off to get 18" spacing for *Til* seeds. For a good crop and to achieve a higher yield, thinning is an important agricultural practice, which can be comfortably achieved using this sowing method. He also sometimes uses a tractor for sowing and it forms five ridges and furrows with 18" space between two furrows. By adjusting the centre rod of the tractor, one can get nine rows of furrows with a spacing of 9" between furrows. These furrows can be used for sowing paddy seeds also.

Restoration of the cultivation of GEB 24

Mukunthan is proud of the fact that he has been able to restore the cultivation of GEB 24 (Kichdi Samba), a fine variety which was almost on the verge of extinction. He is also trying to restore four more varieties of paddy.

Reintroducing the native breed of cattle- Tharparkar

For successful organic farming he realized that he needs cattle for cow-dung and urine and for this purpose he used some Jersey cross animals. But he found that they do not conceive regularly and are susceptible to illness. Then after considerable thought and discussion with various people, he decided on the native breed '*Tharparkar*'. With a lot of difficulty and expenses he brought 12 animals (two lorry loads) from Jaipur, Rajasthan (2200km away) to his farm. These cows are now settled well and on the first lactation they are yielding around 8-10 litres of quality milk with good fat content. Now he has four male calves and four female calves. He proposes to send the male calves to various voluntary organizations to upgrade local stock. Mukunthan claims that this native breed animal has become an eye opener to many farmers down South as its yield is the same as that of the foreign breeds like Jersey and Friesian. He also holds the opinion that it was a blunder to go after the foreign breeds instead of concentrating on pure selective breeding. He acknowledges with gratitude the help given by Mr.Vivekanandan of Seva Trust Madurai who helped him in finding the right person- Mr. Mani Sekar to get the best animals.

New Valve for modified two stroke engine[45]

CONSOLATION

D. Subramanian(36) belongs to Chennimalai, Erode district, Tamil Nadu. He is a weaver by profession, though his family is involved in farming. Subramanian has studied upto the tenth standard. He has always been interested in research. He was awarded the Tamil Nadu Scientists' award for the year 1999 in the discipline of Non Formal Education for his work on the "Fuel Efficient Two-Stroke Engine" by the Tamil Nadu State Council for Science and Technology. This innovation was also published in 'Dinamalar', a leading Tamil Daily in 1999. He thanks his friends Nallasivam, Lokanathan, Kumarapuri Govindarajan and Dandapani who have helped and assisted him in his ventures in many ways.

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Genesis Petrol engines of two wheelers function under two systems, namely, two-stroke and four-stroke system. There are two valves in the four-stroke engine. The first valve draws in the petrol-air mixture and closes. The second valve sends only the smoke out and closes. So there is no wastage of petrol in the four-stroke engine. But in the case of the present two-stroke engine, the petrol-air mixture is drawn from the carburettor to the cylinder. The passage from the carburettor to the cylinder and the smoke outlet are located at the same place. Under this system, the petrol-air mixture is drawn in and the smoke is sent out at the same time. So there is a possibility of a leakage of the petrol-air mixture. This leads to environmental pollution. This made Subramanian think of some solution which would make the two-stroke engine more efficient and this led to the development of the valve for the modified two-stroke engine.

At present Subramanian has all the components for manufacturing single valve type engine. To demonstrate the working of the valve, a TVS 50 moped is required and to demonstrate the working of the two-valve engine he has developed, a TVS Suzuki, Yamaha, Bajaj or any other 100cc motor cycle is required.

The innovation

In the modified two-stroke engine, an outlet valve has been constructed on the top of the cylinder. The innovator claims that the outlet valve timing is controlled by the rotary movement of the camshaft. The outlet valve facilitates complete drain-out of burned gases. Thus by the time fresh charge enters the cylinder, the valve closes. Thus there is no possibility of leakage of the petrol mixture. Due to controlled emission of smoke, atmospheric pollution is reduced and the engine has better fuel efficiency as the wastage of petrol is minimised.

For two-stroke engines with more revolutions per minute (rpm), two valves should be fixed at the top of the cylinder to regulate emission of smoke. These two valves will work alternately and ensure protection of the environment as well as reduction of petrol consumption.

Dr. P.S.S Srinivasan, Head of the Department, Mechanical Engineering, at Kongu Engineering College, Perundurai, Erode tested and approved this new valve for the modified two-stroke engine, developed by Subramanian, in August 2004.

Innovative mind

An earlier innovation of Subramanian's was a new metric system clock which he developed in 1998. In this clock, 100 seconds make one minute, 100 minutes are one hour and such 20 hours form a day. He believes that just as measures of length, weight etc., are based on the metric system, time will also one day be based on this system. He hopes that by accepting this system now, India can set the trend for others.

Keenly interested in projects of national importance, Subramaniam had sent a letter to the President, Dr.A.P.J. Abdul Kalam regarding "Easy ways and plans for connecting river waters." Subramaniam's detailed plan which includes a new method of cutting canals and water diversion, claims to be easier to implement, and would save costs and time. He hopes his alternative approach might be taken up for detailed research and study.

Subramaniam has also developed a new method of bio-gas production and its introduction earned him the Tamil Nadu Government's recognition. His new method differs from the conventional method in that it does not require a big cylinder and the tank is square, not round. Using this method, the automatic process of gas-pressure maintenance and continuous gas production are possible. Further the gas producing tank does not rust and is durable for many years. Subramanian exemplifies in many ways, the true spirit of innovation.

Eco-friendly non-return valve for two-wheeler engines[46]

Arvind Janardan Khandke (54), a 9th grade pass out, hails from Kolhapur, Maharashtra. A cloth merchant by profession, Khandke is an auto enthusiast obsessed with fuel conservation. His hobbies include research work and reading as well as swimming. His aspiration is to pass on something valuable to the next generation. His family comprises his wife, four daughters and a son. His monthly income is Rs. 7000 per month.

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Maharashtra

Genesis Arvind Khandke is a cloth merchant who owns a handloom saree shop in Kolhapur. As part of his business, he used to travel a lot on his Rajdoot motorcycle (manufactured by Escort). While riding the motorcycle he was often troubled by the engine vibration and the high fuel consumption. This forced him to think of developing a device which would overcome the above problems.

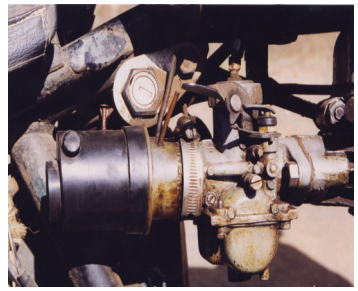
While studying the process, one day in 1980 he found that the air filter was oily and he inferred that there was some loss as the air fuel mixture from the cylinder rebounds and was escaping from the carburetor. To stop that wastage, he decided, to fit a valve type device. Thus in 1983, he designed the first prototype of the valve out of mild steel. But during the trials he found that the flap of the valve was too heavy to work effectively. He changed the material of the flap and designed a new valve using nylon and Poly Propylene to suit 1 HP to 1.25HP engines.

Some of the problems he faced while developing this innovation were the lack of proper o-operation by experts in the field and non-availability of the laboratory/ equipments for the testing of the products. While developing this innovation he recalls that he was not able to concentrate on his business and family life and this single minded devotion has had an adverse effect on his financial position. He took about 12 years to develop the solution

The Innovation

The non return valve is fitted between the air filter and the carburetor in the petrol engine and between the air filter and intake manifold in a diesel engine. It comprises main body having a hollow cavity within and an extended hollow neck at the end for connecting the same over the hose pipe of the carburetor. It essentially ensures fuller combustion of the air-fuel mixture in the combustion chamber and reduces the release of un-burnt fuel. Such un-burnt fuel causes pollution apart from reduction in fuel efficiency.

In existing engine designs, to take advantage of the inertia effect, the inlet valve remains open at about 40^0 when the piston reaches Bottom Dead Center (BDC) at the start of the compression stroke. At this time charge pressure is less than the compression pressure. So during this period, some of the charge escapes through the inlet valve through the carburetor and air filter. This cycle



continues for every suction stroke of the engine. This leads to improper combustion due to inappropriate proportion of air and petrol. Due to this cycle the volumetric efficiency of the engine reduces and hence loss of power takes place. Arvind referred to these effects as "Bounce Back Loss". This loss increases with increase in speed because as the speed increases the valve opening time during compression stroke also increases. In addition, in existing engines, the air filter of the petrol engine tends to get clogged by the oil particles which catch and hold dust particles rendering the air filter element ineffective more quickly than otherwise. The filtering element in the air filter assembly is also expected to remain dry, but this is not the case. To solve this problem, some attempts were made to provide reed valve or rotary valve, the construction of which is quite complicated and hence it was not found suitable. But Khandke's Non Return Valve captures these losses by not allowing the return of the charge towards the carburetor or the air filter side of the petrol engine and thus increases the overall engine efficiency. The valve has to be replaced after 25,000 km and costs Rs.1000.

Testing

To prove the bounce back effect and its losses initially different trials were conducted. These tests were conducted without the valve and with the valve connected. These tests were conducted in the laboratory and on the roads also.

Tests were conducted for Carbon Monoxide & Hydro Carbon emissions on Enfield (350c.c) with and without valve at the Government Polytechnic at Kolhapur in 1999. At 120 rpm the % of CO reduction with valve is 8.3% while that at 2000 rpm is 19%. Also HC % reduction at 120 rpm is 28% while at 2000 rpm it is 82%. As speed rises the turbulence rises and with the valve,the combustion is effective and losses are minimal as compared to without valve condition.

To get the visual effect of the bounce back losses, the test was conducted on a Kawasaki Bajaj Boxer single cylinder 100c.c engine in "Kaushal Auto clinic" Kolhapur and recorded on CD with the help of video camera.

Tests were also carried out on a Bajaj – Boxer (4 stroke engine of a two wheeler) at the PUC test centre of Associated Petroleum Corporation, C.G.Road, Ahmedabad in 2004 and the results turned out satisfactory.

However the results have not always been consistent and a need was felt for some improvement.

Current status

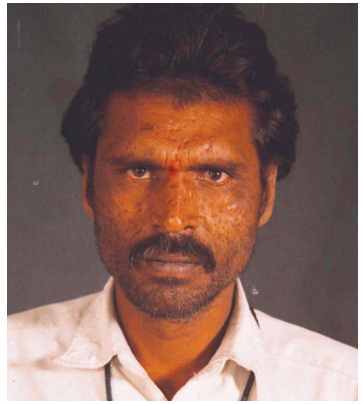
In 1994 Arvind Khandke was granted a patent for the use of this device in two- stroke engines. He then filed a patent application for the use of the device on 4 stroke petrol engines. Since 1996 to 1998 trials were conducted in the D. Y. Patil College of Engineering and based on the results some more modifications were done in the valve in 1999 and 2000. In 2001 he got the patent for four stroke engines. Since 1980 he has been investing his own funds to develop this innovation. This device has the potential to be used in all automobiles (2 strokes/ 4 stroke engines).He has been using it since1982. The innovation was also featured in an article in the December 1997 issue of Indian Auto. Arvind got the first prize in the Innovation Fair at Avenues, 2004 the Technology Festival of IIT, Mumbai.

Applications in current scenario

As per present technology, it is considered that air pollution by vehicles is because of the emission from the exhaust, but Khandke has proved that the bounce back losses from the side of the carburetor also contribute in polluting the air. Scientists have been trying to reduce the pollution from the exhaust side (as per euro 1, euro 2 Norms) but they have not been thinking of incomplete combustion as a reason and at present there is no competitive technology innovation in practice. Hence this eco-friendly valve developed by Arvind assumes all the more importance as it looks towards a pollution free environment.

Cycle operated water-lifting pump[47]

CONSOLATION



Vikram Rathore (38) is a small tribal farmer from Narsapur village, Utnoor Mandal, Adilabad in Andhra Pradesh. He belongs to the Banjara community which is a semi-nomadic community which migrated from Rajasthan several hundred years ago. He earns his livelihood by repairing cycles and other small machinery. He studied up to the 5th standard and then discontinued his studies due to financial constraints. He had no children from his first wife and so married again and now has five children.

Address
At Jaitram Tanda
P.O.Narsapur Mandal
Ootnoor, Via Indravelli
Adilabad - 504346
Andhra Pradesh

Genesis Vikram Rathore has four acres of land on which he cultivates cotton. Some years ago he had grown paddy in one acre which started wilting because of the lack of rain. But he did not have either an electric motor or diesel engine for pumping water. So he asked his brother for his electrical motor to supply water to his crops but his brother refused to give it to him.

Since childhood, Vikram Rathore has been repairing punctures and dreaming about different products and he put this technical bent of mind to good use to overcome this obstacle. He observed the mechanism of lifting water using an electrical motor in which one engine rotates the fan which enables lifting of water. This gave him the idea of rotating the fan manually to see whether water would come up or not. He tried it and saw that some water was coming up. Then he rotated the fan fast and observed that water was coming up with greater pressure. Then he thought of using a cycle to pump the water, but he had no cycle. At that time, his financial condition was so strained that he had to sell the jowar in his house which had been stored for food and buy an old cycle. He had seen some old gears lying in the compound of an oil mill and he requested the owner to give him these gears and bought some other parts from a waste shop. He also bought a one HP motor and then started working on his pump. He attached his bicycle's rear rim to the fan with a rope and rotated the bicycles rings fast and was able to pump a good amount of water from a stream to irrigate the paddy.

The Innovation

This is a centrifugal water pump which is run by rotating the pedal of a cycle. The system comprises a bicycle, rim, belt-pulley, impeller and inlet and delivery pipes. A bare rim replaces the rear wheel of the bicycle. The rim is connected to another pulley with a smaller diameter. The supporting shaft of the smaller pulley carries another rim for second stage speed increment. The shaft also carries a flywheel to increase momentum of the system. The final supporting shaft is connected with an impeller that rotates at high speed and pumps water. The power (energy) generated through this process of pedaling is used to lift the water and push the water from a pipe into the farm for cultivation. This innovation is useful

for pumping water from rivers, ponds, wells and similar water sources thus enabling poor farmers for pumping water for irrigation and cultivation.

Advantages

The conventional centrifugal pump needs either electricity or diesel engine, but the present innovation works on pedaling. This is a non-polluting and environment friendly device. Since it is made of commonly available materials and costs Rs.3000 it is affordable to common people. It requires less maintenance and minimum input energy is required to get the maximum output of water. This device can be transported easily from one place to another. The system can also be used in a flour mill.

Recognition

Adilabad district, from which Vikram Rathore hails, is a drought prone region with hardly 20" rainfall and that too unevenly distributed. So this device has great relevance in the region and the people in his village started believing him on observing the functioning of the device. At about that time the ITDA project officer of Utnoor got to know about this innovation and on seeing a demonstration of this pump, he was very impressed. ITDA supported Vikram financially to improve his design and with this support he bought some more cycle rings and designed a new model with which he was able to lift the same amount of water which a 3HP electrical motor could lift.

A bitter experience…but undeterred

His innovation had attracted a lot of attention and some years ago, a few people came from Hyderabad promising him a big reward. They took him with them and kept him in a house for six –seven days and did not even feed him properly. He somehow managed to escape and came back to his village. Meanwhile somebody advised him to file a patent for his pump before doing anything further. He went to the collector Mr. Sukumar who wrote to the higher authorities in Hyderabad to help him with patenting but unfortunately nothing happened. The innovation that he has made somehow remained localized and did not diffuse despite tremendous interest among the people because he was not sure whether he would get credit unless he got the patenting done. NIF has now filed a patent for the innovation (371/CHE/2004, 23.04.04).

The various obstacles he faced did not deter him from pursuing his spirit of innovation. He has subsequently developed a manual flour mill which is operated through cycle pedal rotation. The flour mill does not require power or any other resources. It is efficient and grinds one kilogram of grains into powder in approximately five-six minutes. A man of great imagination and determination, currently he has got an idea to generate electricity using a cycle and promises that if he is given financial support, he could generate sufficient electrical power to supply to his whole village. An admirable example of the innovative spirit that flourishes in the remote rural regions where one person's creativity can become the basis for improving livelihood and generating jobs.

Bamboo splints making device for incense sticks[48]

CONSOLATION

Usman Shekhani (51) hails from Kanker in Chattisgarh and earns his living through the repairing and sale of electronic goods. He has a Bachelors degree in arts. Usman has always been creative and won awards at science fairs while he was in school. His family has been involved in the business of repairing watches and electronics goods like dish antenna etc and Usman takes after his father in his interest in mechanical work. Usman's family consists of his wife, three sons and a daughter. His daughter is married. His eldest son has completed his post graduation and is now helping him in his business. His younger sons are studying in the12th and 11th standards respectively.

Address
Karma Shala Upkaran
Udyog, C/o Radio Corner
Bhanupratappur
Dist: Kanker
Chhattishgarh

Genesis Once a friend approached Usman and told him that he needs an incense stick making machine. Shekhani had heard about some power-driven machines which had been installed in a nearby village for cutting bamboo for agarbattis. The machines cost lakhs of rupees but they proved to be completely useless and when he visited the village he found that the machines were lying unused in the village gathering dust and rust. On enquiring about this he found that the quality of slices obtained from these machines was found to be unsuitable to the agarbatti industry and was thus summarily rejected and thereafter people had stopped using these machines. He examined the working of these machines in detail and found that even these machines had to be fed cut pieces of bamboo and the machine itself did not do the cutting. It only converted the pieces into thin slices, but these slices were often twisted or broken and of uneven thickness.

Continuing his search he visited Chennai, Bangalore and Hyderabad to gather information on how to get even bamboo slices. He also visited Bhopal with this purpose and there he heard that one bamboo craftsman, Gulab Rao from Itarsi had installed a power driven machine costing Rs 35,000 at his home. He found the address and visited the person but was shocked by what he found. The machine was covered by rubbish and the owner said it had broken down within 15 days after he had bought it. He had bought the machine by taking a hefty loan and ever since he has been trying to repay the loan and now he is immersed in debt. Even his electricity connection has been cut and Usman found the family in darkness and tears.

Deeply moved by this tragedy Usman was determined to come up with an efficient machine for cutting bamboo that would be cheap, manually operated and affordable to the public at large. He promised Gulab Rao that one day something would come which would bring the cheer back to his face.

Usman's attempts at developing this device started in 2001. It took him more than two years to transform his idea into

a feasible innovation. In his first attempt to make the device, he used a single steel blade, then two in series and thus he tried various combinations till he finally found that five blades in series gives the perfect results. Then he observed that there was a danger of cutting the fingers so he added a rubber roller push to hold the chip in place. He has developed several prototypes in his aim of improving his innovation and making it easy and efficient. The major problems he faced during the development of the innovation were finding material and instruments.

The Innovation

The unique handy cutter consists of a wooden bracket, high speed steel blades, adjustable screws and spring loaded pushing roller. The handy cutter comes with a set which includes a hack saw blade and frame, bamboo slice maker made of high carbon steel blade, big knife, scale and pencils.

Bamboo is cut transversely as well as longitudinally into the required size of small pieces using the hack-saw and knotted and un-knotted pieces are separately collected. The un-knotted pieces are used for making bamboo strips using a strip maker, which has also been specially designed and developed by Usman. It provides high quality bamboo strips at higher speed of production compared to the earlier methods. A strip is then passed through the roller and is guided towards the cutting blades where it is cut into five uniform sticks. The thickness of the stick can be varied by adjusting the blades of the strip maker. The number of chips and sticks depends upon the thickness, diameter and weight of the bamboo. Approximately forty sticks can be produced from one cylindrical bass of eight inches. The unique handy cutter can make about 2000 sticks per hour which is approximately four times what can be done manually with a knife.

The pieces containing knots are chopped by using chopper. Using traditional stick making techniques these pieces are converted to ice-cream sticks. Smaller sticks obtained from the unique stick maker are used for making buds and tooth picks. The cost of the machine is Rs 450 (including the set) and training charge is Rs 50. A bamboo plant which weighs six kilogram gives three kilograms of sticks and from the wastage of one bamboo, three bundles of 300 toothpicks can be made.

Advantages

This device helps in cutting a bamboo strip into five sticks at a time and thus improves the efficiency of stick making and reduces the cost per stick.The quality of sticks produced using this cutter is better than that made manually. In comparison with the motorised bamboo cutter this device is simple in construction and

doesn't have any movable part. In addition the device is inexpensive, easy to operate and easy to repair. This device can be used in remote areas where there is no electricity. Theunique handy cutter takes full advantage of the natural qualities of bamboo and by using it slices of varying thickness can be obtained. There is no maintenance cost and it is portable and the output is world class. This device has received a very encouraging technical feasibility report from the Mechanical Engineering Department Laboratory, Rungta College of Engineering and Technology, Bhilai, which states:

"The construction of unique stick maker is completely new and with the help of this machine one can convert 95% part of bamboo into useful product."

Contributing to the cottage industry sector

India is a land of many religions and people of all religions use incense sticks (Agarbattis) for worship. The agarbatti industry in India is a vast and flourishing one and employs a large number of people. Currently crude knives are used and the bamboo is sliced by hand, but this technique used for making the bamboo slivers is extremely primitive and does not give very satisfactory results as uneven pieces are produced. These are not acceptable to the agarbatti industry and hence their production and efficiency is affected. The other alternative is the electricity powered machine which costs around Rs. 80,000 and can produce 20 kg of sticks in a day, but which due to its cost is beyond the means of the common man.

The Indian government is supporting tiny and small scale industries to generate self employment and this device is an innovation that can be useful in establishing such an industry. A family can earn up to Rs.150- Rs.200 per day by using this machine, if the government provides a market for finished products.

According to Usman, bamboo is for poor people and keeping all these things in mind he developed this simple machine that everyone can afford and which is as effective as the costly machines and which can provide gainful employment to lakhs of rural people.

Current status

Usman gets orders through the Forest Department to give training to village societies on how to use his unique stick cutter and he also gives training on how to repair it. Till date he has sold around 1500-2000 machines and provided training to as many people. Usman also kept his promise to Gulab Rao and presented him a set. Usman wishes to specially acknowledge the support and guidance of Mr. Krishnamurti, Divisional Forest Officer, Madhya Pradesh who helped him on various occasions as well as arranged for public demonstrations of this machine. He also donated several of these machines to poor craftsmen to help them get employment. NIF has sanctioned Usman Shekhani a sum of Rs.75, 000 from the Micro Venture Innovation Fund for making prototype to conduct market survey for commercialisation of the innovation. NIF has also filed a patent application for this innovation.

A penchant for service

In addition to his work, Usman also provides training to villagers for various cottage industries like honey purification, making leaf plates (Pattal), bee-keeping, candle-making and animal husbandry. The machine used to purify honey is very costly. But with the method developed by Shekhani, one can process honey for just Rs.30. Usman is keenly interested in developing more such machines that will be useful in small scale industries and increase the efficiency of people working in these industries. He is currently working on an idea to develop a small handy oil expeller for highly priced nuts like Badam and spices like clove.

Cycle operated horse shaver[49]

CONSOLATION

Mohammad Idris (34) hails from Hasanpur Kalan near Meerut in Uttar Pradesh. He has studied up to the fifth standard and started his career as a barber, his family profession. On the advice of his uncle, working in Babugarh army stud farm as a horse clipper, he shifted to horse clipping profession, as it paid better. Idris also manufactures horse accessories. At present, he lives with his family comprising of his father, mother, three brothers, wife and two children.

Address
Shahid Pan Bhandar
House no. 37 Lisadi Road
Tarapuri
Opposite Jaton Wali Gali
Meerut, Uttar Pradesh

Scouted by
GIAN-N

Genesis

Mohammad Idris has about 20 years experience in the horse clipping profession. At first he used the horse clippers supplied by another company. But those machines were quite expensive to maintain. Slowly he started repairing these machines and then he got the idea of upgrading it to an automatic mode. At first, he developed a motor operated model and later the present bicycle operated model. Currently he is working on a mechanized hand held horse clipper, which would be driven by a hand-held grinding machine. He first developed the technology and sold his piece to people in Pilibhit, Bareilly. Till date he has sold about 40 machines. But many others have copied this design and similar devices are available in the market.

The innovation

Mohammad has developed a bicycle - powered horse shaver in which the power of the bicycle rotary drive is transferred via speed cable to the clippers to cut the hair. The main parts of this device include the shaving head, the speed cable and the chain and gear mechanism. This bicycle operated horse shaver needs no electric power. Two people are required to operate it. One person (usually the horse owner) pedals the cycle in standing mode, while the rotary action of the wheel is transmitted to the hand blade unit of the shaver. He has made four prototypes of which three have been sold at Rs 1000 each (used units). A new unit costs him around Rs 3500, including a new bicycle.

Advantages

This device removes the drudgery of combing, sorting, gradual cutting and giving a final touch to the animal's hair, which takes hours when done manually. This unit can thus be used in areas without electricity thus making the owner self-reliant in doing this essential function, while retaining the basic functioning of the bicycle. This is a detachable arrangement whereby the bicycle can be used as usual without any problem after detaching the chain that drives the speed cable. The device is also portable as the shaver does not have to carry additional equipment for horse shaving, since the unit is mounted on the cycle itself and can move along with the user. The most important aspect of this machine is that it runs on human energy and that it can be used on horses, camels, dogs and with some modifications on

sheep. An efficient device, it cuts the hair of one horse in 30 minutes compared to one hour by manual cutting. The other shavers, which run on electric power or motor, have higher operating costs than this.

Target Consumers and Market Potential

Horses, mules, sheep, camels need to have their hair/ wool cut regularly. Many owners have difficulty in getting this done as the electric/motor powered shear units are expensive and few and far in the towns. In addition, hand shears do not achieve uniform cutting action. Given the high pollution levels and the costs of running a motor for shearing, the need for an equally effective and a low cost alternative has been felt nationwide.

The main users of the Bicycle Operated Horse Shaver would be the shavers, who cut the hair of horses, camels, dogs and sheep. A survey was conducted in Malpura, Delhi, Pilibhit & Meerut among respondents whose occupations varied from *Tonga* Drivers to Horse Shavers. Officials of the Centre for Sheep & Wool Research Institute were also contacted. The majority of the respondents were not aware of such a device - except for some in Pilibhit and Meerut- though all were aware of at least one variation of the horse shaving device such as the manual shearer, handle operated shearer or motor shearer. Most of the respondents endorsed the need for automation and felt that the innovation would reduce drudgery. This novel horse shaver thus has huge potential in rural areas where there is paucity of electricity or any other form of energy. According to Dr V.K Singh, Director, Central Sheep and Wool Research Institute (CSWRI),Avikanagar, Rajasthan, the Bicycle Operated Horse Shaver can be used in its present form (i.e. without any modifications) on camels and on *marwari* sheep also whose hair are coarser as compared to that of ordinary sheep and with some modifications it can be used on ordinary sheep also. NIF has sanctioned Mohammed Idris a sum of Rs. 25,000 from the Micro Venture Innovation Fund for the product development and demand estimation of this device.

Foot operated roof tile making machine[50]

CONSOLATION

Sukhranjan Mistry (32) is a native of Shakti Farm, Udham Singh Nagar, Uttaranchal. He completed his B.A. from Rudrapur College. Sukhranjan takes after his father, Meghnath Mistry, in his keen desire to simplify complex technologies. Sukhranjan is actively involved in farming and also serves as the village doctor and runs his own clinic. With a keen interest in social work, he spends his spare time in the Vivekanand educational institute, a social service organisation. He is married and has a son. He earns Rs. 20,000 per annum.

Address
Dev Nagar
Shakti Farm No. 3, Shakti Farm Bazaar, Udhamsingh Nagar, Uttranchal

Scouted by
SRISTI GYAN Kendra

Genesis Sukhranjan's father wanted to reconstruct their old house. But the problem was lack of money to construct the roof of the building. Sukhranjan tried to construct the tiles from cement instead of clay. But due to a problem with the salting of the tiles, he was not able to maintain the quality of all the tiles. So he dropped the idea of making tiles from cement. Then one day on a visit to a town, he saw people working on a cold mixture in making roads and bridges. There he noticed that a device known as an agitator had a great role in making all kinds of cement based technologies. So he tried to establish a link between the road agitator and an agitator mechanism for tiles and came up with the idea of a table which has an agitating platform on its surface. He consulted his father and both of them worked hard in designing an agitating table. They used an old cycle tyre rim and two sticks in making this table. One very important thing is the frame used in making the tiles. It took 15 to 20 days to finalize the design of the frame. Sukhranjan has made one unit and is using it successfully. There is large scale nationwide need for such a cheap effective foot operated device.

The innovation
The device is a manual /pedal operated tile making machine. It is an ergonomic and efficient mechanical device for making tiles which is based on the principle of mechanical vibrations. The tiles so manufactured are useful to construct the roof of the building or like purposes.

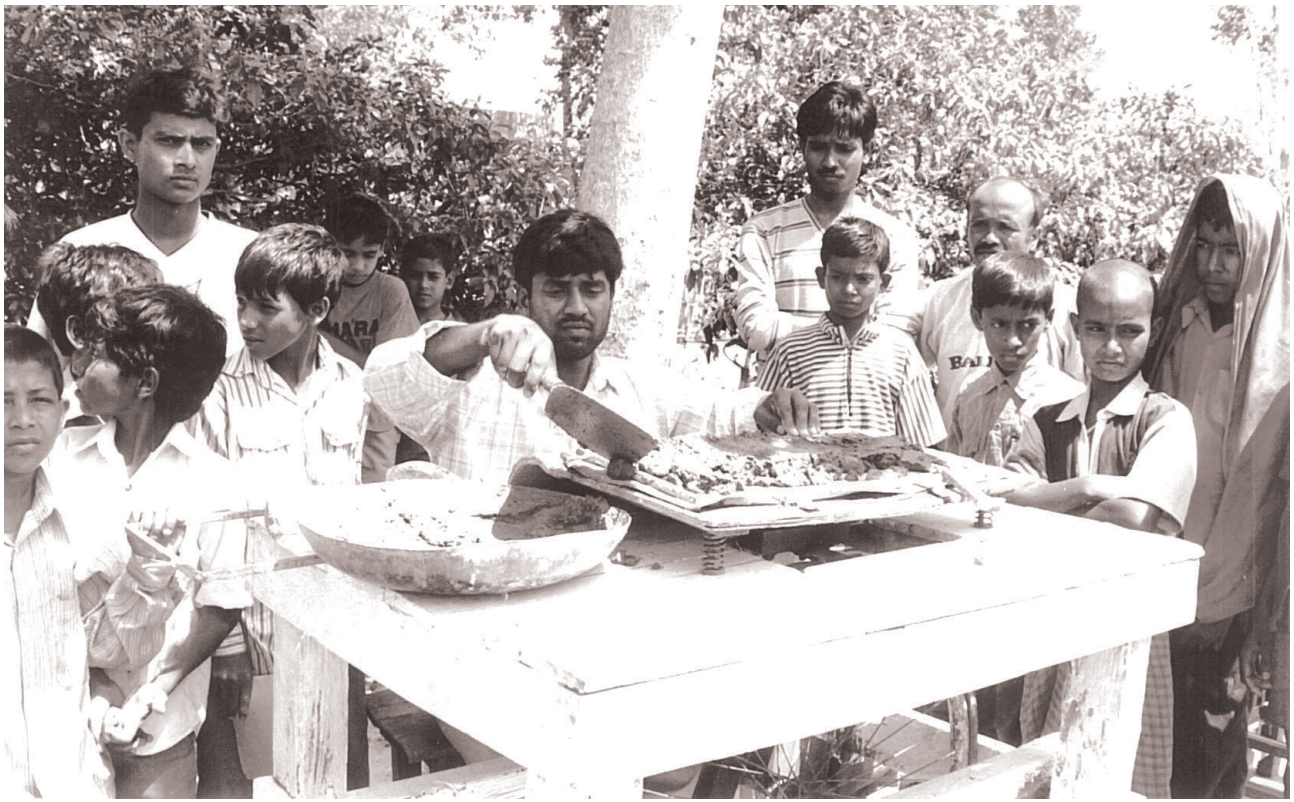
The unit comprises of a bicycle wheel, crank, rope-link, pinion, oscillating striking link, polyethylene sheet and supporting frame. A vibrating platform is moved with the help of a cycle wheel, powered by pedaling. A polythene sheet is spread over the platform pressed by an iron frame. A mortar mixture is made using river sand and cement in the ratio of 7:1. This mixture is spread over the sheet. Then it is stirred over the vibrating platform till air bubbles ooze out. Once the cements set in properly, the frame is lifted and the sheet with mixture is put over the existing made tile. The new tile thus gets made. It is dried and then soaked in water for two days. The machine costs Rs.7500.

Advantages
This device is not like other tile making

machines available in the markets, which are costly and not affordable to the general public. This machine will be most useful in preparing roof tiles at a very fast pace as a number of tiles can be made at a time. It is possible to make 300 tiles per day. In addition tiles can also be made in multiple designs. The operation of the machine is not dependent on electricity and no heating is required to prepare the tile. The cost of preparing a tile is two rupees and it can be sold up to five rupees. The tile made using Sukhranjan's machine lasts for about sixty years compared to twenty years for the clay tile. This machine has a high self-employment potential in rural areas and an added benefit is that women can also operate it. The machine is simple in configuration and operation and can be made with locally available materials by local artisans. There are no running costs or maintenance costs.

Current status

Current and future application areas of this device include in agitation of various liquids and semi-solid entities in chemical and food processing industries. NIF has sanctioned Sukhranjan, a sum of Rs.5625 from the Micro Venture Innovation Fund for product development and demand estimation of the tile-making machine. NIF has also filed a patent application for this innovation(995/Del/2004, 31/05/2004). Sukhranjan wishes to start a business with this innovation. Apart from this, he is also working on a kerosene incubator.

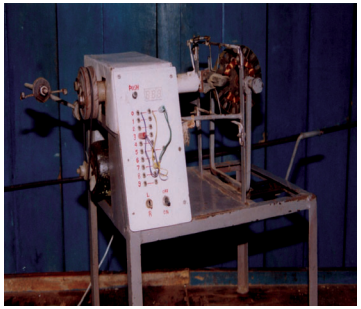


Automatic motor winding machine[51]

CONSOLATION

Kailash Srivastava (32), runs a repair shop in a remotely located village, Dobhi in Tendukheda Tehsil of Narsinghpur district of Madhya Pradesh. He lives with his wife, son and mother. Besides technical skill, Kailash also has inclination towards art and music whihc led him to learn to play the 'tabla'. And this interest has guided him to develop an automatic note generating machine (similar to the harmonium).

Address
P.O: Dobhi, Tehsil: Tendukheda
Dist: Narsinhpura - 487 334
Madhya Pradesh



Genesis

Kailash explains that the amount of work that he received in his shop was gradually increasing and it was becoming increasingly difficult for him to handle such a huge workload. He could also not afford to take the help of heavy winding machines available in the market at that time as the cost was too high. This forced him to search for an alternative which would be portable, handy, cost effective and efficient in functioning.

He didn't have any suitable place to develop his prototype and therefore selected his shop as a laboratory and started his dream project. He took nearly three years to develop a working model of the innovation mainly as he had to face a lot of procurement problems during the construction of the innovation. As Dobhi is a remote village, he had to get all the working components and processing jobs done from nearby Tendukheda and Narsinghpur and had to go to Jabalpur to purchase simple electronic items like transistors, diodes and capacitors. This was a costly as well as time taking process. To overcome this, Kailash used locally available materials like pipes of hand pumps, gaskets of pressure cooker (as conveyor belt) and wooden blocks where possible.

His mother constantly supported him throughout the process of innovation. She allowed him to carry on his experiments in spite of his father's poor health, especially in the face of criticism from others that Kailash should concentrate on his family and not waste time. He was helped a lot by Mr. Suryakant Divagainya from the same village in preparing all the technical documentation of the product as well as for the correspondence with NIF and other institutions. He also acknowledges the help provided by Mr. Rajendra Kumar Jain, the upsarpanch of the village in activities like body design, CD recording etc.

He has been using the machine for the last three years providing full satisfaction to his customers. The innovator declares that the machine has helped him improve his productivity and efficiency.

The Innovation

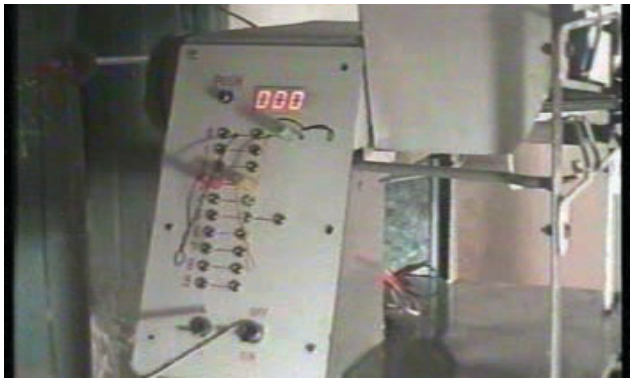
The basic electronic circuitry comprises of the following components namely an AC transformer (9V, 500 mA), DC Regulator (6V),Counting Oscillator IC,

Auto stop IC, Counter ICs(3), Seven segment display, 6V relay, 4007 Diodes(14), 7 V Zener diodes(14), Capacitors, Resistances, Transistors and a 6V, 750 Ma battery. The machine consists of an iron frame fitted with screws to mount the stator/ other equipment for winding. The basic outer assembly comprises of a pulley system aided by shafts and small tunnels which is instrumental in the flow of the winding wire during the process of winding. There is a facility to check the centre alignment of the stator with the centre mouthpiece of a die and lock it. Besides, there is an arrangement for the horizontal movement of the frame.

There are two two-way switches. One is an ON/OFF switch, which starts and shuts down the machine. Another switch is used for the left- right alignment of the rotation of the coil. The equipment to be mounted is prepared by inserting paper attachments in the stator holes to avoid direct contact of the stator with the winding wire. After that the equipment is mounted, checked for centre alignment and locked. One turn of winding wire is manually wound around one of the stator holes and is prepared for action. The number of turns required is then set by the socket pin arrangement on the front of the cabinet. The front side of the cabinet has three columns having 22 sockets of 10, 10 and 2 sockets respectively. This information is conveyed to the three counter ICs. And the process is started by pushing the ON switch. A digital display connected to the three counting ICs and the counting oscillator displays the number of turns getting wound. One counting oscillator IC keeps a count of the number of turns wound. Once, the requisite number of turns are met, the three counter ICs send a signal to the Auto stop IC which activates a relay and stops the machine. The process of winding is powered by a 220 V A.C. electric motor and four wheel bearings. Power supply is received from the 220V A.C. mains lead and is converted to a desirable input voltage by a 9V transformer.

Advantages

This device works effectively for all types of domestic motors like fan motors (i.e. ceiling, table and cooler), transformers, mixer-grinder etc. It has the facility to restart from the same count where it stopped and it works at a speed of 600 rounds per minute. This device takes up to 30-35 minutes to do the binding of a ceiling fan coil. All the dyes are made of fibre which annuls any possibility of scratches in the wires and there is no risk of the wires snagging and breaking. The maintenance cost is very low and the device consumes less electricity i.e., hardly around 70-75 watts and can be operated by inverter also. The quality of the electronic coils made with this machine is very high, because of which the electrical equipment using these coils function efficiently and for a long time. All the parts used in it are easily available in the market. It is shock proof and doesn't create much noise or any waste and therefore can be kept at any corner of a small room. The simple push button systems, automatic operation and smooth coil loading and unloading stations means women can also easily operate this machine. It is equally useful for large factories as well as small individual winders. This innovation also has great social relevance. It has the potential to free thousands of child labourers since in almost every motor winding workshop; the task of winding is done by child labourers. The existing motor winding machines along with dyes of popular brands cost around Rs 22,000 to Rs 28,000 which is beyond the purchasing power of a rural electrician whose annual turnover hardly reaches Rs.50, 000. Whereas the automatic motor coil winding machine of Kailash Srivastava is much cheaper at Rs.



5000. There is wide scope of diffusion of this device in the coil and motor winding industry which is a cottage industry in rural and urban areas.

A resounding success

Presently Kailash has been getting 700-800 motors for coiling on an annual basis for the last couple of years. His customers are electricians (who bring jobs in bulk) whom he charges Rs.100 per motor and earns Rs. 60-75 per piece. The electricians charge Rs 150 from the end users and earn about Rs. 50. A lot of time is saved and customers are happy with the timely service. This machine is currently catering to the needs of 40 odd adjoining villages.

Kailash also got a chance to display this auto electronic binder at the National Physical Laboratory, New Delhi on 19 February 2004 where it was much acclaimed. A report on the innovation has been published in the laboratory's Smarika.The machine was also demonstrated to thousands of people in the Varman Mela. It has also been certified by the District Industry Office, Narsinghpur.

Future prospects

Kailash has also demonstrated the machine to wholesalers of electric goods who have shown deep interest in the same and demanded samples for further demonstration. But according to Kailash, development of another piece would take six months because facilities are not available in the village. He would need a lathe and wielding machine to build the body of the machine. A proper lab is also needed for the same. Apart from this he would have to set aside his work in the shop and concentrate on this device. If he closes his shop for such a long time, he would incur economic losses as well as lose many of his regular customers. Hence currently he is interested in transferring the technology to a third party who will help in developing the product and commercializing it.

But ideally Kailash would like to start a business out of this innovation but this is provided he gets adequate technical and financial assistance. This is because according to Kailash, if the assembly work is distributed among six workmen (cutter, welder, dye maker, electrician, finishing and painting expert, helper), then it is possible to assemble two to three machines in a day. He goes on to explain that with an initial outlay of five to six lakh rupees, it is possible to manufacture and sell this machine in bulk. The material and labour cost of a machine according to his estimate is only Rs. 2000. So if it is sold at Rs.5000, it will be possible to recover the initial investment and also earn a decent profit. NIF has sanctioned Kailash Srivastava a sum of Rs.35, 000 from the Micro Venture Innovation Fund for prototype development for market research of the Automatic Motor Coil Winding Machine.

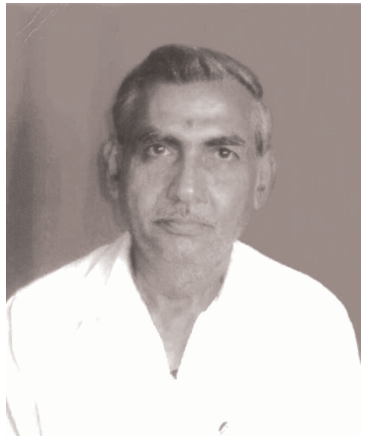
A passion for electronics

During his school days itself, Kailash had an inclination towards electronics and electrical devices. After passing his senior secondary examination (12th standard) in 1989, he planned to undergo training at Lutiya T.V training Centre, Raipur. But his parents didn't give him to go to such a far place. But undeterred, Kailash fled away from home with Rs. 5000 in cash. He had obtained this money by mortgaging his mother's ornaments with a moneylender and undertook a TV training course in both B & W and Colour Television from Lutiya TV training centre.

Now he owns an electrical and electronics repair shop in Dobhi, adjacent to his house, where he repairs ceiling and table fans, small to medium sized electrical motors, transformers (small size) and other coil winding jobs. He has been running this repair shop for the past 10 years. In addition, he also develops and repairs certain electronic circuits which find use in certain consumer electronics goods like television, radio etc. Kailash's tryst with innovation does not end with this automatic motor coil winding machine-he is also working on the following ideas- electricity generation through weight, speciality transformer winding machine, D.C Emergency fan and an automatic musical note generating machine.

Keyway making fixture[52]

CONSOLATION



Vijay Ghodke (58), is a motor rewinding electrician, from Vaijapur, Aurangabad in Maharashtra. He completed his pre-degree from the Nank Road College of Science affiliated to the University of Pune. He runs a workshop and electric winding shop at Vaijapur and has accumulated about 37 years experience in the machinery line (oil engine repairing 12 years and lathe machinery– 25 years). His family consists of seven members. He earns about Rs.6000-7000 per month. But currently he is facing financial difficulties as due to lack of rains in the area, the water level has gone down and hence motors are not being used.

Genesis While working in the workshop with the lathe machine,Vijay found it a problem that he could only do specific and limited jobs on the machine. When any customer came with a small job work with a small diameter, he was unable to utilize the lathe machine completely. In addition there was no other way of doing it but manually which was very time consuming. Then he conceived the idea of a keyway making fixture for lathe machines. He thought about the idea for a long time and once he clarified it in his mind he took one day to make it. Now he can take a big size job or small size job and do it directly on the lathe machine with the help of this fixture.

The Innovation

This fixture is mounted on the carriage instead of the tool-post. It has a horizontal v-notch along the plane of the lathe and another plane strip of metal to support the job from the other side. This can be used to hold jobs with a wide range of diameter. The job is inserted inside the eye of the eyebolt and is fixed to the fixture. This is supported by the v-groove on the main body of the fixture, which is centered with the lathe in use.

The set-up time is five to ten minutes. The device also helps to hold the taper shaft without any damage. This fixture can handle a wide range of work diameters. The key can be made at high speeds with close tolerances. It has a self centering mechanism for maintaining center line. In addition there are no clamping marks on the job. The fixture also allows pipe fitments and cutting of fine teeth on the surface which is not possible in conventional work holding and key-way cutting techniques. The device costs Rs.500.

Advantages

This is a fast, precise and reliable key-way making instrument.In the conventional lathe without using a fixture the set up time for the job is 45-60 minutes whereas using the fixture of Vijay, this time is reduced to five to ten minutes. The cost of making a keyway is also reduced from Rs.70-100 (for 2-3 inch diameter and length) to Rs. 30. The conventional lathe has wide tolerance

Address
Laxmi Nivas
Opp Old Powerhouse
Railway Station Rd, Vaijapur
Aurangabad, Maharashtra

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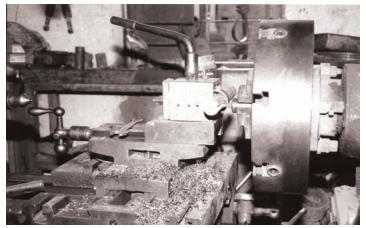
North Maharashtra University



level and so accuracy cannot be maintained up to the desired level but with this fixture close tolerance and accuracy level can be maintained as in a milling machine. While there are other types of keyway making fixtures available in the market, they have low surface contact increasing the possibility of slippage and there is a strong possibility that a hollow pipe with thin walls could develop a dent. But Vijay's fixture enables maximum surface contact to hold the job. Thus, even a job having a thin wall can be handled with ease.

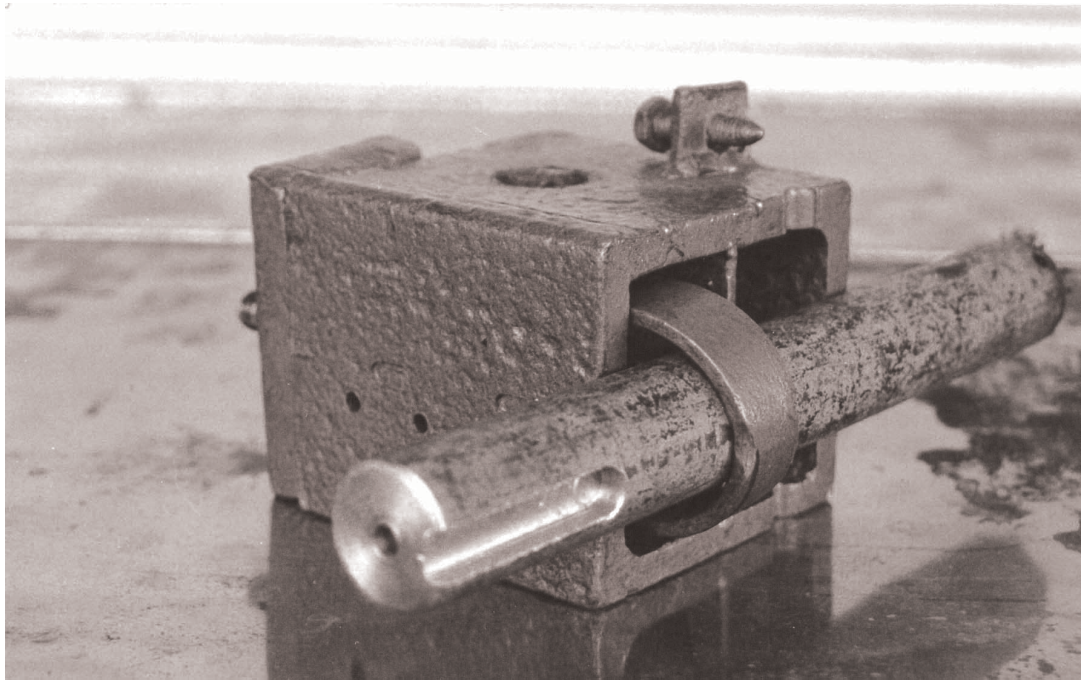
Relevance of the innovation

Keyway making is a part of the everyday work of fabricators. Specialized machines for making keyway are Milling, Slotting and Shaping machines. But small-scale workshops cannot afford those machines. Hence small workshops having lathe machines usually do not cater to jobs that need milling operation. They tend to refer the customer to a workshop that carries a milling machine. In addition set-up time and cost of making keyway increases if keyway is made using tool post and chuck bar of the conventional lathe.

But using Vijay's innovative fixture the setup time can be reduced and hence processing cost can be reduced significantly. Small-scale workshops that cannot afford the specialized machines (Milling, Slotting and Shaping) can also undertake jobs, which require making keyways.

Mechanically inclined

Vijay Ghodke takes after his father, Shantaram Ghodke, in his innovative spirit. His father was working in the railway workshop at Manmad Sub-division as a mechanical supervisor when he had developed a unique double wagon locking system for goods trains for the Railways in 1953-54. It was accepted by the Railways and he was rewarded with Rs.300 and a promotion. In 1961 his father took voluntary



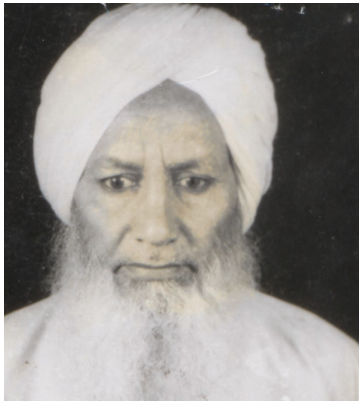
retirement and started an engineering workshop at Deola Nashik. Vijay could not study further after his twelfth standard and then he started working in their workshop repairing oil engines, water pumps and also working on lathe machines.

Later electric motors came into use and he started rewinding and repairing motors. While involved in this he noticed that it was difficult to wind on empty reels and he started thinking of some solution so that the work could be done easily. He succeeded in making a device which would roll the wire without breaking and which could be operated by a ¼ HP single phase 1440 RPM, 220 volts electric motor or in case of a power failure, could be wound by hand. This device is easy to operate and with this 50 kg of wire can be rolled in a day. He has sold about 50 pieces of this wire rolling machine.

Future plans

Vijay has developed only one unit of the key way making fixture for his personal lathe. He has not informed anyone else about the product or sold it in the market because of the fear of copying. According to him the best strategy for the commercialization of this product would be to license it to a large lathe manufacturer. NIF has sanctioned Vijay Rs.15, 000 from the Micro Venture Innovation Fund for prototype development and demand estimation. NIF has also filed a patent application on his behalf.

Vijay also has an idea of doing some innovation in water pumps for increasing their efficiency. He is thinking of developing a fixture for making internal keyways for example for pulleys. Regarding his future plans, he is thinking of starting a dealership of motors or pumps as manufacturing which he is currently involved in requires greater fixed costs and he feels that he should focus on selling these.



Multi purpose bicycle[53]

CONSOLATION

Choudhary Kamruddin (60) is a native of Ratnaki village of Alwar district, Rajasthan and has 40 years experience in repairing watches as well as various mechanical instruments. He owns a watch repair shop and a bicycle/ scooter/ motorcycle repair shop in Bakhtal-ki-chowki. Though he has only completed his primary education, he has managed to learn Urdu, English and Arabic. He earns Rs. 36,000 per annum presently. He has five sons who are all married and settled.

Address
Bakhtal ki Chowki, Delhi Road,
Alwar, Rajasthan
PIN: 301001

Scouted by
Tanmay Kumar

Genesis Once it happened that he procured a functional cycle rickshaw in scrap. He tried to experiment with this and in 1977 he attached a 50 cc moped engine to the cycle and rode it for one year. This inspired him to attach various interesting things to the cycle and for the past 25 years he has engaged himself in improving the design of the common bicycle to make it more comfortable, useful and safe and above all as a means for earning a livelihood. His years of hard labour resulted in the development of the Mewat Ajuby Easy cycle in 2002. Alwar district situated in the North Eastern region of Rajasthan is also known as Mewat, because of the Meos, who symbolize a cultural communion of two great religions of India: Hinduism and Islam, who populate it. Choudhary is one such Meo and hence the name of the cycle. In the same year, the district authorities inspected this cycle and awarded him with a certificate. Choudhary has prepared only one sample cycle so far. Choudhary had filed a provisional patent application and later a complete patent application was filed by NIF on his behalf. But he hasn't approached any commercial organisation as he waits to get a patent before doing anything further. NIF has sanctioned Kamaruddin a sum of Rs.13, 125 from the Micro Venture Innovation Fund for concept testing of the multipurpose bicycle in the rural market. His dream is to produce this model commercially on a large scale for the welfare of society on a very low profit margin but the paucity of funds has prevented him from doing it so far.

The Innovation
Choudhary has modified an ordinary bicycle by adding tools and accessories as well as making it a mobile work platform to service diverse village needs. This bicycle is 25% lighter than the ordinary cycle and due to the presence of an auto gear it is much easier to drive. It has an umbrella attached to it which comes with a sliding arrangement and a locking system and operates automatically. Once the bicycle starts off, current generated by a dynamo, powers the head and backlights and seven indicators (five on the umbrella and two in the front). The cycle also has a large bag batti, a wind shield to protect the rider from strong winds and decorative light bulbs. A 12 V lead battery is attached between the frames of the bicycle. It helps to power a host of utilities at the back side such as drilling unit (for wood, metal), a grinder for sharpening tools, a motor

winding attachment and a wood sawing unit with a lock and lever which can cut plywood of up to 6" thickness.

Advantages

This is an incredible innovation which assimilates an assortment of functionalities on a common bicycle while reducing the weight and improving the basic function. This is a mobile workstation that can generate revenue for the user who goes from village to village offering services such as sharpening of blades by grinding, drilling, motor winding, sawing etc.

A servant to society

Choudhary Kamruddin always believed in "doing something different." He was elected Sarpanch of Saimal Khurd panchayat, Lakshmangarh, Alwar in 1981 and continued till 1988. He also fought the election for the Ramgarh Vidhan Sabha seat in Alwar in 1999 as an independent candidate. He believes that God sent man to earth as his representative to spread His word and to fight against evil and that it is the duty of everyone to fulfill this responsibility. Choudhary has also got a flair for homoeopathy and gives advice to the local people on common ailments.

Improved stove with kerosene heating[54]

CONSOLATION

Sameerul Hasan Liyaqati (36) is popularly known as 'lalla mistri' in his native place Palia, Uttar Pradesh. With about 25 years experience in repairing tractor and truck engines, he earns his livelihood from his tractor workshop and earns about Rs.2500 per month. He spent most of his childhood learning his work. He did not go to school and is illiterate. But he sees to it that his two sons and daughter attend school regularly.

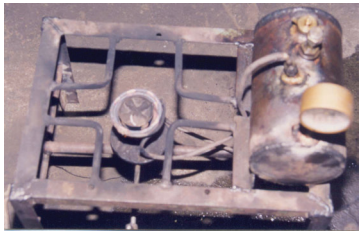
Address
Sameerul Hasan Liyaqati
H No.2, Paliya Kalan
Near Chaman Chowk
Lakhimpur, Khiri
Uttar Pradesh

Scouted by
SRISTI GYAN Kendra

Genesis Once, when Sameerul was staying away from his family, he was forced to cook food on a stove that required pumping air. One night when the pump developed problems, he tried to repair it but he did not have any spare parts. Even after a number of attempts he couldn't succeed. To add to it there was no dry wood available. So he had to go to bed on an empty stomach. The whole night he could not sleep and he thought whether it was possible to develop a stove that did not require a pump. In the morning he went to the workshop and tried many designs. The main difficulty he faced was in collecting the components of the stove like the tank, burner, pipe and regulator. He had to make the pipe coil manually and this took the most effort and time. But finally he succeeded in developing his stove.

He regrets that his family members and neighbours constantly discouraged him from taking up this work as they felt that this was dangerous and would harm him. But after he had made the stove, he received considerable support from his family. At the same time he remembers with gratitude the help he received from some friends namely Kanwaljit, Shakti Singh, Bhumil Kumar Gupta, Chandrabahuki and Daulat Rai who encouraged him and gave him some money also.

The Innovation
This is a modified stove which does not require pumping. A number of novel features help it to achieve efficacy with minimum carbonaceous deposits. Firstly the kerosene storage tank is placed above the burner-stove stand height to facilitate the flow of fuel without pumping. Secondly a bent copper pipe attachment is placed around the burner which is connected to the fuel cylinder. A pressure gauge along with a safety valve is fitted above the tank. On loosening the safety valve; first, the kerosene flows down to the burner due to the force of gravity. A delivery tube flowing from the kerosene tank revolves around the burner and leads back into the pump. Once the flame is lighted, kerosene inside this copper delivery tube heats up. The vapour so formed moves into the tank and creates pressure for the kerosene to move into the burner without any pumping. A valve helps in regulating the flow of kerosene. The safety valve facilitates release of excess pressure in the tank. The stove has been tested upto



a pressure of 75 psi and found to be working without a problem.

Advantages

Novelty lies in the placement of the cylinders and the use of the fuel heating coil as well as the provision of a pressure gauge and safety valve. This stove saves fuel and also the labour involved in pumping air. It does not blacken the vessels that are placed over it. There is also no need to clean the pores of the burner for carbonaceous deposits since the deposits are very low in this high pressure gas burner arrangement. This stove does not make much noise when in operation and therefore is less of a nuisance to people nearby. It does not require much maintenance. At Rs.300, its cost is comparable to the conventional stove. The reduced bio-mechanical tasks make it suitable for women or children as well as for the physically challenged as less effort and time is required.

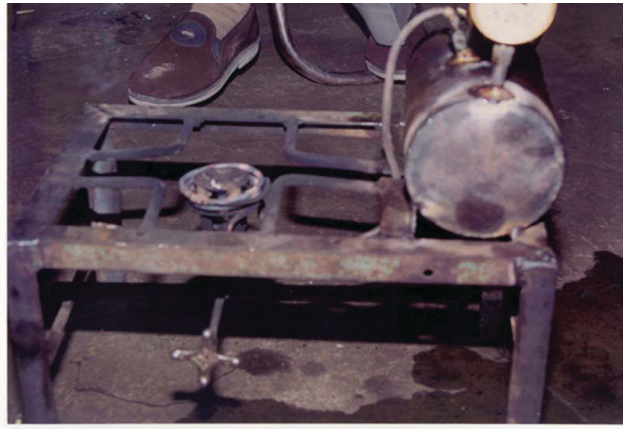
Current status

The device was successfully tried and tested in 2002. He also got an opportunity to attend the Indian Science Congress held in Chandigarh in January, 2004. Sameerul relates that he enjoyed the experience of innovation and feels that if the government gives him the opportunity he is prepared to work on other innovations. He has received several business enquiries on the innovation but so far he has not entered into any agreement. Sameerul is interested in setting up a factory for the mass production of this innovation but he needs adequate support for the same. NIF in coordination with the GIANs has sanctioned an amount of Rs. 37, 250 from its Micro Venture Innovation Fund for prototype development for market research for the improved pumpless stove and three other innovations.

An affinity towards mechanics

Sameerul's interest in mechanics started from a young age. From the age of seven, Sameerul accompanied the late Sardar Jagtar Singh to different places, as his disciple, and learnt the trade of working with machinery. After working as an apprentice for 12 years, he started his own workshop in Raja Mankapur in Gonda district. It was during that time that he made this stove. In 1990 he came back to Paliya and for nine years he worked on HMT tractor engines and also made many modifications to HMT tractors. Now he has a small workshop and has carved a name in the field of repairing tractors and engines.

On his future plans, he talks about how some day he would try to make a diesel engine like the ones made by the Koreans or by Kirloskar. He feels that both these are equivalent in terms of strength. Though the latter has higher fuel consumption, both are equally easy to fit and use.



Modified stove with kerosene heating[55]

CONSOLATION

Niranjan Prasad Sharma (43) hails from Khudaganj, Pilibhit, in Uttar Pradesh. He has studied up to the 8th standard. He is married and has four sons and a daughter. His sons are studying in school and his daughter has completed her B.A. He owns a house and a shop in Pilibhit. A stove repairing mechanic, he earns his livelihood mainly through the business of manufacturing furnace stoves. He earns Rs. 36000 per annum. He also has a keen interest in painting.

Address
C/o. Mahenderpal Gangwar
Vill.:Kanakor, Khudaganj
Dist.:Pilibhit, Uttar Pradesh

Scouted by
SRISTI GYAN Kendra

Genesis

Niranjan got the inspiration for developing the innovation by observing the kerosene lantern, which is widely used in villages. He faced a lot of difficulties in procuring the raw materials for developing the innovation and arranging finances. Niranjan Prasad admits that in his pursuit of developing this stove, he was not helped by his family. It was his own strong determination that kept him going. At the same time, he remembers with gratitude the help given by the Bank Manager of Bank of Baroda, Pilibhit. Niranjan is quite interested in starting a business of his own with this innovation for which he expects the initial investment to be around two lakh rupees.

NIF in coordination with the GIANs has sanctioned an amount of Rs. 37, 250 from its Micro Venture Incubation Fund for prototype development for market research for the improved kerosene stove and three other innovations.

The innovation

This stove is based on the principle of kerosene atomization. The key concept is that of pre-heating the kerosene flowing in from the cylinder thereby converting it into gaseous form. It is then fed into the burner to give a clear blue flame without any smoke, sound or deposition of carbonaceous soot on the cooking vessel. The heating is achieved through a delivery pipe fitted above the flame.

Advantages

This innovation enables higher combustion of kerosene. It consumes 25% less kerosene and burns with a blue flame thus eliminating smoke. In addition as there are no soot deposits on the bottom of the cooking vessels it removes the drudgery involved in cleaning them.

Scientific bent of mind

From his early childhood, Niranjan had a keen interest in science. His foray into innovations include tinkering with several useful devices such as kerosene gas burner, dosa maker, diesel burner as well as small machinery like combustion engines, valves, pistons etc. The kerosene gas burner, he has developed consumes 200 ml oil per hour. It is less noisy and due to the presence of rotating burners, there is less accumulation of carbon. In his dosa

burner, the plate is made of copper and has eight pores in it. It burns with a blue flame and there is less deposition of carbon. The diesel burner he has improved utilizes both water and diesel. A special chamber is made over the burner, from the corner of which passes a small pipe which is used for pouring drops of water over the plate. Apart from the above innovations, he has also designed a diesel furnace, a snack dryer and a heavy-duty cloth dryer.

Pump-less stove with kerosene heating

CONSOLATION

Sarfuddin Kazi (45), of Dharangaon in Jalgaon, Maharashtra is a machinist and owns a welding workshop where he manufactures all the components of the stove. His formal education ended with failure in the sixth standard and he admits that he is barely literate. He has three brothers who are also employed in the workshop. None of them has undergone any formal training.

Address
Pillu Mashidjaval, Dharangaonn
Tal: Dharangaon, Jalgaon
Maharashtra

Scouted by
North Maharashtra University

Genesis Sarfuddin had seen the ordinary stove in operation and noted its drawbacks. It was noisy, unsafe, and required a fair amount of maintenance. Since, the consumption of kerosene was also high, it became an expensive proposition, especially in the context of rising fuel prices. The other alternative, LPG, was also unaffordable to most. Sarfuddin felt that the poor needed an efficient device to meet their domestic requirements. He knew that such a device would have to combine the features of maximum heat generation with minimum fuel consumption.

A keen observer, he analyzed the working of the petromax used in his village. He discussed the working of the petromax with fellow villagers and technicians. He learnt that in the petromax, the fuel is converted into gas and the gas burns without emitting any smoke. He realised that if this principle could be applied to a kerosene stove, a lot of fuel could be saved and pollution could be avoided.
He came up with the idea in 1990 and it took another two and a half years for him to build the first prototype. All the components of this stove such as the burner, the fixed fuel tank, the gas wigs and the frame of the stove were fabricated by Sarfuddin with his small lathe machine in his workshop. Casting was done with the help of a mould and a small burner pit in his workshop. Special actions were performed with the help of a small drill machine and a welding machine. The process of fabrication, was however, fraught with problems. To arrive at the correct diameter of the nozzle as well as the number of holes in the burner, he had to try various combinations. He had to also deal with problems such as leaks in the fuel pipes, a poor flame and a silencer that would not work. After continuous trial and error, he was able to overcome these problems.

One of the features of this stove is the copper coated steel transmission pipe, which does not burst because of heat, pressure etc. Sarfuddin had seen such a pipe being used in the diesel trucks that his father drove, and felt that it would suit his innovation well. While using this stove, one day, he noticed that a spark which fell from his cigarette on to the stove glowed brightly. He then realized that the stove could be used to provide light as well. Sarfuddin acknowledges the help given by his brothers in developing this innovation.

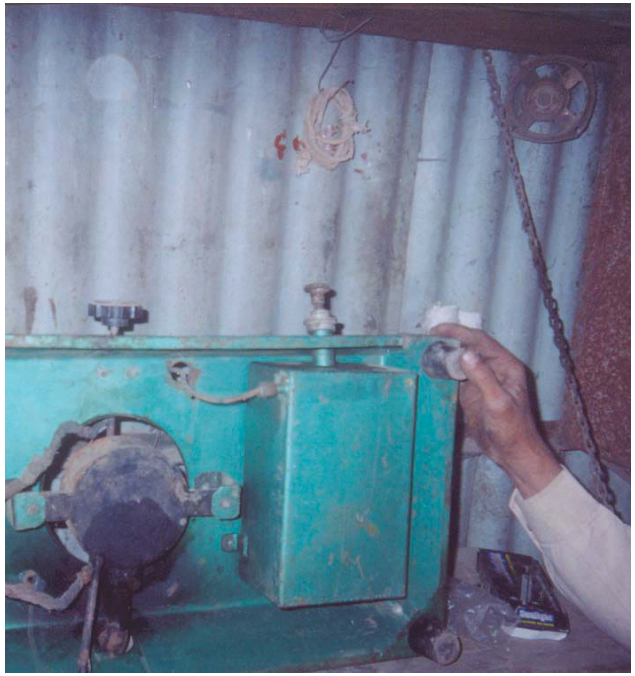
The Innovation

This stove comprises a tank for the kerosene, a burner and a facility for providing light. The tank is connected to the burner of the stove through a copper coated steel transmission pipe which is passed over the burner. A pump is attached to the tank for creating air pressure in the tank. Initially, the stove has to be pumped to produce the appropriate pressure for the fuel from the tank to be transferred to the transmission pipe. At the same time, the fuel transmission pipe is pre-heated with an external source, till it is hot enough to convert the forced fuel into gas. Once the fuel is converted into gas, the external heating is taken away and the kerosene in gaseous form is ignited. The system uses the gas generated for cooking and providing light. The burner now plays a dual role – the primary use is for cooking and the secondary one is for heating of the transmission pipe to generate the gas to run the unit. This gas is also used to provide the light.

With two litres of kerosene the stove can burn continuously for eight hours. If the stove is not used to provide light, it can be used for upto nine hours. The cost of the stove is around Rs.1000.

Advantages

This stove burns with a blue flame and thus does not blacken vessels. It is safer than conventional stoves as after initial pumping to light the stove, stable pressure is maintained in this stove which is different from conventional pumping stoves in which the pressure keeps on changing. In addition this stove is noiseless and does not require cleaning as often as the conventional stove. As the stove needs to be pumped only while starting, less effort is required. While ordinary stoves use brass burners that need a lot of maintenance, this stove uses a burner made by Beed casting. This burner ensures lower fuel consumption as it does not cool as quickly as the brass burners. At 500g, the burner is also heavier than an ordinary burner and this further contributes to conserving heat. The smokeless fumes emitted by this stove reduce the hazards and diseases caused due to smoke inhalation. This stove is also ideal for road-side food vendors and dhabas. Moreover, this stove can be used by canteens in urban areas that require stoves with high performance capabilities and are cheaper than LPG. It can also be used in laboratories where a continuous flame is required for a long time.Though this stove is more expensive than the two types of stoves (pump stoves- Rs.250-300 and



wick stoves-Rs500-550) available in the market, its many superior attributes make it worth the price.

Current Status

With his desire for perfection, Sarfuddin is constantly working on improvements in the design. Currently he is looking at reducing the area of the stove, by placing the tank below the burner instead of beside it as is the case now. This will also reduce the amount of metal used. He has made three stoves till now. He used one model for about 8-10 months to see whether it was working properly. Sarfuddin has plans to start a commercially viable business with his innovation if he can get the necessary financial support. NIF in coordination with the GIANs has sanctioned an amount of Rs. 37, 250 from its Micro Venture Innovation Fund for prototype development for market research for the kerosene gas stove and three other innovations.This innovation was featured in the Lokmat and Deshdoot newspapers. Sarfuddin's skill with machines is well known in his village and the local Industrial Training Institute (ITI) and the villagers are now planning to honour him.

The desire to invent

Sarfuddin has been interested in machines since childhood, especially as his father was involved in repairing primus stoves after he retired as a State Transport bus driver. Sarfuddin learnt some of the basic concepts of working with machines from a friend who was a blacksmith. He preferred watching the blacksmith in his workshop to going to school. Later he tried to replicate his observations at home. When he was 17, he made a machine to make cotton candy just by observing the operation of the machine. At the request of an oil mill owner; he made a steam boiler for Rs.22, 000. The market price of the device was a lakh of rupees. He has also done welding of towers using an electric generator. He is currently working on the idea of a generator which would not require diesel, petrol or kerosene but would be able to convert mechanical energy into electrical energy. He got the idea of such a generator when repairing their diesel generator. Sarfuddin is also skilled in carpentry and in working on gold and silver. Though he has no formal training, Sarfuddin often goes to the ITI in his area to give practical inputs on the functioning of various machines to students.

One of his brothers, Fakhruddin Amanuddin, also shares his innovative spirit. Fakhruddin made a metal cutter in a week as it was required for making school benches. He developed it at a cost of Rs.6000 whereas the market price of a similar cutter is Rs.12, 000.

Social initiatives

The village Dharangaon is known for its communal harmony. Hindus and Muslims live side by side and Sarvadharm Samabhav is the ruling principle of the village and this spirit is also reflected in Sarfuddin's social initiatives.Sarfuddin made a 40 inch tall lamp weighing 40 kg for the local Chintamani Moraya Temple, free of cost. Many devotees donate bells of various types to the temple. At the request of the trustees he made a lamp using the metal from these bells and other offerings. He also donated a decorative piece used in processions to the Masjid, sixteen years ago. The piece, made out of metal (compared to the earlier bamboo one) continues to be used in the procession. When the local school needed 130 benches, he made them himself and gave it to the school at a concessional rate. Popularly known by the name of Jumman in his village, Sarfuddin is known for helping those in need. He accomplishes all these social ventures inspite of his strained financial circumstances. When asked about his dream Sarfuddin has an interesting answer- *"Don't dream, just keep on doing what you have to - then things will happen."*

Fuel efficient two-in-one stove[57]

CONSOLATION

Jyothi Ravishankar, a 33-year-old housewife and a mother of two children, hails from Madar village in the South Canara district of Karnataka. She has a degree in Law, but she is not a practicing lawyer. She lives in a joint family of seven members. Jyothi has received ample encouragement from her husband and family members to pursue her innovation. During her spare time Jyothi pursues her hobbies such as sketching, painting and stitching.

Genesis As a child Jyothi had observed that, while cooking on the traditional hearth, which is still prevalent in most houses in the rural areas of South India, nearly 50% of heat was being wasted and it gets unbearably hot near the hearth. Firewood being a non-renewable source of energy, she thought of developing some manner of using this heat energy that is being wasted. Her resolution was strengthened by the fact that it is very difficult to procure enough supply of firewood, especially for the poor. This formed a perfect backdrop for the birth of the idea and she designed this stove, which would help save fuel as well as prevent wastage of heat. In the process of developing her innovation, she encountered some difficulties. She was not able to get the cooperation from the mechanics at the workshop when she sought their help for building her stove and she had to run around a lot to get things done.

Jyothi has installed this modified stove unit in her kitchen along with five meters of plumbing to connect the hot water to the tank in an adjacent room to work as a (non-electric) geyser and has been using it successfully for the last three years. Word has spread regarding her innovation. NIF has sanctioned Jyothi Ravishankar a sum of Rs.5, 625 from the Micro Venture Innovation Fund for making the prototype to conduct market survey of the Stove cum Water Heater.

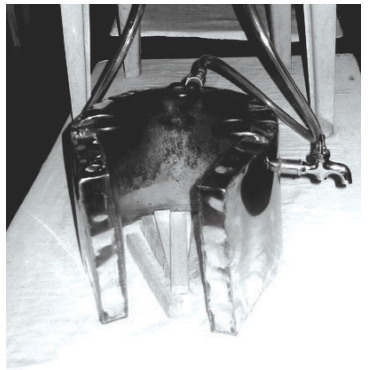
The Innovation

This is a multipurpose energy efficient utility stove which captures the wasted radiated heat in a wood fired stove to simultaneously cook as well as heat water in a tall drum to a temperature of 80 degrees.

The unit works on the principle that cold water flows down and hot water rises up. The arrangement consists of a stainless steel enclosure-envelope on three sides of a wood fired stove and two pipes which are connected to the stove. These pipes are connected to the pipes from the boiler in the bathroom. Cold water comes in from the bottom inlet pipe, gets heated and passes out of the hot water pipes to go and fill a stainless steel hot water container. A separate tap is attached to the hot water pipe on the side of the oven to collect mugs of hot water for making tea, coffee. Thus while the food gets cooked in the oven, the hot water fills in

Address
Amdalu (at post),
Madanthyar – 574 444,
Tal: Bethangadi, South kannada, Karnataka

Scouted by
PRITVI



from the top into the tall drum placed on a stool behind the stove. In two hours up to 150 liters of hot water at 80 degree centigrade is made available in the drum. The entire unit is portable and can be set up anywhere. The cost is around Rs. 1000 because the water chamber of the stove is made of stainless steel to prevent rusting.

Advantages

The novelty of the device lies in the fact that with the same source of heat two functions can be performed simultaneously- for example cooking and heating water in the boiler. There is efficient energy utilization of burnt wooden fuel-stock. It has a wide potential in rural homes where gas cylinders are too expensive, not available or where the supply is erratic.

A housewife with a difference

Jyothi's aim in life is to spend a happy and contented life with her family. At the same time, she is no ordinary housewife. She has proved that along with being a mother and shouldering the responsibilities of home and family, there is a lot that one can do to contribute to save the environment.

She believes that this two-in-one stove of hers will definitely be useful to society and especially to the poor farmer because after a hard day's work toiling in the field, he would definitely welcome a hot water bath and that too without spending any extra fuel. Satisfied with the good response she got from local people and institutions she is motivated to innovate further. She specially remembers with gratitude the efforts of noted littérateur and writer, Shri. P.Ramakrishna Shasthri who brought her work into the limelight.

Finally she says about herself "Though I have a degree in law, I am a contented housewife now. But in future I would like to work or do some kind of business and put my education to good use."

Silk worm rearing tray[58]

CONSOLATION

S. M. Mangali is a 77-year old retired school teacher in Shirahatta taluk in Gadag district of Karnataka. He is now fully involved in agriculture dividing his time between sericulture as well as in the dairy sector. A man with great vision, Mangali has strived hard to do his bit to improve the lot of fellow farmers. Mangali has a monthly income of Rs. 3000 and supports a six-member family.

Address
Post/Tal.:Shirahatti
Dist.: Gadag -582120
Karnataka

Scouted by
PRITVI

Genesis

The inconveniencies encountered by Mangali while using the conventional trays namely high cost, greater space and labour needs motivated him to develop this modified tray. He has been using these innovative trays for the past two years. Currently it is being used only by Mangali, but there is widespread potential for this innovation in the silk-rearing belt. So far there have been no business enquiries and he has not been approached for licensing the technology. Mangali feels that people's attitude must change in order to accept and follow innovations and new ideas. Illustrating this point he explains how he is always ready to seek the co-operation of his fellow farmers and innovators in developing his innovations. He plans to seek help from his former students, some highly placed friends, taluk and district level officials to disseminate information regarding the above. NIF has sanctioned an amount of Rs. 31, 250 from its Micro Venture Innovation Fund for the prototype development and market survey of the modified silkworm rearing tray along with another innovation- the Uzi Fly Trap by Mohammed Wakeel.

The Innovation

Mangali has optimized the size, material, weight and arrangement of the silk worm rearing trays thus achieving increased cocoon capacity along with a host of benefits. These modified trays are rectangular unlike conventional round trays and can be stacked on racks. He has made these 3 feet by 4 feet trays using wooden strips and plastic wires. Hence they are light weight and of low cost. A single person can handle them comfortably and they can be hoisted up to a height of 5-6 feet. More trays can be accommodated on the racks as with the use of these trays the space between two trays on the stands can be reduced to 10" - 12". Thus by using these trays one can double the capacity of silkworm rearing room. These trays are also easier to sterilize and disinfect by dipping in bleaching powder solution or any other disinfectant. With these trays it is more convenient to feed the silkworms, harvest mature cocoons and clean dead and decomposing worms or cocoons. This will also help to prevent the spread of infection if there is any. Further more the trays are long lasting and eco-friendly as there is minimum requirement of wood for its construction. These modified trays remove the tediousness of placing the cocoons in conventional round trays, stacking them and removing them periodically for

cleaning and feeding. This saves a lot of time, effort and money.

A convenient hand weeder

The process of weeding is laborious and is directly related to the quality and quantity of the yield produced. Since traditional weeding practices involve a lot of manual labour, it is time consuming and physically very tiring. This prompted S.M.Mangali to design a low-cost hand weeder. The weeder he designed can accommodate different attachments ranging from 4" to 24" width, as per crop spacing, to do weeding, remove debris and for inter-culturing. This weeder is more efficient than the conventional implements used for weeding. It can be operated while standing, requires less time and less labour and the physical strain caused is comparatively less.

Man with a mission

Mangali makes it a point to attend all the meetings, camps and workshops organized by various NGOs and other organizations in the state for the benefit of farmers, agriculturists and innovators as this gives him an opportunity to interact with like-minded people. He feels that the government must also organize exhibitions frequently, for the benefit of farmers and other grassroots innovators, which would provide a suitable platform to exhibit such useful innovations. He wishes that technical expertise would be extended to innovators to improve their innovations.

While attending gatherings, Mangali talks to fellow farmers and innovators about NIF, the Honey Bee network and Hittalagida. He also tries to convince them to subscribe to the magazines brought out by these organisations in order to gain knowledge and keep abreast of all the happenings in the field of agriculture and related fields. Mangali is also ready to extend his wholehearted support, co-operation and help, if needed, to further the activities of KIN (Karnataka Innovators' Network), Honey Bee and Hittalagida.

Petromax based film projector

CONSOLATION

Horilal Vishwakarma is a resident of Pilibhit, Uttar Pradesh and since his childhood he has been involved in carpentry at construction sites. He has 35 years of experience as a carpenter. His family includes his wife, three sons and a daughter. He never went to school and his children too have had little education.

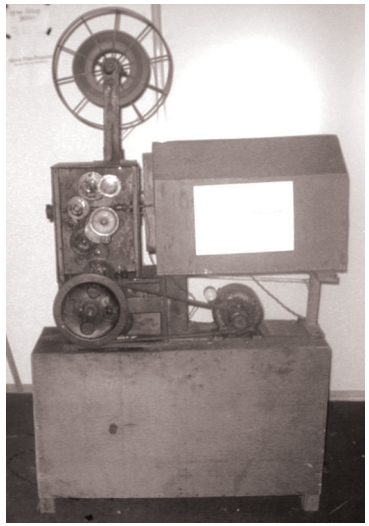
Address
Nayi Basti, Chatri Chauraha Mohalla, Ranjit Singh, Dist:Pilibhit, Uttaranchal

Scouted by
SRISTI GYAN Kendra

Genesis The sources of entertainment in rural villages of India are very limited especially where the penetration of televisions has not taken place. In such places, films are a big hit but the film hall owners cannot afford modern projectors, which would cost lakhs of rupees, hence the need for a cheaper alternative. Horilal was interested in movies right from his childhood and later on he got a chance to work in a cinema hall. The idea of making a low cost film projector for villages cropped up in his mind then. During the process of the development of the film projector he faced many difficulties in the form of financial instability and availability of raw materials. When Horilal first went to the related officers they found his idea of making a projector very stupid and laughed at him. But his consolation was that he got support from his family and he finally achieved his target in a year. It was a matter of pride for him that when there was heavy demand for the film Sholay in 1975, and the existing film projector was not working, this projector was used for a year in Jay Theater, Pilibhit.

The Innovation
The Film Projector uses a binocular lens system with scope for adjusting focal length as per film formats. The projector is made of 32 bearings instead of brushes and this reduces costs. Soundtrack reading is done with a specialized unit made of wood with a low cost diode, amplifier and photo-sensing circuit. The device has an elaborate system of hand cut precise gears to power the drives. There is a fan motor with regulator to power the unit. This projector does not use carbon-arc of electrodes with a sparking gap in the middle to be reflected by reflectors as this requires constant monitoring by the operator to maintain carbon-arc distance precision. Horilal instrad uses a normal 1000w bulb, which needs no supervision. Due to variable speed control as per reel loading, this projector can handle all three film formats -16 mm, 35 mm and 70 mm, which is done by separate projectors conventionally. The speed of the projector is 24 frames per second. Horilal has built a separate lighting box unit that sends the light from behind the main projection unit. The innovator has used this projector as a mobile unit on a pushcart and takes it from place to place and runs it using a hurricane lamp.

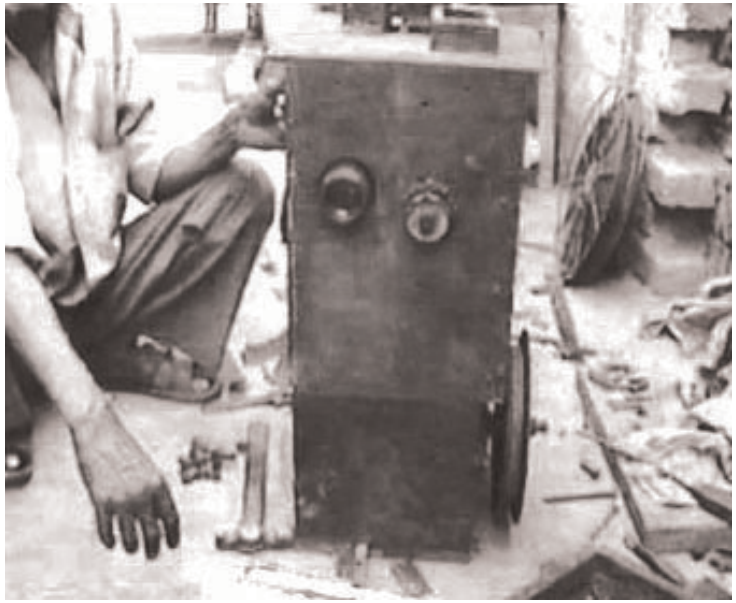
Advantages
The prototype was built at a cost of around Rs. 5000 several years ago. This was much cheaper than the ones found in the market then. The operating cost of the Low Cost Film Projector is comparatively



lower as it uses less power as it runs using a high powered lantern or hurricane lamp. Further the projector also has lesser number of parts and complexity than imported machines.

Relevance

People are not too keen on building cinema halls in rural areas due to the irregularity of power supply and the fact that they have to often depend on generators for running the projectors. Also they want the projector to be portable so that it can be taken to different villages and can be run on a high wattage bulb or a hurricane lamp. Thus the market potential for this projector is good in rural areas. The Indian Army is also a potential customer for the Low Cost Film Projector due to its feature of portability. The Low Cost Film Projector can be very useful to spread knowledge in rural areas and with the help of this device, NGOs would be able to show socially relevant films to the rural people. NIF has sanctioned Horilal a sum of Rs.25,000 from the Micro Venture Innovation Fund for evaluating the technical feasibility and market potential of his innovation.



Seed cum fertilizer drill machine

CONSOLATION

Ramesh Chandra Gurjar, (45) a farmer who has studied up to the fifth standard, hails from Harda, Madhya Pradesh. He is married and has two sons studying in the fourth and fifth standard. He owns two acres of land on which he grows wheat and yellow gram. As he is physically challenged and cannot walk around, his wife does most of the farm work while he thinks of ways to improve farming methods. Fifteen years ago Ramesh had left his parents house and for the past 8-10 years he has been looking after his family on his own.

Genesis

Initially he used to do some amount of farming himself, but then he fell ill with TB and due to severe financial constraints was unable to get proper treatment. His condition worsened to such an extent that a friend Harnath Singh had to take him to Bhopal for medical attention where he was given free medicines and he finally completed the course in eleven months. Though cured of the illness, he remained very weak and as he was not able to farm, his financial condition also worsened. Neither could he afford a tractor or manual labour. He also had the bullocks, but as he was physically challenged he could not plough the land himself. In this exigency he had no option but to think of a solution to his problems and thus he came up with the idea for the seed-cum-fertilizer drill.

In 2001, he made an angle from discarded iron pieces and attached three ploughs to it. He also designed a contraption for him to sit on the angle. After a year, he attached a hollow pipe to sow the wheat. He also attached wheels and a gear system to make sure that the plough and *vavaniu* (sowing pipe) can run through the uneven land of the farm. His wife sowed the seeds while he controlled the bullocks and the plough. In 2003, he made more improvements and fitted three wheels. Now he could sit on the equipment, plough through the land, sow seeds, and control the speed with a breaking mechanism.

The innovation

This is a multi-utility bullock driven flexible agricultural equipment which can be used as a seed-drill-cum fertilizer dispersant as well as for ploughing, inter-cropping, weeding and leveling the land. This device comprises of a plough, seeding pipe, hopper, wheels, gears, hydraulic lifter and metallic chassis. The plough and sow teeth which are attached behind the chassis are adjustable widthwise for facilitating inter cropping. Three wheels support the total chassis. The hydraulic system acts as a mechanical lifter which detaches the attachments from the soil for easy movement enabling transportation without ploughing. This lifter allows height adjustment of the plough and sow pipe as per individual requirement. It also provides for easy turning of the machine. Mechanical braking has been attached for controlling the device. The system with its sow pipe and flexible height can be customized for all seed types and fertilizer needs. Sowing can be done in three rows

Address
S/o- Pannalala Gurjjar
Vill- Kangaon
P O Jigaon Khurd
Harda, Madhya Pradesh

in case of soya bean and in five rows in case of wheat crop. It can be used for rough or uneven surface and for hard and soft soil. There is also a provision for sitting on the device, so that a physically challenged person can use it. Seating can be adjusted for the physically challenged or others as per individual requirement.

Advantages

This innovation saves labor and time as well as dependence of the physically challenged on others and offers an alternative to many who cannot afford farm-labor or tractors. It is lightweight and made of angle channels, and thus completes tilling and weeding in just two-three days. It can also seed four-five acres of land per day and needs just one operator to run it, thus saving labor. In addition the equipment is so simple that one can customize it according to personal requirement or detach the parts that are not required for a particular task. With this equipment it is also possible to do multi-cropping and sow in between the fully grown crops. The plough can be replaced and the teeth of the equipment can be adjusted as per the tilling requirement. Because of these multifunctional features, Ramesh calls his equipment *Bahuhetuk Krishi Yantra.*

A boon for the physically challenged

The provision of lifter, seating arrangement and pressing lever (locking mechanism) to create sustained pressure for the engagement of the ploughing device with the soil are all special features incorporated for a physically challenged person, who cannot walk along /stand on the plough to create pressure. Knowing the needs of the physically challenged first hand, Ramesh painstakingly built this unit so that he could farm as an ordinary person without depending on any one. But this design not only meets all his needs but is also a versatile product useful for society at large.

This device was exhibited in a Krishi Mela in the district and it was appreciated by a lot of people. Some companies have approached him to buy the rights of this machine so that they could manufacture it under their brand. The equipment costs about Rs. 7000 now but if manufactured on a large scale the cost can be reduced to Rs. 5000. Thinking about further improvements, Ramesh plans to fit gears in the equipment so that the load on the bullocks can be reduced. He also wants to fit a sprayer to spray insecticides in the farm. Motorization of the device is also a future option to eliminate the need for using bullocks. His plan is to take a loan from the bank and manufacture this machine and thus earn his living. He looks forward to active support from the Government or other agencies to improve his innovation. He wants his equipment to reach the needy farmers and expects just reward for this vision and achievement. He looks forward to active support from the Government or other agencies to improve his innovation.

Hand pump with attachment for filling animal water trough

CONSOLATION

Swayambhoo Sharma (41) hails from Udaipur, Rajasthan. He has done his Higher Secondary (Commerce). His occupation is agriculture and social work and he earns about Rs. 10,000 month. His family consists of his father, wife, daughter and two sons. His daughter is doing her B.Com and his sons are in the 12th standard and 7th standard.

Address
S/O Shri Jaganathji Sharma
Vill: Madar, Panchayat Samiti
Badgaon, Jagdish Chowk
Near Pipal Tree
Udaipur Rajasthan

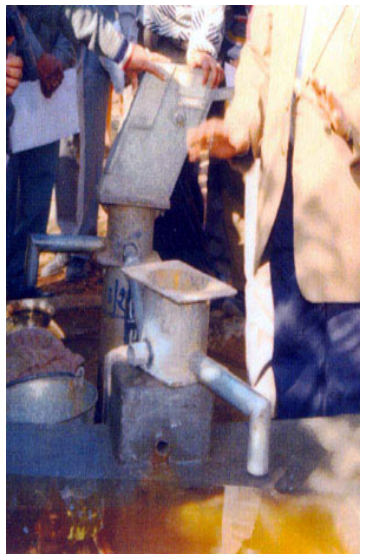
Scout
GIAN- North

Genesis

Lack of surface water sources and falling water table has made availability of clean drinking water a major problem in Rajasthan. For human beings, the need for availability of clean and safe drinking water gets noted and responded to some extent. But for animals this need is much less appreciated.

Formerly the cattle were provided drinking water by cultivators or well holders generally at their wells where a tank was made and fresh water was filled by them. But continuous drought conditions over the last four years have resulted in water scarcity and made it difficult to provide drinking water for the cattle population. Hence an idea that was brought forward was that a pit was dug in front of the hand pumps where the waste water generally flowed and this pit full of water was used by the animals to quench their thirst.

But these became a failure as the animals rejected this water contaminated by dust, garbage, chemical residue of soaps, detergents and other contaminants generated by human beings during their activities around the hand pump. Even if they drank this contaminated water they would fall sick. Swayambhoo Sharma came up with an interesting solution to address the drinking water needs of animals which provided for the continuous supply of clean ground water to fill a watering trough built exclusively for the animals. He developed a prototype in June 2001 and states that he faced no problems in the process of innovation. He spent about a week in making this attachment. He has made about 15 models till date. The cost of this local innovation is only
Rs 2075 and out of 39 hand pumps in the village Madar and adjoining hamlets, this innovative experiment is being used on five hand pumps and the response of the village folk to this idea is very good.His family was supportive throughout the process of innovation and thankful after he succeeded and gained recognition. At the same time he remembers a few people criticizing his work. Those who did not want to contribute to the welfare of animals used to block the second outlet of water by polythene etc. But Swayambhoo relates that he dealt with this obstacle by explaining to these people and then he modified the design by connecting a filter at the second outlet in such a way that it couldn't be blocked.



He proudly declares that all development has been done from his own funds.

The innovation

The arrangement consists of connecting a ½ to ¾ th inch horizontal galvanized iron pipe from the top of the hand pump water chamber to an adjacent water trough. Since this trough is above ground level and up to the level of the hand pump water chamber, every time the villager pumps water for his use up to 20% of the water gets diverted to this tank for animals. The basic trough is six feet by three feet with a height of two feet with nine inches thick walls. Thus apart from meeting his needs, every time the hand pump is used, a villager simultaneously does his bit to provide clean water for the animals.

Advantages

With this attachment no greater cost or extra exertion is required to give clean drinking water to the animals. This device removes drudgery of someone monitoring and filling up the water tank for animals every time it is empty. Women who take care of animals have more time left with them as the tank automatically gets filled with clean water. Further the cost is affordable when one considers the long term benefits of the solution. This solution is superior to current alternatives in quality of water and elegance in delivery. Diversion of fluid with single pumping operation can be used in many industrial operations and plants. Thus the device has potential for multiple applications.

Recognition

"*The low cost tank for animal drinking water linked to hand pump innovated by Mr. Swayambhoo Sharma has been installed at village, Madar, Kavita and Thur, Tehsil Girva, Udaipur. The device has a cost-effective modification in the chamber of hand pumps by which, when any one operates the hand pump to take out water, a portion (25%) of water flows to water tanks connected for stray animals*."

These are the words of Dr. Surendra Kothari, Assoc. Professor and Principal Investigator, Department of Renewable Energy Sources, College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology, Udaipur who had visited the various sites where the innovation had been installed in October, 2004.

CP Talesara, Chairman and Managing Director, Pyrotech Electronic Pvt. Ltd, Udaipur says, *"The innovation made by Swayambhoo Sharma is unique in nature. The same can be used at other places and at the time of scarcity of water in these areas, the tanks are found to be very useful"*

The will to serve

Swayambhoo Sharma is the Deputy Pradhan of Panchayat Samiti Badgaon, Udaipur district. He is known for initiating various welfare activities in and around Udaipur. He has also started cultivating some medicinal plants. Currently he is working on the idea of dual pumps in a single bore well. This is still in the concept stage where the first pump would be a conventional submersible pump and in this arrangement there would be the facility to operate the second pump in the absence of electricity. Ask him about his dream and he states that it is to help society through his social service and similar innovations.

Automatic engine stopper for two-wheelers[62]

CONSOLATION

Tukaram Verma (48) is a motor mechanic living in Tilda Nevara in Raipur, Chhattisgarh. He has about 30 years experience in the field and earns about Rs.50, 000 a year. His family consists of his wife and three children. His daughter is in the higher secondary and his sons are in high school.

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Pt. Dindayal Upadhyay
Chowk, Tilda, P.O. : Neora
Raipur, PIN-493114
Chhattisgarh

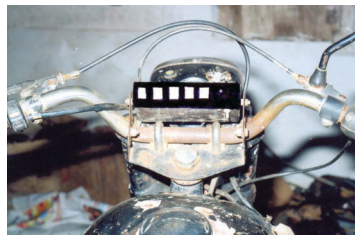
Genesis From a very young age Tukaram has been working in a garage as a mechanic. Even then he had noticed that generally two-wheeler drivers stop many times at railway crossings, traffic lights etc., or when there is a jam, but leave their vehicles running resulting in unnecessary waste of fuel adding to pollution. In rural areas he observed that if two people came across each other they used to spend some time chatting, forgetting to switch off the engine of the two-wheeler. Another factor that spurred him on was that even in ordinary cheap tape recorders there is an auto stopper, so why couldn't there be one in much more expensive machinery like vehicles. He reveals that he constantly thought about this idea since he was 17 years old and after years of efforts and improvements he made the present model of the auto-engine stopper. He claims that this can be used in four wheelers also and that he has tried it on a Mahindra and Mahindra jeep.

The Innovation

The instrument consists of an electronic timer, a relay and a neutral indicator switch. The switch is connected with the timer and gear box and the timer is connected with the relay. The relay is connected with the power supply cable of the spark plug. A welded curved rod is attached to the existing speed changer body, switch, timer-circuit and gear status indication system. The switch is attached in such a way that at various gear positions it makes the circuit complete for each gear indication. Four bulbs indicate the gear status. These bulbs are supplied power through the main cable after regulation. When the vehicle is in neutral position, the switch which is connected with the gear lever gets switched on automatically and completes the circuit due to which the timer starts. After a preset time, the relay stops the current supply to the spark plug and the vehicle engine stops automatically within 25 to 30 seconds as the ignition is cut-off. The power supply could be either from battery or magneto coil. This device can be used only in geared vehicles.

Advantages

The basic unit cost comes to around Rs 175, which makes it affordable to the common man. The cut off time can be adjusted according to the range of the timer. Negligible amount of energy is consumed by the instrument. The instrument function is independent of the fuel used in the engine and therefore it is safe for any type of engine. The working



of the instrument is also independent of the engine starter and so does not affect it in anyway. This machine can be used in vehicles which run on both petrol and diesel. The machine is light in weight. It is easy to install and can be switched off as per requirement. Attachment of this element in two wheelers saves fuel and reduces pollution. This is very relevant especially in the context of the looming energy crisis as well as the ever increasing prices of fuel. In addition the number of vehicles is also increasing on our roads leading to a disparity between demand and supply forcing us to spend precious foreign exchange on oil imports to meet our needs.

Success in spite of hurdles

Tukaram reminisces that the major problems he faced in the process of innovation were lack of financial support and technical guidance. For the entire process of innovation he claims to have spent about Rs.80,000 to one lakh. He considers his lack of education also a hindrance and regrets that he had studied only till the primary school. But inspite of all these stumbling blocks he found the experience of innovation an interesting and satisfying one. He remembers with gratitude Mr. Suresh Kumar and Mr. Babulal Sen who constantly supported and encouraged him in every way. He also confides that his family appreciated this innovation after he got appreciation from others. But now he proudly claims that neighbours and others in the community know about it and acknowledge that it will be very useful.The innovation has also been featured in the newspapers twice. NIF has sanctioned Tukaram a sum of Rs.57,500 from the Micro Venture Innovation Fund for making the prototype for the market survey of this innovation.

Currently his goal is to see that this innovation reaches every person who needs it and he hopes that someday it will be installed in all vehicles. He feels that two-wheeler companies could incorporate the element as an inbuilt part of the motorcycle body. But till date he has not received favourable responses from them though he had sent letters to various manufacturers. But undeterred, he declares, that in the future also he would like to work on further improving the efficiency and effectiveness of the innovation.

Tried and tested

This product was exhibited at the Rungta College of Engineering and Technology, Bhilai and also tested in their Mechanical Engineering Dept, Lab. In the technical feasibility report they have stated that till now only neutral indicators were available in all modern vehicles but this instrument uses neutral indication to switch off the engine. It goes on to say this type of product is not available in the market and is very advantageous as per the fuel economy and air pollution is concerned.

Mr. Choudhary, the Senior Deputy Director of Automotive Research Association of India (ARAI), Pune, talking about the concept mentions that there would not be any legal ramifications of the technology, since riders anyway stop the engine at traffic lights. He also put forward the point that this is purely a customer driven technology and it is up to the customer to validate it.

Reciprocating hydraulic prime mover for water lifting[63]

CONSOLATION

Noushad K.T. (27) is from Kizhupparambu Panchayat, Malappuram district, Kerala. He is a mechanical fitter and supervisor in a re-rolling mill at Kozhikode where he has been working for the past seven years. He enrolled for a part time diploma course in Mechanical Engineering, but due to his exclusive interest in building this device he was unable to do justice to other topics and failed some papers and is planning to attempt them again. His father and a brother are working in the coconut husk business and another brother is a driver.

Address
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P.O: Valillapuzha
Via: Areacode
Malappuram - 673 639
Kerala

Genesis

The idea came to him after he went to a science fair while in school and saw a model of how the rain water just drains off into the sea through the streams and brooks. Ever since, the thought of utilizing this free energy, which he felt was simply being wasted especially in a scenario where we are facing an energy crisis and with the world's renewable resources being depleted at an alarming rate, remained at the back of his mind. Though he was always interested in Maths he had to take commerce group after his 10th standard and later did a course in plumbing from an ITI. Following this he worked for about six months in a small industry and then joined a re-rolling mill in Kozhikode.

It was while working here that he decided to put thought to action and pursue his idea of utilizing the energy in our streams and brooks. He enrolled in a part-time diploma course in Mechanical engineering offered by a polytechnic institute and attended evening classes from 5.30-10p.m. and in the meantime worked on this project at every opportunity. On consulting an engineering trainee at the company where he worked, he was advised to refer a book on Hydraulic fluid machines which proved very useful. It took him about a year to design the device and a year and a half more to carry out various trials and make a working model. He was allowed to use scrap from the company for his various trials and was also given a 2500 litre tank at a nominal rate for his prototype. For the final production of the prototype, he approached the owner of the company he had earlier worked with, who agreed to make the device at the company at no cost, except that of the materials. Noushad regularly visited and monitored the progress at the company and once it was completed, with the help of friends, he installed the working model in a stream in a reserve forest near his home. But unfortunately he had to dismantle it later as the authorities refused to give him permission to operate it there.

The Innovation

A tank is placed or a dam is made in any small stream or brook. Inside this there is a float which is made of something that

is light yet strong- Noushad has welded together 2 aluminium dishes used for solidifying latex. When the water level in the tank reaches a certain height, water enters the float through four valves which open when two wheels at the back of the float strike against certain iron sheets attached for this purpose. Filled with water the float sinks. Once it reaches the bottom, due to the force of gravity and atmospheric pressure a siphonic valve at the bottom of the float opens and water in the float is pushed out of the float and the tank through a pipe and the float rises up again. The whole process is repeated. The force produced by this motion up and down can be used for lifting water to a certain height.

Advantages

This device works automatically as long as water level is maintained and is functional even if there is a slope of at least one meter in a stream or brook and if the volume of water flow is at least one litre per second. Noushad points out that in an ordinary stream or brook the volume of water flow is usually 25-50 litre/s and he claims that this force can even be used for generating a small amount of electricity, which would be useful in an area where there is none. According to calculations, in one day this device can fill a reservoir of about 1500 litres capacity even if the flow of water is 1litre/s. The biggest advantage of this device is that it utilizes energy which is free, easily available and renewable.

Experts' comments

The Professor and head, Dept of Mechanical Engineering, National Institute of Technology, Calicut visited the site on 6th October, 2004 along with three other staff members. They found that the pump could pump upto "a height of 50 m without any external power, using buoyant force of water as well as force of gravity. The amount of water that can be lifted using this equipment from a stream of abundant water is very small. However, it can pump 1000 litres of water within 24 hour duration at 50 m height." They recommend the pump for remote hill areas where electricity isn't available.

The struggle for support

Noushad at first approached CWRDM-The Centre for Water Resources Development and Management at Kunnamangalam with the details of the device but was disappointed with their response. He comments with sorrow and surprise that they did not even understand when he tried to explain its functioning nor did they send anyone to come and see the device. Trying a different avenue he personally spoke to the local MLA but this attempt also produced no results. Undeterred he then approached an organization focusing on water resource management in the state, but they declared that they were not interested in such small projects. As a last measure he has forwarded an application through CWRDM to the Department of Science and Technology, Thiruvananthapuram, requesting funds to make a small unit at Nilambur in a tribal colony which already has a pump house situated next to a river. But currently in this colony, they are unable to pump water from the river as this would require a diesel engine which they cannot afford. By installing Noushad's device the twin objectives, of solving the water problem and demonstrating the utility of the device as a model which can be replicated, would be achieved. But till date he has not received any response. On another front, his gram panchayat has asked him to give a project report but Noushad admits that, disillusioned with his previous futile attempts, he feels that this too would turn out to be an empty promise. Noushad has also approached a

lawyer and has applied for registration of the device at the Patent Regional Office.

Helping hands

But from one quarter Noushad has received unfailing support- his friends and two brothers offered encouragement and contributed physical labour whenever necessary. His parents initially had qualms about the time and money he was spending on the building of the device, but as he was drawing on his own salary they did not oppose his decision. Now, their pride in him is evident, when they describe his determination to succeed in completing it even though he used to come from work only once a week and would then devote all his time to it.

And unexpected help came from Mr.Balakrishnan, a civil engineer who hails from the same village as Noushad. On seeing the drawings of the device, he has asked Noushad to install it on his land. He has agreed to finance it and hopes that this prototype would be helpful in promoting the utility of the device. He states that in Kerala this device is highly useful, especially as there is a lot of water released from dams which just drains away, so this device can be used to lift water to a certain height without the use of any other power except the force of buoyancy. He is full of praise for Noushad for creating this device on his own with little or no formal training, but with his background as a civil engineer he also points out that the device will not be useful in areas where there is water shortage, since for the device to lift water to a particular height, a certain amount of water must be pushed out leading to its wastage.

A heart-felt wish

"*Our drawback is not a dearth of ideas, but a lack of timely support and guidance*," thus declares Noushad expressing his hope for an agency which anybody who has an idea can approach. This agency should be able to provide guidance and direction to the venture, give technical assistance where possible or suggestions on how to carry it forward or whom to approach. He has suffered from the lack of such support and hopes that at least in the future, other innovators won't have to tread such a rough path. On asking him about his dream, he reveals that he wants to do research and especially in the field of utilizing existing energy sources for the improvement of agriculture. He would like to work further on this device and improve it. He explains that he has a lot of ideas but money is a constraint and so…. Listening to him one detects a note of resignation and can't help wondering what if circumstances were conducive.

Button-hole stitching machine[64]

CONSOLATION

Anil Rashmikant Kamdar (42)is a native of Godhra, Gujarat. He has two sons who are studying in a district school. The family lives in a dilapidated rented house. His wife, has been both his critic and confidanté and he would often call her to see his small feats during the making of the machine. After initial skepticism, she gradually gained confidence in his abilities and fervently hoped that his efforts would bear fruit. On many occasions, his wife had helped him in his work, even lifting machine parts, when he was unable to handle them alone.

Anil can read Gujarati and Hindi and a bit of English haltingly. He keeps himself updated on the latest happenings in the country. He hopes the money that he will earn from this machine will enable him to buy a house, invest in his children's education and buy a bicycle for his sons (a long pending demand of theirs). He also wants to invest in aesthetic modifications of the design of the machine and spend the rest, in buying sewing-machine parts for his business.

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Scouted by
GIAN-West

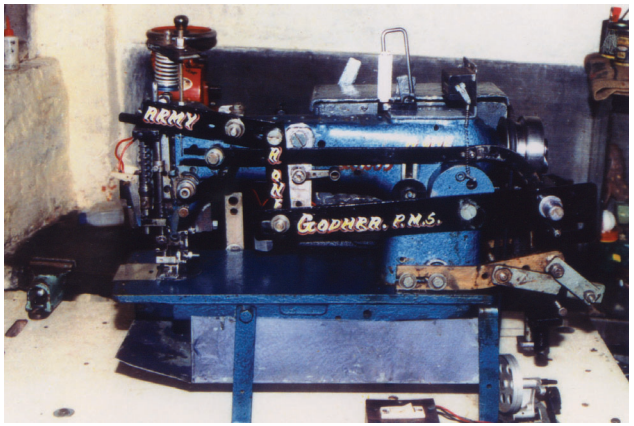
Genesis Five years ago, Anil Kamdar began toying with the idea of building a buttonhole machine. Considering he had little knowledge in designing machines, the task was challenging. So he started studying various parts of the sewing machine closely and their inter connections. He embarked on his mission to build a machine with a better thread cutting mechanism, a better gear mechanism, and an auto pump for lubricating several parts of the machine. In the year 1999, he began work on the machine. "While repairing sewing machines, I came across problems inherent in the Japanese and American versions of the buttonhole sewing machines. I did not copy these existing versions, but rather designed a different one, with newer functions and modes," says Anil.

The Innovation
This machine provides for the fully automatic sewing of buttonholes. It requires only the simple manual adjustment of one element to selectively determine buttonhole length prior to initiation of sewing. The length, width and spacing of the buttonhole for different fabrics can be varied at ease and calibrated with adjustment screws with automatic gear change lever to set different speed settings. This device has variable speed and auto lubrication facility (i.e. once set up for all parameters, it will perform the rest of the operation automatically and calibration is comparatively easier because this can be done by adjustment of some screws).The timer mechanism allows easy shifting of gears to obtain different stitch patterns, by simply setting their sizes only.There is a needle steering mechanism, which guides the needle along the width of the buttonhole with its zigzag motion as one cycle of stitching is completed. The base plate, unlike in the existing machines, remains fixed. It has an auto stop mechanism to stop the sewing process when

the needle or thread breaks and one can re-start sewing from the point of the broken thread by adjusting the jog lever. It also has a counter for counting the number of buttonholes stitched and a light arrangement to enable working in nights with ease. On an average this machine can do 100-120 buttonholes per hour. This button-hole machine runs on a 0.25 HP, 2880 RPM electric motor.

Advantages

This machine has lesser number of parts and so requires less maintenance and cost. In all other machines the calibration is done automatically and hence the chances of failure are higher, whereas in Anil's innovation the adjustments are done mechanically which tend to be more accurate.Unlike other machines, in this machine the base plate is high, so that all the mechanisms below the base plate are easily accessible and bobbin-shuttle adjustments can be done without much effort. For maintenance and adjustments, one need not lift the whole machine. It enables easy thread handling as it is equipped with thread trimming, thread-tension and spring-loaded material clamping system.The cutter-unloader mechanism in this machine gives flexibility of finding faults in the machine while the machine is running, thereby making fault identification easy and accurate.



Overcoming all obstacles

In the process of developing this innovation, Anil had to overcome all manner of hurdles. He took his savings, all of Rs 5,000, to buy various parts of the machine. He used to commute long distances to work and while travelling he would spend time thinking about his machine. He would spend two hours every morning, and three to four hours in the evening tinkering and experimenting with his machine.

His wife and relatives pressurized him to give up the idea, but instead he distanced himself from people, and even stopped attending Church on Sundays. Without electricity supply to his house at that time, he worked under the light of an oil lamp.

Months passed in many such experiments, and he soon wanted new machine parts. Since the parts were difficult to find in the market, he bought a hand-drill for about Rs 1,500, and began crafting the spare parts. For over two years, he worked with the hand drill- cutting, moulding and making the parts -as he wanted. He even used a small lid of a bowl, as a part of the machine. Anil's enthusiasm was infectious and soon his wife began to assist him.

After his savings got exhausted, he began using a major part of his daily income on his machine. He gave less than the normal amount to his wife for household expenses and even had to postpone his elder son's schooling by a year. His wife argued that the amount of money he was wasting on the machine could instead have been invested in their children's schooling. Soon bickerings gave way to pleading, but Anil ignored his wife's persistent pleadings. They were on the verge of seeking a divorce but reconciled later. He sought help from friends and relatives at times, when he could not afford to sustain his family financially. But they used to ridicule his far-fetched dreams and turn him away.

It was this attitude of theirs that steeled his resolve to

build the machine and prove them wrong. His determination, patience and confidence in his abilities kept him going. He dared to invest about Rs.4-5 lakhs from his meagre income, on making his dream a reality, over a period of four years inspite of severe family and financial pressures. In 2002, the machine was ready but he kept tinkering with it to improve its functions.

Current Status

When he was confident that the machine worked, Anil wanted to sell the technology. So he wrote a letter to the Chief Minister of Gujarat and the Governor of Gujarat. The Chief Minister's office advised him to contact the Industries Commissioner, who in turn asked him to contact a Patent Attorney in Bangalore. The Industries Commission, Govt. of Gujarat also contacted GIAN and informed them about Anil Kamdar and a few days later, a representative from GIAN visited Anil and documented his innovation. In early 2003, he was given financial assistance to improve and modify his innovation. The District Industries Centre of Godhra district also informed the media and a Zee News correspondent interviewed him in October 2002. GIAN has filed a patent application on his behalf and has also sought the help of a sewing machine expert to modify the machine with the active involvement of Kamdar. His machine has since then been showcased at various exhibitions and workshops and a prototype is available at the GIAN office. GIAN is simultaneously on the look out for entrepreneurs, interested in manufacturing the machine commercially. Currently the Technopreunal Promotion Program (TePP) Scheme of the Department of Scientific and Industrial Research, has agreed to support the development of the prototype.

Anil has also made a wooden model of a modified version of his prototype. The idea is to use this wooden design in calculating and designing a better machine or its parts the next time. This assumes relevance as the current prototype is crude and suffers from a number of limitations. Because of the play in the moving parts and components, the operation of the machine is noisy and the mechanism heats up. The machine is also big in size because the components have not been optimized.

An example to others

Anil believes that patience and courage can convert ideas into reality. *"I have never ever given up hope on anything ever since I was a child*," he says. His passion for innovating is evident when he reveals that he has also made a lock-stitch machine (used for stitching the hems of denim garments). He has also completed the design for a button-stitching machine. Apart from these has developed the design for a bicycle with gears which may travel at 50km/hr and will have greater pick up.

Questioning the prevalent attitude towards innovation, he says, *"We Indians tend to have a kaam chalao (laid back) attitude and make do with whatever is available, without attempting to improve things. Innovations are indispensable if a country is to progress. Products from countries like USA and Japan are considered the best, why can't we strive to be number one?"* Difficult indeed for a man to understand whose dream is to contribute in every manner possible to the welfare of his countrymen.

Double acting reciprocating pump[65]

CONSOLATION

Manubha Vaduji Jadeja (41), known by the nickname of Budhubha, hails from a farmer's family of Mundra Taluka of Kutchh district, Gujarat. Manubha has also served as the Vice Sarpanch (deputy head) of the gram panchayat (village council) for about a year and a half. Manubha's family consists of his wife and two sons.

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Scouted by
Pravin Rohit & Ramesh Taviyad

Genesis

In the monsoon-dependent Indian scenario, equipment for lifting water from the ground plays an important role in farming. As farmers face acute water scarcity due to the falling water table, accessing under ground water through an efficient reliable pump has become imperative. Having had first hand experience both in farming and in motor rewinding, Manubha knew that drawing groundwater by using submersible pumps was an unreliable and expensive preposition. This made him search for an alternative to draw the groundwater with lesser recurring cost and which small farmers could afford. Initially he started working on the single acting reciprocating pump. But discharge level of this kind of pump is very low and it also has fluctuating discharge because one stroke is idle out of two strokes in a cycle. Realising this limitation, Manubha thought of making both the strokes effective. The main problem he faced was in getting the parts most of which were not available readymade and so he had to get the parts fabricated and assemble the pump. Of particular challenge was the task of obtaining quality weld joints without losing mechanical alignment. Finally after about two years of hard work, he developed the innovative concept and working prototype. The cost of the pump without motor would be about Rs. 8,000 for 6" bore diameter and Rs.2500 for 3" bore.

The innovation

This innovation comprises a water lifting pump adapted to be operated by means of a prime mover through a balancing mechanism. It can be mainly classified as having two parts i.e. a pumping unit and a lifting mechanism

The pumping unit

The pumping unit consists of the piston, cylinder (Bi-housing body), valves, oil seal, sleeve, compression ring, piston rod and suction and discharge pipes. The pump works on the principle of reciprocation of the piston and the cylinder. Creation of vacuum resulting in suction and compressing of the water resulting in discharge is the basic principle of operation. Each cycle consists of two strokes. Both the strokes are effective and hence it is known as a Double Acting Reciprocating Pump.

Lifting mechanism

The lifting mechanism consists of the crank, coupler, walking beam and

connecting rod. Prime mover (electric power or diesel engine), belt and pulley, revolute joints and bearings are also the accessories of the mechanism. The mechanism works on the principle of four-bar linkage mechanism having single degrees of freedom and there is a provision of balancing the load in the mechanism.

Functioning

Using two chambers in the cylinder as well as a creative arrangement of valves, double acting is achieved. This water lifting pump can be installed in the well bore or any other suitable water source simply by increasing the length of the piston rod of the pump. Manubha has also developed an idea of balancing mechanism in this pump. In the conventional pump, weight of the piston rod remains unbalanced and so during upstroke, the lifting mechanism needs to carry the extra load of the piston rod. However during the down stroke the piston rod reduces the required workload. But, due to this, the total system suffers from an unbalanced load distribution throughout the cycle. By introducing the balancing mechanism, the innovator has introduced a system, where throughout the cycle, the load is uniformly distributed. Adjusting the weight of the balancing mechanism enables the smooth operation of the pump.

Advantages

This pump has a discharge of 220-litre/ min at a water head (discharge) of 18 metres. Unlike the single acting reciprocating pump, in this pump, both the strokes are effective and thus gives continuous water supply with no fluctuation in discharge. This pump can be operated by electricity or a diesel engine. Since the motor is above ground level, it is easier to maintain as compared to the submersible pumps. The unique balancing mechanism gives constant load distribution throughout the cycle- a desirable criterion for any mechanical system.

Apart from lifting water from deep wells, irrigation and water storage in overhead tanks, the pump can also be used easily in conjunction with sprinkler systems since the relation between discharge and flow pressure can easily be controlled, unlike submersible pumps where it cannot be controlled. The other applications for this double acting reciprocating pump could be in oil rigs, hand pumps and also in Auto/Fire extinguishers due to high pressure discharge of this pump.

Institutional support

Various institutions have been involved in promoting this innovation in terms of evaluation and product development. They are the Rural Technical Institute, Gandhinagar, LD College of Engineering and Nirma Institute of Technology as well as GIAN and SRISTI. The Department of Science and Technology has supported the project under the Technopreneur Promotion Programme (TePP) scheme. NIF has filed a patent application(28/MUM/2003, 08-01-2003).

The desire to be different

After completing his eighth standard, Manubha took to farming but due to frequent droughts in the area, he did not find it satisfactory. Then he worked as a truck driver for six years (1983-89) and in this period he gathered some knowledge regarding mechanical / electrical items. But because of risk and uncertainty involved in this, he quit driving trucks and worked for some time in an electrical motor repairing shop where he acquired quite a good understanding of motor repairing and winding. He did it for seven years and then left it as he felt that he was not utilising his ability there and he didn't want to remain an 'ordinary man'. In this period he also used to repair and service pumps of various types. After trying out these various options, he finally took up farming again in his 12 acres of land and utilised his innovative mind in developing the Double Acting Reciprocating Pump, which he believes will make the task of drawing water affordable to everyone.

Multi-purpose sprayer[66]

CONSOLATION

Mulubhai Senjaliya (38) is a farmer cum artisan of Vavdi village in Junagadh district, Gujarat. He studied up to the 5th Standard and then worked for about five years in a diamond processing unit. Later on, he started a small puncture repair shop in his village which he ran for about four years and then handed it over to his cousin. Now he is fully involved in farming and owns five acres of land. He is married and has a son and two daughters.

Genesis

The increasing cost of cultivation and maintenance costs of conventional big tractors and the limitations of bullocks have forced the farmers to look for alternative faster and productive ways. Fodder problem in dry regions has further necessitated the need for farmers to use mechanical means of traction and farm operation. But the machines available in the market are the 18 HP-45 HP big tractors which are expensive, less efficient in fuel consumption and are out of reach of poor farmers. Mulubhai needed something which required little upkeep, to till his land, as he had no other person to help him. So he set himself the target of designing a small 5.5 HP tiller and a multipurpose farm machine. He got the various components from different markets and made this tiller cum sprayer with his own efforts. This innovation is a vital versatile product within the reach of a common farmer for his diverse needs.

When this small and compact tiller having a spraying system was evaluated by other peers of Mulubhai such as Bhanjibhai who has also designed a 10 HP tractor, they said that the tiller had been designed very well especially as Mulubhai has made it very small by having the differential and the gear box together. Till date Mulubhai has made and supplied four units to other farmers. The diffusion potential of this device is high as it will be a boon for small farmers.

The innovation

The innovator has assembled a mini-tractor or a tiller unit which is a compact contraption and uses the stationary 5.5 HP irrigation engine along with the four speed and reverse gearbox and transmission of a Matador-307. The engine and gearbox is installed on a self-fabricated chassis having a four-wheel base. The front wheels use Maruti tyres and the rear wheels use Mitsubishi tyres. It has a diesel tank of 10 litres capacity. The unit is equipped with facilities such as steering; simple brake system etc to operate the vehicle. The tract width is 32 inches and the distance between the front and rear wheel is 54 inches. The device is started by hand cranking.

The 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. The pump can be operated with

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Scouted by
GIAN-West

the engine power and it creates sufficient pressure resulting in a uniform pesticide spray. The engine can carry a load of one ton.

This small contraption also has provision to attach small farm implements behind it such as plough, cultivator, shallow and blade harrow and seed cum fertilizer drill to perform normal agricultural operations like shallow ploughing, inter-culturing and sowing. It has a speed of 25 km on the road and 6-8 km in the field. This device is suitable for small farms and for a garden.

Advantages

Easy manoeuvrability, low maintenance cost and fuel economy are the useful features of this contraption. The tiller/multipurpose sprayer also has very high fuel efficiency, which is claimed to be one litre of diesel per acre of cultivation. This device costs about Rs. 90,000 which is affordable to an ordinary farmer compared to bigger 18 HP tractors costing about two lakhs rupees. This device completes ploughing of one acre in two hours consuming 1.5 litres of diesel per hour. For sowing or harrowing of an acre, it takes one hour and consumes 0.75 litres of diesel.

A creative spirit

Very creative right from childhood, Mulubhai has always been experimenting with new ideas. He has extensive practical knowledge in the area of farm machinery and always tries to fabricate the implements /machines himself rather than buy the same from the open market. He dreams of developing an under-sea missile capable of hitting enemy targets.

Remote operated device for firing crackers[67]

CONSOLATION

Balram Singh Saini from Pasiyala**,** Haryana is a third year B. A. student. In his free time he assists his elder brother in his electronic devices repair shop. Both his elder brothers, class eight and nine dropouts respectively, are actively into the field of electronics. Balram has also developed a pistol for firing crackers and is now working on a low power clothes iron. Apart from these technical pursuits, he also finds time to write novels and does some freelancing for local newspapers. The Honourable President, Dr. A.P.J Abdul Kalam has been a source of inspiration for Balram.

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Scouted by
Prem Sinh Saini

Genesis

Balram Singh Saini was quite disturbed by the news of mishaps caused by firecrackers during Diwali and once in 2001 when his nephew was injured due to a firecracker, he decided to develop a device to minimise accidents. He discussed the idea with his brothers and they encouraged. Till date, two prototypes have been built and tested and each unit costs about Rs.300. The first prototype developed by the innovator was a simple model having a strong platform for igniting a single cracker with the help of a remote control. This model was further modified for several crackers in model two. The third prototype with modifications and additional features is under development for better control and compactness of the design. This version of the device will run on LP gas lighter and will have an advancing feed mechanism to make the firecrackers move in one by one in sequence as the relay switch turns on and off and it would run on a 3V DC motor power supply. Some of the problems that Saini faced during developing this innovation were financial and lack of moral support from outsiders but he also remembers with gratitude, the constant technical and financial support offered by his elder brother, Prem Singh Saini. Balram wants to start his own manufacturing setup for his device provided he gets some financial help.

The innovation

This fireworks remote control firing and securing system consists of an ordinary Infra Red TV remote control unit(transmitter), an electronic receiving unit, switching circuitry, relay switch, separate LED for each firework loaded, separate heating element for each cracker, a timer for switching current to each heating element and a LED platform and attachment for holding fireworks/ crackers.

The remote control generates and sends the Infra Red signal to the electronic receiver. The receiving unit receives the signal and sends an electric current that runs through the timer and cables to the heater, which ignites the fuse of the fireworks. The heater is a coil made of tungsten wire or any other suitable heating element. This heating element is connected to the fuse of the fireworks. It has a base for placing a number of crackers (noise bombs) and a separate

attachment for holding aerial fireworks (rockets) connected to the base and a hollow pipe for holding or guiding the fireworks.

The device currently works on 12 V DC, which can either be fed directly from a DC power source/ battery or AC mains through a power supply. A timer is incorporated within the device to select each cracker one by one and this selection is indicated by the glow of respective LED beside each loaded cracker. Once the LED at a particular cracker glows, the signal from the remote can be transmitted at that instance to ignite that particular cracker.

Many kinds of firecrackers such as bombs, rockets and flower pots can be deployed on the mild steel base fireworks loading platform. This unit has the provision to keep up to 10 crackers simultaneously on the platform and choose the order of burning with the remote control unit. It is stationary at the time of usage but is handy and can be installed at any place and for various fireworks. NIF has sanctioned Balram Singh Saini a sum of Rs. 8,750 from the Micro Venture Innovation Fund for the prototype development and test marketing of his innovation.

Advantages

This is a unique and one of its kind solution for the Indian firework market. As it helps in maintaining a distance from the place of the ignition of the crackers, it saves the person who ignites the crackers from exposure to a very toxic mixture of gases which contains more than eight kinds of metallic compounds which are hazardous to human health. This is especially relevant as it has been recommended by the health agencies to maintain at least three metres of distance from the place of ignition of crackers. Further there is no need to buy a remote as any standard TV remote could be used. This device could also be used for scaring birds and animals in agricultural fields. Other applications could include bomb disposal, remote explosions in quarries and mining industries and by railways and road building authorities for the safe explosion of rock-faces and rock profiles from a distance.

Impact of the Technology

According to rough estimates, nearly 10,000 people get injured by crackers every year and most of the victims are children in the age group of 8-16. Growing concerns towards the menace of firecrackers has sensitized many in society, which is quite evident from the several cases of Public Interest Litigation in the recent past.

The impact of this technology would be enormous on our society, particularly, among those sections of society which use firecrackers extensively for expressing their joy. This device has great market potential especially given the fact that the crackers used during the Diwali season alone costs more than Rs.1000 crores and no similar device is available in the Indian market. Further this device is based on the innovator's understanding of the psyche of children as this device ensures that control of bursting crackers lies with a person who stays away from the actual place of burning.

Motorcycle sprayer[68]

CONSOLATION

Ganeshbhai Nanjibhai Dodiya (54) hails from Ghogha Samdi Village of Bhavnagar district, Gujarat. He has been tending farms ever since he was 12 and circumstances forced him to be familiar with agricultural machines and implements from a young age, since finding labour has always been a problem in that region.

He currently has 4.8 hectares of irrigated land which he inherited from his father. He also owns a tractor and a sizeable cattle-shed housing buffaloes, cows and goats. He cultivates cotton, bajri (pearl millet), jowar (sorghum) and tuver (pigeon pea - Cajanus cajan). Ganeshbhai did not go to school but later in life went to " Praudh Sikshan Kendra"– an Adult Education Programme of the Government for a few days and therefore now he is able to read and write to a certain extent. He has a daughter and three sons. Two of his sons are involved in farming and one is working in a diamond processing unit. The average annual income of the family is around one lakh rupees.

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Scouted by
Dilip Koradia

Genesis Ganeshbhai decided he had to somehow overcome the perennial labour shortage by developing some machine for pesticide spraying that would drastically reduce labour requirement. He was fairly well acquainted with several agricultural machines and was quite comfortable operating and repairing them. He was also a keen observer.

He once came across cement mortar being cured by spraying water on floorings, plasters etc. The task was accomplished by using a pump that was driven by a small motor or portable engine. He believed that a pump could be adapted to work as a sprayer as well. So, he coupled a pump to the prime mover he already owned — his own motorbike, a standard Enfield and it worked!

The Innovation

This innovative sprayer is mounted on an Enfield motorcycle and is powered by its 5 HP engine. The spraying of pesticides is done through a nozzle mounted on a spray boom installed at the back of the motorcycle. The pesticide filled tank is placed above the pump and gravity ensures that the pump is automatically primed, as the fluid tends to flow into the pump and flood the chamber. It has five openings-two are connected to the regulating valves to control the spray, one to the pump, one is the air inlet and one is connected back to the tank to return the excess fluid. Air enters the system from the inlet once the water is pumped. The regulator valves serve the purpose of balancing air pressure and controlling the outlet pressure. Water is pumped in the system and the returning water serves the function of stirring the mixture in the tank. As the motorcycle is driven between rows of plantation, the pump sprays pesticides on the crop.

The innovation can be attached to any Enfield Bullet motorcycle. The sprayer is used eight times a month during the three-

month long cotton-growing season and one acre of land (0.4 ha) requires roughly 300 litres of the mixture for spraying. This unit consumes three litres of diesel in three hours and can finish 1.5 acres at one go within an hour. The capacity of the tank is 70 litres.

The furrows of a cotton field are normally six feet (1.9 M) apart and one can easily ride a motorcycle through the field. The height of the sprayer is adjustable to suit the height of the cotton plant at the time. But when the crop is full-grown, it is difficult for a motorcycle to move in between the rows. For spraying at this stage, he made an arrangement in which the vehicle and the pump coupled to it are parked outside the field and a 100-feet-long (30 m) flexible pipe is used to spray the field.

Advantage

This is an extremely flexible product with adjustable height and width of spraying boom. Since a motorcycle requires less space to move it can be used in a more versatile manner as compared to power sprayers that are mounted on tractors. It is much simpler to assemble and dismantle and takes hardly10 minutes to assemble on to the motorcycle. Since the pesticide is sprayed at very high pressure, the spray is extremely fine and wastage of pesticide/insecticide is minimized. Since crops like cotton demand frequent spraying, this Enfield sprayer comes as a boon in times of labour scarcity. The spraying time is greatly reduced as the motorcycle mounted sprayer can cover more area in two hours than manual labour can cover in two days. This is also a highly energy-efficient product. The initial cost as well as operating costs of the sprayer is quite low compared to other power sprayers. It is also easier to handle and lighter than the conventional back operated knapsack sprayers. With this sprayer no extra labour is required as the farmer himself can cover the field.

Of great relevance

The most critical operation in cotton-farming is to protect the crop from bollworm and other similar pests. Repeated application of pesticide is the bane of cotton cultivation, although it is a lucrative cash crop. The comparatively small size of the cotton fields found in most regions of India virtually rule out aerial spraying for crop protection. More than 90% of spraying is done by manual sprayers like knapsack sprayers and foot pump sprayers. But these conventional sprayers are slow and require tedious manual cranking to operate. Another problem is the acute labour scarcity due to the movement of labourers toward cities for diamond cutting/polishing which pays quite high wages. Small farmers with limited land holdings cannot afford to buy the tractor-mounted sprayers or power sprayers available in the market, as these are very costly. Thus

due to the inability to spray the fields quickly and effectively, the small farmers have their crops wiped out by pests. This motorcycle operated sprayer of Ganeshbhai's offers a solution to most of these problems.

Technology diffusion

Ganeshbhai has made a prototype for his own use. About 40 cotton farmers in adjoining districts have adopted the technique especially as most land-owning households in the Saurashtra region have motor cycles, which is a multipurpose and durable vehicle for them.

A few farmers have also made their own machines incorporating some modifications and gone ahead. Mansukhbhai Jagani, another innovator who lives in Amreli district, was asked to evaluate whether this innovation could be so modified that it could be attached to any motorbike instead of just one model. Mansukhbhai accordingly made some alterations so that this unit can be fit on any motorbike. This innovation was supported by the Department of Scientific and Industrial Research, GOI, under Technopreneurial Promotion Programme (TePP) through GIAN (West) in the year 1998-1999.

This innovation was one of those from India displayed in South Africa on June 12-14, 2002 in an exhibition organized by the Department of Small, Medium & Micro enterprises (SMME) of Northern Provinces, South Africa jointly with the Commonwealth Science Council (CSC), London.

Adding Value?

How an innovator can sometimes feel betrayed in the process of value addition is brought out in the case of Ganeshbhai Dodiya. Students from IIT-Bombay took up a project to add value to his motor cycle driven sprayer. At the time of the Science Congress held at Pune in January, 2000, he was invited to showcase his innovations. When the improved sprayer was brought for display from IIT, Ganeshbhai got upset. He would not call this so called improved sprayer as 'his' innovation. When media approached him to pose for a photograph, he would not agree. When the reason for his displeasure was probed, he pointed out that in the so called improved sprayer; the power was drawn from the wheel. Thus when the motorbike would be standing still, the sprayer would not work. Whereas in his design, the motive force was drawn from the engine. The motorcycle might be still but the engine could work and power the sprayer. Everyone involved learnt a lesson from this incident- all realised that it was very important to draw upon the innovator's own vision while trying out improvements. At the same time, it is interesting to note that after a while Ganeshbhai lost interest in his innovation. He asked GIAN to take up the further value addition and business development through any other innovator or entrepreneur since he wanted to focus on his farming.

Dual purpose sickles

CONSOLATION

Kishorebhai Ranchhodbhai Bharadwa (44) is an artisan from Galvav village of Junagadh district, Gujarat. The eldest amongst four brothers he has studied up to the 10th standard. The original profession of his father was making pottery and later on he shifted to carpentry and fabrication work. After his SSC, Kishorbhai got admission in the Industrial Training Institute for a technical course but during the same time his father lost his finger in an accident. Suddenly all the responsibility came on Kishorebhai's shoulders and he had to leave his studies. He started manufacturing farm implements such as harrows and ploughs for bullocks and tractors as well as iron grills for doors and windows. Later on his two brothers, who studied up to the 12th and 7th standards, also joined him in the workshop. Kishorebhai has about 23 years experience in repairing and manufacturing farm implements and he is famous for quality work in the surrounding villages. He is married with a son and two daughters. He has a workshop of about 100 sq.yard area and his annual income is about Rs. 25,000 to 30,000.

Address
At. Galvav
Ta. Manavadar,
Junagadh Gujarat

Scouted by
Jayantibhai Patel &
Amrutbhai Agrawat

Genesis Kishorebhai and his father are famous in Galvav and neighbouring villages as experts in farm implements. Farmers would often bring their problems concerning their tillers, hoes, ploughs, trailers, etc., to Kishorebhai and would mostly get appropriate solutions. In 1995, a group of people from a nearby village had come to his workshop for some such work. They were quite satisfied with the solution provided by him but before leaving they wondered why it was that Kishorebhai had not come up with any new ideas despite being such an accomplished artisan. Kishorebhai parroted his father's words, "New ideas are for the wealthy and educated folks. When you eke out a hand-to-mouth existence, it is but impossible to innovate." But Kishorebhai's customers were not satisfied with this reply and kept on nagging him to come up with some worthwhile idea and bring fame to the area. One common need these farmers approached him with was for getting their grass-shearing knives sharpened; as the shearing blades usually got blunt after cutting grass for a period of between eight to ten hours. This led Kishorebhai to think up an idea for improving the life of the tool between resharpenings. Thus he designed the three types of sickles, which had features to address specific difficulties.

The innovations

A normal sickle has a long blade with a wooden handle. One has to sharpen the whole blade when it gets blunt. Repetitive sharpening of the blade makes its base thin and one has to discard the sickle and buy a new one, after four to five times of sharpening. To avoid this, the innovator has developed three different types of sickles.

The first type of the improved sickles incorporates two C-shaped, metallic guard plates, with a thin blade sandwiched in between. The blade is fastened in position

through screws near the wooden handle. So whenever there is a need to sharpen the blade, the thin blade can be removed and sharpened and then fixed back to the iron base. The user need not rush to the workshop with the blunt sickle.

The second type of sickle is two-sickles-in-one. The two sickles face opposite directions and are joined together at the base near the wooden handle. Kishorebhai avers that this sickle is good for cutting tough grass, silage or hay. Using the right grade of steel, the shaping of the teeth and the edges have been so fashioned that the blades retain their keenness. If the blade on one side gets blunt, the other side can be flipped and used.

The third type of sickle has a concave shaped edge for harvesting crops, while on the top of it; a small pointed metal piece is attached between the sickle and the handle which is used for removing weeds and also to break soil clods.

Advantages

These sickles are multi-purpose and can perform different functions of harvesting, interculturing and weeding. They provide ease of handling and maintenance to the farmer and labourer. Furthermore they are cheaper than the combined costs of conventional tools used for these specific processes. The first model costs Rs.90, the second one Rs. 65 and the third model is priced at Rs.55. The replacement cost of the blades is Rs.15-20.

Current status

These improved sickles have had quite a satisfactory reception from the villagers. However, the adoption rate has been extremely slow. Most villagers find the sickles quite useful but the price is beyond their paying capacity as the normal sickle costs only Rs.30. Only three farmers have purchased the improved sickles; the rest come and borrow these sickles from him. Both Kishorebhai and his father Ranchodbhai are quite disillusioned that they are unable to muster adequate financial support to popularise their sickles. They feel that sustaining the innovative spirit needs economic support, which they did not have adequately. Now NIF has sanctioned Kishorebhai Bharadwa a sum of Rs. 8,250 from the Micro Venture Innovation Fund for pilot production and test marketing of these Innovative Sickles.

Relevance

Hand tools are particularly important for small farmers and labourers who can neither afford nor require mechanised implements for farming operations like sowing, ploughing, harvesting, inter-culturing etc. Even a small improvement in these hand tools can lead to large-scale improvement in productivity or in working conditions across the country. However, de-centralised production and small scale of operation has not allowed these hand tools to undergo notable changes over the years. So it is left to small local artisans and farmers to make innovations in the tools to improve their functioning.

Innovative in spirit

Currently Kishorebhai is working on developing an innovative refrigerator without using electricity. According to him, the gas currently used in refrigerators is harmful to the environment. Also electricity supply in villages is irregular and therefore the conventional refrigerator is not a viable option. The refrigerator proposed by him claims to also save energy. He also wants to make a *santi* (poly-cultivator or multi-purpose agro tool bar) that will be drawn by a single bullock. He has one sincere wish- that the attitude of the government towards artisans would change for the better. Hopefully, his wish will come true one day.

Small diesel engine for motorbike[70]

CONSOLATION

Mansukhbhai Sanchaniya Suthar, (60) hails from Atkot village, Rajkot District, Gujarat. He has studied upto the fifth standard. He owns a service centre for automobiles, named "Ravi Auto Diesel Services" and has about 40 years of experience in repairing diesel and petrol engines. For 15 to 16 years he was a carpenter, after that he became a lathe operator and worked for a few years in "Jagtat Diesel Engineering" at Atkot which made 5.68HP diesel engines. After getting a lot of experience from the same shop, Mansukhbhai purchased a lathe and some other machinery and in 1972, he started his own workshop, Vishwakarma Mechanical Works. Initially he manufactured threshers, pumps for lifting water and repaired diesel engines and other machinery useful for rural livelihood. But because of his financial situation and the market competition, he shut his manufacturing unit and started this automobile workshop in 1982, which is now his main source of income. His two elder sons are helping him with the workshop while the youngest son is a painter.

Address
Ravi Auto Diesel Services
Kailashnagar, Rajkot – Bhabnagar Highway
Vill.- Atkot, Ta- Jasdan
Dist- Rajkot, Gujarat

Scouted by
Jivrajbhai

Genesis Eight years back Field Marshal Company brought a diesel engine from Germany and displayed it at an exhibition held in Rajkot. Mansukbhai went to see the engine and got a chance to talk with the chief engineer of the Field Marshal Company. Mansukbhai asked whether the size of the machine could be reduced. The chief engineer told him that it was not possible. Then and there Mansukbhai took it as a challenge to develop such an engine. In the process he faced a number of problems, the engine got heated up and even got burnt a number of times. He had to make changes in the material used as well as timing and grades of oil. Mansukhbhai remembers that people kept on saying that he was wasting his time, but he kept focusing on his work, ignoring what people said. Finally he made his dream come true by developing a 3.5HP diesel engine. He spent almost 4.5 lakhs on building the first prototype in four years. But he asserts that the present design of the modified engine can be produced within Rs.12, 000. Mansukhbhai has not sold any engine commercially till date.

He has received a Sammanpatra from SRISTI in 2003 for this innovation. It has also been featured in three newspapers Ruttan Prabha, Gunnargartan and Vishwakarma vishwa. NIF has sanctioned him Rs.31, 375 from the Micro Venture Innovation Fund for prototype development and testing of the innovation.

The Innovation
Mansukhbhai has developed a four-stroke compression-ignition diesel engine with a swept volume of 205 cubic cm which is capable of developing a brake horse power of 3.5 at 4500 rpm. Almost all the main parts of this engine are made of aluminum while in the conventional one they are made of cast iron. As

thermal conductivity of aluminum is quite high, it helps in quick transferring of heat. The size of the flywheel has been increased and this contributes to increasing the speed of the engine. The dimension of plunger has been decreased from 6 mm to 5 mm so the compression of the fuel is better and fuel is converted into fine form more quickly. The dimension of the plunger guide is changed so the number of gears required is reduced. The dimension of the crank rod has been reduced leading to a reduction in stroke length and increase in speed. In the conventional diesel engine, there is bushing (which needs lubrication to counter wear and tear) in the piston, while in this one the innovator has used bearing. The diameter of the injector and the number of holes on the injector is less compared to the conventional one and hence injection is at higher pressure and this helps in better ignition. Diesel is converted into spray more quickly as the dimension of the nozzle is reduced. The injection system i.e. fuel and compressed air injection system are at right angles to the engine body, so it takes around five minutes to fit it, while in the conventional one it takes about one hour.

The innovator has also developed a 7.5 HP diesel engine weighing 35 kg.

Advantages

The main feature of this innovative engine is its compact size which is almost half of the conventional diesel engines of similar ratings. It is also one third the weight of the conventional diesel engines and weighs only 24 kg as major components such as engine block; cylinder head etc, are made of special aluminum alloy. It has a high strength to weight ratio which is essential for mobile applications. The engine has an improved cooling system wherein the sizing of the fins and orientation of the engine block in the vehicle frame ensures optimum dissipation of excess heat to keep the engine running efficiently. The quantity of lubricant used is only 600 gm as compared to two litres used in the conventional one. The design requires less maintenance and repair. When mounted on a motorcycle (Rajdoot brand) used in rural areas, a mileage of 100km/litre and speed of 55 km/hour was achieved along with a pillion rider. Due to its small size and light weight construction, it can be used in two wheelers and for various other applications such as pumps, mini-flour mills, lawn mowers, motor-boats, small elevators, portable power generation sets etc.

Moving forward

Mansukhbhai has a very good reputation among diesel engine manufacturers and has been called by many top level engine manufacturers (like P M Diesels Ltd) to solve the problems of their company in the area of R & D in engine technology. Now he is planning to develop an engine that can be run using any fuel like petrol, diesel and gas. He also has an idea for making a two-piston tractor. Mansukhbhai had also earlier developed a lathe machine for diamonds, a groundnut separator and a drilling machine. He attributes his interest in innovations to the influence of his mother, who was always making toys from waste clothes, with new designs etc. Even at the age of 60, he travels to Rajkot frequently, is active on the lathe machine in his own workshop and is ready to take up challenges for any development in the engineering area.

Bicycle mounted sprayer[71]

CONSOLATION

Mansukhbhai Jagani (40) the farmer cum artisan with a passion for mechanical innovations hails from Mota Devaliya village in Amreli district, Gujarat. He is the principal breadwinner of his family consisting of his wife, three daughters and a son. The eldest among four brothers, Mansukhbhai went to school only up to the primary level and then due to the weak financial condition, joined his father in agricultural work. He later worked in a diamond-cutting-and-polishing factory in Surat for some time. He also worked as a farm labourer in various places when there was no work in the diamond-polishing industries. Being dissatisfied with this work, he then returned to his village and got informal training for about a year in iron welding and fabrication works. Thereafter he started a small repairing and fabrication workshop in his own village and for the last 22 years, he has been running this workshop. He provides services to the villagers for repairing diesel engines, farm implements and also manufactures and sells various farm implements like harrow, plough, seed drill and grills for doors and windows.

Address
Vill: Mota Devalia
Tal: Babara,Amreli - 365 410 Gujarat

Scouted by
Mahesh Parmar

Genesis

Aware of the problem faced in the spraying of agrochemicals in the field, Mansukhbhai, decided to develop a sprayer which is efficient and affordable by the farmers. He decided to mount the sprayer on a bicycle, which can be found in every household.

He took a conventional bicycle and changed the position of the central sprocket to the rear wheel and rear to central sprocket. At the central sprocket, he also replaced the pedals and attached piston rods, connected with the mechanical brass cylinder pumps on either side. He put a 30 litre PVC storage tank on the carrier which serves as an input to the cylinder and also attached a four feet long spray boom with nozzle along with accessories for adjustment to either side of the bicycle carrier. After working hard for eight days, he succeeded in developing the innovative bicycle operated sprayer. He later made another prototype in which he put two tanks of 20 litres each on either side of the bicycle for ease of balancing. He has sold three units till date.

The Innovation

This portable spraying system is an assembly of a modified sprocket-pump assembly, tank and an adjustable sprayer boom. It can be mounted on any bicycle available in the market. A drum containing the solution is firmly attached to the frame of the bicycle. The reciprocating pistons are connected to the sprocket with linkage mechanism. A number of spraying nozzles are connected to a manifold and their direction and height are adjustable according to requirements. The arm containing the nozzle holding manifold can be folded back while not in use. The driving sprocket and the driven sprocket are interchanged from their usual position in a conventional bicycle. The bigger sprocket is fitted to the wheel hub and the smaller sprocket is the driven one. While pulling along the bicycle, the forward

and backward movement of the bicycle through the chain and modified sprocket arrangement is transferred to a pump assembly which pumps air into the tank to generate pressure for spraying through the sprayer boom nozzles. The flow of the liquid from the tank to the spray boom and vice versa can be adjusted with the help of control valve. Both portability and drive are provided by parts of the bicycle.

Advantages

This sprayer is energy-efficient and easier to operate and maintain. As it is a flexible product with adjustable height and width of spraying boom there is greater flexibility for using it for various crops. Further, the bicycle requires less space to move, therefore it can be used in a more versatile manner as compared to power sprayers that are mounted on tractors. A labour saving device, it can be used to spray one acre of land in 45 minutes thus covering more area compared to manual spraying. It is easy to assemble and dismantle. It serves the dual use of sprayer cum bicycle. It costs Rs.2200 (excluding the bicycle).

Relevance

The knapsack sprayers generally used by farmers involve continuous pumping by one hand while holding the sprayer with the other. The whole process of spraying is thus very tiresome and also leads to hand, back and neck pains with prolonged use for any scale of operation with heavy backload. Also this device requires a lot of time to cover the bigger spraying operations which increases cost for spraying as well as the hazard of pesticide mist getting into the eyes. Manual labour has also become scarce due to the migration of farm labourers towards cities. Other options like two-wheel mounted and tractor mounted sprayers, are too expensive and not of much use in small holdings.

A series of innovations

Motorcycle driven multi-purpose farming device (Bullet Santi)

In 1994, Mansukhbhai Jagani, developed an attachment for a motorbike to get a multi-purpose tool bar. This addresses the twin problems of farmers in Saurashtra namely paucity of labourers and shortage of bullocks. This motor cycle driven plough (Bullet Santi) can be used to carry out various farming operations like furrow opening, sowing, inter-culturing and spraying. Mansukhbhai's intermediate-technology contraption proved efficient and cost-effective for small-sized farms. It could plough one acre (0.4 ha) of land in less than half an hour on just two litres of diesel oil. Using motorbike-santi, the cost of weeding a typical field was found to be just Rs 8/ha because as much as 10 ha land could be covered in a single day.

A seed-cum fertiliser dibbler

Jagani has also developed a seed-cum fertiliser dibbler. This device enables more efficient sowing, faster and cheaper than other options available. This equipment is helpful in both sowing the seeds and fertilisation of the crops which require fertilisers to be impregnated in ground, near their roots. Wastage of seeds and fertilisers is prevented. Due to uniform sowing the germination percentage is also increased.

Recognition for rural talent

Mansukhbhai Jagani bagged the second prize in the first annual competition for honouring grassroots technological innovations conducted by the National Innovation Foundation in the year 2000 for his Bullet Santi. This innovation was also displayed at the Indian

Science Congress, 2000 at Pune as well as at the Swadeshi Vigyan Mela at IIT, Delhi. He also got the opportunity to display his innovation in South Africa in an exhibition organized by the Department of Small, Medium & Micro Enterprises (SMME) of the Northern Provinces jointly with Commonwealth Science Council (CSC), London, on June 2002 with the help of SRISTI and NIF. At the exhibition, he had the occasion to demonstrate to a distinguished audience the retrofitting of a two-wheeler with a pesticide sprayer. Since only bicycles are available with Northern Province farmers and not motorbikes, Mansukhbhai mounted the sprayer on a bicycle on the spot. The knowledge and skill of this rural genius impressed everyone present. In fact, Mansukhbhai's motorbike-polycultivator is considered a typical example of a product with global applications. With design inputs from NID, Ahmedabad, help in patent-application-filing from the Boston based THT law firm and business-plan development by Sloan School of Management of Massachusetts Institute of Technology, the innovation has literally gone places. NIF has sanctioned him Rs.20, 000 from the Micro Venture Innovation Fund for pilot production and test marketing of the bicycle sprayer. the

Hand driven sprayer[72]

CONSOLATION

Gopalbhai Surtia (50) is a farmer from Katholi village in Baroda district, Gujarat. He has studied upto the 8th standard. He has about 12 acres of land. He is married and has two sons. His father, Shri Parakram Singh, is a quite renowned singer of Gujarati traditional "Bhajans" and is still actively involved in farming at the age of 75. Gopalbhai's elder son is also involved in farming while his younger son is a professional singer.

Genesis Gopalbhai has developed an innovative "Hand Driven Sprayer "for spraying pesticides in the cotton crop. Gopalbhai conceived this idea because of the labour shortage and the difficulty he experienced in carrying 15 kg of weight on his back when using the conventional knapsack sprayers. He started working on this idea in 1997 despite opposition from his family members but now everyone is happy with him due to his success. Even neighbouring farmers borrow his pump now.

Value addition on this device has been done by a student of NID (National Institute of Design) under GRIDS (Grassroots Innovation Design Studio). This technology was transferred by GIAN (West) on non exclusive basis to M/s Nilgiri Industries of Ahmedabad with sharing of benefits with Gopalbhai.

The innovation

The sprayer consists of two wheels of a conventional bicycle, piston assembly, iron chassis and spray boom accessories. Two wheels are mounted parallelly at a distance of 2.5 feet on a self-made iron chassis. A small wheel is kept in between in such a way that it would convert the circular motion of the wheels into the reciprocating motion of the pump piston with the help of an eccentric connecting rod. A 20-litre barrel is put on the same chassis. While the unit is pulled manually, due to the motion of the wheels, the small wheel at the middle is rotated. This rotation helps in the reciprocating motion of the piston of the pump. This in turn, generates pressure and the liquid is sprayed through the nozzles fitted on the spray boom.

Advantages

The barrel for storing pesticides can be customized according to the needs of the user. The nozzle and spray boom can be adjusted as per the requirement of spraying. It costs around Rs. 3500 only. In addition it is extremely easy to maintain and repair. This sprayer can spray one acre of land within 5-6 hours.

Innovative in spirit

Gopalbhai has always been experimenting with new things as part of his daily life. But as his family has often tended to discourage such new experiments, he works mostly in the night when everybody is asleep. His next idea is to make a robotic bullock (Iron Bullock) for agricultural use. He has also got plans to give training to small monkeys to use them in agriculture operations like weeding, inter-culturing etc. According to him, animals are always loyal to human beings and if they are trained properly, the problem of labour shortage could be overcome to some extent.

Address
Katholi village, Sankheda
Baroda-391145

Tricycle mounted sprayer[73]

CONSOLATION

Subhash Vasantrao Jagtap (55), hails from Shendurni in Jalgaon, Maharashtra. His formal education ended with the seventh standard. He is a local fabricator and has a workshop named Sachin Welding Works in Shendurni. He has been engaged in this work for the last 25 years. He is married and has two sons and a daughter. He has a monthly income of Rs.3000.

Address
Vill: Shendurni
Tal: Jamner, Jalgaon
Maharashtra

Scouted by
North Maharashtra University

Genesis Carrying heavy cylinders of pesticide on the back and spraying continuously by hand on the fields is a tedious and back breaking practice. Once during the spraying season, Subhash was discussing the problems faced by a farmer while spraying. The major problems are the weight of the structure the farmer has to carry on his back and secondly, the irritation and skin diseases caused due to direct contact with the pesticides. Then the idea struck him of developing a mobile spray pump that would solve both these problems.

He used an old throw-away bicycle and household utensils to develop a prototype of the mobile spray pump. He purchased two 16 inch wheels. He indigenously fabricated the chassis out of household utensils and the pump out of brass utensils because the components he required were not readily available in the market. He also bought some spare parts from the local market and fixed them on the cycle. He went through various steps in developing this innovation. Sometimes he failed but after about nine months he succeeded in making the final prototype.

Subhash also mentions that he took inspiration from the 'Kisan King' hand driven sprayer developed by Gopalbhai Surtia, consolation award winner of the Third National Grassroots Technological Innovations and Traditional Knowledge Competition conducted by NIF. Subhash saw a model of this in an exhibition, held in Pune in 2002. He thought about the shortcomings in that model and improved upon it by indigenously fabricating the components of the sprayer and introducing the spray drive engagement and disengagement feature as well as the ability to spray horizontally as well as vertically. He recollects that his family was initially hesitant about his idea because the innovation was affecting his regular work and income but once he succeeded they felt very happy and proud that he has created something new, different from his routine work. There were also a number of comments when he was working on the idea that this was a very simple device, but he did not let any of this affect him as he has complete belief in his creativity.

The Innovation
The unit needs to be pushed by the user. The wheels are attached to the chain and sprocket arrangement through the axle of the wheels. A chain-sprocket drive transmits the motion from the axle of the wheel to drive the pump which can be engaged or disengaged by a shifter

mechanism. When it is engaged with the sprocket, the pump starts reciprocating with the help of the four bar mechanism attached to the axle. This reciprocating motion generates the pressure inside the pump and imparts momentum to the fluid and this is sprayed with the help of nozzles. This neutral gear acts as a switch to get the liquid supply whenever desired. When it is disengaged from the sprocket, the pump is free and the structure can be moved without spraying any pesticides and hence the farmer can take the mobile spray pump anywhere without the fear of wastage of the pesticides.

Advantages

The entire unit is simple in its structure and easy to repair and maintain. The tank attached to the unit has a capacity of 25 litres. The advantage of the device lies in its easy manoeuvrability and ease of operation. The cost of this unit is about Rs. 5000. Another advantage is that the spray boom can spray both horizontally and vertically and in addition to the boom there is a flexible pipe which can be used to spray trees and tall crops. The product can be effectively used in fields with hard soil, low crop length and a distance of three to four feet between the rows for e.g. cotton, peas etc.

Current Status

He has fabricated a prototype of the innovation and leases the unit to the farmers for spraying pesticides on their fields. He has taken the innovation to North Maharashtra University and it has been tested at the Godavari College of Engineering, Jalgaon. It got a good response wherever it was shown. He was also felicitated by his community at various functions and meetings and he claims with pride that now people know that in his workshop something new is always being made. This innovation has been covered in the newspapers but he has not sought any publicity. Local experts also have heard about the innovation and think that it will be useful. They feel that it is different from existing devices as it has a good water tank capacity and three nozzles. He wishes to transfer the technology to an entrepreneur who is ready to purchase the technology.

An innovative family

Subhash Jagtap possesses good analytical skills and has indigenously developed many fabricating machines. He has also developed a forging machine, drilling machine and a plywood-cutting machine in his own workshop to suit his requirements. Subhash is currently working on a device that will be operated with the help of bullocks and which would use the weight of man and bullocks to operate a pump and lift/fetch water. His dream is to keep on making devices which are useful for the common man.

Subhash takes after his father in his innovative spirit. His father was a turner in Indian Railways during the time of the British. At the age of 16 years, his father succeeded in making one important part for the railways and from that day he was selected by the railways. Since he was under age he was asked to wait for a couple of years before entering in service. During his service, his father was rewarded many times for his outstanding work.

Mentoring

Jagtap has also helped his farmer friend, Gopal Bhise, recipient of consolation award in the Second National Grassroots Technological Innovations and Traditional Knowledge Competition conducted by NIF. Bhise had developed a multi-purpose farm implement fashioned out of inexpensive bicycle components. Various attachments connected to this device enable it to be used as a bicycle weeder, tiller and harrow. This device is very easy to operate and is ideally suited to the needs of marginal farmers who cannot afford to maintain bullocks. Subhash Jagtap had helped Bhise in manufacturing this device and also in motorizing it.

Auto compression sprayer[74]

CONSOLATION

Arvindbhai Patel (48) hails from Vanch, a village 10 km from Ahmedabad in Gujarat. The youngest in a family of three sons and three daughters, Arvindbhai had only his own motivation to pursue his studies as no one else in his family had any formal education. After completing school in 1972, he got admission at Shri Vivekanand College, Ahmedabad for the undergraduate course in Commerce. After struggling hard for a year trying in vain to cope up with college studies in English medium he had to eventually quit. For two years, he worked in an automobile garage in Ahmedabad where he received practical training as an automobile mechanic. In 1980, he got an opportunity to travel to Saudi Arabia, where he worked on the latest models of automobiles. After finally coming back to India in 1984, this accomplished technician and fabricator has been pursuing his passion for innovations.

Address
92, Pragati Park-2, Nr. Dhruve High School
B/h. Dhiraj Housing,
Maninagar Ahmedabad
Gujarat

Scouted by
GIAN-West

Genesis In case of conventional sprayers, spraying is done by continuous pumping by hand. This monotonous work tires the user after some time. In addition shortage of labour is a big problem for farmers especially as spraying has to be done at a particular time, failing which the pest attacks can be a serious problem.

Arvindbhai tried to think of some means by which the monotonous job of hand movement could be avoided. In conventional sprayers the basic means of oscillation is done by hand. He observed that during walking, parts of the body also generate different kinds of motion and he felt that this motion could be utilized for the oscillation of the piston in the cylinder. Arvindbhai hit upon the unique idea of magnifying these jerks by using some additional weight. So he used a spring and additional weight to magnify these jerks to generate the requisite pressure in the tank to spray the pesticide. This device thus works on the concept of dead–weight oscillation which causes the reciprocation of the piston and results in spraying action.

The Innovation

Arvindbhai used an iron tank to store the liquid. He chose iron, because the pressure generated in the tank is very high and a weaker material may not be able to withstand that pressure. A piston assembly is attached in the middle of the tank with an extended spindle coming out of the tank. A spring is provided on this extended portion of the spindle. The piston is attached to a weight of almost 5 kg on the upper side, which rests on this spring.

The sprayer is mounted on the back of the user, like a regular knapsack sprayer. When the user walks with the sprayer mounted on his back, jerks are transmitted to a dead weight, which rests on the spring. Due to the jerks of walking, the spring is compressed, pushing the piston downwards. Once the spring reaches the bottom, it bounces back /rebounds and pushes the weight upward, thus pulling the piston upward and one stroke is completed. The cycle continues and pressure is generated in the tank due to subsequent strokes of

the piston. This pressure is used to spray the liquid in the tank through the nozzle of the dispensing unit.

Arvindbhai has now modified the configuration of the auto – compression sprayer and made a new model in which the oscillation rate of the dead weight is intensified. Two storage tanks have replaced the single one as used in the previous design. The dead weight is placed in the intermediate gap between the tanks connected by a common pipe. To avoid alignment problem the dead weight is hung at the bottom instead of the top as in the previous design. In this new model, a pipe guides the spring to avoid oscillation. Each tank has a capacity of seven and a half litres and thus the total capacity of the device is 15 litres. The cost of this sprayer is expected to be around Rs. 3500.

Advantages

The main advantage of the device is that it does not require any extra energy/torque for spraying. It is extremely energy efficient, easy to operate and produces an extremely fine spray. It is also easy to repair and requires less maintenance. There is no comparable pump available in the market which works on a similar principle. This device eliminates the tiresome and repetitive manual pumping action needed in standard back mounted pump-sprayer units.

Current status

Patent application has been filed by NIF. The technology has been licensed with the help of GIAN (W) to an entrepreneur in Ahmedabad on non-exclusive basis. The entrepreneur is helping Arvindbhai to convert the crude model into final working prototype. It is possible to license this technology to other entrepreneurs as well.

Arvindbhai also has plans to provide two spray nozzles to get double the output after increasing the pressure by piston-chamber optimization. Then the operator can cover two parallel rows simultaneously and thereby cut down the operation timing by half.

Innovative works of Arvindbhai

Harnessing the Sun

One day in 1978, while on his way from Ahmedabad to his village, Vanch, Arvindbhai met Prof. A.R.Patel of L.D. Engineering College, Ahmedabad. During the course of their conversation, the topic of solar energy cropped up. Arvindbhai developed a fascination for solar energy, which drove him to fabricate a 50-litre solar water heater in 1985. He used HDPE/PVC for the storage tank and straw of *bajra* (pearl millet) for insulation. Between 1985 and 1990, he made eight different models for trying out different materials and correcting the flaws or deficiencies he came across until he was fully satisfied. He has sold two-dozen solar water heaters of different capacities- 50, 100, 200 and 500 litres.

Auto air-kick pump

Arvindbhai has also developed a novel auto air-kick pump, to inflate the tyres of scooters and motorbikes, which uses the built-in kick-start mechanism of the vehicle. The compression obtained in the air in the cylinder of the engine while cranking is utilized and this compressed air is transferred to the tube with the help of this device. It is handy, portable, light in weight, compact in size, easy to use, flexible, self-repairable and the best alternative to a spare wheel. Arvindbhai believes that every scooter or motorbike rider should have this gadget and maintain optimum tyre pressure on daily basis as this contributes to fuel conservation also. He was awarded for this innovation in the second national competition of NIF. GIAN has helped him in commercialising this technology.

'Natural' Water cooler

The idea of the water cooler had come to Arvindbhai when he was suffering from severe fever once. His wife used to apply a cold pack to his forehead repeatedly to give relief from the high temperature. He used this vapour-absorption principle for getting drinking water cooled. The cooler is useful for supplying cold drinking water in the hot summer, particularly in areas where the availability of electricity is absent or erratic. Arvindbhai developed his no-electric-power, 'natural' water coolers in three different capacities of 5, 10 and 20 litres. He sized the components to ensure that the temperature of the water at the outlet was at least 5 to 10 degree Celsius lower than the ambient temperature. About 20 units have been sold and are in use. GIAN and SRISTI have helped him in commercialising this novel water cooler.

Harnessing wind power

The idea of harnessing wind power struck Arvindbhai one day in 1996 when he was looking at clothes drying in the wind. He used a curtain, a rod and an air pump to fashion a rough model of a wind tunnel. After several experiments and fabricating different models, he came up with a horizontal "Low Air Thrust Multi-curtain System". The device, Arvindbhai visualises, can be beneficially used for pumping water, heating water, inflating tyres, drip irrigation and even for running a grinder/juicer. He obtained a provisional patent for this device in 1997.

Kite reel holder

Even his children have been instrumental in triggering off ideas in Arvindbhai for new innovations. Normally, while one person flies a kite, another person holds the reel, allowing it to unroll as per requirement. Once during the kite festival, his daughter refused to hold the reel for her brother who was flying the kite. To settle the children's quarrel, he designed a new reel holder to wind kite thread. With this new holder, a person can fly a kite without an assistant to hold the reel. The holder, which is made of a light metal, allows the thread to wind and unwind easily and it moves in the direction of the wind.

User-friendly tongs

When posed with the problem of developing user friendly tongs for the kitchen, Arvindbhai developed some tongs which are very simple and consist of an adjustable knob, guide shaft and holding loops. All the parts are made of aluminium and it is quite easy to handle as well as quite reliable and adjustable with the facility to use the device for variable size of utensils.

The struggle for formal support

Arvindbhai had contacted various agencies, which are supposed to encourage application of renewable sources of energy and assist in the development of equipment in the sector. He appealed to establishments like Gujarat Energy Development Agency (GEDA), Department of Science and Technology (DST) and Council for Advancement of Peoples' Action and Rural Technology (CAPART) seeking funds for validating and perfecting his innovations. But there was no positive response and he became extremely frustrated.

In May 1998, he saw an advertisement released by the Ministry of Non-Conventional Energy Sources (MNES), Department of Science and Technology, which invited innovators to seek any assistance they desired. He wrote a letter to the department giving details. Unaware of how the bureaucracy functions through countless cogs and wheels, he went to Delhi thinking that it would expedite matters. He went straight to the Prime Minister's official residence where he met one of the personal assistants to the PM. This PA was considerate enough to mark the letter to the concerned ministry. The Central ministry forwarded the letter to GEDA, asking the Agency to look into the matter. Accordingly an engineer from GEDA, Mr. R N Pandey was asked to see the innovations and submit a report to New Delhi and he visited Arvindbhai in August 1998. He also recommended changes to a water-cum-air cooler developed by Arvindbhai and told him to focus on one application. On his advice, Arvindbhai modified his innovation accordingly.

Arvindbhai acknowledges that after his initial struggles, various organisations stepped in and helped him to different extents to realise his dreams. Notable among them were SRISTI, GIAN, Sardar Patel Renewable Energy Research Institute (SPRERI), L D Engineering College and Rural Technology Institute (RTI), Gandhinagar. He says that the last-mentioned three organizations were very helpful in product testing.

Arvindbhai's wife, a schoolteacher who holds an MA and BEd admits that at first she considered him over enthusiastic about his innovations and would often ask him to start on a new job as all this work on innovations did not earn him good money. But her views regarding her husband's zeal for innovation changed once he got recognition from SRISTI, NIF and National Research Development Corporation (NRDC).

Black Pepper thresher[75]

CONSOLATION

P. K. Ravi (32), a workshop mechanic, hails from Murikkassery, Idukki in Kerala. He runs his own workshop, "Our Engineering Industry". He is married and has two children. Right from his childhood, he has shown interest in repairing machines. He was not interested in studies and discontinued them after completing his intermediate course. He started his own workshop four years ago after having gained experience in welding workshops.

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Scouted by
T.J.James

Genesis Sometime ago, Ravi was faced with a financial crisis and the work in his workshop came to standstill. He was forced to think of some other means of supplementing his income. Belonging to Idukki district in Kerala which has huge pepper plantations, he was aware of the problems faced by farmers in threshing pepper especially as manual threshing is a very tiresome and tedious job. This made him think of making a pepper thresher. He consulted a number of people in this regard, but did not get any encouraging response. But refusing to be discouraged, he started working on it and developed a pepper thresher on his own. He tried threshing some pepper which he had at home and found that it was successful. He claims that his machine, which he has named 'Aurora', is superior to all the machines available in the market. For the last three seasons, several pepper growers in different areas have been successfully using his machine. Ravi has filed a patent application for this innovation. This innovation has been widely covered in the various newspapers of the state.

The innovation
The thresher developed by the innovator consists of a feeding hopper made of iron sheet, a rotating wire-loop type threshing drum and a concave metal sheet with perforated bottom, all of which are mounted on the main frame. Power from an electric motor is transmitted through the V-belt and pulleys to the threshing drum. The machine also has the facility of manual operation.

The harvested pepper spikes are directly fed to the hopper, in the rotating drum. The threshed pepper passes down through the perforations and gets collected at the berry outlets. About 100 kg pepper can be threshed in a one HP machine in ten minutes (50 kg in a ½ HP machine) The machine is stopped to cleaned to remove unthreshed spikes, cords and other debris after operation. Intermediate cleaning can be also done by manual cranking of the threshing drum. After cleaning, the machine is ready for the next fresh lot of pepper spikes.
It can be operated with or without a motor and it can be operated by a single person**.** A one HP or half HP motor can be used. The machine also has a separate system to grade the threshed pepper**.** Ravi has made two models of the machine. A big model which has a capacity of 100 kg and

can thresh 600 kg of pepper per hour and a small model which has a capacity of 50 kg and can thresh 300 kg/ hr. The average threshing efficiency observed is 90percent with only 2 to 3 percent damage.

Advantages

As compared to the conventional thresher, Ravi's innovation has a number of advantages. This innovative machine can be operated automatically and manually whereas the conventional thresher can only be operated manually. His small machine can thresh 300 kg pepper in an hour, as against the comparative conventional device which can just thresh 70 kg in an hour. Ninety per cent f the berries can be separated from the spikes in one run and no damage occurs to the skin of the pepper whereas in the conventional device 20 percent of the skin is destroyed. The manually operated model costs Rs. 5000 and the mechanically operated machine costs Rs. 12,000 whereas the current devices available in the market cost Rs.15,000. In the innovative thresher, pepper can be collected at one place without the need of manual labour but in the conventional device it needs to be collected manually. The operation of this innovation is simpler and easier. P.K.Ravi's innovation has the further advantage that by changing the leaf blade, it can be used for threshing white pepper and paddy as well whereas the conventional device cannot be used for threshing paddy or other grains.

Testing and evaluation

The Spices Board (Ministry of Commerce and Industry, Govt. of India) has recognized his innovation and included it in the board's subsidy scheme. The report given by the board attests to the cost-effectiveness of the device. It states that manually one labourer can separate 150 kg of berries from spikes in a day, whereas, using this equipment 300 kg of berries can be separated in an hour. Thus the wages of two labourers per hour can be saved as for operating this machine only one person is enough for the whole day. The electricity consumption per hour is less than one unit (1 kilo watt).

The Faculty of Agricultural Engineering and Technology, Kerala Agricultural University evaluated the pepper thresher developed by Ravi and have noted that the average threshing efficiency observed is 90percent with only 2 to 3 per cent damage. They also recommend this machine as cost effective and easy to operate and handle.

Improved Fodder cutter

CONSOLATION

Chandrapal Singh (32) is an innovative farmer who hails from Dofda, Basti in Uttar Pradesh. He did his Bachelor of Arts from Shiv Harsh Kisan College, Basti. After passing out of college in 1995, he has been doing farming. For sometime, he tried to operate a mini rice mill, but had to give it up due to financial difficulties. In his spare time, he reads books on science, ayurveda, general knowledge, religion, etc. He also spends a lot of time in observing new machines to figure out how they work and studying the problems that farmers face in carrying out agricultural activities. He has developed an idea for a fodder cutter which has greater capacity, consumes less energy and cuts fodder with great accuracy, thus proving to be a boon for farmers especially in rural areas.

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Genesis Being a farmer himself, Chandrapal Singh closely observed and used existing machines to process fodder. He noticed that the problem with such machines is that fodder has to be fed in these machines in small quantities. Some farmers operate it by hand, others use a motor. So long as the blade is sharp, it is easy to cut fodder, but as the blade turns blunt it becomes more and more difficult and the cut fodder is also spoilt. The problem with the motor-powered device is that of feeding it with raw material. Its capacity is limited and there is a great danger of the person feeding it, cutting his hands. Also the blade becomes blunt quite often and it has to be sharpened again and again. Because of this most farmers prefer to use hand-operated chaff cutters.

When serrated sickles came into fashion, Chandrapal began thinking that if the blade is replaced by a serrated blade, then the problem of frequent sharpening could be solved. But there was a problem here. The normal blade cuts by exerting pressure, where as with a serrated blade one cuts by sawing.

He thought about making a new type of fodder cutter in 1997 when the wheat straw got wet in the rain. As it was wet, the stalk twined around the axle of the chaff cutter. Even when very small quantities of straw were used, the engine stalled. Around this time he saw a cutter which had 100 axles. It had a very high capacity and was fitted with stoppers in the form of strips that were welded to it. He estimated that if the number of axles were increased, the output may also increase. Then he thought that it might be possible to make these axles from circular plates of metal. By fitting these plates to a shaft, it may be possible to make thousands of axles. Since these axles are also very thin, the output may be high.

He experimented by applying a pulley and varying its rpm and pressure. He noticed that along with increasing the rpm if the size of the meshing is also increased, then the output increases. This happens because when the rotation is fast, the stalk of wheat breaks, whereas when it is less the stalk twines around the shaft. He also noticed that as long as the axle of the

device has a core, the output is good, but once the core gets worn out, the output rapidly falls. He also observed that the thinner the axle, the higher the output. Also when the size of the straw is large, the output is high.

He figured out that if the wheat straw was kept parallel to the plates and if the stoppers are fitted between the axles, then it would be more convenient to operate the device and thus the idea of a new fodder cutter was developed.

Innovative Idea

The device consists of about 100 discs which are mounted on a 1.5 to 2 m long shaft. Each disc is a plate with a diameter of about two feet and is circular in shape. There is an aperture in the middle and on the edges there are facilities for fixing the blades. These blades are serrated and about six to eight blades are fixed on each disc. The thickness of the plate is about two mm. After placing the blades all around the disc, a ring is placed over them and then fixed with bolts. Another option is to make the serrated edge on the edge of the disc itself. To keep the discs with the serrated blades separate, small rings are placed on the shaft between the discs. This distance depends on the size of the straw and the size of the cut fodder that is desired. There is an advantage in keeping the blades separate. When they become blunt or worn-out, they can be easily replaced. The shaft should be very firmly fixed to the bearing to reduce friction and other damages. The blades used should be of a high quality so that wear and tear is minimal.

Functioning

The fodder bundles would be fed to the machine parallel to the shaft. There is a slanting trough on which the fodder bundle can be kept. The straw that has to be cut is kept on the slanting trough and as the shaft rotates, it is drawn in and cut. Due to the slope the straw will move down on its own. If the straw is very long, the uncut part can be fed again to the machine. To rotate the shaft at high speed it is connected to an engine or a motor. There are several ways to control the cutting rate and load. One method is to vary the rpm of the machine. Another way is to place several semicircular discs between the cutting discs and then move them as per requirement. The stopping strips fixed to separate the cut straw from the discs should be fitted in a slanting position so that the cut straw moves away from the cutting blades. If the stopping strips touch the rotating discs, they can damage the blades and create unwanted noise as the machine operates. Since the machine has a very high output, very soon the cut fodder accumulates before it. A vacuum fan could be used to remove the cut fodder. Wet fodder cannot be blown away very far with a fan, but wet fodder is usually cut only in small quantities every day. The machine can also be placed at height so that there is space below for the cut fodder to accumulate.

Usually farmers possess few animals and therefore, there is a need to develop cheaper machines. For this the diameter and the number of the discs used can be reduced. Discs could be one foot in diameter or even less.

Advantages

In existing machines the fodder has to be fed in small bundles and care has to be taken that the quantity inserted is not too much or too little. If the quantity is too much, the machine is not able to process the excess fodder and ejects it as it is, or sometimes even stalls. If this happens the straw has to be manually pushed inside the machine, and while doing this there is possibility of injury to the hand. Where as in this modified machine the bundles are simply placed on the feeding platform and there is no need to handle the straw manually. Therefore it is much safer to operate. In existing machines after running for sometime, the blades become blunt and have to be sharpened again. After running for one hour, the blade has to be taken out and sharpened by an ironsmith. This innovative machine does not require frequent sharpening of the blades. Since the blades are serrated, they last much longer. When the teeth get worn out, new teeth can be cut on the blades. The existing machine has a limited

capacity and consumes a lot of power. But the proposed machines may have a high capacity and consume less power. Due to slanted feeding trough for straw in this innovation, automatic feeding may be possible and less man power may be required. Chandra Pal estimates the cost of the model at Rs.5000-6000. He feels that the cost of subsequent machines could be reduced when manufactured in bulk. NIF has sanctioned him a sum of Rs.12,500 from the Micro Venture Innovation Fund for prototype development of the fodder cutter.

Other ideas

Chandrapal Singh is the owner of a mind brimming with ideas. Some of his other innovations are:

Threshing machine

Chandrapal Singh has an idea of modifying the fodder cutter that he has made so that it can function as a thresher, on which if the ears of wheat are placed it will automatically thresh them and separate the grains from the straw. It should have a high capacity, should be able to handle wet straw and should not consume too much power.

Multi-fuel engine

He has another idea for an engine that can run on every type of fuel. According to him such an engine would utilize solid fuels like wood, coal, etc. and help to alleviate the energy crisis to an extent. In this multi-fuel engine cheaper fuels could be used to generate power and it would be suitable for all types of fuel as compared to existing conventional engines which are different for each kind of fuel. In addition in this novel engine the fuel gets longer time to burn and therefore burns completely, thus it has high efficiency and causes less pollution as compared to the conventional engine in which the fuel does not burn completely as it get less time.

Modified Seed-dibbler

Chandrapal Singh has also developed an idea for a modified seed-dibbler which would not only make holes at several places in the ground simultaneously but also inject seeds into these holes. With this device, the seeds are evenly distributed and are placed at uniform depths into the soil. Therefore, fewer amounts of seeds are required for sowing and the germination level is also high. This would be especially useful in intensive agriculture which is necessary to meet the increasing demands of a rising population.

Magnetic shock absorber

CONSOLATION

Kalpita Patil, a 19 year old diploma student of Computer Science is from Pachora, Maharashtra. Her father is the office superintendent in M.M. College and her mother is a home-maker. Her younger brother is in his B.Com final year. After completing her diploma, Kalpita wishes to do her MCA and later if possible to do Research and Development in computers. Her hobbies are reading and software development. She has this advice to give other youngsters who wish to innovate, *"If you have any idea, please implement it and make it public so that others will also benefit from it."*

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Scouted by
North Maharashtra University

Genesis Kalpita has developed an idea for a magnetic shock absorber - (for automobiles and two-wheelers) which makes use of the magnetic repulsion between dipoles to achieve shock absorption. Often when riding on her two-wheeler, Kalpita used to face some problems while moving on the bumpy road due to its unevenness. But one specific incident stands out. It happened a year before and she was in a hurry to get to class. She was on the highway and was about to take a turn to the right side, when in the middle of the highway, her two-wheeler's shock absorber broke. The next thing she knew was that she had fallen on the middle of the road and was not able to either get up or walk. At that time from her right, a heavy vehicle was coming at her with full speed and then she shouted loudly and some people gathered around her and stopped that vehicle and admitted her in hospital.

This incident made a deep impact on her. She analyzed the source of the accident as the shock absorbers which were worn out and were not performing well. A student of science, she got an idea of making shock absorbers with magnets. She observed that the like poles of two magnets of the same properties and strength repulse each other and they keep a constant distance between each other because of their magnetic fields. This made her think that if the shock absorbers are made of magnets with similar poles facing each other, it may give better performance and no maintenance would be required for the same.

Once she got the idea, she made a prototype of the shock absorbers with plastic pipes and magnets. She covered the similar poles of the magnets with the same coloured plastic and used a different colour for the other pole, to differentiate between the opposite poles. Thus about two to three months after her accident, she developed this magnetic shock absorber.

The innovation
The unit comprises of two circular magnets and a rod (straight cylindrical rod which can be used as axle). One magnet is attached at the bottom of the rod and is the base magnet. The other magnet is free, with a float and has the similar pole placed towards the base magnet. The

similarity of poles creates repulsion and a certain distance is maintained. As per load condition, the floating magnet moves and closes the gap until the magnetic repulsion is strong enough to create the damping action. In this manner a shock absorber without springs working on the basic law of magnets -Opposite poles attract and similar poles repel- is prepared.

Advantages

This shock absorber will eradicate the problems faced in the spring shock absorbers due to friction and other factors. This will also reduce the maintenance costs as it does not need repairing, changing of springs or dealing with leakage problems as in spring or oil shock absorbers. This magnetic shock absorber can be used in vehicles carrying heavy or less load. Improving on her concept she says that to make these magnetic shock absorbers even better, a chain of more than two magnets can be used to tolerate the shocks or weight and make the vehicle more comfortable

She has made only one model. NIF has integrated the innovator's concept by making another model. The sample model costs about Rs.10-Rs.15. She hasn't publicized this innovation and is currently working on incorporating the idea in the barber's chair.

Support and encouragement…

"Various incidents and experiences give me ideas for facing any problems that come up in life"

Though triggered by an accident, Kalpita rates her experience of innovation as quite interesting. She showed it to her family who felt very happy and inspired and encouraged her to do even better. She specially acknowledges all the help provided by her younger brother who brought her any material which she required for the experiment. In their town, most of these materials were not available but still he managed to get it somehow. She would like to also thank Mr.Samir Raosaheb who encouraged her to do such innovative work.

More ideas…

Kalpita has also got an idea of making a pesticide from the leaves of a poisonous herb – zahari nagin (*Ipomoea carnea*). She has observed that there is never a single worm or pest on the leaves of this herb and considers that as proof of how poisonous the plant is. She feels that if the desired quantity of the essence of this herb can be mixed with water and sprayed on the crops through spray pump, it might kill all germs and pests. According to her this would be a very cheap and effective method of pest control.

Walking stick for the elderly[78]

CONSOLATION

Gopal Suresh Patil (19) hails from Dondaicha village in Dhule district, Maharashtra and is in his second year of Bachelor of Arts. He has an elder sister who has studied till the 12th and now helps their mother in household work. His father is a B.Com degree holder and works as a teacher in a school for the deaf and dumb run by an NGO in the village. The family income is Rs.6000 per month. *"They gave me time and old batteries and even though I was a child they never discouraged me,"* thus Gopal expresses his gratitude towards his family who supported him throughout the process of developing a novel walking stick for the elderly.

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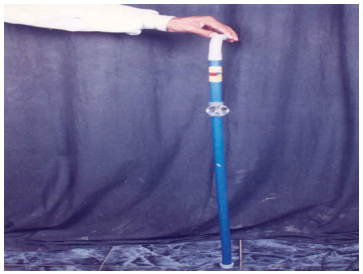

Genesis
Gopal used to notice his grandfather facing problems in carrying the torch, his tiffin and a walking stick when he used to go to the fields in the night. This made him wonder how he could ease his grandfather's discomfort and one day he came up with the idea of a walking stick with light. He made the device in one day.

The innovation
The innovation comprises a walking stick made up of PVC pipe with a switch at the upper end of the stick to turn the light source on and off. There is an illuminating light source (a reflector with a small bulb used in torches) towards the upper end of the stick (just after the curved part of the stick). A T- Joint is used for securing the bulb on the stick. Four power source/ batteries are arranged vertically one above the other in series at the lower end of the stick to supply the power to the small bulb through wires and a switch. Out of the two wires coming from '+' and '-' ends of the power source respectively, one wire goes to the bulb directly and the other wire goes to the switch and then to the bulb and thus the circuit is closed whenever the switch is put on to illuminate the bulb. This stick illuminates the area close to the feet of a user in the night and enables the user to be mobile at night also.

Advanced or improved night stick
In his first experiment he took a stick and tied 10-12 batteries i.e. pencil cells to this stick with a thin strip of cloth. He gave the connection with a wire and put a DC bulb then added a switch to put the bulb on and off. He later developed a more advanced version of the stick. For this a hollow stick or a PVC pipe according to the required height is required. The pencil cells (discharged or with little power in it) are inserted in the hollow pipe and the connection or wiring can be given from inside the pipe. The bulb is connected to the wire with a holder.

Gopal made the first prototype in 2002 when he was in the tenth standard. It took him about 15 days to complete the first prototype. This device costs Rs.70 currently but Gopal feels that when it is mass produced the cost can be brought down to as low as Rs.45 per stick. In

addition the operating costs are negligible as the used up pencil cells of the remote control, radio, clock, lighter, toys etc can be re-used in this device. Till date he has made ten prototypes. He gifted one to his friend's grandfather one is being used by his father. One Mr Sahebrao Pawar has been using it for a year and is fully satisfied with this device.

Constantly improving

Focused on improving his innovation further, he plans to install a battery re-charger at the bottom of the stick and is also trying to add a horn system so that it has the added facility of producing sound. He is also working on overcoming the existing drawbacks namely that the focus should be from inside, the L bow should be tight and the light should be brighter.

A gift for the elderly

In villages people go out to the fields to relieve themselves at night. In the case of the elderly, they carry a tin with water in one hand and a stick in the other hand. At night ideally they require a light also but they are unable to carry one as neither hand is free. But this novel walking stick solves all the problems – the aged get support from the stick and the requirement of light is also met by it. This aid could be sold through NGOs dealing with the welfare of the elderly.

A fulfilling experience

Gopal remembers with satisfaction that lots of people appreciated his innovation. Elders blessed him. He also got some suggestions regarding making it self-generating etc. He faced no criticism but while he was making it, initially people kept on saying that this was a very simple idea. But now they realize that something which is simple can be unique and useful. This innovation was demonstrated in the village and also in North Maharashtra University, Jalgaon and SSVPS Engineering College, Dhule as well as in a workshop at state level at Yeotmal. Testing of this device was done by Industrial Technical Institute, Shindkhedu. The response was positive from all these organizations and all appreciated the device. This is not Suresh's first experience with innovations - he had earlier made a bicycle horn with a small tin and stones. He wishes to give full credit to his family who supported him throughout the process. His parents admit that initially they were worried that he was not concentrating on his studies but still they did not restrict him from doing what he wanted. They are now very happy and proud of him. His dream is to make some device which will be useful for the common man.

Pedal operated pump[79]

CONSOLATION

Nasiruddin Gayen (40) hails from Mograhat village, South 24 Parganas, West Bengal. He is married and has three children. Ever since he was a teenager, Nasiruddin always displayed a curious streak. He did not like to study, but preferred romping around the fields, with questions buzzing around his head: "Why doesn't the sun stop shining- How and why the earth rotates –who made this nice system of earth, moon etc" - a number of these questions considered heresy by his religion. His innovative nature found an outlet in the pedal-operated pump[1] which he has developed.

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Scouted by
U.S.Bhattacharya

Genesis Nasiruddin noted the numerous difficulties faced by local farmers in arranging irrigation. Diesel pumps came at high rents; man power was scarce and expensive for carrying water from the local, natural sources for irrigation. He also noted the difficulty faced by women, the elderly, children and the physically challenged in using the ubiquitous hand-pumps for extracting ground water. Pumping was strenuous particularly for the weak, ailing and those with heart problems especially as it had to be done standing / in bent position. In addition delivery was not continuous and water came only with each stroke.
Since in ordinary pumps only half stroke is used for suction, delivery is low for agricultural needs. Further hand pumps are stationary and water required had to be tediously carried far-off.

Observing all this Nasiruddin, a matriculate village youth of the remote South 24 Parganas village in West Bengal neglected higher studies ,his work and wandered around wondering if and how he could make some solution for this problem. Nasiruddin's father, a village school teacher, could not fund him but this did not deter Nasiruddin , who saved from the daily tiffin allowance given to him and managed to fabricate a two-barrel, continuous suction /discharge reciprocating pump model sometime in 1982-83. He displayed this model at a District Science Fair in 1983-84, where he got the first prize. After some more tinkering with his model and fantasising about its various possibilities for two-three years, he again got a chance to display it at the Salt Lake Science Fair in 1985, where also it got a prize. However in these three years he could get no support to commercialize his invention or receive any personal sustenance for further work.

The Innovation
The present invention relates to a pedal water pump which is particularly useful for pumping water from the canal for irrigation purposes and to draw water from wells, tube wells and reservoirs.

It comprises two cylinders each having a piston and an inlet and outlet connected to a common source and outlet respectively. The unit has five valves, one located at suction at the bottom, two at the entry of the twin cylinders and two at the delivery pipes located at the top. Other components include shafts, bearings,

connecting rods and plummer blocks to transmit power from rotary to linear motion and give constant water output. The entire arrangement is supported with a steel channel frame legs and can be transported to site and the suction pipe can be connected to a water source or put in the canal.

The user sits on the seat and pedals the unit, thereby operating the flywheel, which runs the gear which drives two sets of pistons located in two vertical cylinders. The rotary motion of the pedal is translated into alternate vertical up and down movement of the pistons in their respective cylinders. While the piston in one cylinder goes up, the piston in the second cylinder goes down and this ensures constant discharge of water and no dead stroke for the pumping operation.

Advantages

The unit delivers 100 liters of continuous flow per minute compared to 70-80 liters per minute of intermittent flow for a normal reciprocating hand pump. This novel pump is portable and can be taken and installed on site at will. The pump is very cost effective as it costs about Rs.31 per litre per minute. It costs Rs. 2500 for a complete cast iron unit and Rs.3000 for a unit combining aluminium alloy and cast iron components. The novel twin cylinder system with connecting rod/gear/flywheel arrangement ensures constant delivery of water without any dead stroke. There is constant steady output with lesser biomechanical load while using for longer time. This is easier to pedal than pumping by hand especially for people with heart ailments, elderly, women and children.

From pillar to post

But determined to attain his goal, Nasiruddin sold some of his ancestral land and managed to make one small workshop, where he fabricated the working prototype of his model. He decided to pursue a career in marketing this product. He also got his idea registered for patent protection and later put together some money to arrange filing of patent through an attorney in 1986. He then went through a series of troubles-lack of support, familial opposition, labelling as a maverick, non-earner and study –shirker (he had not yet pursued higher secondary in the struggle to transform his innovation to success). Another two years passed away before he got patent registration in 1988. But still no entrepreneurial support had come and due to personal financial limitations, Nasiruddin was also not able to market the same himself.

Finally he approached the Department of Science and Technology, West Bengal in 1988-89 which sanctioned approximately over one lakh rupees to the Saha Institute of Nuclear Physics for development of the project. Thus after 6-8 years of intense struggle, Nasiruddin received government support- he was appointed to a purely temporary post of project technician of the project entitled 'Pedal operated pump' sponsored by Science and technology dept, Govt of West Bengal, on a monthly salary of Rs. 800. But since the professor in charge of the project failed to deliver the final working, marketable prototype, the project was discontinued around 1991-92.

A new chapter of further struggles

By this time Nasiruddin, under family pressure for employment, struggled to clear his Higher Secondary (1989) and BSc (1993) both through part time classes and evening college. From1993 he kept on trying to realise his dreams but in vain.

Collaboration with institutes

Ultimately after another ten years, in 2002, i.e. approximately 20 years after conceiving the innovation, Department of Science and Technology, West Bengal once again made a grant of Rs. 1.5 lakhs under Dr. Amit Roy Chaudhary, Dept. of Applied Mechanics and Dwg., Bengal Engineering College (Deemed University), Howrah where the prototype is now under further development. Nasiruddin Gayen has been given a purely temporary project post with a salary of Rs.2500 per month.

The Secretary DST, (West Bengal) had asked Dr. Choudhary to make a project proposal keeping in mind

the fact that this pump should be made a marketable product. After getting this project, according to Dr.Choudhary his first observation was that the kinematics and mechanism of this pump is very simple and superb. He felt that he had nothing to add in this aspect. He has made some small changes to improve this pump keeping its marketability in mind. The main objectives of these changes were weight reduction, greater flexibility and making the product more aesthetically presentable. Weight reduction was done by changing the cylinder wall thickness and by replacing cast iron by plastic. To get different types of output, it was suggested to make a slot instead of a hole at the crank head in crank connecting rod mechanism. Better surface finish was given by advance quality machining. Dr.Choudhary reiterates that all these changes were made under his supervision with the strong and active participation of Mr. Gayen.

Considerable social impact

This innovation has great social significance as it delivers water faster and saves time, effort and can be used on any site. This product will be especially useful for the small farmers for serving the purpose of irrigation on a small scale. It also offers flexibility of use as it can be driven manually or by motor. Currently the innovator's prototype is in use and DST sponsored development work is underway for further development.

The pedal-operated pump innovated by Nasiruddin Gayen is undergoing development work under the guidance of Dr Amit Roy Choudhary, Bengal Engineering College, sponsored by the Department of Science and Technology. Nasiruddin Gayen has developed a unique hand pump that, unlike conventional hand pumps, not only delivers water continuously but also requires lesser biomechanical effort for operation due to the use of bicycle pedaling arrangement.

Traditional herbal healer

APPRECIATION

Karimbhai Sumara (58) hails from Veerampur village in Banaskantha district, Gujarat. He currently treats 40 patients per day, some of his patients coming from Rajasthan, Maharastra and 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.

Busy Practitioner

Until three years ago, Karimbhai was a 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 who required his attention.

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 treats a gamut of diseases like heart ailments, arthritis, diabetes, skin disorders, cold and cough, asthma, fractures, genitor-urinary-tract infections, intestinal ulcers etc. and even cancer. Some of the practices he uses:

Leucorrhea

In this condition there is excess bleeding during menstruation. For this take *Mal*/*Nagli* (Finger millet, *Eleusine coracana*) (250 g) and soak it in water (500 ml) overnight. Next morning cook the finger millet with the same water in which it was soaked until the water reduces to 100 ml. Decant the water. This cooked finger millet is given to the women having this problem and the water should also be drunk. This practice should be repeated twice.

Dermatitis

The symptoms are itchy eruptions on the skin, itching sensation, redness of skin and wounds caused because of fungal infection. A paste is made of a sufficient amount of the roots of *Chitrak* (Ceylon leadwort, *Plumbago zeylanica*) using water and this is applied on the infected area.

Alternative treatment

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

Alternative treatment

Bark of *Kerda* (*Capparis decidua*) and leaves of *Mamejava* (*Enicostemma littorale*) 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.

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VPO Virampur
Banaskantha, Gujarat

Scouted by
Jalamsinh Jhala

Diabetes
Symptoms of this illness include sugar intolerance and infected wounds. Usually patients come with either laboratory reports or diagnosed by a doctor.

Roots of Awalkanti/Shatavari (Asparagus, *Asparagus racemosus*) and Chitrak (Ceylon leadwort, *Plumbago zeylanica*), leaves of Mamejava (*Enicostemma littorale*), rhizomes of Amba Haldar (*Curcuma amada*), seeds of Kharhadiya/Sarpankho (*Tephrosia purpurea*) and Gugal (Indian bodelium, *Commiphora wightii*) are all taken in equal proportion. All of these are ground to the powder/ paste form and with the help of water, pills are made and are taken orally twice a day. Continuation of this practice for a month, results in the decrease of the sugar level by 100 points at the end of a month.

Psoriasis
The symptoms include boils/inflammation on the entire body and itchy eruptions.
Collect the fruits of *Vinchhuda* (*Martynia diandra*) and air dry them. Coarsely grind these and soak for 2-3 days in water. This solution is then distilled. Distillate thus collected is used internally and externally. Take one tea spoonful of it orally once a day and apply this distillate on the infected parts 2-3 times a day. This will cure psoriasis within two months.

Varadh/Pneumonia in Children
This condition which occurs only in children and has the symptoms of severe cough and cold is called Varadh. Seeds of Kasundara (Stinking weed, *Cassia occidentalis*) (50g) and Jayfal (Nutmeg, *Myristica fragrans*) (four nos.) are ground to the powder form. One tea spoon of the powder is administered orally twice a day. This cures varadh within a week.

Arthritis
Joint pain, stiffening of joints, inability to stand straight, pain while walking, etc are the common symptoms.
Bark of *Saragva* (Drum stick, *Moringa oleifera*) (200 g) is ground and boiled with water. The entire amount of water is then allowed to evaporate and the paste collected thus is mixed with Amba Haldar (*Curcuma amada*) paste (100 g) and black pepper powder (100 g).

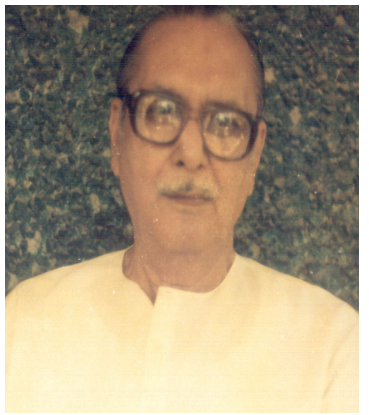
AIDS
Equal amount of dry roots of Avalkanti/Shatavari (Asparagus, *Asparagus racemosus*), Amba Haldar (*Curcuma amada*), Kdvi Dodi (*Leptadenia pyrotechnica*), Dodi (*Leptadenia reticulata*), *Chitrak* (Ceylon leadwort, *Plumbago zeylanica*) and *Athani* (available in forests of Rajasthan only) are mixed and ground to powder form. Ten grams of this powder is taken orally twice a day. Karimbhai claims to have cured more than 8-10 patients of HIV/AIDS till date. And according to him, it takes not more than three months to cure the patient completely.

A nature-lover
An ardent advocate of environmental conservation, Karimbhai's work in this field is three-pronged and includes monitoring the abundance or scarcity of the various herbs vis-à-vis their demand and cultivation of those plants that are becoming scarce as well as those needed in large quantities, educating the youth about the importance of diversity and about ways of utilizing the bounty of Nature without disturbing ecological balance and processing of medicinal plants in such a manner that a stable supply position is maintained and also in a manner, which assures consistent 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 the British Broadcasting Corporation (BBC) to honour experts in indigenous knowledge.

Future Plans
Karimbhai has joined with three more herbalists and applied for financial assistance under the Technopreneur Promotion Program (TePP) of the Department of Science and Technology (DST) so that the market potential for his blood-pressure medications can be systematically assessed. He is quite hopeful of getting the needed funding and dreams of the day when the true potential of the herbs of the Aravalli ranges could be realised.

Pioneer inventor of rice processing machines[1]

POSTHUMOUS AWARD FOR OUTSTANDING TECHNOLOGICAL INNOVATIONS



(Late)Shri Bhubaneswar Borthakur was born on June 26, 1918, in Sibsagar district of Assam. His father, late Lakheswar Barthakur, was the first Assamese Director of Agriculture of the then province of Assam in British India. His mother, late Ms. Biraja Bala Barthakur was from the well-known Kataki family of Sibsagar. Barthakur passed his matriculation examination from Jorhat Government High School in 1932, securing fifth position in the board. His academic career was outstanding and he obtained his B.Sc. degree from the prestigious Presidency College of Calcutta and his B.L. degree from Earl Law College, Guwahati.

Due to the sudden death of his father, he could not complete his postgraduation in Mathematics. Being the eldest, Bhubaneshwar had to take on the responsibility of his family. He found himself at a loss, when his father expired, as he had to face entirely new circumstances and challenges.

Though he had the option of joining government service, his independent and innovative spirit made him take up business as his profession and in the process, he became one of the pioneering entrepreneurs of north-east India. His contribution towards the modernization of the rice milling industry in the country will always be recalled with a great sense of pride. Having developed fifteen innovative technologies, seven of which secured Indian patents more than thirty years back, he had set standards of excellence which still remain as a valid point of reference. He passed away in 1999 leaving behind three sons and a daughter and a legacy of innovations, enterprises and a spirit of fortitude, unparalleled not just in the North–Eastern region but even in the rest of the country.

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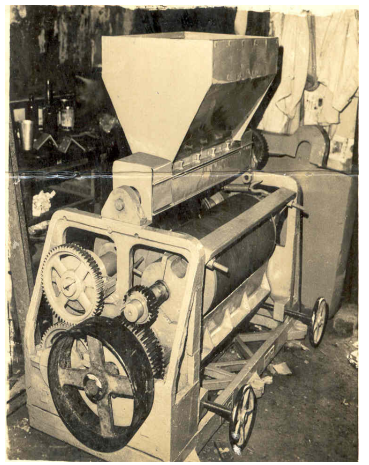
Scouted by
Sri.Kabir R. Bora

Genesis In the mid sixties, Bhubaneshwar concentrated on improving rice-processing machines. He started thinking about the bleak future of his mill as well as the other small and medium sized rice mills during the late fifties because the market was beginning to be controlled by a few big mills. It struck him one day that he could possibly make some headway by improving the milling technique and achieving greater outrun of rice.

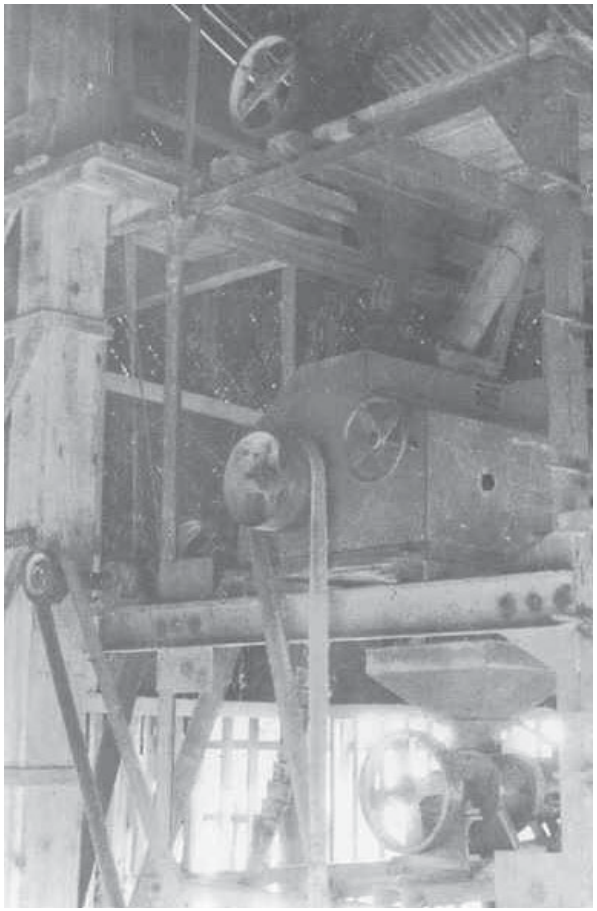
Bhubaneshwar undertook research in the field of improvement of rice milling in 1961 essentially to improve the rice recovery ratio to make it at par with international standards.

He invented a new set of machines and techniques, capable of achieving almost the ideal out run of 75% against the 65% out run that could be obtained by using the conventional sheller and polisher available at that time. This also contributed to solving the difficulties of modernization of the industry. Bhubaneshwar invented an emery-and-rubber roller Sheller as well as a sliding cone polisher for paddy and husked rice. These machines were considered very



important for the construction of a complete unit of rice mill.

Bhubaneshwar claimed that with his new machines, cent percent shelling of paddy was possible and hence, in his unit, the paddy separator was not incorporated. Ordinary millers could thus afford it since paddy separators were very expensive at that time. However, later when the Japanese-made paddy separators became available in the market at a much lower price, Barthakur thought of incorporating these separators into his units.



Innovative works of Bhubaneshwar Barthakur

There are four areas in which he developed innovative technologies in his life long pursuit of greater efficiency in various areas such as: a) agricultural processing, b) wood processing, c) public utilities and d) household utilities.

a) Agricultural processing

(i) The Barthakur Modern Rice Mill

The main innovative components of the Barthakur rice mill are the Sheller and the Polisher. The salient features of these two units are given below.

Emery and rubber roller Sheller

Bhubaneshwar developed a new kind of sheller known as Barthakur sheller. These shellers were used in place of rubber roll shellers since the wear and tear of rubber rolls was high and repairs were expensive in the mid 1960s. The sheller consists of one rubber roll and one emery roll rotating in opposite directions. The rubber roll was made up of a number of 'O' rings or rubber washers stuck together and pressed to form the roll. This could, therefore, be fabricated by any mechanic locally.

The basic principle of this device was to shear away the husk from the grain by allowing grains to pass through the requisite gap between the two horizontal parallel rollers; one of rubber and the other of emery rotating at different speeds in opposite directions. The emery scratch removes the husk and the rubber acts as a cushion and holder.

Advantages

The use of very soft rubber together with the cutting edges of the emery, has resulted in shelling with complete elimination of breakage of grains. The life of the rollers is almost at par with emery disc shellers. It has thus all the advantages of line gap shelling compared to surface gap shelling of the disc shellers. This is achieved without the associated drawback of high wear and tear of the double rubber roller shellers.

Since the rolls could be fabricated locally, the recurring cost on rubber rolls is reduced. Visual inspection and necessary dressing of both the rollers is possible in this machine without dismantling them. The husking efficiency was found to be around 80-85% with very negligible breakage. The capacity of the machine is large compared to its size and cost. The running cost on account of roller replacement and power consumption is very low compared to the different speed double rubber roller sheller.

Sliding cone polisher for paddy and rice (with husk)

The basic principle of the device is to polish the grains through mutual rubbing. The machine may briefly be described as a casing with a sliding arrangement placed horizontally on a base plate. During the operation of the machine, the roller is rotated by a prime mover, and grain for polishing is fed into the gap between the roller and the casing through the adjustable intake aperture. The grain is pushed by the helical screws on the roller into the conical gap**.** Here the properly adjusted blades arrest the peripheral motion of the grains while the straight ridges rotate the grains. The cumulative effect of rotation and arresting of the grains results in mutual rubbing of the grains. The grains are continuously pushed forward towards the discharge end and in the course of this movement, the grains are polished by their mutual rubbing. The conical shape of the annular gap between the casing and the roller with its diminishing cross sectional area imparts the necessary increased pressure on the grains required for their proper polishing. Ultimately, the grains come out through the discharge aperture of the casing.

The Barthakur polisher is a modified version of the Engelberg huller. In the Engelberg huller, the rotor and housing are cylindrical. Bhubaneshwar modified it to be conical with the bigger diameter of the cone towards the inlet.

Advantages

This machine can be used for both paddy polishing and polishing of rice with husk with some modifications. The conical formation of the annular gap between the roller and casing surfaces makes it possible to impart uniform pressure on the grains. For this reason as well as for the fact that abrasiveness of the husk is used for polishing of the rice no breakage occurs in polishing them. As the grains do not change their direction while coming out of the pressure zone of polishing, their shape remains intact. For the same reason, there is no wearing of the grains in the course of their mutual rubbing to effect the necessary polishing. As the arrester blades do not obstruct the discharge outlet, no grains get locked in the polishing operation to be pulverized as in the case of common hullers. Due to the mutual rubbing of grains to near perfection in this machine, no residual paddy is left out after the polishing operation. This results in complete elimination of the use of the paddy separator. By suitable selection of the dimensions of the operating parts of this machine, the yield of rice from raw paddy directly put to this machine, as in the common huller, has been found to be as high as 71 percent. Apart from paddy and rice polishing, wide use for this machine has been found in production of flour of wheat, corn and other cereals. Spice powder can also be conveniently made with this machine. Manufacturing of high grade dust tea is another very important application of this machine.

National lab acquires Bhubaneshwar's technology

Dr. M.S.R.Desikachar, the then Chairman, Discipline of Rice Technology of Central Food Technological Research Institute (CFTRI), Mysore visited his mill in 1970 and and was very impressed with Bhubaneshwar's innovative works. CFTRI, Mysore purchased one sheller and one polisher on Dr Desikachar's recommendation. The object of procuring the machines by CFTRI was primarily to preserve the machine at CFTRI and to show it to their students who could study it and be inspired by the design innovations.

ii) ***Machine for drying parboiled paddy and other grains***

This machine comprises arrangements for drying

parboiled paddy or other grains. The paddy or grains are transported by rotating vanes over a series of steam heated concave trays placed one after another. The evaporated moisture is carried through a hot-air circulating fan. All the bearing and driving mechanisms of the vanes are outside the hot chamber. The direct contact of the grains with the steam pipes allows a high degree of transference of heat to the grains for quick drying. Individual steam control of the heating pipes of each tray makes it possible to maintain the necessary temperature gradient of the trays in the course of the process of drying the grains. It can be operated in all kinds of weather.

iii) *Machine for parboiling of paddy under pressure*

Since the temperature of the water, used for soaking the paddy to be parboiled, should remain sufficiently lower than the boiling point of water, steam pressure cannot be utilized for generating pressure on the soaking water. The required pressure is provided with the help of compressed air or a hydraulic pressure arrangement so that the total steeping period is appreciably reduced. Due to the use of pressure during steeping, a greater amount of water soluble vitamins and other food values, which are subsequently sealed in the grains by the process of parboiling, become permanently fixed in the grains.

iv) *Improved process for the parboiling of paddy*

Water soaking time is reduced and thereby fermentation is eliminated. Besides, in this process, both the soaking and steaming are done in less space.

v) *Other contributions towards agri and food processing*

High frequency stirrer, Soluble tea manufacturing process, Device for separating light materials by oscillation and impact, grading of paddy with conical rollers;Canonical Oil Extractor, Cattle driven power tiller, Belt used thresher, Grain sheller with variable speed rollers of abrasive and elastomer materials, Sheller for de-husking paddy by variable speed abrasive and elastomer rollers with posed grain feeder are just a sample of Bhubaneshwar's range of innovations in this field.

b) Wood processing

Saw mill and timber seasoning plant

During the sixties, Bhubaneshwar added a mechanized wood processing unit to his rice mill and saw mill and replaced the original name "Annapurna Rice & Saw Mill" by "*M/s* Barthakur Industries & Agencies". Various machines like planner, drilling machines and slotting machines were purchased and Bhubaneshwar got some chiselling machines and circular saw machines made locally using his own innovative ideas and thus saved money.

c) Public Utility Equipment

Overhead dumping platform for the reloading of solid materials to carriers

The device provides an arrangement for collecting solid materials such as city garbage, industrial waste etc., by arranging a higher platform with bins so that the collected material could be very conveniently loaded to the carrier in bulk. His other contributions in this field are a Holder for tram, bus and other thin tickets, Controlling system for railway unmanned crossings, Oscillating frame saw and Composing systems for printing press.

d) Household Equipment

Improved safety razor assembly

In this assembly, the corrugated gripping arrangements on the covers hold the slightly upturned edge of the blade on its side away from the shaving edge and this permits movement of the razor blade along the curvature of the covers in between them and thus the necessary projection of the shaving edge outside the razor covers can always be maintained. This feature allows continuous sharpening and thus provides for great economy and shaving comfort. Other examples include improved hand loom equipment, Improved water taps and a Small sewing machine.

The successful entrepreneur

In the late sixties, the then Chief Minister of Assam, Bimala Prasad Chaliha and a team from the Assam Industrial Development Corporation (AIDC) visited Bhubaneshwar's mill and observed the prototypes and demonstration of different rice processing machines invented by him. Highly impressed with the construction and performance of the machines, the Chief Minister, himself being an inventor of certain devices, encouraged Bhubaneshwar to go ahead with the project without any hesitation. Accordingly Bhubaneshwar submitted his project report regarding the rice processing machines in 1969 and subsequently negotiated with the AIDC for jointly manufacturing and marketing his machinery. In the joint venture, the role of Barthakur Industries was to manufacture and supply the machines and the role of AIDC was to offer initial financial support as well as monitor collection of orders and supplies.

Subsequently Bhubaneshwar set up an office in Calcutta in 1969 and started his factory at Howrah. By July 1970, orders for twelve machines were in hand against which eight units were manufactured for supply. Around that time a large number of orders were expected from different parties of Assam and from West Dinajpur. A few months later in 1970, Bhubaneshwar entered into a licensing agreement with M/S Bihar Ispat in Ranchi, in response to a proposal by their family unit M/s Steelsworth Pvt. Ltd. in Guwahati. He then shifted to Ranchi and with his co-operation and guidance, M/s Bihar Ispat continued to manufacture and supply rice milling machines against subsequent orders.

An icon of his time

Bhubaneshwar Barthakur, patriot, philosopher, writer, innovator and entrepreneur, was an icon of his times. Fired by the zeal of patriotism and his concern for the moral and spiritual upliftment of the downtrodden, the publicity shy Barthakur actively associated himself with several service organizations. During the fifties, Barthakur took up cudgels for the introduction of the National Register of Citizens based on birth and death records and also wrote and published a booklet on the subject. He also submitted an elaborate and concrete proposal for utilization of the water resources of Assam through modern technology.

He was the Chairman of the Assam Rice Mill Owners' Association for ten years. In addition, he also held the post of the Director of Assam Agro-industries Development Corporation Limited (State Govt. undertaking). For his untiring efforts for the improvement of the common man and his sympathy for the working classes, he was nominated as a member of the North-east Railway User Consultancy Committee and Shramik Kalyan Parishad by the Government of Assam. A great admirer of the philosophical and scriptural heritage of our motherland, Barthakur served as the President of "Uttar Purva Loka Kalyan Parishad" and Divine LifeSociety for a long period. He had an extensive knowledge of the scriptures. '*Srimad Bhagawat Gita',* the holy book, was the guiding scripture of his life. He was one of the founder members and guiding spirits of the Vivekananda Kendra Institute of Culture, Guwahati.

A voracious reader and a prolific writer as well, Barthakur was the founder and a regular contributor to Vivekananda Journal *"Jagriti"* since its inception. His translations of the "*Tulsidas Dohavali"* and *"Patanjal Yogadarshan"* into Assamese were highly acclaimed by his contemporaries. His frequent writings on the *"Gita", "Sankhya Darshan"* and other scriptural subjects also were appreciated. As his parting gift to the Vivekananda Kendra, he presented the Assamese translation of the "Selections from the complete works of Swami Vivekananda" a few months before his demise. The version of the book in three volumes exemplifies his deep insight into our scriptures and ethics, and his understanding of the life and message of the great patriot saint Swami Vivekananda. He also wrote *"Niti Katha" (Moral* stories) for children, besides a number of articles on Indian philosophy and heritage.

109 year old check dam with water discharge through the dam wall chamber

POSTHUMOUS AWARD FOR OUTSTANDING TECHNOLOGICAL INNOVATIONS

Padmadutt Balutiya (1826-1910) was a resident of Baluti village of Nainital district, Uttar Pradesh. A middle class farmer, his leadership qualities and profound wisdom were widely acknowledged. He was often consulted on various difficult problems and due consideration was given to his suggestions throughout the district and adjoining areas.

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or Tulsi kunj,
Kathgodam janpad,
Nainital, Uttranchal

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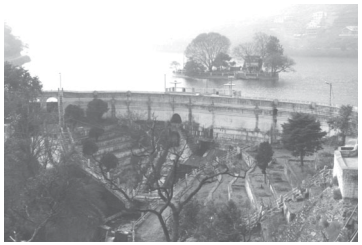


Background

A very interesting story has been passed down through generations about the building of this check dam. According to the elders in the area, in the late 1880s, the water in the Nal Damyanti Tal and its vicinity used to flow in the form of a rivulet across an area two kilometers long and down the hills to Bhabhar and Tarai area. However, the water could not be used though there was tremendous need for water for drinking and irrigation for the settlements as Bhabhar area was in the process of being settled. Robertson, the British Commissioner at the time, had a dam constructed to retain the water in Bheemtal, so that it would not be wasted and could be used when the need arose, especially during the summer. But the dam broke down during the rainy season. Colonel Ramsay, who succeeded Robertson, was a generous and intelligent officer who, at the request of farmers, decided to do something to solve the problem of water shortage. He thought that if a check dam was made, then the water from the natural source that was flowing away could be collected in the valley and could then be transported through canals. Accordingly, he put up a proposal and sent it to London through the Viceroy of India. The proposal was accepted and Ramsay decided to construct a check dam.

As soon as Padmadutt came to know that Ramsey was going to build a dam, he went to the site and checked the design of the dam. He felt that the design was flawed and told Ramsey that it would not be able to withstand the water pressure. He suggested that instead of the straight wall, if the dam could be constructed with a convex shape it would resist the pressure of water. In such a case, the force of water would not concentrate at a particular point but would be distributed evenly over the entire length, thus minimizing the water pressure. Unfortunately, Ramsay did not heed Padmadutt's suggestions and had the dam constructed 'his way'.

The dam was washed off in the first rain. Ramsay tried three more times, but each time he met with the same results. He was, however, still not ready to listen to Padmadutt and so Ramsay wrote to London, explaining his case and asking for a specialized engineer. The engineer came and started the work with a new

design. Again Padmadutt went to Ramsay and suggested that if this dam also was not able to withstand the water pressure, he should be allowed to build the dam the next year according to his design. Ramsay agreed.
Padmadutt returned to his farm, but he continuously kept on thinking about the dam, 25 kilometers away. Finally he sent one of his farm labourers to the work site and asked him to report within the first week of rain. As Padmadutt had predicted, the dam was washed away in the first rain and his man reported this to him before the official message came from Ramsay. Padmadutt immediately set out for Ramsay's office and waited outside his room. When Ramsay came out, Padmadutt told him that the dam has been washed away. Till then, Ramsay had not received any official message from the work site. Impressed by the interest and initiative taken by Padmadutt Balutiya, Ramsay called a meeting and instructed every body to follow Padmadutt's advice in building the dam.

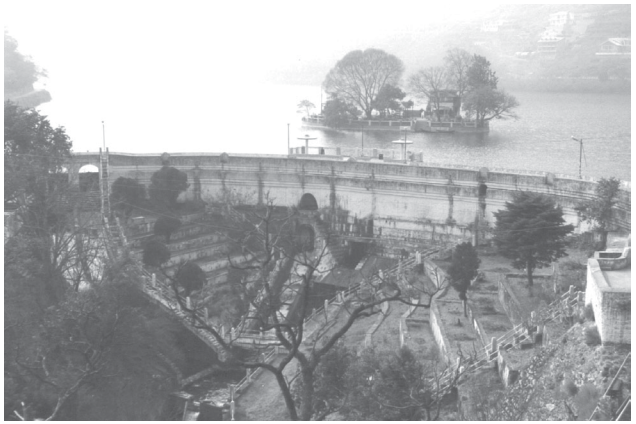
The Innovation

The 109-year old check dam in Bheemtal is truly a modern day wonder. The dam, designed by the late Padmadutt Balutiya in 1895 continues to stand strong and has not required any repairs since its construction. The dam was designed based on the old traditional method i.e. *"lehria"* method which has been used to make bunds for rice fields since ancient times. The check dam is constructed in the form of a canal shaped like an arc. Water is allowed to enter this canal so that the force of the water inside the canal reduces the force exerted by the water from the outer side. This enables the check dam to withstand the heavy force exerted by the water. The pressure on the second wall of the dam is automatically reduced, as it is not in direct contact with the larger volume of water. Several outlets are made on the second wall of the dam so that water is discharged uniformly. These outlets are at different levels so that water can be discharged in such way that it exerts minimum pressure in the process.

Among the many reasons given for this dam to stand the test of time for so many years, one is that the shape of the dam facing the flow of water is convex. Another is that, due to the presence of water on both sides of the dam, the pressure on the dam itself is lessened. In addition, instead of only one sluice gate, the check dam has four gates that dissipate the water pressure on the dam structure equally. The building material is also unusual. Instead of cement, traditional materials such as lime, flour, powdered pulses and straw have been used.

A visionary leader

One of Padmadutt's major contributions was in developing the small town of Haldwani by making the



forest areas near Kathgodam arable. For this, the British sought his help as he was familiar with the entire area. The region was difficult to access and getting labourers was not easy. Padmadutt then thought of setting up a mandli (collective farming). He managed to convince all the men and women of Baluti village (except the elderly, children and the ill) to come and work in the fields every day. They used to get up at 4a.m. in the morning and set off for the fields. Singing patriotic songs, they started work at 6a.m. and worked till 5p.m. in the evening when they would start the long journey back home. They would do the work in the fields by rotation and the owner of the field used to arrange for the midday meal.

In the evening when they had to go back, collecting people at one place was a difficult task and for this too Padmadutt had an innovative idea. He contacted the Kathgodam railway station master and requested him to order the train driver of the Kathgodam express to let out a loud whistle while passing through the forest, so that the farmers could know that it was 5 p.m. as the train passed through the forest at that time. In this way he was able to contribute to the establishment of a new city. This practice of the train letting out a loud whistle continued long after his death.

A monumental achievement

Padmadutt Balutiya used local materials, designs and his insights about the way to manage stress in a difficult terrain in building this dam. The resultant check dam has not only withstood all the vagaries of nature but has also created an example worth emulating. This 109-year old dam has now become a tourist attraction and stands as a tribute to the triumph of indigenous knowledge.

One wonders though, whether state institutions and architects of formal policy and projects, now, would let a natural genius go as far as Balutiya was let by the British officer. Especially as till now, official credit for the development of this dam which led to the prosperity of the Kumaon region is given to the British Colonel Ramsay and not the grassroot designer, Padmadutt Balutiya.

 Late Padmadutt Balutiya 109 year old check dam with water discharge through the dam wall chamber

Amphibious bicycle[3] and other technological contributions

TRANSPORT NATIONAL FIRST LIFE TIME ACHIEVEMENT

Mohammed Saidullah grew up in a small village called Jatva-Jeneva (Purvi Champaran) of Motihari district, Bihar. His father Shaikh Idris was a farmer and a Congress village leader during the time of Independence. Saidullah has studied up to the tenth standard in Ramsingh Chatuani in Gajpura but could not complete his studies due to personal reasons. He married Noor Jahan in 1960 and has three children - two daughters and a son. He is 60 years old and a devout Muslim and proudly claims that he has never asked for help from anyone but Allah. Self respect and self development are two tenets of his character and he is a very compassionate man who often helps out friends who are in financial difficulties.

"An inventor's mind should be free; not bound with conditions"- is the belief that has fuelled Mohammad Saidullah's passion to develop multi-functional products such as the amphibious cycle, the mini tractor, key operated table fan, fodder cutter-operated mini water pump, spring-loaded (shock absorber) bicycle and others. He draws inspiration for his innovations from his experiences in life.

Apart from these innovations, Saidullah nurtures two ideas in his mind. One is to develop a mini electric powerhouse . This would produce electricity to operate at least two fans and two bulbs. The cost of developing this would be Rs.50,000. The second idea is to develop a helicopter, which would cost Rs. 25 lakhs. Most of his innovations have the name 'noor' in them. This is to revere the memory of his late wife whose name was Noor. Thus we have the "Noor bicycle", the "Noor Rahat" electric power house", the "Noor water pump" etc.

Mohd. Saidullah lives with his daughters in Mathia deah village in Purvi champaran (Motihari). Unfortunately his love for innovations has been at a personal price as his son is estranged from him and is demanding land and money but Saidullah has sold all of his 40 acres of land in pursuit of his innovations and his generosity.

Address
Purvi Champaran,
Gramin Mashinari,
Avishkar Kendra,
Motihari - 284 809,
Bihar

Scouted by
Azhar Hussain Ansari

Genesis The state of Bihar is prone to floods. In 1975, there was a big flood in Champaran which lasted for about three weeks and Saidullah had to cross the river to get provisions. To cross the river he had to use a boat and in the city he had to use a bicycle. Then it struck him that if he could make the bicycle float on water as well as move on land it would save money. Within three days, he had developed such a bicycle. This amphibious bicycle is also known as "NOOR Bicycle". Using this cycle he crossed the Ganga from Pahelaghat to Mahendrughat (Patna). Initially he spent Rs.6000/- on the development of the floating bicycle. But now he says he will be able to build it at a cost of Rs. 3000/- .

The Innovation
The amphibious bicycle comprises a

conventional bicycle modified with two extra attachments attached to it that enables it to run on both water and land. The first attachment consists of four rectangular air floats, which support the bicycle while moving in water. These rectangular floats are in two pairs and each pair is attached to the front and rear wheel of the bicycle with a piece on either side of the wheel. These floats can be folded when the bicycle runs on land. These floats are lightweight and hence the cyclist does not feel any extra burden.

The other attachment comprises the fan blades attached in a radial manner on the spokes of the rear wheel. When the cyclist pedals the bicycle in water, the blades attached to the rear wheel also rotate and force the water to be pushed backwards thus enabling the bicycle to move forward. The blades are arranged in such a fashion that it can be driven in the reverse direction as well.

Advantages

The advantages are obvious as people in rural areas need no longer solely depend on the few overcrowded boats for crossing the river. Further, crossing the river can be done at one's own convenience. As the cycle operates on both land and water, the time and money required for hiring a boat to cross the river and for further transportation on land is saved. Further applications could be in amusement parks or children's parks, for sending provisions to people living around a lake, for removing aquatic weeds or for dragging a raft carrying goods, nursery plants etc.

NIF has sanctioned Saidullah a sum of Rs.33,750 from the Micro Venture Innovation Fund for the prototype development for market research of the Amphibious Bicycle.

Other innovations

Mini tractor

The mini-tractor comprises a conventional tractor modified in such a manner that it has a clutch-plate free system, uses a dynamometer instead of battery for light and has a hydraulic lifting mechanism for propelling farm implements. An air pressure horn is also used in it. It is easy to handle and costs only Rs.70,000. Moreover it can be used to transport material. The first model of the tractor was made in 1984 and could be used for ploughing and tilling. It consumed five litres of diesel per hour to run for six hours with a 20 quintal load at a top speed of 18kms/ hour.

Key operated table fan

In 1960, in the context of irregular electricity supply and its increasing cost, Saidullah thought of developing a fan that would work with a key, to provide some relief from the relentless heat during the summer season. The key operated fan is a conventional fan modified in such a way that there is a coiled spring and hand crank-key attached to it. On rotating the hand crank-key, the fan stores potential energy in the coiled spring and uses it to deliver rotational torque. By hand cranking the key for half a minute, the fan rotates for one hour. The cost of this fan is Rs.1000. Its advantages lie in the fact that there is no running cost for the fan as electricity is not required. This is especially a boon in the rural areas where electricity is scarce.

Fodder cutter operated centrifugal pump

The centrifugal pump consists of a flywheel (fodder cutter wheel) attached to the conventional centrifugal pump. The diameter of the flywheel is larger than the

impeller. A handle is provided on the flywheel to rotate it so that the effort required is minimal. When the handle on the flywheel is rotated by hand, the impeller of the centrifugal pump also rotates and the pump delivers water at ground level with a 20 feet suction head and zero delivery head. The discharge capacity is 10,000 litres per hour. The advantage of the pump is its quality of conserving energy, as neither electricity nor diesel is required. Further, only human power is required to supply water to the farm. The manufacturing cost of the pump is Rs. 3000/-

Spring loaded (shock absorber) bicycle

The spring-loaded bicycle is a modified bicycle with a number of springs attached to it, to absorb the shocks on an uneven road. One spring is attached below the seat of the bicycle; two springs are attached to the axis of the front wheel with one end each attached below the handle. The carrier at the back of the bicycle is also supported with two springs with one end of each attached to the axis of the rear wheel. These five springs, by absorbing vibrations from the road, make the bicycle shock-free and provide greater comfort to the cyclist while riding. The springs attached to the rear wheel absorb the shock at the rear wheel thus ensuring a comfortable ride for the person sitting on the rear seat also. The cost of the spring loaded bicycle is Rs. 2500. NIF has sanctioned him a sum of Rs.15,000 from the Micro Venture Innovation Fund for the development of the prototype for market research.

Bicycle operated through conserved energy by pedal operation

This innovation is a conventional bicycle modified in such a manner that two chain drives are used instead of one. While riding the cycle, when the cyclist pedals ten times, the coiled spring is tightened and stores energy in it. After ten times, the cyclist stops pedalling. The stored energy in the coiled spring helps the cycle to move forward for about one kilometre with a speed of 20 km/hr. After covering one kilometre, the coiled spring is unwound. Hence there is no energy stored in it and the cyclist has to repeat the process. This idea originated with a friend's commenting, "Up to what stage will you drive a cycle, why not purchase a motorcycle?" To this Mohd.Saidullah replied that he could make his bicycle function like a motorcycle. He fulfilled the claim he made to his friend, as the speed of his innovated bicycle is higher than that of a conventional one. It also requires less effort.

Mini turbine for electricity generation

This is a turbine which is attached with bucket-blades in a radial manner. The turbine is placed inside the water surface and when the water falls on the inner curved surface of the bucket-blades, it rotates the blade of the turbine. This rotational energy is further transferred to the dynamo that transfers the energy for lighting the bulb. This turbine gives the energy to run two bulbs simultaneously. The advantages are that it is easy to handle and a low cost alternative. Further, it makes use of a renewable source of energy, flowing water, especially in the context of our looming energy crisis, when every bit counts.

Awards and accolades

Mohd. Saidullah had once sent a letter to Pt. Jawaharlal Nehru regarding his innovations and invited Panditji to come and see them. Though Panditji received his letters and replied that he would come, he was not able to and sent a letter to Mohd.Saidullah regretting his inability to visit his place. Mohd. Saidullah's innovations have also been featured in various newspapers and news channels such as Pratiyogita Darpan, The Times of India, Hindustan, Ankur, Jansatta, Nepal Newspaper and Doordarshan. Many organizations have contacted him including CSIR, CAPART and TIFAC. CAPART contacted him in 1993 regarding his innovative fodder-cutter operated mini water pump. A team from CAPART visited his house and tested this machine in a pond, bore well, and hand pump. They offered him a certain amount and asked him to develop one machine for CAPART. He asked them to approach him through the proper channels with a written non-disclosure agreement and only then would he manufacture it for them. But they did not comply.

Technopreneur Promotion Programme (TePP) of the Technology Information and Forecasting and Assessment Council (TIFAC) also wrote to him and sent a cheque of Rs. 25,000 for the development of the amphibious bicycle. But they stipulated some conditions, which were not acceptable to Saidullah. Saidullah firmly believes that for him to come up with an innovation, his mind must be unfettered and not restricted by any conditions. He continues to keep the cheque with him. On January 26, 1994, Purvi Champaran Collector, Mr. Binod awarded him for his various innovations. Dr. A R Kidwai, governor of Bihar honoured him on January 26, 1995 in Patna with the first prize for a tableaux (*Jhanki*) of his innovations during the Republic Day Parade in Gandhi Maidan, Patna but he is yet to receive any certificate, medal, trophy or award money. In November of the same year, the district collector of Chapra, Bihar honoured him during the Sonepur mela.

A life-long passion for innovation

Since childhood, Saidullah has had an interest in mechanical things. He was always busy solving problems by putting forward innovative solutions in the form of inventions and in one such attempt even broke all the locks in his house. Initially he worked as a mechanic because of his interest in making things with iron and this has proved invaluable in his efforts to construct the innovations himself. A day on which he doesn't work with iron is, according to him, a wasted day. Carpentry, masonry, tailoring etc., are also part of his repertoire.

A philosopher, his mind is always occupied with innovative ideas which would benefit the family and society. When he gets an idea his whole face lights up with a smile. Impelled by a deep love for nature, which he believes is God's gift to man, he has tried to make his innovations as environment-friendly and agriculture-based as possible. On his innovations, he has worked alone apart from occasional help from his family.

The harsh reality of life

Mohd. Saidullah is currently engaged in the honey business because his income as a mechanic was not sufficient to fulfil his family's needs. Everyday he rides his bicycle for about 30 km to the market to sell honey of Lichi, Cronj, Liptus, Khaisari, and Mustard plants. His monthly income is Rs. 1300. He admits that he often feels quite disheartened due to a lack of land and money as well as people's niggling queries regarding his innovations especially regarding the number of items he has sold. He comments, **"***Hamara saman hai agar sahi, to kyon rah gaye wahin ke wahin"* which translated means "If my innovations are of good quality, then why am I not successful?" Out of sheer frustration, he even broke his fodder cutter operated water pump-the sad plight of a grassroot innovator.

Groundnut digging cum separating machine and trench digger[4]

FARM MACHINERY - AGRI PROCESSING NATIONAL FIRST

Yusuf Khan (32), has studied till the seventh standard and has a workshop of farm machinery in Sikar in Rajasthan. He has been involved in the business of farm tools for the past fourteen years. He makes trench digging and groundnut digging machines as well as other agricultural farm implements. Some of the problems that Yusuf faced during the development of this innovation were financial constraints and availability of raw materials. But he remembers with gratitude the financial and constant moral support offered by Mr. Rakimuddin Nechwa during the process of this innovation. His family and neighbours also stood by him during tough times and his neighbours even helped him to take the machine to distant places for testing. He has offered his services to other innovators for improving their innovations.

Address
Bevali Village
Sikar, Rajasthan

Scouted by
Sundaram Verma

Genesis Two-thirds of Rajasthan has sandy soil and groundnut is grown all over the state. The process of groundnut digging involves digging up the ground and separating the groundnut from the soil. But normal groundnut diggers fail to dig out all the groundnuts from the field and many pods still remain in the ground. These have to be manually extracted by labourers. The work is not just strenuous and time consuming, but also costly for the farmer. This gave Yusuf the idea of mechanizing the whole process and led to the development of this unique machine that meets the needs of the farmers and saves a considerable amount of money, time and effort.

The Innovation

This sturdy rugged desert unit is retrofitted on a 35 HP tractor and is powered by the coupler from the tractor unit and has an elaborate system of crankshafts, flywheel, connecting linkages and rotating vanes on a shaft. A sieve is provided with a vibrating mechanism to filter the groundnut from the soil. As the tractor moves forward, the vanes rotate and dig into the ground. They scoop and drop the soil-groundnut mixture into a vibrating storage unit with a sieve base. The system of linkages and drives vigorously vibrates the entire unit to shake the soil loose. The groundnuts stay trapped at the top in the central storage unit as the soil gets sifted out onto the ground. A window hatch is provided at the back that can be lifted and the groundnut taken out by a person into a basket. The unit consumes four litres of diesel per hour and completes digging one hectare full of groundnut in one day. It weighs 300-400kg and costs Rs. 45,000. Compared to other groundnut digging devices, which only dig and cut groundnut crops, this machine digs out the groundnut and separates it from the soil through the vibrating sieve. This groundnut digger is lighter than other diggers and is able to run on uneven

ground. This device can also be used for collecting stones from fields and roads.

Advantages

Yusuf has addressed a pressing problem that groundnut farmers in the harsh desert climates of Rajasthan have faced. They do not have an efficient way of harvesting the groundnut beneath the soil that ranges between 15% to up to 25% of their harvest. Losing even an average eight quintals below the ground (25% of the harvest per hectare) means a loss of Rs 12,000, which is a huge amount for any farmer. Manual harvesting takes up to 50 people working at Rs.80/day to remove groundnut in one hectare in a day. Labour is both scarce and expensive in the desert area and the operation is

tedious as the soil has to be sifted and each groundnut has to be picked by hand. Most farmers have large land holdings in the area (greater than 2 hectares and going up to 50 hectares) and there is a need of completing the harvest as fast as possible in October so that sowing can be completed for the next season, which starts immediately. The machine developed by Yusuf addresses all the above problems. It is an excellent way to improve productivity, cut costs and address the labour shortage. Some of the farmers who have bought this unit also loan it out to others at the rate of Rs. 1500 per day, thus making a handsome profit. For the other farmers also, it is a good bargain as they spend only Rs.1500 instead of Rs 4000 that they would have to pay to the labourers.

Current status

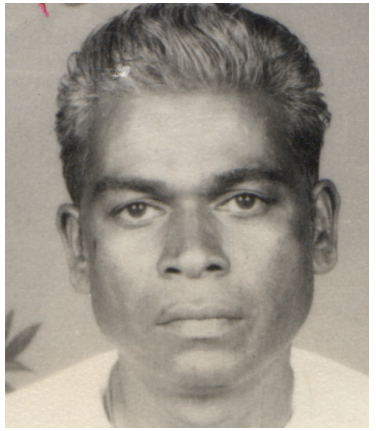
So far, Yusuf has sold more than 15 units of this machine to the local farmers. He wants to start a business with his innovation provided he gets financial help. He is also open to partnerships. NIF has filed a patent application for this innovation.

Trench digger

Apart from the groundnut digging machine, he has made some modified ploughs and trench digging machines. His trench digging machine is more flexible, cost-effective and can be attached to any tractor. The breakdown rate and fuel consumption is lower than that of the other available trench diggers. He has also developed a mechanism for increasing the speed of trench digging machines. The earlier version of the trench digging machine required a truck to be hired for transporting it from one place to another, as it moved only at a speed of 3km/hr. This proved to be rather expensive. Khan made modifications in the gearbox so that it is now possible to move the machine at the speed of a tractor (10 km per hour). The improved model of this machine is costlier than the earlier one by Rs.15,000 to Rs.16,000, but such is its demand that in a year, he has manufactured and sold five such machines.

Grading machine for raisins[5]

FARM MACHINERY-AGRI PROCESSING NATIONAL SECOND



Ramdas Madhavrao Jagtap (51) belongs to Jopul village, Nashik, Maharashtra. His father was a carpenter, but Ramdas was not interested in carpentry, so he set up his own welding workshop in 1969-1970. He makes farm machinery, bullock carts and other such equipment. Though educated only up to the eleventh standard, he ensured that his sons had the opportunity to pursue higher studies. His eldest son has completed his post graduation in Inorganic Chemistry and works as a school teacher. Two other sons are engineers in the Chemical and Mechanical disciplines. The youngest son is studying computer engineering.

Genesis Ramdas belongs to Nasik District (Maharashtra), which is a major centre of grape production. A few years ago, some farmers approached him with a request to develop a machine to separate stalks from dry grapes and also grade them into different quality raisins. Till then, this was mostly done manually.

Grading of raisins involves sorting raisins by size, mainly for exports. To produce raisins, bunches of grape are first brought from the vineyards to the raisin-manufacturing sheds. There, they are processed according to the variety of raisins to be manufactured. Two of the main grades are the green coloured raisin *Hirwa* and yellow coloured raisin *Pivla. The Hirwa* grade is mainly made for export and *Pivla* is for sale in the domestic market.

These raisins need further processing – cleaning, removal of debris and grading into various sizes. Conventionally, this was done manually by women who worked for minimum wages. The grading was done by them based on visual inspection. To find a solution, Ramdas spent two years using the principle of the thresher for grading but this didn't work. The main reason was that there is a marked difference in the weight of the grain and the debris compared to the difference in weight of the raisins and the debris, which is much less. With his knowledge and experience, he developed a machine in 1993 that would cater to the grape farmers' requirements.

However, there were a number of shortcomings that took time to be rectified. One problem with the first design was that because of excessive beating in the machine, the sugar would secrete out when the raisins were kept in cold storage and thus the sugar content was reduced. This spoiled the quality of the raisins. Ramdas made a few changes and within a year came up with a modified design. Another problem he faced was that the blower was picking raisins along with the debris. So he reduced the diameter of the impeller and thus reduced the intensity of the vacuum. The raisins were now not picked along with the debris. Gradually, the grape farmers got to know of this machine. After studying it, they

Address
Vill: Jopul, Patil Baba,
Tal: Dindori,
Dist.:Nashik,
Maharashtra

Scouted by
North Maharastra University

realized that this machine was easy to use and very efficient and began placing orders
with him.

The Innovation

This is a single unit that removes dust and twigs and grades raisins by size. The machine consists of three motors and three sieves, blower, a belt and pulley mechanism and a rubber brush.

The grapes are dried for 15 – 20 days and then treated with chemicals to ensure proper drying and protection from pests. The dried grapes are fed into the machine through a feeder, which has a rotor with a rubber brush. A 3 HP motor drives the mechanism. The brush hammers the dried grapes to get the small twigs off the grapes. These dried grapes are then passed through the blower, which blows the dust off them and cleans the grapes with the help of a high-pressure airflow. The blower utilizes the power of a 2 HP motor. The dried grapes are now cleaned and are graded with a vibrator connected to three sieves. The dried grapes separated over each sieve are collected in a different chamber after they are scaled in specific grades. These are then finally processed for making raisins (*kishmish*). The machine grades the raisins into three sizes – large, medium and small.

There are two models of the machine- the smaller model grades about two tons of raisins in 12 hours and the bigger one grades four tons in the same period. The machines weigh 600 kg and 1000 kg respectively. The smaller machine costs Rs.30,000 and the bigger one Rs.45,000.

Advantages

This machine saves time by blowing away the dust, removing the twigs and grading the raisins by size. This simplifies the entire process for the farmer and after the raisins are graded, the farmer visually inspects the quality. With this device, the operator is safe from exposure to the dust from the blower. This machine helps in removing the tediousness involved in manually cleaning every single raisin and grading it accordingly.

The other comparable machine is imported and costs around Rs.20,00,000. It grades grapes according to their colour, size, shape etc. The cost advantage is overwhelming in the case of Jagtap's unit - it costs only about Rs.45,000 and gives satisfactory results compared to the imported machine. This could become an important factor in users' choice of equipment in future.

Current Status

Ramdas Jagtap has been working on this machine for more than a decade and has been selling it to local grape farmers in the Satara, Sangli and Sholapur regions

of Maharashtra as well as in Bijapur, Karnataka. One unit has also been installed at the manufacturing unit of 'Rangoli' raisins, one of the biggest raisin exporters of the region. So far, Ramdas has sold 25-30 small units and 40-50 big units. These machines have high diffusion potential in all major grape growing regions. Many prominent grape farmers of the area have bought this grading machine from him.

Generally, farmers make some of the payment in advance when they order the machine and the balance is paid when the machine is ready. Ramdas has employed a couple of labourers. He hires more when he has sufficient orders. He manufactures the machines during November to January and sells them during February to April as the demand is seasonal.

This machine can also be adapted for grading mangoes for making pickles and other fruits. Ramdas was not keen to patent the machine as similar machines were already available in the market. Following Ramdas' innovation, three other fabricators have copied the design and are now supplying them to the major grape growing regions of Maharashtra, Andhra Pradesh and Tamil Nadu. However these manufacturers have also recognized the fact that the original machine was developed by Jagtap. His machine also incorporates additional features which farmers find useful. Once sold a machine cannot be patented as the technology is supposed to have come in public domain.

Other contributions to the grape industry and laurels earned

Ramdas has also developed a machine that washes the dry grapes. Apart from this he has fabricated a conveyor belt for a grape packaging factory that facilitates the movement of grapes from the primary house to the packing hall for the purpose of export. This is very useful for grape exporters as the area for packaging is generally very small. By using this belt, a large number of boxes can be packed quickly and the labour charges are reduced. This has prompted several grape exporters to have the conveyor belt installed.

Jagtap was honoured by the National Research Centre for Grapes (Indian Council of Agricultural Research) for his contribution to grape production/ processing/ marketing on December 23, 2002, on the occasion of 'Kisan Diwas' organized to mark the birth centenary of Lal Bahadur Shastri, former Prime Minister of India. Maharashtra Grape Growers' Association, Pune, has also recognized his valuable contribution to grape processing in Maharashtra. Jagtap has also received awards from the local communities for his innovation.

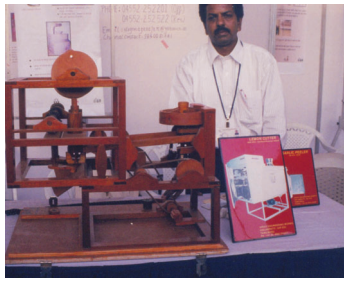
Lemon cutting machine and garlic peeling machine[6]

FARM MACHINERY - AGRI PROCESSING NATIONAL THIRD

M. Nagarajan (45) lives at Usilampatti, a small village 40 km away from Madurai in Tamil Nadu. He has studied up to ninth standard. He is married and has two children. Being the eldest in the family, he supported the education of his younger brothers and sisters and also got them married. He is the sole bread-winner of the family. His dream is to develop such machines related to food processing which are not available in the market. M. Nagarajan has modified a garlic-peeling machine and a lemon cutting machine significantly. These improved machines address the two-fold problem of the pickle industry, namely, inefficiency due to low degree of automation and short supply of labour during peak seasons, which limits the capacity.

Address
VIRGO Engg. Works
29/85, Theni Main Road, Usilampatti-625 532, Tamil Nadu

Genesis Nagarajan owns a small scale lathe workshop named Virgo Industry. The factory has been manufacturing accessory parts like aspirator, destoner, heat reducer and grinder used in the rice hulling units for the past 17 years. It operates from a very small and old rented house. Virgo Industry was founded by Nagarajan's late father who used to provide support services to the nearby rice mills. But over the last few years, continuous drought affected not only the farmers but also all the dependent industries. Most of the rice mills in the nearby areas have closed down. These circumstances forced the entrepreneur to seek some other avenues for survival. Nagarajan's close interaction with the pickle manufacturers exposed him to the problems prevailing in the industry. Some of the local pickle manufacturing companies requested him to design and develop a system to peel off garlic for making garlic pickles. Nagarajan successfully designed and developed a garlic-peeling machine in 2002 after two years of hard work. Later, he developed a lemon cutting machine as well.



Garlic peeling machine

The garlic peeling machine consists of a 2 HP electric motor, blowers, a peeling chamber, inlet, outlet, exhaust pipe and drives. The peeling chamber has a provision for garlic inlet and a shaft on which the blades are arranged in such a manner that there are six rows and each row consists of four blades placed at an equiangular distance of 90 degrees. The blades are arranged in two consecutive rows. In one row, the blades intersect vertically and horizontally, and in the other row, the blades intersect diagonally. The peeling chamber is cylindrical and the internal walls are serrated. The drives consist of three shafts and pulleys and are transmitted with the use of V-belts. The machine consists of two blowers of different sizes. A housing, made of a steel sheet, covers the entire mechanism. The manufacturing cost of a single prototype

is Rs.52,000 inclusive of labour charge and other running costs.

How the machine works

The garlic is fed into the peeling chamber through the inlet chute. Power is transmitted from the two HP motor shafts through V-belts. The pulley, fitted on the shaft, rotates the small blower. Pressurized air from the small blower removes the excess moisture from the garlic on the way to the peeling chamber. The cloves entering

the peeling chamber are pushed by the pressurized air from the big blower to the rotating blade. The rotating blades hit the garlic cloves towards the serrated wall of the peeling chamber and there these get peeled. At the same time, the pressurized air from the big blower pushes out the dust and the skin of the garlic cloves through the exhaust pipe. The peeled garlic cloves from the peeling chamber are collected through the outlet by gravity.

Advantages

The machine has the capacity to peel 200 kg of garlic cloves/hr. The garlic cloves thus obtained are of uniform size and can be neatly and conveniently collected and recovered. Another feature of this machine is that it is easy to construct, operate, and maintain. The machine helps to achieve greater productivity, is energy efficient and labour saving and reduces the drudgery in the slow laborious manual process of peeling garlic. It can also be used in other food processing industries apart from the pickle industry.

Lemon cutting machine

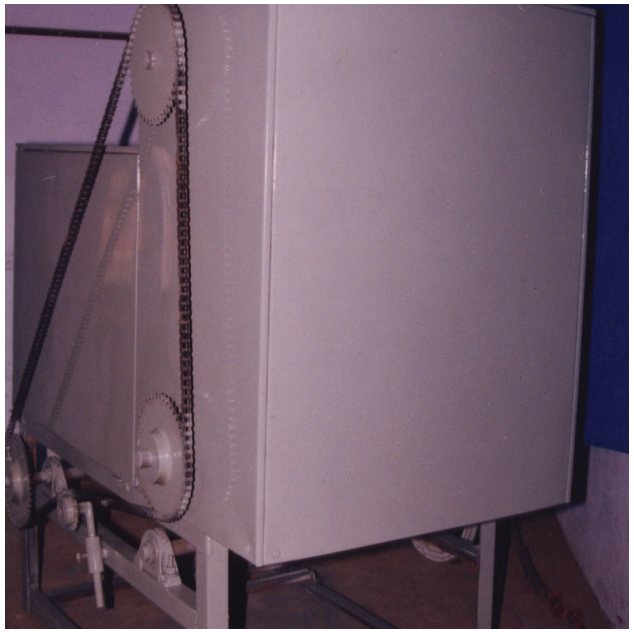
The Innovation

This innovative machine can continuously cut large quantities of lemon into required shapes and sizes. The machine includes two fixed hoppers - one conical and another circular, both having two outlets. When a taper disc, fitted in the circular hopper rotates, it makes the lemons move forward through a passage one by one. This passage is in the shape of a channel, which has the provision of a chain control regulatory mechanism in the centre. This serves as a gripping system and ensures the movement of lemons subsequently into the cutting system. Before the lemon is cut into eight pieces, there is a mechanical regulatory mechanism, which so opens and shuts the inlet chute that the lemons are cut in sequence. In the cutting chamber, the lemon is placed on the upper side of a multi edged cutter with four edges facing four directions and fixed in position.

Subsequently, a plunger, which is fitted above, moves vertically to press the lemon to the cutter and the lemon is cut without the shape being destroyed. The lemon is cut into four slices with a single stroke of the plunger and in the next movement there is a diagonal cut that divides one entire slice into two. Thus, a total of eight slices come through the outlet.

This machine is capable of cutting lemons ranging in size from 0.75 inches diameter to 2.5 inches diameter

with the help of a spring loaded mechanism which also provides a better grip on the lemon which ensures uniformity in cutting. For packaging in smaller



quantities, the lemon has to be cut into smaller pieces (12 to 16 pieces). Changes can be made in the present machine to do this as well as to grade the lemons. This results in lower cost of production.

Advantages

The slices of fruit produced by using this machine are of a uniform size and can be neatly and conveniently collected and recovered. Optimized power transmission ensures less consumption of electricity (7-8 units in 8 hours of operations). This device is labour saving - only one person is required to operate it. There is a minimal wastage of the lemons in the cutting operation i.e. 100% of the yield is utilized. The machine is compact and made of stainless steel, which makes the process hygienic. The half CAM lever mechanism in the machine ensures that the lemons are fed to the cutting chamber one by one to avoid cluttering and this ensures proper cutting of the lemons. The synchronization of the movement of the four-edged vertical blade and rotary horizontal blade ensures that the lemon is cut right across both the axes and this ensures removal of seeds without any effort. This feature not only saves manpower costs and wastage due to improper cutting, but also contributes to the quality of pickles (seeds in pickles often cause irritation to the consumer). The cutting capacity of this machine is 160 lemons/ minute or 450 kg per hour. This innovative technology has an edge over two other manufacturers, who make similar machines, in terms of the low initial investment (Price-Rs.100,000) and low operating cost. This machine is also easier to operate and maintain than existing alternatives.

From the social benefit perspective, the technology offers a less hazardous process for labourers, usually women, who spend a considerable amount of time in cutting the lemon manually to the required shape and size. They often suffer from blisters on the skin while handling lemons as these are highly acidic.

According to Nagarajan, the manufacturing cost of a single prototype is Rs. 82,000 inclusive of labour charges and other costs. His selling price is Rs. 95,000.

Recognition from the formal sector

Nagarajan finds the whole experience of innovation very inspiring and feels that this spurs him on to innovate further. Contrary to the experiences of most grassroots innovators, Nagarajan's innovations were accepted and appreciated for their commercial value by industry sources. S. Kulwant Singh, (General Manager–Operations), The Food Division of Cavin Kare mentions that they purchased two garlic peelers from him and these are working satisfactorily. They are now planning to purchase the lemon cutting machine for their pickle processing unit at Gudur. They believe this will save a lot of manual labour and improve hygiene as well. CavinKare is also encouraging and supporting Nagarajan's R&D efforts in other areas of food-processing. Its technical team from Chennai had visited Nagarajan's small workshop at Uslampathy on quite a number of occasions. CavinKare is a company which

was started with Rs.50,000 and its MD Mr.C.K. Ranganathan was the recipient of this year's *Economic Times Entrepreneur of the Year award.*

Industry Analysis

Pickle manufacturing is a very labour intensive industry. The major reason attributed to this could be the prevailing small scale of the process of preparation of pickles. Most of the over 500 pickle manufacturers spread across the country, with major concentration in South India, operate at either the cottage, small or tiny industry scale with a few exceptions. The consumption pattern is also skewed towards South India. Of late, the export of pickles has witnessed a rapid growth primarily due to the increasing demand from Indian diaspora around the globe and increased awareness about Indian cuisine and accompaniments in Western countries.

The industry is labour intensive. Even a small scale pickle manufacturing unit would on an average employ about 400 women. On the positive side, the industry has provided significant employment for rural and semi-urban women. However, low automation causes inefficiency and hence, makes processing expensive. Another important feature is the seasonality in pickle manufacturing. The season is during April-June and September to mid- December. It is observed very often that availability of labour becomes the limiting factor for the industry during the season.

Current Status

The market research conducted by NIF reveals that the pickle industry is very keen to adopt these devices developed by Nagarajan due to their low initial cost and high efficiency. Since this industry is concentrated in South India, Virgo Industry may have some additional locational advantage over other suppliers. Nagarajan had already given a few Garlic Peeling Machines for testing at the consumer end. He was also advised by GIAN on ways to protect the intellectual property rights of his new improved model. In fact, he also sensed the problem of his technology being copied by some fabricators in the region, and he stopped the sale of the earlier lemon-cutting machine. He requested NIF through its regional collaborator Sustainable- agricultural and Environmental Voluntary Action (SEVA) to file a patent for these two machines. Now, since both the patents have been filed by NIF, he is willing to take his innovations to market. NIF has also sanctioned Nagarajan a sum of Rs. 1,87,000 from the Micro Venture Innovation Fund for the commercialization of the Lemon Cutting Machine and after successful commercialization Rs. 15,000 has been repaid by the innovator as the first instalment.

In addition, parallel efforts are being made for technology licensing. But the only limiting factor is the capacity of Virgo Industry which is quite small. It can manufacture only three lemon- cutting machines or four to five Garlic Peeling machines a month. Nagarajan has a small team of five people. Two of them are trained (Industrial Training Institute) and the others are semi-skilled. The challenge is that the innovator recognises the constraint and wishes to explore other opportunities of scaling up through joint ventures or licensing.

There are several lemon cutting machines and garlic peeling machines already sold around the world. The Chinese and Korean machines are cheaper than US machines. But Nagarajan's machine is more cost effective compared to all Indian and imported machines. There lies his competitive advantage, which might generate greater success for him in future.

Match sticks of natural fibre[7]

ENERGY NATIONAL FIRST

Uttam Sambhu Patil (76) belongs to Nandurbar, Maharashtra and retired as Head Master from a local High School. Being a science graduate and teacher, Patil was always interested in research and development activities. He has put up several science projects at school exhibitions. In 1972 he got the national award for meritorious invention for the pencils he had made out of stalks of jowar. A freedom fighter, he is constantly inspired by any development that has the potential to improve the economy of the country. His two sons are in the technical field and two daughters are married.

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Co-op. Society
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Maharashtra

Genesis Demand for a number of natural fibres is coming down due to the decline in industries based on such fibres. Uttam Patil was aware that growers of such fibres in many Indian states were suffering. The labourers dependent upon the cultivation of such fibres were also on the receiving end. Uttam Patil wanted to do something to address this problem. He thought of the various alternative products that could be made using natural fibres. One idea that occurred to him was that these fibres could be used to make matchsticks. However, he faced a number of problems while designing the matchsticks, one of which was finding the right binding agent for the fibres. After trying out glue and various other starches, he developed the right combination. Another idea of his was using some natural oil to weatherproof the matchsticks. This would further harden the matchsticks and improve their appearance. The matchsticks would thus burn continuously and extinguish immediately.

The Innovation
Uttam Patil has successfully developed a process of making splints for safety matches using some natural fibres. The natural fibres are bound by natural starch to give it the required thickness and strength. This is then coated by some natural oils to provide the final finishing. The splints thus obtained are cut to the required length/size. These splints are then dipped into phosphorus solution to coat the tips with the igniting material.

Advantages
In comparison with the conventional matchsticks, these matchsticks burn longer. The matchstick burns slowly but steadily, reducing the chances of the user's fingers being burnt. Further no harmful chemical is used except the mandatory phosphorus. Preparing these matchsticks is much easier and cheaper than preparing wooden matchsticks which require huge machinery for cutting logs of wood to suitable size. The innovation has a significant impact on the environment and can also change the dynamics of the safety match industry. NIF in coordination with GIAN- West has sanctioned an amount of Rs. 12,500 from its Micro Venture Innovation Fund towards laboratory testing and technology transfer of the matchstick. NIF has also filed the

patent and the number is 345/MUM/04, 22.03.04. GIAN is also exploring the option of technology transfer with one of the large companies.

Eco-friendly with employment generation potential

As these matchsticks provide an alternative to wood, they reduce the pressure on our rapidly depleting forests and contribute towards maintaining the ecological balance. Afforestation requires decades, whereas these fibres mature in six months, making it a viable alternative. The manufacture of these matchsticks has significant employment generation potential in the small-scale industry sector as well as for women working at home. Even the waste from industries processing natural fibres can be used to manufacture these matchsticks. This assumes significance in the context of the large amount of agro-waste, which is underutilized in an agriculture-based country like India.

Current status

At present Uttam Patil manufactures the matchsticks for personal use. He sends the sticks to institutes and other places for demonstration purposes but has not commenced commercial production. He has also provided drawings of the machinery required for making the matchsticks. These machines, once developed, would enable the mass production of matches. He is willing to transfer the technology to established entrepreneurs and help in product development. He has also developed a match strip to replace the conventional matchbox.Uttam Patil believes that everybody should have a sense of creativity. Citing his example, he points out that he persisted with his efforts to innovate even though he lacked money and laboratory facilities.

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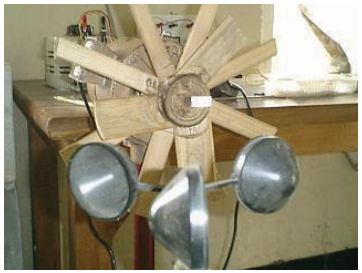
Jorhat, Assam

Scouted by
Brighupati Hazarika,
Amlan Jyoti Bordoloi



Modified fan design made of bamboo[8]

ENERGY NATIONAL SECOND

The brothers, **Nipul Bezbora** (25) and **Bipul Bezbora** (28) are from Bezgaon, a village in Jorhat district of Assam. They could not complete their education and earn their living by farming and ploughing in neighbouring fields on a daily wage basis. They have a small arecanut plantation.

Genesis Nipul and Bipul had bought a rice husking machine but were facing problems in separating the rice from the husk when the mixture fell from the machine. To remedy the situation, they built a simple fan to blow the air for the separation. But due to size constraints, they could not get the requisite amount of air to separate the husk. And thus began the journey of improving the innovation. Finally one model made of bamboo was completed on June 15, 2002. They tested it in an innovative test rig developed by themselves and the results were encouraging.

"We are quite amazed by the thinking of the inventors who had no formal training in science and engineering. They should be capable of more."

This is what Dr.S.R.Kannan, Vice President, Corporate R&D and Quality, Crompton Greaves Ltd., has to say about the accomplishment of Nipul and Bipul Bezbora.

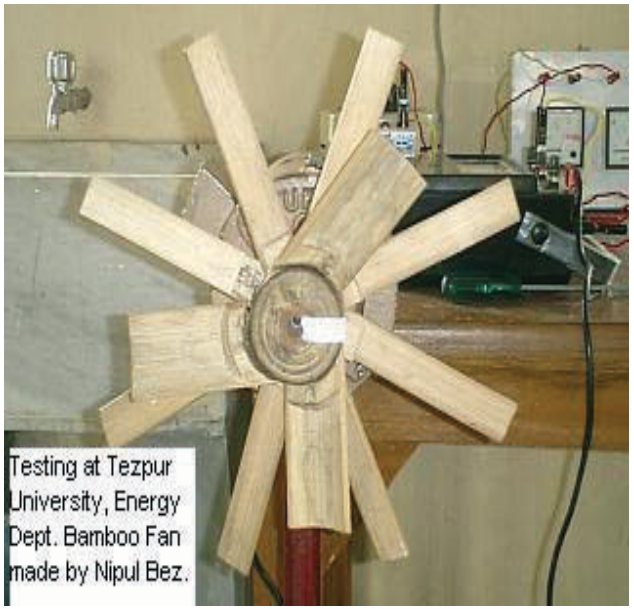
The Innovation

The innovators have developed a multi-bladed, double-layer fan to blow air in order to separate rice and husk when the mixture falls from the rice husking and winnowing machine. This unique fan is made of bamboo. Unlike normal fans that have one set of blades circumferentially on the axis, this machine has two sets of larger and smaller blades located circumferentially on the same axial shaft. The bigger blades are eight in number, straight and small in width. The smaller blades are four in number, curved and arranged next to the bigger blades.

The curvature provided to the smaller front blades, helps in sucking the air due to the creation of a vortex. This feature is attributed to the Coanda Effect, which is the tendency of a stream of fluid to stay attached to a convex surface, rather than follow a straight line in its original direction. The effect is named after Henry Coanda, a young Romanian Engineer who used the principle to power an aircraft in 1910.

The layer of blades at the back functions as in a normal fan and sucks in the air and feeds it into the layer of blades in the front. Because of the unique arrangement of the two layers of blades, a wedging action is formed, which pushes the air forward through the front layer while producing a vacuum in between the blades. As a result, more amount of air is sucked by the back layer at a rapid pace and is channelled out through the front layer. This

unique process basically improves the efficiency of the unit and sucks in and delivers more air. Due to the unusual arrangement of the two-layer blades, they develop vortex airflow, which results in higher amount of air/unit energy supplied as compared with single layer designs.



The significance of the innovation is in the arrangement of the blades and their placement, the angle of the blades with respect to the axis, the relative position of the smaller and bigger blades and the direction control of the fan for focusing and distribution of air. Each bamboo fan costs about Rs.100.

Advantages

A comparative study of the performance of different fan designs with the bamboo fan indicated that the multi-bladed, twin layered bamboo fan has several advantages over conventional designs as (i) higher value of air flow rate per unit sweep area, (ii) higher value of air flow rate at comparatively lower speeds and (iii) less noise. Further, it is environment friendly and saves energy. It is particularly relevant in rural development as it can be used as a Forced-Air Paddy cleaner in the rice mills. Also, since fewer fans are required for a large area, the cost of the equipment is not very high.

A passion to innovate

Solving local problems using locally available materials and creating unusual but useful devices for domestic needs has always been a passion for Nipul and Bipul. Their other innovations include a bamboo cycle rickshaw, for carrying their agricultural goods, developed in 1995, as well as an arrangement to prevent theft of power tillers. They also modified the power tiller's mudguards which enabled easier negotiation of ridges in the field and provided a safeguard for the user.

Neither adverse economic condition nor educational disadvantage has hindered these brothers from pursuing their dream of coming up with different innovations. Their community has honoured them by attributing them with the title of "Vishwakarma". Nipul has also been recognized and awarded as "shilpi" and social worker by "West Jorhat Sahitya Sabha" on the occasion of its centenary celebrations in 1998 especially as he is always ready to offer a helping hand to the villagers for solving their personal problems.

Manual wood cutting machine[9]

ENERGY NATIONAL THIRD

Karuna Kant Nath (40) is a carpenter and has studied till the fourth standard. He has a small furniture shop at Gharara Dallang Ghat village of Darrang district of Assam, where he lives with his wife and daughter. He has been engaged in carpentry since 1976.

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Scouted by
Mr. Akshay Kumar &
Mr. Trilokya Bora

Genesis Karuna Kant needed to saw wood frequently in order to make furniture. However, he was unable to pay the cost of getting this done in the nearby saw-mills. Sawing the wood manually, on the other hand, took up a lot of time and effort. Then the idea of developing a manual device that would saw without using electricity or any other fuel took root in his mind. This was in 1995. Around this time, when he went to the forest to fetch some wood he noticed a couple of wood–cutters using a big saw to cut wood. The sight of the woodcutters moving the saw up and down in order to cut the big log inspired him. He felt that if he placed springs at both ends of the saw in place of the woodcutters, he would no longer have any difficulty in sawing the wood manually.

Though he was enthusiastic about developing this idea, his financial circumstances did not allow him this luxury. Nor was his family receptive to it. Forced to push this idea to the back of his mind, he carried on with his modest business of making furniture. But time and again the idea kept haunting him till one day he decided to look at it from a completely different perspective. He decided that if his friends could find money within their small incomes to waste in useless activities like gambling and drinking, he could also set aside some from his limited income to invest in a useful activity such as developing the manual wood cutting machine.

Spurred by this decision, he started experimenting with his idea and developed various prototypes through trial and error. The first model was not satisfactory, but things began to take shape from the second model onwards and since then he has made several modifications to improve the design of his machine.

The Innovation
The manual wood cutting machine is an energy saving device that works on the principle of inertia of motion. The machine can be used to cut big logs as well as wood for furniture .

Details of the latest prototype

Construction details
Wood has been used as the structural material. Some parts are made of steel and RCC. The height of the machine ranges from 5-10 ft. It consists of two wooden columns on which steel channels are fitted, a Bed, two Fly wheels made of composite material i.e. steel and RCC, two connecting rods made of wood, cutting

blade, flexible clamp made of iron and eight Ball bearings.

Design and Functioning

Two steel channels are fitted on the two wooden columns within which the vertical up- down movement of the bed through the bearings is possible. Two composite flywheels are fitted on the top of the machine through the two wooden columns and two connecting rods made of wood are attached to the flywheels. The other end of the connecting rods is fitted with the bed. Cycle tubes are connected to the bed to store energy during the reciprocating movement.A flexible clamp is provided with the bed to hold the wood being cut, depending on its thickness. These link mechanisms are done in such a manner that the vertical movement of the connecting rods causes a rotary motion of the wheels and a vertical linear motion of the cutter. A cutting blade is fitted on the middle of the machine vertically.

During the operation, wood is placed on the bed and the vertical movement of connecting rod is achieved manually either by the movement of the hand or leg with little effort. This is possible because of the movement of the flywheel that gets rotated with the additional force of inertia. Consequently the blade fitted in the middle of the machine cuts wood as a result of its linear motion.

The flywheels used by Karunakant are unique in their application as well as composition-they are made of iron and RCC. Though the concept of composite flywheel has become a buzzword these days in the field of research and development, Karuna Kant has applied it successfully without having any formal knowledge of the concept. Another unique feature of the system is the arrangement of its bearings (i.e. the support bracket for sliding) which makes the up-down movement of the bed through connecting rods possible and facilitates a two-dimensional movement in the system.

Advantages

Compared to existing options such as an electrical saw mill or manual labour, the manual wood cutting machine of Karunakant has a number of advantages. It costs only Rs.12, 000 as compared to an electrical saw mill which costs Rs.1,00,000. In addition there are no running costs as it does not require any power supply as compared to the saw mill which requires a 10 HP motor. The cost of cutting wood as well as the time required is less than that needed if manual labour is used. In addition, it is quite efficient and easy to operate, thus reducing drudgery. It especially assumes relevance in the current scenario where the government has banned the setting up of new power saw mills which forces people to wait for long hours at saw mills to get their wood cut.

Current status

NIF in coordination with Grassroots Innovations Augmentation Network- North East (GIAN-NE)has sanctioned an amount of Rs. 72,500 from its Micro Venture Innovation Fund towards the commercialization of the machine. NIF has also filed the patent application for the machine.

Variable gear system for cycle rickshaws[10]

TRANSPORT NATIONAL SECOND

Sheikh Jabbar grew up in a traditional weaver's family in a village near Nagpur. But in the late 50s and 60s mechanization led to the closure of these mills and the family's only source of livelihood came to an end. So they started looking for alternatives and Jabbarbhai took to auto driving and later turned to truck driving. Currently he ferries school children from school and back on his cycle-rickshaw to earn his living and operates within a radius of 2km from his house. He also has a small rickshaw repairing shop to supplement his earnings. Jabbarbhai has married thrice and now lives with his third wife and three children, two sons and a daughter. His children are studying in a local school and his wife Shakeela works as a maid and earns about Rs.1000 a month. Jabbarbhai has four children from his earlier marriages. But he regrets the fact that his sons are not interested in his work. But inspite of all the hardships and the ups and downs of life he has lived through, at 70, there is a sense of serenity and calmness on Jabbarbhai's face, a rare sight in today's world.

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Scouted by
Late Vinoo Kale

Genesis Once Jabbarbhai was watching a rickshaw puller driving in front of his truck and it struck him that he could make the rickshaw puller's life easier by attaching another gear to it. He went on thinking about it and one day the whole picture of how such a system could be made was ready in his mind. Quite excited he discussed this idea with his friends but got nothing but ridicule for it. Their response made him also feel slightly sceptical as he thought that if anything could be done on a rickshaw, others would have already done it especially as "there are many highly qualified people in the world who would have thought about it". The only thing which kept nagging him was the fact that rickshaws are designed by people who do not use them and therefore are not familiar with the problems the rickshaw pullers face. This motivated him to pursue his idea and he went to a fabricator and discussed it, but the fabricator also discouraged him and even said that the idea was impractical and could never be realised.

Determined not to give up his idea, Jabbarbhai left off driving trucks and bought a rickshaw for Rs.550 in 1975 with the dual purpose of earning his living as well as trying out his ideas on it. Though the idea of fitting a gear often crossed his mind, he found that he had neither the time nor the resources to work on it. The daily rigour of pulling rickshaws also took its toll on his health and he fell sick and could barely work for more than 2-3 hours which lead to a constant decline in his earnings.

Finally one day he felt that it was high time to work on the idea he had as he needed to earn more, particalarly as his daughters needed to be married off and he himself was getting older too. With this aim he bought some tools and spare parts and began developing his "two-gear rickshaw". In his free time he would open

the freewheel, axle and other parts of the vehicle to understand its mechanism. Completely involved he would lose all sense of time and wake up at odd hours. He used to go around hunting for scrap and spare parts in the Chor Bazaar and would go without food for hours. Soon his wife also began assisting him. His friends and relatives ridiculed his lofty ideas and asked him why he tinkered with a well functioning and new rickshaw, but none of this deterred him from the pursuit of his goal.

Fifteen years after the idea struck him the two-gear rickshaw was ready - after umpteen highs and lows - and he could ride it for the first time in 1989. Jabbarbhai continued to improve his innovation. Next he developed a four-gear differential system with double axle, which would overcome a mechanical flaw prevailing in the normal rickshaw where only one of the wheels is powered from the torque given by the puller. Whereas here by transferring it to both wheels, it became a "two-wheel" drive. The next stage in development was a four-gear rickshaw with differential mechanism and single axle in which the double-axle was removed and a single continuous axle was introduced. The power from the pedal was thus transferred to both the wheels, but in a much simpler fashion and it also reduced the add-on weight.

The Innovation

The principle employed in the gear-system developed by Jabbarbhai is similar to the double sprocket system, where two free wheels are used. Free wheel is a simple but indigenous mechanism which allows rotation in one direction and becomes free in the reverse direction. Jabbarbhai used this mechanism and converted it into a gear system. He devised a mechanism in which the gear is changed or engaged with the help of a dog-lift, which can be activated by the rickshaw-puller with the help of the lever attached to the handle. As soon as the puller pulls the string, the dog-lifter is released and the cam gets released- it moves up and in turn gets locked with the teeth inside the free wheel and thus the gear is engaged. Once the vehicle gains some motion, the puller shifts to second gear.

Thus the modified system has the following features - improved free wheel, multi-gear system, drum brake means and multi-chain system. It is simpler in construction, of lower cost and easier to maintain compared to similar devices which have got US patents. Compared to the traditional rickshaw cycles and the ones developed by IDC and IIT Delhi, this model developed by Jabbarbhai has three and four gear speed options.

Other innovative features

Apart from this gear system Jabbarbhai has also made a few other modifications to improve the performance of his rickshaw. One is that of a disc-brake at the back which is adapted skilfully for a cycle rickshaw. Normal

rickshaws have their brakes fitted on the front wheel; but this has some disadvantages as the rickshaw has a tendency to upturn if brakes are applied suddenly, especially when travelling fast as the puller might loose control of the vehicle. This would be an added risk for Jabbarbhai especially as his rickshaw has four gears, but with this brake system that problem would be solved. In a normal rickshaw simple metal-flats are used to absorb the bumps. Whereas in his rickshaw ,Jabbarbhai has added a spring along with a metal flat in a slightly different manner and this has improved shock absorbing qualities.

The struggles

Jabbarbhai relates how the whole experience of developing an idea into a tangible product was a long arduous1 process. How there were days and nights when he used to feel utterly depressed and lost because initially his idea would not work. And unfortunately he could not even discuss this with anyone as they considered it foolishness or madness. Sometimes his colleagues would peep into his workshop and laugh at him or walk away without comprehending his effort. But what kept him working was the belief that this idea would indeed succeed. And when finally he successfully rode a double-geared rickshaw, his joy found no limits- "I was on top of the world."

Unexpected support

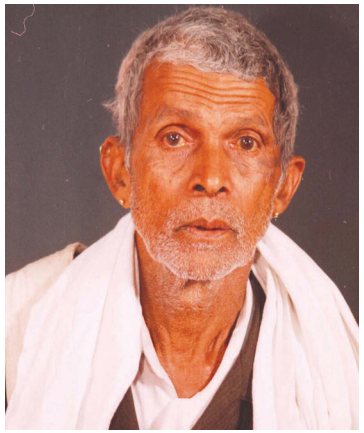
Jabbarbhai's experience with formal institutions such as research institutions, universities and the government left a lot to be desired as he found them rarely interested in doing anything tangible or substantial. They just kept on giving false promises. The exceptions were people from the alternative and appropriate science technology practices, who showed a lot of interest and got him funds where possible. Late Vinoo Kale, one of the key members of the Centre for Science for Villages (CSV), took a keen interest in this innovation and often used to travel in Jabbarbhai's rickshaw as well as request his friends and relatives to travel on this rickshaw. Kale also approached the Department of Science and Technology, Govt of India, through CSV, for financial assistance for the development and promotion of Jabbarbhai's innovation and got a sum of Rs. 95,000 sanctioned in 1992 for the pilot project of installing such gears on 24 cycles. This experiment helped in getting necessary feedback and contributed to solve problems existing in the rickshaw. Kale also introduced Jabbarbhai to Prof.Yashpal, who covered this innovation in 1992 in the popular programme on science-Turning Point on Doordarshan. On the 14th of April, 1997, Jabbarbhai left for Delhi on his rickshaw to attend a mela, which Medha Patkar had invited him to inaugurate. He undertook the long journey via Bhopal, Mathura and Agra and used to start driving his rickshaw at five in the morning and go on till twelve midnight and then rest and start again in the morning. He finally reached Delhi after ten days and he remembers how on the way he met several well wishers who appreciated his innovation and offered him tea and food. His current supporter is Mr. Satish Ghanekar, a bank employee, who has a keen interest in mechanical problems coupled with a deep admiration for Jabbarbhai. Satish spends all his free time working with Jabbarbhai, assisting him in various tasks.

Current status

Rickshaw-walas, in his neighbourhood were very excited but apprehensive as well about this innovation when Jabbarbhai originally came up with it. But now that they have seen him pulling it over years, they feel it works and they also want the system. But the system is expensive for them and they would require some financial help to implement it. Jabbarbhai at the same time laments that rickshaw pullers have looked down upon his innovation just because it has not come from a scientist or a laboratory. Otherwise he is sure that they would have appreciated it more. Jabbarbhai plans to own a few rickshaws so that he can install these gears on them and give them to rickshaw pullers in order to promote its use. NIF has sanctioned him Rs.28,750 from the Micro Venture Innovation Fund for product development and demand estimation of this innovation. Jabbarbhai has filed for a patent.

Traditional herbal healer

APPRECIATION



Kunjira Mulya (75) hails from Mala village, Karkala taluk in Udupi district of Karnataka. His father, Angara Mulya was a well known herbal healer (*Naati vaidya*) during his time and he used to treat cattle and human diseases. Kunjira Mulya learnt the skill of herbal medicine from his father. As long his father was alive, he never treated any ailments, as per the family tradition. But, he assisted his father in the collection of medicinal herbs from the nearby forest patches and also in the preparation of medicines. For the last 30 years, after the death of his father, Kunjira Moolya has been practicing herbal medicine in Mala village.

A healer par excellence
Kunjira Mulya treats both human and cattle ailments. According to Kunjira Mulya, so far he has successfully treated over 5000 humans and an equal number of cattle during the last 30 years. With great pride he states that as on today no one has succumbed to death as a result of his treatment, although most of his patients happen to be terminal cases.

Human diseases
Some of the major diseases which affect human beings which he treats are: Malaria, Typhoid, Rheumatism, Jaundice, Herpes, Mumps, Vomiting & Diarrhoea, Diabetes, Sores, Piles, Asthma, Epilepsy, irregular mensus and White discharge.

Poisonous animal bites
He has also got successful antidotes for Cobra bites, as well as other Snake bites (Viper, Krait), Scorpion bites, Spider bites and Bee/Wasp bites.

Cattle diseases
In cattle he treats immobility of limbs, Bloating of stomach or stomach pain, Diarrhoea with mucous and blood, worm infestation in wounds, loosening of teeth disease and limb fractures.

An extraordinary case
Kunjira Mulya recollects one of the rare cases that he dealt with in 1985. Once all six members of the family of Obayya Gowda fell sick after consuming mushrooms collected from a neighbouring *'Bhogi haadi'* (Hopea plantation). Presumably they must have cooked one of the varieties of poisonous mushrooms and consumed it along with their night meal. One by one, the members of the family started suffering from vomiting and dysentery and by early morning their condition was critical. Luckily for them, their neighbours got to know of their plight and called Kunjira Mulya for treatment, since there were no hospitals or clinics in the neighbourhood. After studying the situation, Kunjira went to the nearby forest patch and collected four medicinal herbs and made a decoction and gave them and this saved a family which was practically on the verge of death.

A Parataxonomist too
Besides being an herbal healer, Kunjira

Address
VPO Indiranagar
Distt. Udupi, Karnataka

Scouted by
Mahalaxmi Parthasarthi

Mulya also served as a parataxonomist in the Biodiversity Conservation Prioritization Project (BCPP) of WWF-India, which led to the preparation of India's first People's Biodiversity Register (PBR) of Mala village panchayath. The ongoing People's Ecosystem Assessment Project (PEAP) of the Ministry of Environment and Forests (MoEF), Government of India, under the guidance of Prof. Madhav Gadgil of the Centre for Ecological Sciences, Indian Institute of Science, Bangalore, owes a great deal to Kunjira Mulya for his valuable contributions towards the documentation of traditional knowledge and biodiversity of the Western Ghats of the Mala village Panchayath region. Kunjira Mulya commands respect for his knowledge not only of medicinal plants and herbal medicine, but also of other plant and animal taxa covering over 800 species.

Recognition

Kunjira Mulya was felicitated by the Bhuvanendra Nature Club-India (WWF-India), the Nature Club of Sri Bhuvanendra College, Karkala, in 1996 along with the *'Pashu vaidya'*, Kadari Srinivasa Prabhu (another cattle herbal healer of Mala), during the 42nd Wildlife Week Celebrations-cum-Salim Ali Birth Centenary Seminar on 'Conservation of Biodiversity of Wetlands'. Jnanapeeta Awardee Padmabhushana Dr. Kota Shivarama Karanth, Deepak Sharma, Conservator, Wildlife North Circle, Shimoga, K. Amaranath Shetty, MLA of Moodbidri, were among the dignitaries who felicitated these traditional knowledge holders. Since then a number of organizations have felicitated him and he was also invited for the conferences of the *Naati vaidyas* in several places including the one state level conference recently held in BAIF, Tiptur where he was felicitated. New Delhi's 'National Board of Medicinal Plants' has recently awarded *'Vanaoushada Pandit*-2003' award to Kunjira Mulya. This award includes a bronze idol of *Dhanvantri*, a citation and a cash award of Rs. 10,000.

Future worries

Kunjira Mulya is 75 years old now and what worries him most is that with his demise, his entire traditional knowledge which he has quite proudly preserved will also vanish. He tried to teach this methodology of herbal treatment to his youngest son, who was not enthusiastic about it and did not have the confidence for identifying and procuring the medicinal plants required for the preparation of these herbal medicines. One hopes that the extraordinary knowledge of this healer shall be documented and maintained for the benefit of future generations.

Traditional bone healer

APPRECIATION

Pushpalata Saikia (40) hails from Pangria, a remote village in the Jorhat district of Assam. She has been practicing a traditional method of treatment for bone fracture and backache successfully for years. She treats nearly 20 to 30 patients daily and charges no fees. She has learnt the practice from her husband late Sidanand Saikia and her brother in law Dulal Saikia. She has not made any improvement over the practice. She has treated more than 500 patients and cured 95 percent of the patients suffering from bone fracture.

Address
Charaibahi, Pangiria
Jorhat
Assam

Scouted by
Alok Pradhan,Amlan Jyoti Bordoloi
Bhrigupati Hazarika

Method of preparation
The leaves/stem of Harjura lota (*Cissus Quadrangularis linn*) (25 g), leaves/stem of Pochotiya (*Vitex nigunda*) (25 g), leaves/stem of Kehraj (*Vebesina Prostrata*) (20g) and leaves/stem of Kolialota (*Merremia umbellate*) (25g) are taken and all of them are mixed and oil seeds (10 g) are added to this mixture. The mixture is then ground and boiled to get a composition in the form of solid paste. These materials are available in the jungles- some plants are only available during summer and some are available during winter.

Method of administration
In order to treat a person the paste so obtained is applied on the affected area of the body or wound and allowed to remain there for a period of at least 24 hours. The medicine should be applied on the affected area and covered with a calcium plaster sticker, above which a cloth is to be tied. The medicine should be allowed to remain on the affected area for exactly 24 hours. The application should not be tampered or otherwise it would turn ineffective. This treatment is useful for the removal of pain, backache, healing of minor bone fracture, painful conditions of frozen shoulder, stiff neck, musculoskeletal disorder and post operational pain.
In case of a fracture the herbal composition has to be applied every three days for a period of one to four weeks depending on the nature and severity of the fracture. Instead of placing the broken bone in its original place, the application is said to elongate the bone and then join the broken area. This is the reason cited for taking out the application after exactly 24 hours.

A family tradition
There have been numerous traditional ways of curing broken bones all over the world and the Saikia household in Assam is one of such families who have been practicing it for 6 - 7 generations now. The contents of the herbs, which are used for the treatment and its preparation is not known to anyone except a few members of the family. The person in knowledge of the contents of the herbs generally reveals it to the eldest member of the family on his/her death bed. It is so secretive that the girls born in the family are never told about the exact specification of preparing the medicines and its application. The reason is that they will get married and leave for their husband's home and thus it will no longer

remain a secret. Though girls married into the family are told about the herbs, it is done only when there is no adult male in the house. Pushpalata Saikia had come to know about the practice from her husband late Sidanand Saikia and her brother in law Dulal Saikia.

The intriguing story behind this medicine

There is a story regarding the founding of this medicine. Non-vegetarian food such as fish, egg or meat of duck, chicken and even pork is common among the people of all satras of Assam. Sometimes pigs are sacrificed on certain festive occasions and at such times the entire village eats the pork after the ceremony is over. The discovery of this wonder drug started from this "sacrificial pig" and the great grandfather of the present generation of the Saikia household was the one who discovered it. Around 100 years ago, on a festive occasion a pig was sacrificed. Since it turned dark on that particular day due to a delay in the proceeding of the rituals, the villagers thought that it would be better to keep it in the Dekhi Ghor (Paddy store house) overnight and distribute the pork on the next day. They covered the cut pig that had been slashed open longitudinally in the stomach with different kinds of leaves. The next day when the villagers came to distribute the pork around the village they were aghast to see that the wounds of the pig had healed miraculously. They all ran away thinking that it was the handiwork of some departed soul or may be a ghost. But the elderly Saikia, though surprised to see the miraculous healing of the sacrificed pig, was not intimidated by the incident. After pondering over it for days he came to the conclusion that may be there was some medicinal property in the leaves, which were used for covering the sacrificed dead pig. He started searching for the same kind of leaves in his backyard, the village and also the nearby forest. After he was satisfied that the leaves he had collected were the same as the ones used to cover the dead pig he took a goat of his and deliberately broke its leg. Then he started to bandage its broken leg with the leaves and after many trials he successfully found out the right ones and also refined the dosage. All throughout this experiment of his, the people of the village called him names and tried to discourage him from doing it but he didn't let that deter him. Before his death, he called his eldest son and told him about the herbs and the application. He also told him to use it for serving society and not for earning money. He also ordered him not to divulge it to anyone outside the family excepting inside their household and laid down certain rules and regulations for passing the information down to the next generation as mentioned above. This shows that he was very concerned that this practice should be used for service and not for exploiting people. These rules are followed with all its strictness till the present generation.

Traditional Herbal Healer

APPRECIATION

Devika Rani hails from Adaikkanoor village, Dindigul district in Tamil Nadu. She is 33 years old. She has only studied up to the 8th standard. But, she is much sought after by the women of the neighborhood for solutions to their gynaecological problems. Although she could not afford to go for higher education, Devika used her high-school education as the foundation for independent further studies to specialize in the treatment of what are known as women's diseases. She has acquired considerable expertise in the field. Women of the area repose confidence in her for the treatment because she takes pains to educate them.

Address
W/O Mr. Ponnadaikkan
Adaikannoor, Tal: Natham
Dist: Dindigul, Tamil Nadu

Scouted by
CCD, Tamil Nadu

Leucorrhoea

One such ailment which Devika treats is "the whites" technically called leucorrhoea. It is basically a discharge of white, viscid mucus, resulting from inflammation or irritation of the membrane lining the female genital organs. Devika has taken it upon herself to bring relief to local women from leucorrhoea. She dispenses a simple and safe preparation that she makes herself using herbal ingredients. She collects the ingredients from common wastelands and nearby forests or buys from the local herbal drugstore.

The medicine

Leaves (a handful) of *Cassia italica* (Mill.) Spr. (syn. *C. obovata* Coll.) and *Enicostema axillare* (Lam.) Raynal [syn. *Enicostema littorale* auct. non Blume, *E. verticillare* Baill.] are ground together. The paste is added to half a glassful of cow-milk. One tea-spoonful of cumin powder (*Cuminum cyminum* L.) is added to this and the ingredients are mixed well. The mixture is to be drunk on an empty stomach in the morning daily till the disease gets cured. Devika claims that she has treated 20 patients using the above formulation.

The medicinal properties of Oroxylum indicum The traditional community knowledge of various tribes of Manipur such as Anal, Kuki, Mao, Maram, Tanghkul and Zeliangrong

APPRECIATION

Oroxylum Indicum Vent., a member of family Bignoniaceae is mostly sighted along the river banks or slopes of the hills. Except in the western drier area, the plant is distributed throughout India and South East Asia. The use of this plant for the treatment of various ailments is part of the local tribal communities' knowledge of various tribes in Manipur such as Anal, Kuki, Mao, Maram, Tanghkul and Zeliangrong.

Address
c/o P. Soloman Maram
Senapati, Manipur

Scouted by
GIAN-NE

The medicinal properties of *Oroxylum indicum*

The decoction of the bark is taken for curing gastric ulcer and a paste made of the bark powder is applied for mouth cancer, scabies and other skin diseases. The seed is ground with fire-soot and the paste applied to the neck for quick relief of tonsil pain. Also, a paste made of the bark is applied to the wounds of animals to kill maggots. Decoction of the bark is given to animals for de-worming. The sword-like fruit or a branch of the plant is used by the farmers to kill crabs in wet paddy fields.

Potential anti-cancer properties

During a botanical exploration tour to Senapati district (1999) which is situated in the northern part of Manipur, Mr.A.A.Mao of the Botanical Survey of India, learned from Maram Naga villagers that a man of about 50 years of age, Pashi Maram had been diagnosed with cancer in 1995. He underwent chemotherapy and radiotherapy for one month and his family was informed that due to the advanced stage of the disease, he would live a maximum of six months more. On the advice of a Tangkhul Naga whom he had met in Imphal, Pashi Maram then took an herbal decoction of the bark of *Oroxylum indicum*. Surprisingly after coming home, he led a normal life till 2000 with intakes of only pain relief medicines and analgesics along with the herbal medicine. But in January, 2001 he passed away.

The method of preparation

The bark from the trunk, branches, roots etc., of the *Oroxylum indicum* tree is stripped off and they are dried in the sun for around 2-3 days. After drying, the surface layer is scraped off and a handful of the dried barks/roots are boiled in two to two and a half litres of water for about one and a half hours till the liquid attains a dark red colour. After this the mixture is cooled down and then strained to separate the liquid from the mixture and this liquid is stored in a bottle. One cup of this liquid is then taken three to four times a day. A spoonful of honey is added to the decoction to neutralise its bitter taste.

Traditional herbal healer

APRECIATION

P. Munnamalai hails from Vemparali, Dindigul district in Tamilnadu. He is 35 years old and has 10 years experience in practicing these cures.

Munnamalai uses the parts of various plants and herbs for treating different illnesses such as night blindness, vomiting and giddiness, diarrhoea, leucorrhea, fever, dysentery and scabies. He claims that he has successful treatments for Cancer, Paralysis, Polio and White discharge. He is also involved in farming. He gets an income of about Rs.100 to Rs.250 per day from his practices.

Address
P.O.: Vemparali
Taluka: Natham
Dist.: Dindugal, Tamil Nadu

Scouted by
CCD, Tamil Nadu

Traditional herbal healer

APRECIATION

Mr. K. Balasubramani hails from Vedasanthoor, Dindigul in Tamil Nadu. He is a Sidha Doctor. He is 33 years old.

Balasubramani got a certificate of "Sidha Maruthuva Pandit" from Sidha Maruthuva Gurukulam at Madurai. He uses the parts of various plants and herbs to treat a variety of illnesses such as skin diseases, Leucorrhoea, cough and he has also got antidotes for poison as well as remedies for pimples and a solution for growing thick, black hair. He has been successfully treating patients based on his 10 years of experience in Naturopathy medicine.

Address
Thennampatti
Taluka: Natham
Dist.: Dindugal
Tamil Nadu

Scouted by
CCD, Tamil Nadu

Traditional herbal healer

APPRECIATION

N. Thangarajan, (67) hails from Karaikudi in Sivagangai dist., Tamil Nadu. He pursues Sidha and Homoeopathy.

Thangarajan has participated in various short term training courses like Child medicine, Natural medicine and also Diabetes medicine conducted by Aringar Anna Govt. Indian Medical system hospitals at Chennai. Apart from this he has also participated in a training course on 'Natural health life' at Thiruvannamalai as well as in a one day training on Aids at "Meenakshi Mission Hospital" Madurai and Chennai.

Thangarajan uses various herbs for curing a number of illnesses namely fistula, anaemia, cough, fever, rhinitis, bed sores, night blindness, hair loss, delirium, dysentery, diarrhoea and jaundice. At present he is helping others through herbal and Naturopathy treatment freely.

He is quite interested in social service as well as activities of a spiritual nature. His dream is to open a hospital to help the people through Sidha, Homoeopathy, and Naturopathy at low cost.

Address
Kalanivasal Puthu Road
Karalkudi,
Dist.: Sivagangai
Tamil Nadu

Scouted by
CCD, Tamil Nadu

Traditional Herbal Healer

APPRECIATION

K. Bose (58) hails from Sooranam village, Sivagangai District, Tamil Nadu. He is primarily an agriculturist and in this field he strictly follows the advice provided by the agricultural department. He started reading medical books written in Tamil and learnt a little about medicine in general. What he has learnt he has been sharing with his family, friends and relatives. Later he got in touch with the Covenant Centre for Development, Madurai and started participating in their activities. This improved his knowledge on medical care and medicinal plants and he started to plant a variety of herbs and medicinal plants around the little pond in his property. He is also a member of the Pollachi Azhiaru Vedatri Mahavishi Centre. Through this centre he has learnt simple exercises to overcome diseases. He has shared this with many and helped them to get over their ailments. In addition he also learnt yoga from Prof. Aandiappan and he has observed that yoga can cure diseases.

His youngest daughter was affected by Polio at the age of one and a half years and her two hands and legs got affected. He pursued western medicine, acupuncture and traditional / native medicines continuously for two years and both hands and a leg became fully functional, but one leg could not be put right completely. However today she attends to her affairs without depending on anybody.

Address
Sooranam, Tal.: Ilayangudi
Dist.: Sivagangai, Tamil Nadu

Scouted by
CCD, Tamil Nadu

Some of his treatments

Dental problems
"Karisalankanni" leaves (*Eclipta prostrata*) are collected and dried in shade and then some salt is added and a sooranum (powder) is made and if this is used to brush teeth, all dental problems will be taken care of. He cites his example to prove the effectiveness of this method- he is 58 and has been brushing his teeth using this method. His teeth are strong and he can even crush bones. He distributes this "Sooranam" freely to others.

Poisonous bites
Sriyanangai (*Andrographis paniculata*) is picked and dried in the shade and a sooranam (powder) is made. To this pepper powder is added and a capsule is made. This according to him cures poisonous bites.

Diabetes
Murunga (*Moringa olifera*) leaves are boiled in water and one tumbler of this is taken in the morning on an empty stomach. If this is done for 20 days, the sugar level can be brought under control. He has taught this to many and he quotes a case in which one person managed to bring his sugar level down from 217 mg to 120 mg and has managed to sustain this without any change in food habits.

Asthma
Thoothuvalai, Thulasi (*Ocimum tenuiflorum*), Kandankathari (*Solanum santhocarpum*) and a little honey are mixed well and eaten regularly and this cures asthma.

Hair oil
"Karisalankanni", "Maruthani", "Curry leaves" and "Ponnankanni" are ground together and small pallets are made and dried in the shade for five days. This is then soaked in coconut oil for five days and thereafter the oil is applied in the mornings and evenings. This prevents loss of hair, dandruff and greying of hair.

Traditional Herbal Healer

APPRECIATION

Esakkiammal (78) hails from Ottapidaram ,Tamil Nadu. She learned the local health practices from her ancestors when she was very young. She doesn't keep count of the number of people she has treated. Most of her treatments have been successful. She quotes herself as an example of the effectiveness of her treatments- so far in her life, she has not had to go to the hospital and she treats all the simple ailments of her family at home itself.

Her husband Mr. Aiyapillai was a freedom fighter and was arrested in connection with the Salt Sathyagraha in Tuticorin and was subsequently released from prison as per the Gandhi Irvin Pact. Both she and her husband had burnt mill cloths as a part of the boycott of foreign cloth. Both of them were imprisoned and she was detained for two hours and her husband was transferred to another prison.

She had five sons and a daughter. A daughter and three sons died due to severe penury in the family. Her husband died in 1974 and ever since she has managed the family from the income generated through small businesses. Her elder son dropped out from school and started working in a workshop. Now he manages his own workshop. The second son is a graduate but earns his wages through sundry works. She has 26 cents of land in "Theni" gifted by her father.

Address
6, Ochayi Compound
Chokkakoothanoorani
Rathinapuram-625 011
Dist.:Madurai, Tamil Nadu

Some of her treatments:

Blood pressure
Boil a handful of drumstick leaves (*Moringa oleifera*) in water and drink the water after cooling.

Giddiness
Boil Cumin (*Cuminum cyminum*) seeds in two tumblers of water until it is reduced to half of its value. To this add lemon juice and honey and drink.

Liver pain
Remove the skin (outer cover) of the "Onion" (*Allium sativum*) till the white petals show. Consume this onion with rice soaked water with a little salt added. Do it in the early morning on an empty stomach.

Contusion
Grind equal parts of red-gram (*Cajanus cajan*) and mustard to a paste like consistency and apply it as poultice over the affected part for two days consequently.

Cuts
Grind "Kooraipoo" (*Aerva lantana*) and slackened/slaked lime in equal parts and apply over the cuts and tie with a cloth. Pour water periodically over the cloth on the affected part to prevent drying out.

Eye irritation and watery eyes
Boil "Sithahathi" (*Sesbania alata*) in "Gingely oil" (*Sesamum indicum*) and apply the drained oil on hair.

Dysentery
Extract juice from "Kuppaimeni" leaves

(*Acalipha indica*) and consume with curd.

White discharge
Take the pith of "Sotrukatralai" (*Aloe vera*) leaves and wash thoroughly. Consume on an empty stomach in the morning.

Headache
Extract juice from "Kuppaimeni" leaves (*Acalipha indica*) and add equal volume of "Gingely oil" and boil it. Apply it on the head at lukewarm temperature. After four hours rinse the hair with shikakai powder and take a bath.

Diarrhoea
Crush pepper(*Piper nigrum*) and boil it with one tumbler of water. The decoction of the same can be consumed twice a day.

Traditional Herbal Healer

APPRECIATION

Mrs. A.Chandra hails from Uluthimadai, Virudhinagar district in Tamil Nadu. She is 37 years old, married and has a son and daughter.

Mrs.Chandra treats rat bites and inherited this practice from her ancestors. People from about nine surrounding villages approach her with this complaint. She has been practising this for the past 15 years and enjoys a good reputation in her area. About 10,000 patients have come to her and been treated successfully. She also practises treatments for gastric problems, skin diseases, fever, loose motion and she has developed antidotes for scorpion bites and viper bites.

Method of the practice

A paste is made of the leaves of *Elimarunthu chedi* (a plant whose local name means green leaves for rat bites) and this is applied on the bite and bandaged. The patient is then made to stand in stagnant water for some time. Usually they get cured by this immediately and are able to leave. But if not cured instantly, she allows the patient to stay at her house and repeats the treatment till he/she gets cured.

Address
U. Sengamadai
Thiruchuli, Viruthunagar
Tamil Nadu

Scouted by
CCD, Tamil Nadu

Traditional Herbal healer

APPRECIATION

A. Azhagan hails from Natham, Dindigul district in Tamil Nadu. He is 28 years old and a graduate in Science (B.Sc.,).

Azhagan belongs to a traditional agricultural family. His family supplements their income by rearing poultry as well as livestock. His family only uses organic fertilizers for cultivation. After finishing his graduation he took to farming. He also learned traditional practices from his elders and from books.

He has also been practicing various methods to cure the ailments affecting their domestic animals and birds for the past five years.

Some of his cures include that for sterility of women, body heat, cycosis (white dots on the face), diabetes and to facilitate proper growth.

Address
Kavarayapatti
P.O.:Reddiapatti
Taluka: Natham
Dist.: Dindugal
Tamil Nadu

Scouted by
CCD, Tamil Nadu

Traditional herbal healer

APPRECIATION AWARD

Mrs. K.Arumugam (45) is a widow. She is from Kothamangalam village, Sivagangai district in Tamil Nadu. She has a nine year old son. She learnt the ethnic veterinary remedies from her father. She is a representative of Sooranam Mahakalasam and has treated about 400 cases. She has 20 years experience in this field. Her neighbouring communities appreciate her knowledge and practice.

Some of her practices:

Weakness in the legs of animals
Take dry ginger (*Zingiber officinale*) rhizomes (50 g), Kuppaimeni leaves (*Acalypha indica*) (a handful of leaves) and *Clome gynandra* leaves (one handful) and grind all of these and mix with rice water and give it to the animal.

Constipation in Animals
Extract the juice of Thumbai leaves (*Leucas aspera*) and Kuppaimeni leaves (*Acalypha indica)* and thrust it into the anus of the animal through a papaya stem and immediately the animal will be healed.

Swelling on the neck
Take the leaves of Kovai (*Coccinia grandis*) and squeeze it to extract the juice. Add this to castor oil and apply this on the animal's neck for four days and it will get healed.

Rheumatism in animals
Take leaves of Surai (*Zizyphus oenoplia*) (one handful) and a few rhizomes of dry ginger (*Zingiber officinale*), Thippili (*Pipper longum*) and garlic (*Allium sativum*) and grind it to a paste and mix it in water and give it to the animal till it is relieved of pain.

She also practises some treatments for human ailments:

Concussion
Grind paddy (*Oriza sativa*) seeds (one handful) and Manjal (*Dodonea viscosa*) into a paste and then apply on the swollen area.

Sprain in babies
Daub the gingely oil (*Sesamum indicum*) and tamarind (*Tamarindus indica*) leaves on the baby. Put the baby immediately into the cradle and twist the cradle a number of times. The baby is relieved of the sprain.

Address
Kothamangalam
P.O,Sakoor, Sivaganga
Tamil Nadu

Scouted by
CCD, Tamil Nadu

Traditional Bone Setter

APPRECIATION AWARD

Reviben Pratapbhai Chaudhary is a 53 year old local healer. An illiterate lady, she belongs to Vanagala village in Mehsana district, Gujarat. The local population, about 2,500 odd people of Vanagala and neighboring villages, contact her for the treatment of human and animal bone problems (mainly dislocation of joints). She helps others, often at the cost of her work, without any fee.

Reviben has gained considerable experience and expertise in setting bones. Relating how she started treating patients, she mentions that once when she had gone to collect fodder with another lady, that lady had dislocated the joint of her leg. Reviben set the bone and applied a sort of ointment made up of turmeric and salt (both of which were heated in proportion to make the ointment). After that, she gradually started treating children's ailments, pregnancy problems and various veterinary diseases and disorders like fracture and dislocation of joints.

Reviben has learnt the remedies and cures for many other problems such as sprain, yoke gall, retention of placenta, foot and mouth disease, bloat, intestinal worms, etc. But currently she is only treating the dislocation of joints as the majority of her patients approach her with that problem. She visits over 16 neighbouring villages to offer free services.

Address

At & Post: Vanagala
Ta.: Unjha
Distt: Mahesana, Gujarat

Veterinary related

Treatment of fracture in all animals: Seed flour of *Guar* or cluster bean (*Cyamopsis tetragonoloba*) (Five kg); turmeric (*Curcuma* longa)
(50 g), salt (50 g) and a small quantity of water are mixed together and gently heated. This paste is applied on the fractured limb which is then bandaged. This treatment is repeated at an interval of 8-10 days for 1-2 times. The animal is cured within 20-25 days.

Alternative treatments for fracture
Boil pearl millet grains in water along with salt and turmeric (*Curcuma longa*). Make a paste and apply this warm paste on the affected part for 2-3 days.
Take river sand. Add some water, turmeric and salt. Make a paste and apply that on the fractured bone.

Dislocation of joint in animals and humans:

A paste is made of dung, mud, salt and turmeric (*Curcuma longa*). The paste is gently heated and applied on the affected part. This should be done for 2-3 days.

Yoke gall in bullock
Salt mixed with warm water is used for fomenting the affected part.

For bringing the animal into heat:
Seeds of Chanothi (*Abrus precatorius*) are powdered and used.

Alternate remedy
The central dark purple/blue part of one

peacock feather is fed with *chapati* or *roti* or wheat bread

Foot and Mouth Disease
Hot ash from the *chullah* or indigenous oven is collected and spread on the platform where animals rest. The ash controls the maggots in wound.

Bloat
Mustard (*Brassica juncea*) oil is drenched to the animal. This cures bloat.

Intestinal Worms
Salty water is drenched to the animal. This leads to expulsion of intestinal worms.

Stopping the bleeding when an animal's horn gets broken
Apply a paste made of *dudheli* (*Pergularia daemia*) on the horn. This stops bleeding.

***Khujali* or Itching**
An extract of *dudheli* (*Pergularia daemia***)** is applied on the affected part for two days to cure itching.

***Shwas chadhe* or Asthma**
Ramji or *geru* or ochre is mixed with water and drenched to the animal.

Arthritis
Wrap leaves of *dhatura* (*Datura fastuosa*) on the affected part.

Diarrhoea in animals
Leaves, branches and fruits of *gundi (Cordia gharaf)* are fed to animals.

Traditional Livestock Healer

APPRECIATION AWARD

Devshankarbhai Pandya, (25), farms 15 hectares land in his village Timana, Bhavnagar district, Gujarat. He lives in a joint family with his brothers and mother. Devshankarbhai is an enthusiastic person and has always been keen to learn new things. His grandfather, Revashankar Mahadevji Pandya, was a renowned herbal healer and used to treat animals as well. Devshankarbhai, as a child, used to accompany him on his journeys, and due to his interest and inquisitiveness, learnt various treatments from his grand father.

Devshankarbhai remembers with pride that a number of cases especially of removing the dead foetus from the animal's womb had come to him which the qualified veterinary doctor was not able to cure and which he was able to deal with successfully.

But he also relates an experience in which he failed - "Once I was called by a farmer from Bhadrawal. The farmer's cow had a dead foetus inside and doctors had said that this case can not be solved and you should forget about this cow. I went there and cut the foetus and took it out in the morning. But unfortunately, the cow died within half an hour." He continues, "Later I came to know that, the foetus died on the previous evening, and by the time, I operated, septic had infected the mother badly." Devshankarbhai is also a good surgeon and operates minor cases such as of anuria.

Address
At & Post: Timana
Ta.: Talaja
Dist. Bhavnagar

Some of the practices used by Devshankarbhai

Anuria
This problem mostly occurs in bullocks. It happens because of the small calculi in the urine pipe, as the bullock's urine pipe has a distinct sigmoid shape. Devshankarbhai claims that he knows a special trick to identify the location where the calculus is present. According to him, he punctures the place and makes the urine flow faster from the pipe and later he administers an aqueous solution of ash (cow dung cake's ash) when the severity is less.

Anoestrus
Moth bean seeds (*Vigna aconitifolia*) (3 kg) are soaked in water for 24 hours. Next day, the water is discarded and the seeds if possible are tied up in a piece of cloth so that they will sprout within a day or two. Such sprouted moth bean seeds should be administered to the animal with the problem of anoestrus. If the animal is young and weighs less then only 2 kg moth beans should be taken. This treatment should be done for two days and animal will come into heat. This treatment has no side effects.

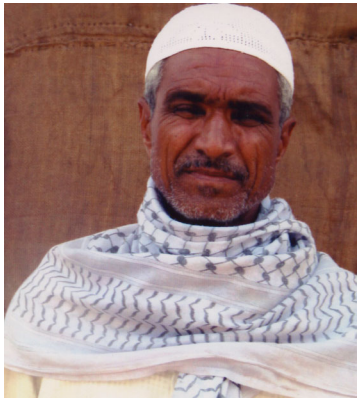
Bleeding in udder
Gundi (*Cordia myxa*) bark (100 g) and soil of the termite's burrow (Rafda) (100 g) mixed in water should be administered twice daily during lactation to stop bleeding in udder.

Retention of Placenta

When the problem of retention of placenta occurs, he prepares decoction of the whole plant of *chanothi* (*Abrus precatorius*). Chanothi (*Abrus precatorius* (250 g) and water (1 L) are taken and boiled until it's reduced to 0.5 L. This decoction is filtered and drenched to the animal. This practice expels out the placenta within an hour of administration.

Wound

Equal quantity of Awal (*Cassia auriculata*) and Amba Haldar (*Curcuma amada*) should be taken and boiled with sufficient amount of water. Once it's properly boiled, it is kept for a while till it reaches normal temperature and then it is smashed to pulp. This pulp should be applied on the wound and covered with Gundi (*Cordia myxa*) bark. He claims that this treatment heals the wound very fast (time may vary depending upon the wound size).



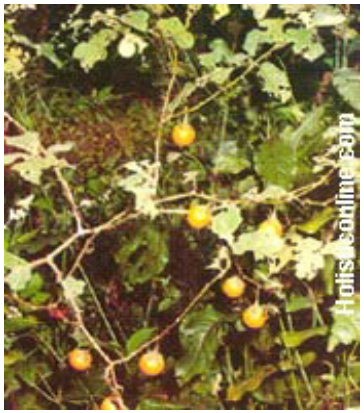
Traditional Livestock Healer

APPRECIATION

Rasulbhai Musebhai Vhora (45) is fully engaged in farming. He was born and brought up in Jenabad, Surendranagar in Gujarat. He leaves in a joint family with his sons. An enthusiastic person, he has always been keen to learn new things.

He relates that he had learnt all these veterinary medicines and treatment from a Sindhi trader, who used to come to his village for selling bullock and other cattle. He was 20 years, when he learnt these practices. He has been practicing for the last 25 years. Due to his knowledge and successful handling of cases, he is widely known in the surrounding 40-45 villages. Of particular significance is his selflessness- he never charges even a single penny from anyone.

Address
At & Post: Jenabad
Ta.: Dashada
Dist. Surendranagar
Gujarat



Post delivery- Excess bleeding from Vagina

After delivery when excess bleeding occurs, the animal becomes weak. It starts shivering, and remains lying down. To treat this, leaves of *kanther* (*Capparis sepiaria)* (500 g) are crushed and the juice is extracted. To this Sakar (Mishri - a form of sugar) (500 g) and water (500 ml) is added. This solution is then drenched to the animal and it gives instant relief. Continuation of this practice for three to four days, cures the animal completely and it regains its energy.

Inflammation

For treating inflammation due to some external injury, a paste is prepared using jaggery and fresh fruits of Bhoy Ringani (*Solanum xanthocarpum*). This paste is applied on the inflammation.

Retention of Placenta

When the problem of retention of placenta occurs, a decoction is made from the whole plant of Sangetara (*Crotalaria burhia*). For this Sangetara (*Crotalaria burhia*) (500 g) is taken and water (2 litres) is added and this is boiled until it's reduced to one litre. This decoction is filtered and drenched to the animal. This practice expels out the placenta within an hour of administration.

Yoke gall

For treating the wounds due to the yoke on bullocks, Rasulbhai chews the roots of berry (*Zizyphus mauritiana*) and spits on the affected part and the wound heals.

Diarrhoea or blood in the excreta

When the animal is suffering from diarrhoea or there is blood in its excreta, he takes leaves of Nani Gundi (*Cordia gharaf*) (200 g) and extracts the juice from it and adds Sakar (100 g). This solution is drenched to the animal with water, twice a day resulting in a complete cure within three to four days (results may vary with severity of problem).

Anoestrus

When the animal doesn't come into heat, he uses seeds of Bhilama (*Semecarpus anacardium*-marking Nuts) (seven in number), crushes them and gives it along with the feed to the animal. This brings

the animal instantly into heat and he claims that he has never required repeating this practice more than twice.

Prolapsed Uterus

First of all he washes the uterus with alum solution, and then pushes it back carefully such that the uterus is relocated properly. He burns equal amount of pearl millet hay and Gundi (*Cordia myxa*) leaves. The ash of this is mixed with water and drenched to the animal after replacing the uterus.

Traditional Livestock Healer

APPRECIATION

Chokharam Rayal (75) is a traditional animal healer and hails from Toda, Nagore Dist., Rajastan. Fully involved in the treatment of his patients, he travels up to 50 km from his home to treat them. His father also used to treat cattle and bone-related ailments. Some of the cures he uses have been passed on to him by his ancestors. Some other cures he has devised himself. Chokharam does not charge anything for the treatment he offers. His source of income is a patch of land which is not irrigated on which he cultivates sufficient grains to meet his personal needs.

Address
VPO Toda
Via Chitawa Adaksar
Nagoure Rajasthan

Treatment of veterinary problems

Blood appearing in the urine of cows and buffaloes
Take ghee (250 g), goat's milk (1.5kg) and jaggery (250 g) and mix them well. Give this to the animal for two days. The animal will stop passing blood with urine.

Constipation in animals
If a cow or a buffalo has difficulty in passing stool, boil the leaves of Jamal Ghota (500g) with water (1 litre) and give it to the animal to drink.

Eczema
Boil mustard oil in an iron vessel. When it is boiling add the fresh leaves of neem and keep on boiling till the leaves turn black. Remove the leaves and apply the remaining oil on the affected area once a day for 4-5 days.

Allergy
Mix the juice of lemon with water and wash the affected area. After this apply coconut oil. One lemon is sufficient for 100 gm of water. The amount of water is to be taken according to the area affected by the allergy.

Alternative cure
Grind the dry roots of Bavli and take this powder (100 g) in a mud vessel and in the evening wet this powder with water (1 litre). In the morning strain the water, add a little bit of jaggery and give it to the animal, suffering from the allergy, to drink. It will be cured.

Prolapsed uterus
This is a serious condition in which the uterus of the female animal protrudes outside the body before or after conception. To treat this cook Chutara (100 g) in water (1.25 litre) and add dana chili (1 litre) and the flour of bajra(300 g). Cool this preparation and give it to the animal to eat. If the sick animal is given this concoction twice a day for two days, it will be cured.

Alternative treatment
Maida of wheat flour (1kg) and Desi ghee (clarified butter) (150 g) are mixed and kneaded well. This is then mixed with milk (1.5litre) and fed to the sick animal. This is repeated on four consecutive days in the evening. This medicine is to be administered on an empty stomach and the animal should not be given any food or water at night after taking the medicine.

Chokharam mentions that he improved upon the earlier existing treatment in the following manner:

Earlier maida was mixed with water. Because of this the maida stuck to the linings of the stomach and made the animal sick. To counter this he mixed the maida with ghee. He also started using milk to make the medicine more palatable to the animal. Also ghee and milk also give strength to the sick animal.

Treatment for retention of placenta

For treating this Sesame oil (300 ml), Granular sugar (300 gm), Milk (1250 ml) and water (300ml) are mixed well and boiled. Then it is cooled till it is only slightly warm and fed to the sick animal. If it refuses to eat, use a feeding tube. If there is any difficulty, pour the mixture into a bottle, connect a rubber tube to the mouth of the bottle and insert the other end of the tube deep into the throat of the animal. Keep the bottle above the head of the animal. This medicine is administered once and if needed again after 12 hours. While feeding the medicine with a bottle and rubber tube care must be taken that the medicine does not go into the respiratory tube. The animal must also not be fed grains or green fodder. It should only be given dry fodder to eat.

Diarrhoea in cows or buffaloes

If loose motion does not stop, take the young leaves of the banyan tree and grind them with water (250ml) and mix with milk (500 g). Give this medicine to the animal once every day for four days. The diarrhoea will stop.

Injured knee

Take the dry bark of peepul tree, grind it and add the sharbat of gud. When it is slightly warm, apply it on the knee and tie a bandage. Do this two or three times a day for three days and the knee injury will be cured.

Testimonials

The manager of Shri Gopal Goshala, Danta in Sikar vouches for the treatment developed by Chokharam using maida, ghee and cow's milk for the condition of prolapsed uterus. Previously for this condition, they used to approach the veterinarian who used to apply sutures which would often come out or cause ulcers. But with the cure prescribed by Chokharam, there are no such problems and now whenever one of their animals develops such a problem they use this method.

Treatment of certain ailments affecting human beings

Boils and lumps

If boils or lumps appear at any place of the body such as behind the ear, on the neck, in the armpits, etc., dry the leaves, fruits, stem and roots of Khara Khaddu plant and grind them to a powder. Mix this powder with cow urine and apply on the boil or lump in the morning and in the evening. The lump will subside in three days. In the case of a boil or wound, it will be cured in 3-7 days.

Lumps in the breasts of women

However much the breast may be swollen or sore, grind the Khara Khaddu plant after drying it and grind it. Mix the powder with cow urine and massage the breast with this paste twice a day for seven days. The swellings and lumps in the breast will go away.

Exceptional case

Chokharam also relates an incident in which a young lady, who had been diagnosed by doctors as suffering from breast cancer, was brought to him. Her breasts had been operated upon twice to remove the lumps, but she could not be cured. Chokharam prepared the above medicine and applied it to her breasts for eight days and she was completely cured. This was seven years ago and the woman is still alive and healthy.

Blackening or rotting of the thumb/toe

Chokharam relates a case when a girl's toe had become swollen and turned black. A famous doctor of Sikar, operated upon her twice but she was not cured. Chokharam treated her with the powder of Khara Khaddu and cow's urine and she was cured in five days and the problem did not resurface.

Mouth sores or swelling of the face

If any person has developed mouth sores or swelling of the face, grind the wood of Brahma pipli with water and apply the paste on the face or the sores twice a day for three days.

Traditional Livestock Healer

APPRECIATION AWARD APRECIATION

Dhanudin (84) hails from Khudiya, Kangra district in Himachal Pradesh. Dhanudin has devoted his entire life to mitigate the sufferings of animals. Today he has learnt to treat almost all animal diseases. His knowledge of animal diseases is indisputably acknowledged by the people of 30-40 villages in nearby Gram Panchayats. Even qualified vets seek his advice on difficult cases.

Address
Vill and Po: Jased
Ta: Surani Khaudia
Dist: Kangdal
Himachal Pradesh

Dhanudin is so involved in his mission he is mostly away from home, treating sick animals. The hallmark of a truly great person is that even though they have unlimited knowledge of their subject, they are all humility and are always ready to help those in need with their knowledge. Dhanudin himself has never hesitated to share his knowledge with others.

Dhanudin belongs to the Gujjar community whose chief occupation is the production and sale of milk and milk-based products. They keep a large number of milch animals for this purpose. By being in close contact with animals throughout their lives, they have acquired exceptional insights into animal healths, their problems and cures. Yet Dhanudin showed little or no interest in cattle rearing in his young days. So he used to seasonally migrate with a group of labourers to Assam-Manipur-Nepal-Jammu regions to extract resin from pine trees for his livelihood. But an experience when a foreign couple rewarded him for treating their cow successfully, made him decide that he would make use of his special skills to help sick animals. Today Dhanudin treats 400-500 sick animals in a year.

Nowadays Dhanudin is not keeping in good health. He has become slightly difficult of hearing and is also suffering from rheumatism. In the absence of proper traditional medicines, he has been forced to rely on allopathic medicines because he feels that he has not long to live.

The most common animal ailments in the region are foot and mouth disease, infertility and complications at the time of delivery of calves and Dhanudin has treatments for all these. Apart from these veterinary problems he also treats various other ailments:

Ephemeral fever
Root of *Acyranthes aspera* and turmeric (*Curcuma longa*) in the ratio of 6: 4 are ground and pills (50 gm) are prepared. The pill is soaked in mustard oil and one pill is given orally after every three hours. Half the quantity of medicine should be given to small animals.

Grass tetany in legs
Sangaraf (*Sulphatum hydragyrium*) is ground finely and mixed with the latex of *Euphorbia royleana* and a paste is prepared. The paste is applied to the hooves with the help of a brush made of bamboo after every 1-2 hours. If this irritates the animal, butter can be applied to soothe.

Diarrhoea

Cissampelos pareira (one twig), *Curcuma aromatica* (one rhizome) and *Mangifera indica* (one mango) are dried and ground separately and mixed together adding a little water and pills of 50 g each are prepared. This medicine is given thrice a day for two to three days.

Poisoning due to ingestion of *Lantana camara*

Old fruits of *Phyllanthus emblica* (100 g) are powdered and mixed with mustard oil (200 ml) and administered orally twice a day for two days. Along with this, rice water (0.5 liter) can also be given twice/thrice a day.

Edema

Coal made of wood of *Acacia catechu* (50 g), bark of *Holarrhena antidysenterica* (100 g) and seeds of *Piper nigrum* (15 g) are ground separately, mixed together and by adding a little water pills of 50 g each are prepared. Two pills are administered twice/thrice a day.

Innovative Technique of Using Clay Pellets for Sowing Paddy

APPRECIATION

Ram Abhilash Patel (48) is a resident of Jasra, Allahabad. He studied upto the intermediate and spent all his childhood in the village involved in agriculture, which is his family occupation. He has his own farmland in Jasra where he pursues his farming activities. Patel is quite Internet savvy and has an e-chaupal installed in his house. He lives with his parents, his wife and children (two sons and a daughter). Ram Abhilash also has plans to devise a mechanism to use *Gobar* gas instead of the normal LPG in gas cylinders for preparing food.

Address
Vill.Tikri kanjasa
Post Kanti, Janpath
Allahabad-212107
Uttar Pradesh

Genesis Ram Abhilash got the idea of this method from within the household. He noticed that when children made clay pellets just for fun, they start germinating in the rainy season. This inspired him. He faced a lot of problems in finding the right kind of soil namely clay for this method. This was required because other soils break under pressure, while he had to ensure that the pellets remain as such during sowing and germination. But his family backed him right throughout the innovation. This method has been tried and tested in his land in the village. He has been practising this technique since 1994 and some more farmers (around 10) in his neighbourhood have also started practicing the same. He plans to start a business using this method if some financial help is provided.

The innovative method

The crop production of paddy depends on the way the plants are sown. Ram Abhilash Patel has developed an innovative way of sowing paddy using clay pellets.

In this method, pellets (mixture of pond soil and paddy seeds) are prepared and these pellets are ready for sowing after drying. The pond or river soil is taken and mixed thoroughly with paddy seeds. When the mixture is ready, then small pellets are prepared with each containing 3-4 seeds. The pellets can only be prepared in the month of April and May so that they dry within 2-3 hours; otherwise if it takes more time for drying then there is a risk of the seeds germinating and thus getting spoiled. Pond soil is used as it is very fertile and helps in minimizing weeds. These pellets can be sown manually or with the help of a seed drill but the manual practice is followed, as seed drills are not available for this size of pellets. Rows are made facing east to west or vice-versa so the plant will get ample air and sunlight. Normally in a family these pellets are prepared by women and children and after drying these can be stored for about a month

Advantages

This novel method saves both time and money. There is no need to prepare a nursery for paddy plants. By using the nursery method, the crop takes approximately 160 days to mature while

using this technique it takes about 145 days. With this method farmers need not wait for monsoon to start sowing. As pond/ river soil which is very fertile is used to prepare the pellets the use of fertilizers is minimized. As the seeds are in a mud shell they are protected from birds etc. The process also saves water as no standing water is needed in the field. Most importantly the output is maximized by this method, which Ram Abhilash has proved experimentally by cultivating paddy in a field by all three methods namely pellet, nursery and direct sowing. The paddy production using these methods was 17 quintals, 15 quintals and 14 quintals respectively.

List of Scouts

Sr. No.	Name of the Scouts	State
1	North Maharashtra University, Jalgaon	Maharashtra
2	Sundaram Verma	Rajasthan
3	Brighupati Hazarika	Assam
4	Amlan Jyoti Bordoloi	Assam
5	Akshay Kumar	Assam
6	Azhar Hussain Ansari	Bihar
7	Late Vinoo Kale	Maharashtra
8	Parshottambhai B Patel	Gujarat
9	Ishwar Kiradiya	Gujarat
10	Dr Prakash K. Gandhi	Maharashtra
11	Arvind Kumar Patel	Gujarat
12	Kabir R. Bora	Assam
13	Shambhuram Mudoi	Assam
14	Dr Nilotpal Kakoti	Assam
15	Diganta Kalita	Assam
16	Pravin Rohit	Gujarat
17	Kamaluddin Ahmed	Assam
18	Bhikhubhai Rathwi	Gujarat
19	Ramesh Chhababhai Patel	Gujarat
20	Ramesh Taviyad	Gujarat
21	Jagdish Vaghela	Gujarat
22	Dilip Koradia	Gujarat
23	Jayantibhai Patel	Gujarat
24	Amrutbhai Agrawat	Gujarat
25	Jivrajbhai Dafda	Gujarat
26	Mahesh Parmar	Gujarat
27	Suresh More	Maharashtra
28	Jamal Singh Jhala	Gujarat
29	Mahalaxmi Parthasarthi	Karnataka
30	Shriraj Amin	Gujarat
31	Mukesh Sonara	Gujarat
32	Chandraprabha Das	Assam
33	Pinaki Bora	Assam
34	Pravin Vankar	Gujarat

Scooter for the physically challenged

TRANSPORT NATIONAL SECOND

Dhanjibhai Kerai (31) is from a middle class farmers' family in Mundra taluka, Kutch district of Gujarat. He did not go to school but later on out of his own wish, he went to "Praudh Sikshan Kendra" – Elders' Education Program of the Government for three months and learnt reading and writing to some extent. Dhanjibhai was born physically challenged. Yet, he displays tremendous determination. Standing hardly one and a half feet (0.5 M) tall, he weighs just 19 kg. At the age of two years, a severe attack of polio left him disabled permanently and ever since he has no use of his legs and one hand. His movements are excruciatingly slow. But unfazed by this disability, he is full of zeal. Though he does not have any formal education or training, he has acquired knowledge of repairing electrical appliances and automobiles and is reputed as an excellent mechanic in his area. This self-taught young man is always on a look out for ways to make his life more useful and comfortable. He has designed for himself a special scooter with which he can travel 150 km in a day. Dhanjibhai is unmarried and lives with his parents. He has 20 acres of non-irrigated land and his father is looking after the farming.

Address
Karaghogha, Mundra,
Kutch, Gujarat

Scouted by
Parshottambhai Patel &
Ishwar Kiradiya

Genesis Dhanjibhai had always wanted to drive a scooter but it seemed practically impossible for a man who was unable to use two feet and a hand. Gradually, his desire turned into determination. To fulfill his dream, he started collecting a number of items with which to retrofit a scooter in a way that his constraints would not be obstacles in riding it.

The first predicament was that he could not hold the handlebar of a two-wheeler with both hands and keep his balance. So he decided to convert the two-wheeler into a four-wheeler. This was to be a unique experiment. He bought two old auto rickshaw wheels and picked up a fairly strong steel pipe. With these, he set himself on the job and succeeded in modifying the scooter and customizing it as per his needs for his day to day conveyance so that he could drive the vehicle himself.

The Innovation
Basically this is an assembled scooter with the chassis and engine being that of a Bajaj Priya and the outer body of a Bajaj Chetak. The scooter has two support wheels (Modified Luna supports) on either side for balancing the vehicle. A removable seat has been fixed in front of the usual driver seat for Dhanjibhai to reach the handle bars. A lever has been attached to the rear wheel brake, for the driver to be able to apply the brakes with his hand. The two rear wheels are kept a little higher so that the vehicle does not skid. With this set up the driver is able to conveniently drive the vehicle and reach a maximum speed of 60-70 km/ hour.

His friend, Kamalbhai, first test-rode the scooter for two days before giving Dhanjibhai his go-ahead for trying it. This whole experiment had taken about three months and it took Dhanjibhai three days

to learn how to drive this scooter. Around Rs.3000 was spent on this experiment. The only problem he faces is in starting the scooter for which he requires somebody's help. A person lifts Dhanjibhai and places him on the seat of the scooter and he positions himself and holds the handlebar. The person then starts the scooter by cranking the kick pedal after which Dhanjibhai rides away merrily on *kuchcha* and *pucca* roads. The significance of the innovation being that it frees this physically challenged person from dependence on other people and provides him with a reasonable degree of mobility.

Dependence to self-reliance

Dhanjibhai recalls that he used to travel on his mother's back, wherever she went, until he was 15 years old. It was at that point in his life, that he decided to take matters into his hands and literally so. Since then, he attends to all his personal chores himself. Not satisfied with that, he was also determined to become self-reliant and to earn his own living.

Once Dhanjibhai's maternal uncle staying in London had sent him a two-in-one radio set-cum-tape recorder. After a few days, Dhanjibhai dismantled the tape recorder and decided to put it back again. But he did not succeed in doing so even after trying for three consecutive days. He left the tape recorder at that stage and concentrated on fixing an engine of a moped to his bicycle. One of his friends Kamalbhai Singhal helped him in welding the engine on his cycle. The moped-engine-powered bicycle was ready in four days and encouraged by this success, he once again returned to the tape recorder. After carefully observing the wiring he started reassembling it and this time he succeeded.

The success with his uncle's two-in-one radio set-cum-tape recorder, gave Dhanjibhai the confidence to repair electrical and electronic appliances. Soon, he was trying out his skill on television sets, radio sets and other electrical and electronic gadgets. He bought a few old tape recorders and radio sets to work on in order to perfect the art. "*Many people willingly gave away their old gadgets to me*," he says. He repaired them, and sold them off to those who could not afford brand new items.

Dhanjibhai relates his learning and exploratory experience:

"There was nobody in our village to whom people could take their tape recorders, radio sets or watches when they developed some problem and they had to be simply abandoned. I first bought a repairing kit and started work. I kept my charges very reasonable. Also, I put my most sincere efforts in getting things working. Then, I started mending and vulcanizing bicycle and scooter tyres. By and by, I graduated from audio to video. I got a VCR from a relative, studied its mechanism and learnt to repair that too. As soon as I mastered one skill, I began looking for another to study and master."

Gradually, he found enough work to keep himself busy. Thus he took to repairing electrical gadgets as a profession and this provides him with a decent livelihood.

A sought after mechanic

Dhanjibhai eventually started assembling new tape recorders and television sets out of components sourced from the electronics market. He has assembled and sold 150 tape recorders, 80 radio receivers and 50 television sets, 20 colour TVs and 30 black-and-white TVs. He does not assemble the sets for stock but starts work only after securing an order. He earns Rs 200 to Rs 300 per day on an average and that makes him financially self-reliant.

Owners of electronic-goods shops in Bhuj, Mundra and Mandvi vouch that Dhanjibhai is a reliable and skilled mechanic. They often pass on the repairing jobs they get on Dhanjibhai.

"*Sometimes, they even insist that I should carry out repairs on sophisticated and latest gadgets. That is the time when I realise that the sky is*

the limit for a person to keep learning," Dhanjibhai declares proudly. The users of 'Dhanjibhai-assembled machines' are very happy with the performance of the products and claim that these are even better than branded goods from established companies.

Looking to the future with hope

Dhanjibhai is very grateful to his friends who have always helped and supported him. As he cannot start the scooter by himself, he has to always take a friend with him wherever he goes. He is not very comfortable with this 'dependence' and so is all set to incorporate a self-starting mechanism in the scooter which he plans to develop it himself.

It is a pity that many scooter companies when contacted by SRISTI, which honoured him with the SRISTI *Sanmaan* in 1999, have not given much response as yet. But sooner or later, the industry will have to respond. There are enough Dhanjibhai like young people in this world who want to be independent and self-reliant. Markets will have to eventually respond to this un-met need of the physically challenged.

Boiled tea making machine for customised taste[12]

GENERAL UTILITIES NATIONAL FIRST

Ashok Kumar Dhiman (21), a native of Firozepur, Haryana has had a keen interest in science from his early childhood. While studying in the sixth standard, he made a photo enhancement system in which, on a reel of 35mm, one could take 44 photos instead of the usual 36. By the time he was in the tenth standard, he was the proud innovator of a pair of binoculars, a number based locker, and an automatic curfew siren. After his tenth standard he underwent ITI training.

Address
Vill: Firozpur,
Gadhi Kotaha,
Panchkula - 134 204,
Haryana

Scouted by
Balram Singh Saini

Genesis The responsibility of making tea for his ailing mother often fell to Ashok and he found this a tedious process, essentially because there was no LPG or kerosene stove at home. Preparing two cups of tea meant that he had to go through the entire process of lighting the wood fire in the conventional *chulas.* Also, if nothing else needed to be cooked then, the wood which had already been lit would be wasted. This forced him to think of a solution which could prepare tea using electricity. He didn't use the conventional electric heater as it consumed too much electricity and he thought of a creative new solution. He took four months to develop the prototype. The initial prototype had cost him about Rs.8000 but he maintains that with a degree of redesigning and refinement the cost can be brought down to Rs.3000.

The Innovation
This machine facilitates the Indian method of making tea by separately pumping in water, adding tea-leaves and sugar, heating, adding milk, boiling and filtering, and dispensing the tea automatically into cups in pre-assigned proportions. Each user can set these proportions according to his/her taste. Apart from putting the cups and setting the number to deliver up to four cups, the entire tea making process is automatic and the cups are laid out on a sliding tray once the tea is ready. It produces four cups of tea in five minutes and can be used as many times in a day as required

In this machine, the water, tea leaves, sugar and liquid milk are taken automatically from different containers within the machine and are boiled in a vessel equipped with a heater. The water is collected from the container in this heating vessel with the help of a pump. After the water boils for some time, tea leaves and sugar are added from their respective chambers (placed just above the heating vessel) with the help of a motor operated mechanism. This mixture is boiled for some time and thereafter liquid milk is added from the milk container. This whole mixture is then boiled for about 30 seconds to one minute and the tea is ready. The tea is then poured into cups with the help of an outlet tube. The boiling time at each stage and the timing of the operation is controlled with the help of a mechanical timer.

Advantages
This device has the capacity to store tea-leaves and sugar for a month and milk and

water have to be filled only once a day. An additional advantage is the provision for personalising the taste. Since processing happens in a closed system, contamination or evaporation of milk is minimized. By circulating hot water in the system, the entire unit can be cleaned effectively. The heater being of low capacity, the machine can also be run with the help of an inverter during power power cut. This machine is easy to build and operate and requires minimal maintenance.

Various other tea-making machines are available in the market, made by different companies but each has its disadvantages. First, they are not suitable for preparing the tea as per the process followed in India. In the existing machines premix powder or tea-bags are used and the water is boiled in one container and added to tea leaves in another container and thereafter black tea is collected in cups. Further the devices available in the market are rather complicated and are very costly with the cheapest model costing Rs.15,000 as compared to the Rs.3000 required to make this machine. Cleaning is also difficult in such machines.

Current status

Initially the tea-making machine had 18 motors and the structure was quite fragile. GIAN (N) took up the task of making modifications in the machine. One of the first objectives of the value addition process was to reduce the number of mechanical moving parts and replace these with electronic parts so as to make the machine sturdier and easier to maintain. This would reduce the weight, increase efficiency and cut costs. Later a market survey was conducted by a student to assess the features that consumers wanted and additional price they were willing to pay. A focus group discussion was also organised to discuss with experts the best strategy to take the device forward. The experts feel that there is a market waiting to be tapped with the main users being hostels, restaurants, offices/ corporate and families. They also feel that thorough market research and test-marketing should be done before commercialisation. Some prototypes should be installed in selected localities for demonstration and for collecting direct feedback from users.The modifications are still going on and NIF is quite hopeful that once modified, the machine would change the way Indians make tea. An amount of Rs. 37,500 has been sanctioned for prototype development of the machine under the Micro Venture Innovation Fund of NIF. Also, NIF has filed a patent application for the machine (994/ DEL/2004, 31/05/2004).

Triumph amidst adversity

Ashok's first job was that of a turner-fitter in a local company where he worked for two years. He has recently found a job with a company. He earns around Rs.2500 p.m. and that is the sole income of the family. He recalls that, while making the device, he faced a lot of financial difficulties and regrets that he did not receive any support from his family. He was discouraged in his endeavours and there were even attempts to break his tea making machine.

In spite of all this he never lost his zeal. His model has been displayed at GIAN (North) and various exhibitions. It was also featured in the "Dainik Jagaran" newspaper and a couple of other local newspapers. Ashok hopes to start a business of his own with this innovation. Even now he spends more than 50% of his meagre income on experiments, gadgets, scientific equipments, books etc. At present he is working on a water reactor which would produce electricity at a minimal cost for which he would require Rs.20, 000-25,000 to meet the initial construction costs. One salutes the indomitable spirit of this grassroot innovator.

Septic tank baffle system- an effluent filtering device[13]

GENERAL UTILITIES NATIONAL THIRD

Rajesh T R (30) is a native of Panancheri panchayat in Thrissur district, Kerala. But in his life span of 30 years he has wandered and worked in most of India with the exception of Manipur and Kashmir. The eldest of a family of three sons, he left home to fend for himself and did everything from working in a lathe workshop to marketing various products from machinery to liquor. He is presently involved in construction work. He is married and has two younger brothers who are goldsmiths.

Address
Thekkila House,
Karipaukunnu,
P.O: Koottala,
Thrissur - 680 652
Kerala

Scouted by
Peermade Development Society

Genesis While working in the construction business, Rajesh T R felt that the present design of making baffles in septic tanks was too expensive and that he could come up with something simpler. He backed it up with research and borrowed books on engineering from the public library in Thrissur, of which he is a member. He could, however, lay his hands on only one book on Sanitary Engineering. After reading everything he could on the subject, he thought about it for about two weeks and developed a prototype, to which he later made a few modifications. He then installed it in a neighbour's house, where he had been entrusted with the job of constructing the septic tank. Five years since the installation, no problems have been reported

The Innovation
The septic tank is a combined sedimentation cum digestion tank where household sewage is treated. The lighter solids including grease and fat rise to the surface to form "scum" and the heavier solids settle down in the tank to form "sludge" which is gradually decomposed by bacteria. The liquid waste or effluent goes into the drain field and undergoes oxidation. The baffle in a septic tank helps to reduce the disturbance of the settled sludge and keep the solids and scum in the tank. In the conventional septic tank, two baffles made of concrete are used. However, in Rajesh's innovation, only one baffle made of PVC pipes is necessary. This circular baffle which consists of three chambers works as a divider and filter.

Advantages
The system is cost effective, because, instead of a normal septic tank measuring 2.6m X 9m X 1.8 metres costing Rs.10, 000, by using this unit inside, the size of the tank can be reduced to 1.8m X 9m X 1.8 m. This results in a saving of Rs.3,500. Other advantages include a greater capacity for settling, digestion and storage of sludge, the clearer effluent that is relatively free from stench and particles of excreta, and above all the sheer simplicity of the idea.

The future of the innovation
Though friends and family believe in his ability and have supported him in his endeavours, Rajesh laments the lack of

institutional support for his ideas. He had initially approached a premier research institute in his area with his idea for the baffle system, but did not get a satisfactory response from them. NIF has applied for a patent on his behalf (806/CHE/2004, August 17, 2004). Rajesh has not approached the Panchayat or government authorities with his idea as he did not want to give undue publicity to his innovation, since it is still in the process of being patented. Rajesh hopes that NIF will be successful in finding someone who is willing to invest in it and commercialise it. He does not wish to set up his own business with this innovation as he has already tried his hand at running a couple of businesses which made huge losses and had to be shut down. NIF has sanctioned him Rs.62,500 from the Micro Venture Innovation Fund for making the prototype to conduct market survey of the innovation.

Aspiration

As a child, Rajesh wanted to become an engineer, but now his greatest dream is to get sufficient income so that he can devote his life to what he likes best- research. But rooted in reality, he admits that the exigencies of eking out a living have reduced his time for reading and keeping himself updated with the latest developments in the world of science. He foresees that if this state continues, in a number of years his mind would become stagnant and ideas might no longer flourish in it as they do now.

A stoic view on life

He states unhesitatingly that he has seen all sides of life – there have been times when he slept hungry on a pavement and times when he has been flush with funds. He has been through the crucible of life and is able to view most things with equanimity. With time he has also begun to understand what makes him tick- the fact that routine, mundane work does not interest him and that he needs something challenging and difficult to work at his peak. When one subject captures his attention, he focuses on it to the exclusion of everything else. His ideas and their development give him satisfaction.

Rajesh has strong and passionate opinions on myriad subjects. One is about the present system of research which he feels is just an extension of a master's degree and M Phil. which makes the student feel obliged to take a Ph.D. There is no genuine interest in finding something new or devoting oneself to it as in the Western approach. His comments on the current system of education are scathing- it stifles independent thinking and children end up mindlessly mugging up details that make no permanent impression on them. They do it as a means to an end- getting the certificate or degree but not for learning. Belief in God has not been a part of his life since he was 12 years old, but at the same time he does not impose his views on his wife and family. He believes in certain universal truths and that one can find that peace within oneself and need not seek it in places of worship.

An asset to his community

Rajesh has proved invaluable to his community in solving various problems- be it of a technical or social nature. He often finds himself counselling friends and advising them on all matters- professional as well as personal, helping school children with difficult maths and science problems and volunteering for various social causes. According to Mr. Chandrasekhar, a school teacher whom Rajesh often consults, *"He has a brilliant mind and needs to be encouraged"*. Mr. Vinayan, a community leader, who has constantly offered encouragement for his endeavours, concurs and hastens to add *"What makes Rajesh stand out is his humility and 'open-heart'- he treats everyone equally".*

HMT-an improved paddy variety

PLANT VARIETY NATIONAL SECOND

Dadaji Ramaji Khobragade (65) grew up in a small forest village called Nanded in Naghbid taluka of Chandipur district in Maharashtra. He left school after the 3rd standard due to adverse economic conditions and also because his help was necessary in the farm. Currently, he is the only earning member of his family, which comprises his son (who does not earn due to his ill health), his daughter-in-law and three grandchildren. He owns 1.5 acres of land and his income is Rs.12, 000 per annum. At present Dadaji Ramaji also cultivates three acres, once given to his son by a relative.He had to sell two acres due to the illness of his son. Occasionally he works as a daily wage labourer to support his seven-member family.

Address
Vill: Nanded
Tal:Nagbid
Chandrapur
Maharashtra

Genesis In 1983 Dadaji Ramaji noticed three yellow seeded paddy spikes commonly called as 'lomb' in 1.12 acres field, planted with the *Patel 3* variety of paddy. He picked these three spikes, brought them home and stored them in a plastic bag. The next year he sowed the seeds of this yellow variety separately in the middle of his field. As his field was close to the jungle he planted the rice amid a fence of thorny bushes to protect it from pigs and other wild life. Observing the high yield of this variety, he preserved the seeds. The following year he cultivated the seeds separately and got nearly ten kilograms of husked rice. On cooking the seeds he found them to be tastier than the *Patel* variety.

In 1988 he sowed four kg of seeds in an area of 10 ft X 10 ft and produced 400 - 450 kg of rice. The next year 100 – 150 kg seeds were sown from which he obtained 50 bags of paddy and he sold the seeds (40 bags) to one of the traders at Nagpur. Since the name of the variety was not known, the trader purchased the seeds in the name of Swarna Sona. Soon he began distributing this new variety to local farmers on their demand.

In 1990 Bhimrao Shinde, a large land owner in Nanded, bought 150 kilograms of seeds and sowed it in four acres of land. He obtained 90 bags of yield and sold the same to a trader from Talodi. The trader gave the name HMT to this variety as HMT watches were very popular at that time and he had recently acquired a new one. Ever since the name HMT has stuck.

The paddy variety

Dadaji Ramaji selected and bred the HMT rice variety from the conventional '*Patel 3'*, a popular variety of that time developed by Dr. J. P. Patel, JNKV Agriculture University, Jabalpur. He succeeded after five years of continuous study and research on a small farm owned by him without any support from the scientific community. It has an average yield of 40 – 45 quintals per hectare with short grains, high rice recovery (80 %), better smell and better cooking quality in comparison with the parent ones.

Current status

Dadaji Ramaji contacted the paddy research centre regarding this variety, but they refused to recognize his farm research, as it was not based on scientific research techniques. But in 1993, the Gram Panchayat of Nanded passed a resolution in their meeting to recognize the work done by the farmer and to acknowledge him as a Paddy Seeds Producer. He received public recognition for the first time by Vilasrao Mutyan, the then MP (1993) of Chimera constituency, who felicitated him on the occasion of the inauguration of a statue of Indira Gandhi at Nanded in 1994. He was also felicitated by the BDO, Nagbhid on the occasion of Krishi Melawa (Agro meet) in 1994. After publication of his work in newspapers, a letter from the Collector of Chandrapur to Punjabrao Krishi Vidhyapith (Agricultural University, Akola) lead to him getting recognition first by Dr. Moghe and then Directorate of Research, PKV, Akola.

Now most of the farmers in the Vidharbha region have started growing this variety as it fetches them a better price and has improved their economic situation. This is visible, as Dadaji Ramaji puts it: "*Their thatched roofs transformed into tiled roofs - a sign of prosperity*". This variety is now being marketed in Andhra Pradesh, Gujarat, Chattisgarh, Madhya Pradesh and Maharashtra.

A bitter experience

In 1994 Khobragade was approached by the Sindewahi Rice Station, a part of Punjabrao Krishi Vidyapith. It took five kilograms of seeds of the new variety under the pretext of experimenting. But in 1998 they released a new variety named PKV HMT. They claimed that Khobragade's variety was 'impure' and that they purified the local HMT and released it under its new avatar called *PKV HMT*. To Khobragade there is no apparent difference between his and theirs.

This classic case of formal science refusing to acknowledge the achievements of the informal was published in *The Hindu* newspaper. According to the report, Mr. A.D. Bhombe - Assistant Professor Botany at the Punjabrao Deshmukh college of Agriculture at Nagpur who was earlier a senior rice breeder at the Sindewahi rice station – clarified that the original selection of HMT was made by the farmer. But he went on to explain, "We felt that this HMT was a mixture and it needed to be purified. The seeds were collected from this farmer and we purified it. Farmers cannot maintain individual plant selections over the years. In the farmer's method, there is some chance of natural crossing."

Several social activists like Ashish Kothari and others felt that the university had not been fair to Dadaji Ramaji. Several journalists wrote about his travails and pleaded for better recognition to him. Meena Menon, a journalist from Mumbai wrote to NIF highlighting the saga of struggle that Dadaji Ramaji had gone through to get due recognition from the formal system for such a useful research.

Vikalpa, a NGO from Nagpur wrote to NIF in December 2002 enclosing detailed information about the research by Dadaji Ramaji. They provided the entire history and series of events from 1983 till 2001.

Dadaji Ramaji, the innovator complains: "Now these new seeds are sold for Rs.1200 a quintal. What have I got out of all this? The government wants to deprive me of any credit and the variety they claim to have released is exactly like mine." (The Hindu, 17/6/2001)

An indomitable spirit

But undeterred by this experience with the establishment, Dadaji Ramaji does what he enjoys most; he continues in his father's footsteps. His father had a habit of selecting and breeding crops which young Dadaji had often observed and later picked up. His father used to take the grains in his hand and grind them between his palms like an expert and observe the number of broken grains to judge the quality. The young boy was so enamoured with the idea of cultivating new varieties that he became obsessed with it. He would even carefully pack the new variety in polyethylene bags and show it to his friends.

Pursuing this passion, Khobragade has selected and bred seven more varieties of paddy in the last 20 years namely Chanaur, Nanded 92, Nanded Hira, DRK, Vijay Nanded, Dipak Ratna and a new unnamed variety in the year 2001 apart from HMT. The average yield of all the new varieties is about 15-16 quintals per acre. Out of these eight varieties, Vijay Nanded yielding 25 bags/ acre and HMT 20 bags/ acre have been commercially successful. One variety is mildly scented. Khobragade named another variety DRK after himself. Just as in childhood, he proudly displays each variety he has carefully framed and labelled.

At the same time, harsh reality makes him express his hope of being rewarded for this innovation. He says he would spend the award money to buy a pump set and a pair of bullocks, as presently he has to hire bullocks to till his farm. He would also like to improve the condition of his dilapidated house. But on the subject of his ambition he declares his wish of sharing ideas with other farmers and feels "*If other agriculturists follow my way of working in the field, it would result in higher yielding varieties and better prices for the crop.*"

Indrasan- a farmer bred high-yielding rice variety

PLANT VARIETY NATIONAL SECOND

Indrasan Singh, a farmer by profession, is a resident of Inderpuri village, Udham Singh Nagar District, Uttranchal. In 1942 he actively participated in the freedom movement and spent 18 months in Gonda & Gorakhpur jails. After Independence he was awarded a piece of land of about 15 acres by the Govt. of India, in Inderpuri, and he has been living there ever since with his five sons, four grandsons and three granddaughters. For the first few years, he had to struggle hard, as it was a forest area, infested with mosquitoes and algae but with persistence he was able to make iit arable. In 1972 he was awarded a Tamra Patra by the then Prime Minister Smt. Indira Gandhi.

A prominent member of his community, Indrasan got elected as Sarpanch of the village eight times. Though his formal education ended with the fifth standard he is currently a member of Uttar Pradesh Seeds and Trai Development Corporation Limited. Now in his nineties, he finds his memory failing and cannot recall all the incidents of the past. But he recalls having met Mahatma Gandhi during the freedom struggle in Meerut jail. During the 11th Shodh yatra, (26 May - 4 June 2003, from Gokulnagari to Dehgala) the members of the Honey Bee network honoured him at his doorstep and tried to atone to some extent at least, the years of neglect. It was at this time that the decision was made by the shodh yatris that Indrasan should be recommended for national recognition by NIF, given his extraordinary contribution. It was one of the first farmer-developed varieties which has diffused over thousands of hectares all over the Indo-Gangetic plains.

Address
Vill.: Inderpur
Pratappur
Dist.: Udham Singh
Nagar, Uttaranchal

Scouted by
SRISTI GYAN Kendra

Genesis This idea for an improved paddy variety stemmed in response to apparent problems that Indrasan faced in cultivating high yielding variety seeds procured from the Pantnagar University. Eight years back he had got a few seeds of the 'Ratna' variety from Pantnagar. After planting, he found that one plant was different from the others in terms of shape and structure, so he marked it and harvested seeds from this plant separately. He got eight spikes from this plant and kept the seeds in a safe place. The next year, he planted the seeds again, and took special care of those plants. He continued the process for the next four years and planted rice seedlings from those seeds in half an acre of land. He was very surprised to see the yield of 32 quintals per acre

Characteristics of the variety
This farmer-bred variety of paddy named "Indrasan" has a yield of about 8000 kg/ ha which is quite high in comparison to conventional paddy. The efficiency of the crop as well as the recovery rate of the grains is much higher than other varieties. The starch obtained is of superior quality. The major distinguishing characteristic of this variety is its red coloured roots. It matures in 120 days and reaches a height of 80-100cm with spike lets of equal length. Another point in its favour is its

high resistance to disease unlike other traditional varieties.

Support and recognition

Indrasan's neighbours helped him in the process by sowing the seeds of this variety developed by him in their farms. Later he distributed the seeds of this variety to other farmers of the village who reported very high yield and good quality seed grains as compared to the commercially cultivated paddy varieties. Indrasan then distributed the seeds in other districts of Bihar, Uttaranchal and Uttar Pradesh. Now "Indrasan" variety finds its name in the price list of standard seeds and Indrasan Singh has converted his farm into a 'Seed farm' with the help of Pantnagar University.

One person who helped a lot in his endeavours was Dr. Harvera, who helped him in advancing this variety towards commercialization. Furthermore he received the support of his entire family especially when he had to allocate about an acre of his cultivable land for the development of this variety.

Public recognition came when Kisan Bharti, a famous magazine from Pantnagar Agricultural University, published an article on his innovation in the mid 70s. This advanced his fame and credibility and Indrasan received hundreds of letters from the northern states.

New acid lime variety

PLANT VARIETY NATIONAL THIRD

V Antony Samy (62) lives in Puliangudi village of Tirunelveli District, Tamil Nadu. He has two sons and one daughter. He has studied up to the eighth standard. His elder son is a graduate in Agriculture. Antony Samy owns 40 acres of irrigated land with three wells and boasts of a monthly income of Rs.2,00,000.

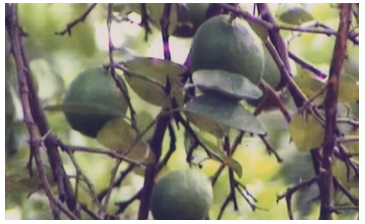
Address
53 B, West Car Street,
Chinthamani, Puliyangudi,
Tirunelveli Kattabomman,
Tamil Nadu

Genesis Puliangudi village is known for the cultivation of Acid lime. The climate, soil and marketing facilities are quite suitable for the cultivation of this crop, thus making this village the leader in acid lime cultivation. In 1982, Antony Samy left seed production enterprise due to high input cost and started the cultivation of acid lime. Since 1962 he had been cultivating on a small scale, but from 1982 onwards he expanded his cultivation of acid lime to 30 acres of land and made a good profit out of it. Then he started facing problems like declining productivity, micronutrients deficiency and quick wilt problem in seedlings of acid lime; which led to large scale pruning of the crop. He found a deficiency of trace elements such as Zinc, Boron, Iron and Copper in spite of applying mineral fertilizers to the crop. So he rushed to the Indian Institute of Horticulture(IIHR), Haseragatta for technical guidance and there he met Dr. Edward Rajan, Soil Scientist who told him that the low productivity was due to the shallow root system of citrus plants. He also told him about the germplasm collection (nearly 280 accessions) of acid lime in the research institute and advised him to graft by using locally available rootstock.

Accordingly Antony Samy purchased a few rootstocks from IIHR and raised the seedlings in his farm. From these he selected rough-wild lemon rootstock. In the mean time he evaluated and selected two scions out of thirteen mother plants with good performance, which he had maintained in his farm over many years of observations. He grafted this scion to wild lemon rootstock and found that it was highly superior to existing varieties. He measured the tap root length of the new variety and confirmed that the desirable characteristics and vigour of the citrus trees are due to the deep root system.

He planted the first batch of 120 plants using wild citrus rootstock in1996. In the second batch he used 200 wild citrus rootstocks grafted with the first generation citrus plants (F_1 obtained by grafting wild citrus with high yielding Edward lemon). The second-generation plants have maintained the good qualities of the first. Antonysamy is now planning for the third generation grafting by using wild citrus rootstock of second generation-grafted plants.

Antony Samy also adopted various other measures to ensure a good crop. He planted country onion and Giant African marigold around each plant to repel nematodes and other foliar pests. There



were no intercrops and the fields were weeded regularly. He used organic pest repellents once a fortnight followed by a spray of fish ensilage and cow's urine to promote plant growth. He added about 7kg compost per plant, every six months, in the initial stages of crop growth and this was gradually increased to 10 kg per tree from the second year onwards. He used Neem cake, cow urine and Notchi (*Vitex negundo*) for control of foliage caterpillar. He also sprayed 'Panchakavya' as liquid fertiliser during the time of flowering i.e. October-November. Apart from this he designed his own drip system to deliver four litres of water per day per plant in the initial stages of growth. The water delivery was gradually increased to 30 litres per day as the crop reached peak yield from the fifth year of planting. Antony Samy also suggests increasing it to 100 litres a day during peak summer.

Characteristics of the new citrus variety

The grafted plants are vigorous in growth, disease free, pest resistant and bear a higher number of violet-tinged flowers in each leaf axis on lengthy bracts. They are also shorter in stature and have a larger surface area for exposure to sunlight. These plants are drought tolerant and resistant to quick wilt. It takes 135 days to mature (from flowering to harvest) in summer and 150 days in winter. The root system is highly developed, penetrating the soil up to five to six feet in depth compared to a maximum of two feet in the ordinary grafted variety. The lateral roots (shallow adventitious roots) are also well developed in the new variety. The fruits are bigger, more juicy and suitable for pickle and processing industries.There is fruiting all year around and peak yields are obtained in April-May and August–September when there are premium prices in the market. The cost of cultivation of acid lime works out to Rs.37,500 per hectare in the first year, and the cost for maintenance in the second and subsequent years would be about Rs.15,000 per hectare. The trees may be kept in good stead for about 25 years. The market price for the fruits varies from Rs.200 per 1000 fruits in peak season to Rs.500 in the off-season.

Advantages

The water requirement for this new variety is 20 % less than that of the local variety. 90 % of the fruits produced are first grade fruits compared to only 60 % of the fruits of the most popular variety. The new variety comes to bearing from the 3rd year onwards as compared to the popular variety which comes to bearing from the 5th year onwards. Only 2 % of the twigs are removed as against 15 -16% of twigs which need to be pruned at the end of each season in the popular variety. The yield per hectare is 35,500 kg in comparison with the popular variety of the region which has a yield of 20,500 kg. The productivity is 4000 fruits per tree per year compared to 2500-3000 fruits in the ordinary variety.

Constant improvements

Mass multiplication and propagation of the new citrus variety

After seeing the success of his new variety, Antony Samy wanted to market it. Till date he has raised 1000 grafted plants by using wild rootstock. But he realised that he would not be able to cater to the high market demand and therefore he decided to give this propagation work to his friend Vijay Anand who has established a mother unit for mass multiplication and propagation of the new citrus variety. Antony Samy is also trying budding method of reproduction instead of grafting to undertake mass propagation.

Trying the new variety under dry land conditions

Antony Samy wanted to cultivate this new variety undernatural conditions, without any watering. With this

aim he has been growing a few plants without watering from 1998 onwards .His experiment worked and the plants are bearing fruits without watering. But the yield is around 1500-2000 compared to 5000, when the plants are watered regularly.

Searching for other good root stock

Appreciating the successful outcome of using wild citrus rootstock, he started searching for other varieties of wild citrus plant stock, even from other states. He went to Andhra Pradesh and procured wild citrus plants from Railway Godur village. Now he is growing different types of rootstock and continuing his experiments.

Other successful experiments

Innovative grafting in Amla

Antony Samy gathered different wild *amla* varieties from the Western ghats and raised the seedlings in his farm. These wild varieties were tall in stature and the fruits were not of uniform size. This lead to difficulty in harvesting (because of unusual height) and fetched low prices in the market. So he grafted improved varieties of amla such as "NA7" and "*Kanchan*" with the wild amla variety root stock. Then again he did top work with the graft with well performed local varieties as scion. The resultant grafted plant is of short stature and bears uniform sized fruits through out the year. This new variety can be used for high density planting, because of its short stature. Harvesting of the fruits is also easy. The trees started yielding two years after top working. On an average each tree yields about 60 kg of fruits in a year. This experiment is in the initial stage and evaluation is going on.

Switching over to organic farming

In the late 1950s Antony Samy used only inorganic fertilizers for farming. In 1972 he started seed production of crops such as different varieties of paddy, hybrid cotton, tomato and bajra. During that time he earned a lot of money. He had the parent line of bajra 5141A and distributed seeds to National Seed Corporation, MAHYCO, EID Parry and SPIC. In 1982-1983 he noticed that the fertilizer requirement had increased up to 600 kg/acre. But even with this input, there was a drastic reduction in the yield and quality which in turn lead to great loss to farmers. He observed that the plants near the compost pit were healthy and produced fertile pollen grains and this inspired him to practice organic farming in his field. He started using 100% organic manure/inputs. Currently he also cultivates sugarcane, bajra, pulses and fodder crop for animals. He also prepares herbal remedies for control of crop pests on his own. Antony Samy has received a certificate from the Indian Society for Certification of Organic Products (ISCOP), Coimbatore for his farm.

The urge to make a difference

Antony Samy is the moving spirit of the Small Farmers Agricultural Engineering Service Centre and its activities. This organisation, which was founded by Gomathinayagam, a retired teacher, has been active in Puliangudi village since 1975. The centre has been instrumental in setting an example for the rest of Tamil Nadu that if farmers wish they could make the barren land bloom and mine gold from it without depending much on the government. The centre has less than 50 farmers as its members and most of them have very little formal education. But what is most impressive is that these farmers speak admirably of how Koreans and Israelites raise grape nurseries in mid chamber conditions, how they manure their vineyards and harvest 40 tonnes of the fruit from just one acre of land. When asked how they know all this, Samy replies coolly, "By listening to educated men and reading farm magazines."

Besides organising seminars and debates on farming, the organisation subscribes to almost all the farm magazines in Tamil and "Kisan World" a farm journal in English. It employs a mechanic to attend to the repairing of the members' pump sets and also provides them with a motor on nominal rent if theirs' goes out of order. What makes its members enterprising is their readiness to experiment with what they read and hear about newer and better ways of farming in the light of experiments in countries like Korea, Japan and Israel.

Propagation of rubber by budding

AGRICULTURE NATIONAL SECOND

K C Kuriakose (71) lives in Karimpuzha panchayat in Palakkad district, Kerala. His formal education ended with failure in the 3rd standard. Ever since he has learnt at the school of life. Farming has been his passion and his wife and four sons share his interest.

There have been disputes about Kuriakose's claims to be the original innovator of the technique. However, The Rubber Research Institute of India vide their communication dated Feb 23, 2004 have commended the improvements made by Kuriakose in young budding technique highly and have endorsed his claims.

Address
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Genesis Kuriakose started the Cheerakuzhy Rubber Nursery in 1979. At about this time he came across the budding technique in a magazine and decided to teach himself by experimenting on rubber plants. Consequently during the 80s Brown Budded plants were distributed on a large scale from his nursery. In 1994 he started experimenting with different kinds of budding. Initially he tried planting seeds directly in polybags and brown budding was done in them but this turned out to be unprofitable. Then he tried green budding (developed by the Rubber Board) in which budding was done on three month seedlings in polybags but it was also not viable due to very low budding success. He persisted with different materials and methods and found that budding using buds from tender shoots of about 20-25 days old was very encouraging. Thus after a series of experiments and observations he was able to standardize the technique in 1997 and termed it as Young Budding. Initially people were hesitant to buy this new variety so he gave 10 free plants to everyone who bought rubber saplings from his nursery.

The Innovation
Young budding is an economically viable technique which can be applied on a commercial level as a method of vegetative propagation in rubber. High quality seeds are planted in polybags during July-August and budding starts from the 28th day and can continue up to the 60th day. The bud sticks are 20-25 days old. After 15-20 days budding success is assessed and the plants are retained in polybags for 5-6 months. The stock plant is cut back at 8-10 cm from the bud patch during January and after 10 days a new plant starts growing. About two gram of NPK mixture in liquid form is applied monthly apart from regular watering. Four months after this the saplings are ready to be transplanted to the field.

Advantages
Budding success in Young Budded plants is 95-98% whereas in Brown Budding it is only 60-80%. In the Young Budding technique, the root system remains more or less intact which ensures better growth and helps the trees resist strong winds and also gives them greater protection against

drying out in the initial years. In Brown Budding, roots are cut back during planting which retards the growth. In the case of the traditional method of brown budding, the budding is done after the seedlings have grown in the nursery for one year and they remain in the nursery after budding for another six months. Then they are removed from the ground and transplanted into polybags. After six more months they are ready for planting. So in effect it takes about two years for a seedling to become ready for planting using this technique. Whereas in Young Budding the seedlings becoming ready for planting within 10 months.

Young budding saves labour as well as costs. As the plants remain in the polybag, during the entire process, the labour of transferring them from the nursery to the polybags as required in Brown Budding is eliminated. Similarly space requirements are cut down by two-thirds and about two years are saved in terms of tapping as Young Budded plants become ready for tapping in five years as compared to the seven or more of Brown Budded plants.

Young Budding according to Kuriakose is particularly women-oriented as the budding is done on delicate seedlings which require patience and a gentle touch, both qualities which he attributes to women. As the saplings become ready for planting in 10 months, women are also able to handle the loading of the plants etc, and he proudly proclaims that about 90% of the employees at the Cheerakuzhy nursery are women. Gender disparity in wages is also addressed to an extent as for budding both men and women get the same wages whereas this is not the case in other kinds of agricultural labour. This assumes importance especially for women from the lower economic strata, as over the years he has seen that in such families, women are the major contributors to household income.

The following table (no 1) provided by Kuriakose illustrates the advantages of young budding over brown budding taking into consideration the economics of planting.

Table 1 - Economics of planting

Particulars Cost of plants	**Young Budding(Rs.)** (450XRs.16)7200	**Brown Budding(Rs.)** (450XRs.20)9000	**Savings(Rs.)** 1800
Transportation charges from nursery to plantation area(25km)	346	500	154
Carrying charges to field pockets(Approx.Labour cost)	400	1000	600
Planting cost	200	400	200
Casualties	(5 X Rs16) 80	(25XRs.20)500	420
Total	8226	11400	3174
Planting cost per plant	18.28	25.33	7.05

Awards and accolades

Initially on taking a sample of a Young Budded sapling to the Rubber Board, Kuriakose remembers that they were not prepared to acknowledge that budding could be done at such a young stage. So he left an application with the Rubber Board mentioning that he had used this technique of Young Budding successfully. As a result officers from Rubber Board Research visited the nursery. Later, he has received all possible guidance and support from the Kottayam Rubber Research Institute.

In honour of his contributions to the agricultural sector and with special reference to the development of and improvement in the Young Budding technique, Kuriakose was awarded the prestigious Karshakashri award in 1998, instituted by Malayala Manorama, a leading daily in Kerala. In 2000 official recognition came from the Rubber Board when the Publicity Deputy Director visited the nursery and published a report on Young Budding in their magazine. Following this the Director of the Rubber Research Institute and other scientists came to the nursery and after detailed observations purchased 5000 Young Budded seedlings and distributed it in 10 regions in Kerala for comparative studies with brown budded plants.

Kuriakose specially mentions the Rubber Production Commissioner, Dr.A.K Krishnakumar, who visited the nursery in 2001 and declared that this technique is a great step forward in the development of the rubber industry. He also issued a certificate to Kuriakose stating that this new technique has provided satisfactory results. Keenly interested in popularizing the technique, the Commissioner arranged a two day training session for 15 nursery owners from various parts of Kerala at Cheerakuzhi nursery. Later a team comprising the Chairman of the Rubber Board, the Research Director as well as the Vice Chancellor of the Kerala Agricultural University visited the nursery and recommended wide-spread use of this technique. A recognition that holds pride of place in Kuriakose' memory is the time he was invited to present a paper on Young Budding at the Rubber Planters' Conference held at Kottayam in 2003 to celebrate the 100th anniversary of Rubber cultivation in Kerala. This paper was later published in 'Rubber Planters Conference India 2003', released by the Rubber Board. From 2002 onwards, due to the increase in demand, bookings for Young Bud plants started a year in advance. From 2003 franchises of Cheerakuzhi Young Bud nurseries have been started all over Kerala. Young Budding also has got a lot of mileage on the media-with newspapers, a radio station and a cable channel running features on it.

71 and going strong

At 71 Kuriakose wishes to continue making innovations and contribute in his way to the agricultural sector which he believes is the backbone of our economy. He points out that in a scenario where labour costs are increasing and labourers are difficult to find, the agricultural sector will not be able to progress unless steps are taken to reduce its dependence on labour.

Kuriakose also declares that he has other ideas up his sleeve. One idea, of reusing waste water for agriculture, is still in the infancy stage. He goes on to relate another instance of an innovation in which he improved the performance of a power tiller and took it to a nearby engineering college, where he was told that such small machinery was of no interest to them. Not giving up, he found an opportunity to attend a meeting at the college at which the Vice Chancellor was present and

spoke up saying innovations by ordinary people should be encouraged. Accordingly the Vice Chancellor asked someone from the college to come and look at it, but nothing has come of it so far. Kuriakose' belief in the ordinary man and his potential was echoed by the Rubber Production Commissioner when he had visited the nursery and Kuriakose proudly quotes him, "It is from the ordinary people that all great discoveries and inventions have come. You can ignore them only at your expense."

What makes this ordinary gentleman, extra-ordinary is his willingness to share his knowledge with everyone. He says,"A *lamp should not be hidden under a pot depriving others of the benefit of its light."* His son remembers that when the Production Commissioner had wondered whether Kuriakose would have any qualms in making his discovery free for the public, his father had immediately replied that he would not even be able to meet the demand for Young Bud plants in his own district and wishes to train as many people as possible in this technique since according to him his contribution becomes worthwhile only when widely used.

Fungal control in honey bee

AGRICULTURE NATIONAL THIRD

V J Joseph (45) completed his 12th standard in the science group and apiculture has been his passion ever since. His wife is also involved in this work and his son, who is in the 5th standard, finds the bees and their life more fascinating than his books. He lives in Kanhangad municipality, Kasargode district, Kerala.

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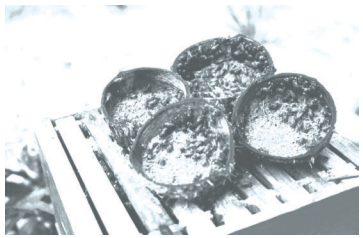
The Genesis V J Joseph's interest in honeybees was aroused after attending a week-long class conducted by the Khadi Board on apiculture in 1980. Since then he has been rearing honey-bees and has also been invited to give classes by the Bee-keeping co-operative society. But in 1984 there was a widespread fungal attack(chalkbrood) leading to the honey bee industry almost being wiped out in Kerala. Bees have two distinct life forms (brood and adult) and most diseases are specific to either one stage or the other. The most virulent diseases at present are those of the brood, specifically American foulbrood and European foulbrood. Other brood diseases include chalkbrood, a fungal disease which appears to be on the rise. Chalk brood can happen at any time but there is a greater possibility during the rainy season. During this period the number of bees decreases as there are fewer flowers and hence bees can't collect pollen and honey. The queen lays fewer eggs and thus some of the cells become empty making it easy for the fungus to attack these cells. The disease affects the larvae and they die out. The remaining bees become listless and weak and darker in colour and the queen stops laying eggs in such a situation ultimately leading to the death of the colony.

There was no medicine available for this fungal attack. The only option available was requeening with resistant bee stock which was often not successful. Joseph consulted a number of traditional healers about the medicinal properties of various plants and accordingly experimented with various combinations of these plants for almost 10 years before he succeeded. His focus was on an herbal medicine as he felt that any kind of chemicals would be harmful to the bees who subsist only on pollen and honey.

The medicine

It consists of aloe, tulsi, turmeric and Spreng(*Plectranthus amboinicus*) in a sugar solution as bees will take it only if it is sweet. The medicine is placed in a bowl, on the top of the box in which the colony lives, with a towel soaked in it and the medicine drips out through the sides of the towel which overlap the bowl. When the bees start bringing pollen again it is a signal that the colony is healthy and that the queen has started laying eggs.

This is a completely herbal medicine; hence there are no harmful effects for the bees or any contamination to the honey. The cost of medicine for curing a diseased colony in one box would be about Rs.150



and this is quite cost-effective when one considers that during peak season from December to April one can harvest as much as 15-20 kg of honey from a box and sell it at a price of about Rs.60/kg. In addition, during peak season, a colony would fetch a price of about Rs.800.

Future plans

Along with two other partners Joseph has built a plant for the commercial production of honey and this anti-fungal medicine under the brand of CANAN. The plant is expected to be operational in about two months and

will employ 10 people. They are aiming for producing 1000 bottles of honey per day and 500 bottles of the medicine. They have succeeded in getting AGMARK certification for their honey with a shelf-life of 4-5 years.

The plant is situated on the Mysore-Bangalore road with the nearest railway station 15 km away and the airport at Mangalore 70 km away. The Federal Bank has reportedly sanctioned Rs. 10 lakhs for this project. They were not able to avail of any government scheme as the government provided subsidies only for projects of up to Rs 5 lakhs, but recently the Khadi Board has informed them that the ceiling had been raised to 10 lakhs. As Joseph is planning to produce the medicine commercially, he has avoided any kind of publicity and only a few friends and relatives are aware of it. Currently he is planning to get this herbal medicine patented.

The fruit of dogged determination

Joseph admits that after the crisis in 1984, when he persisted with the honey-bee industry, he faced lots of criticism and discouragement and was told that the industry had no future and that he was wasting his time. But now the few, like Mr. James, an owner of 600 boxes, who have used the medicine stand by it as "extremely effective." For Joseph, it was a matter of his livelihood and developing a medicine was a necessity not a hobby. His success in finding the cure gives him immense satisfaction as he feels it will help to revive an industry especially as there is great demand for honey as an ingredient for Ayurveda medicines especially in Kerala and also as a food item in other states. His dream is to make a success of his business and establish the brand, CANAN.

Tree seed broadcaster and innovative water management practices

AGROFORESTRY TECHNOLOGY AND WIDE SOCIAL IMPACT NATIONAL FIRST

Premjibhai Patel (70) has been planting millions of trees, developing new models of financing and designing check dams and evolving new techniques of irrigating freshly planted tree saplings in dry regions. All these have been feats of an extraordinary maverick. Premjibhai, after having had a busy life in a city as a trader, decided to go back to his roots. When he noticed these roots drying up, he decided to develop new devices for scattering seeds on road sides- about 45 billion seeds. All this was done from his own pocket too. If even one percent of these survives it would mean millions of trees. He started this work from his homeland Saurashtra and moved on to other regions in the states of Gujarat, Maharashtra, Madhya Pradesh and Rajasthan. At seventy years, his spirit is still young- he continues to experiment, innovate and explore newer ways of revitalizing the resource management system in dry regions.

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Scouted by
SRISTI

Genesis Premjibhai was born in Bhayavadar village in Upleta Taluka, Rajkot district. Although he belonged to a farming community, he took to trading as a profession and soon became a distributor for Reliance Textiles. Till 1975, he conducted his business in Upleta and later moved to Mumbai. But he never liked Mumbai. Frustrated by the lifestyle in Mumbai, he yearned to retire and do something that would make a difference to the world. He pondered over this for two years, considering various options such as politics and social service. But he was repelled by each of them because of the 'filth' (moral decadency) in each.

He recalls how a character in a play written by Manubhai Pancholi, a well known educationist in Gujarat, kept coming back to his mind over and over again during this period. The character, Gopal Bapa, was an old man who generated employment for many young, unemployed people through horticulture, by growing trees such as *'amba', 'bor'* etc. Drawing inspiration from this character, he decided to venture into tree planting. To begin with, he supported tree planting around temples in his own village. He selected the areas surrounding temples, for doing so, simply because people do not cut the trees around temples. He hired a person to organize this work and paid for all the expenses incurred. Once the temples in his village were covered, he moved on to plant trees around temples in two other villages. Then in 1984, he entrusted this work to a local voluntary organization, Gokul Goshodhan.

Later in 1987, his son, Shri Rayjibhai Patel, who is an industrialist in Ahmedabad, sent him an article from *Suvichar* (a local magazine) on Elzeard Bouffier's work (originally a story titled "The Man Who Planted Trees", written by famous French writer Jean Giono). Elzeard Bouffier is depicted as a shepherd who devoted his retired life to tree planting. He supposedly created a forest 10 km wide and 50 km

long in 35 years. So moved was Premjibhai by the story that he decided to spend the rest of his life doing the same. He discussed his plans with his son, who supported him whole-heartedly.

Planting trees: scaling up

Thus in 1987, Premjibhai returned to his village in order to fulfill his dream. In the beginning he set out every morning with a bagful of seeds and a small spade in his hands. He would wander around the fields in his village and plant seeds on the bunds of fields and along road sides. People who knew his wealthy background used to express slight derision and wonder why he was doing this.

By and by, Premjibhai felt the need to scale up his activity. He bought a motor-cycle to increase his mobility and at the age of 55 he learnt to ride a motor cycle. He used it for both procuring seeds as well as sowing them. Each day he would set off on his motor cycle taking along a bag of seeds with him and stopping randomly at any village on the way. After locating individuals or institutions with a good reputation of voluntary service, he contacted them and tried to motivate them to volunteer in the work of ecological restoration. He also contacted local schools and wherever he found the teachers responsive, he recruited school children for this task. He gave all of them seeds requesting that they sow them. When he ran out of seeds, he bought more from any dealer he came across and resumed his journey to find collaborators. In this way he had travelled over 1, 40,000 km, during the first five years, on motor cycle.

The Innovation

Premjibhai relates the genesis of his automatic seed sowing machine. A young man used to visit him regularly to collect seeds. Premjibhai knew that he was a committed person. So Premjibhai requested him to bring 10 to 12 other friends along with him. Premjibhai took a sack of seeds and all of them set out in a four-wheeler. He gave a bagful of seeds to each and dropped two persons at every milestone. He asked them to broadcast seeds on both sides of the road while walking down to the next milestone. This way they covered a stretch of 150 km.

Later, when Premjibhai chanced to see the growth of trees on this road, he found that the trees had grown in a very haphazard pattern as the volunteers had broadcast them with their hands. This made him think of developing a tool which could broadcast seeds uniformly from a moving vehicle. He felt that if the seeds were blown with air they would spread evenly and they might grow better. He also thought about the fan stove used in making tea. He kept on thinking of this design and discussed this idea with his daughter and son-in-law who run a steel business in Rajkot. They encouraged him. Then he bought a motor, a fan and pipe from the scrap market and started to work. In the first version the pipe was lower in height so the seeds fell near the blower pipe. In the next improved model he fitted a longer pipe so that the seeds could be blown to a longer distance.

The result was a petrol-driven mechanical blower which could be mounted on the back of a jeep. The blower, fabricated in Rajkot at a cost of around Rs 12,000, could blow seeds to a distance of 15 m. Premjibhai soon adapted it for use on railway tracks as well, to broadcast seeds on the sides of the tracks. He has two machines of this kind.

The following factors have to be considered while using the seed blower. Direction and speed of the wind are important factors for evenly spreading the seeds. If

there are strong winds, it is advisable to keep the vehicle's speed slow. On the other hand, if the wind speed is too low, the seeds could fall on the track. In this case the speed of the vehicle should be faster. It is also important to feed the seeds evenly so that they get blown and sprout at fairly regular distance.

In one year using these machines he broadcast ten tons of tamarind seeds in the villages around Ahmedabad. He says that this blower has been given to various organizations for seed broadcasting. He has no plans to replicate the innovation and sell it and so far has not received any orders for the same.

Choice of species and technology

Mesquite, locally known as *'ganda bawal' (Prosopis juliflora)* was Premjibhai's first choice among tree species. It is one of the hardiest species capable of surviving in arid and semi-arid regions. It is also salt tolerant. Its thorns provide it a natural defence against cattle and other grazing animals. He was well aware that this was not a very popular choice to make, but he convinced people with the following argument: "The trees of *Prosopis juliflora* are like soldiers who get killed on the battle-front while the other trees in the background remain unscathed."

However, after a while, he added more trees and grasses to his list of species to be used for reforestation. These included Flame of the Forest (*Butea monosperma*) known locally as *palash* or *khakharo*, *awali* (*Argyreia speciosa*), *neem* (margosa - *Azadirachta indica)* and *desi baval* (babul - *Acacia nilotica*) trees and *dhaman* (*Grewia titiefolia*) grass.

These species do not need much care or protection from grazing animals and cattle. Some species of plants such as neem are vulnerable to destruction by cattle at an early stage of growth. Premjibhai has ways to overcome this. He plants such trees within clusters of thorny bushes that offer natural protection from grazing animals, when they are young and vulnerable. For reaching such hard-to-reach locations, he uses a hollow crowbar approximately five feet (1.5 m) long to convey the seeds to the selected location. One end of the pipe-like steel shaft is pointed and the other end slightly flared. The hollow crowbar is used to dig a small pit even while one stands safely away from the thorny shrubs. The seeds are fed in from the flared end once the pit is dug.

The sites he selected for tree planting were mostly public or common property lands. They included road-sides, railway-line sides, bunds, village wastelands and other common property lands. To tackle wastelands, he often hired tractors and opened up the soil with the help of disc harrows and disc ploughs or tillers. The seeds were dibbled by volunteers in the rows in the soil opened up by the tractor.

Plantation in drought prone areas

Premjibhai has also developed a technique for the plantation of trees in places where there is a scarcity of water and which are drought prone such as Kutchh, Bhuj and Saurashtra.

For this he made plastic pipes of seven inches diameter with a height of approx 1-1.5 feet. Each pipe has two holes on opposite sides at the top. First a pit of around half a foot is made and the pipe is put in it. The seedling is planted beside the pipe and the pit is covered with soil. Then the pipe is filled with a mixture of sand, soil and gravel. A small stick or branch is put through the two holes and the pipe is taken out. Now when water is poured on the sand, it will directly reach the roots of the plant.

By using this technique of plantation, there is no loss of water at all. The rate of successful plantation can also be increased using this method.

Propagating the idea

Premjibhai however had one rule, he never went back to check whether the individuals/ institutions he had distributed the seeds to, had actually sown the seeds or not. Nor did he check whether they used these seeds for personal gain. This was a conscious decision and perhaps this was the secret of his success in mobilizing a large number of individuals and institutions to join him in his mission.

The only safeguard he adopted in subsequent stages was to refuse seeds to those who came to him repeatedly to collect more. He would give such persons the contact addresses of reliable dealers who stock and trade in seeds. He felt that those who have experienced the success and impact of their contribution should buy the seeds and propagate the programme on their own.

As another strategic step in this direction, Premjibhai compiled a list of all the dealers who collect and sell seeds in the country and sent copies of it to all those whom he had contacted since 1987 for the seed sowing programme.

For furthering his mission, Premjibhai has also made an interesting suggestion to the district education authorities to shift the school annual vacation from April-May to October-November. This would enable students to participate in both tree-planting as well as farming operations. The authorities have so far not responded to this suggestion, but Premjibhai is not likely to give up so easily.

Check dams: new models

Presently Premjibhai is concentrating on watershed development through his own organization Vruksh Prem Seva Sanstha Trust. The work is being done through 150 nature clubs on 1000 hectares. In dry regions, water scarcity strikes any observer as the number one problem. The government has several schemes to encourage the development of checkdams on farmers' fields. Most schemes involve a lot of subsidies. The result is that people often consider these check dams as government projects and don't own the responsibility for maintaining them.

Premjibhai introduced a scheme under which people, who united to bear all the costs of check dams except cement, could apply for assistance. Once he got such requests, Premjibhai would visit them, look at the location and confirm whether the applicants deserved the help of the cement subsidy. Another novel practice he introduced was asking farmers to think and improve designs by which they could save their labour and cost. Since farmers had to bear much of the cost, they also had the incentive to innovate and there couldn't be more striking contrasts in implementation. While government schemes had uniform design with often uniform costing norms, in this case, the variability became the hall mark of cost effectiveness and efficiency.

Premjibhai is also a fast learner. While the government has been deliberating upon the merits of the semi-circular check dam design developed by Bhanjibhai of Visavadar, Junagadh, Premjibhai tested it and also replicated it with some location specific improvements. Innovations in check dam designs have become almost a rule with him, rather than an exception.

Success in his mission

In 1987, when he began to do this work of broadcasting seeds on his own, he bought 130 kg of seeds. This amount had increased to 13 tons in 1988, 80 tons in 1989 and 90 tons in 1990 and so on. The total number of seeds which were either planted or distributed by him for planting till now is estimated to be 550 tonnes (2004). Till date he has built 1,500 check dams for which he has given the complete financial support and 400 other dams for which he has provided the cement. He has also been instrumental in laying out 50,000 feet of pipelines for recharging underground wells.While a major part of the amounts he has spent was from his own savings, his son too chipped in to support many of his activities. Premjibhai is confident that money would not be a constraint as long as he continues to possess good health and the strength to continue with his travels. Supporting this fact he quotes the instance when Bansali Charitable Trust gave him Rs 75,000 in three instalments. Similarly, Amarsinghbhai Khavecha, an NRI from USA supported the cause with Rs. 1, 00, 000. Even at 70, Premjibhai does this work with fantastic levels of enthusiasm and zeal.

(*Reference:Article by Srinivas Chokkakula in Honey Bee,7(3):3-4-5,1996 and Vruksha-Prem Seva Trust (2004*))

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Scouted by
Sundaram Verma

Trench digging machine[20]

GENERAL MACHINERY NATIONAL SECOND

Radhey Shyam Tailor (62) was born in Shishu, a village in Sikar district of Rajasthan. He is a Commerce graduate and has worked for 40 years in the designing and drafting of several implements. He owns a workshop at Sikar. He knows a number of languages like Rajasthani, Punjabi, Oriya, Bihari and Bengali.

After completing his higher secondary education from Kaladera in Jaipur, he went to Calcutta to do his graduation. Initially he joined Modern Construction Co. Ltd., Shodhpur in the crane division as a supervisor. Three years later, he joined another company 'Mains Fields Ltd. Sealdah Industrial Area as a Supervisor. There he worked on gas hot plate manufacturing. He also worked for Hindustan Tyford Ltd., Bahadurgadh in Haryana for seven years where he gained experience in the complete fittings of the plant and machinery. After leaving Bahadurgarh, he came back to Sikar and joined 'Om Shiv Shakti Cement Plant Pvt. Ltd.' and served for 17 years as a maintenance officer.

Nathulal Jangid (43) is also a resident of Sikar. His family has been in Sikar for the past three generations and has been involved in the farm tool machinery business. He has studied up to the fifth standard and got married at the age of 13 years. After that he started helping his father in the workshop. He has worked for 20 years in various jobs. He has four daughters and a son who are studying. Nathulal specially acknowledges his uncle Rameshwarlal Jangid, a resident of Jaipur who helped him financially as well as provided moral support. Nathulal would like to start a business of his own if he gets some financial support.

Genesis On a trip to Jaipur, Jodhpur and Delhi in 1997, Radheyshyam and Nathulal came across labourers digging trenches manually. Laying cables for telephone or electric lines sometimes takes months to complete when done manually. Radhey Shyam and Nathulal were deeply affected by the plight of these people working in harsh weather. The idea of developing a machine that would be able to do this work came to them. They took up the challenge of developing a machine that would do the same work with greater efficiency and in a more cost effective manner. This would also give the labourers some respite during their work.

The first prototype of the Trench Digger was developed in September 1999. The machine was developed as an attachment for the tractor so that the desired output could be obtained with a minimum of investment. It took the innovators three months to make the first machine but now it takes only about 25 days. The first prototype has been used in Sikar and also on the Gujarat border for telephone cable laying. Radhey Shyam and Nathulal have received several orders for more units. NIF in coordination with GIAN- N has sanctioned an amount of Rs. 18,529 from the Micro Venture Innovation Fund for product development and market estimation of the machine.

The Innovation

Tailor and Jangid have developed a trench digging attachment that can be retrofitted to a modified 35-40 HP tractor and can dig in one hour, a pit 65 metres long, six feet deep and fourteen inches wide with a fuel consumption of 2.5 liters of diesel per hour. A frame is attached to the body of the tractor to support the structure of the digging machine. The arrangement consists of a planetary gear system and motion converter unit to deliver power from the tractor, a chain gear and roller system and a belt with sharp trench digging blades of high carbon steel. The machine has a long arm with a rotating chain over it and sharp edged blades (spades) mounted over the chain to shovel the earth that has been dug and level it on either side of the cut trench. This chain is supported by a large wheel at the rear end of the arm and two mini wheels framed up on the main-frame slot. As the manipulation of the machine requires strong hydraulic levers, the rubber tubes supplying the oil have been replaced by metal tubes to withstand the high pressure.

The material used for the machine is mainly cast iron, but the roller chain is tempered MS steel. The machine is fourteen feet long and the total weight is one ton (1000 kg). A weight of 90 kg has been placed in the front to counterbalance the heavy rear end to prevent the tractor from toppling. However in this machine, the tractor can't be separated and used independently.

The machine is essentially driven by a tractor. The gear drive system slows down the rotary motion of the tractor wheels without affecting its efficiency since the tractor axle still would run on its normal speed. With the help of the motion converter, the horizontal rotation of the shaft is converted into the rotation of another shaft at right angles to the original shaft. This second shaft is connected to a chain gear and a roller chain passes over it. This digs the ground and throws out the soil as the chain rotates continuously. At the rear end of the shaft, the chain is attached to a smaller gear wheel and it imparts a rotating action to this third shaft. The third shaft then with the help of attached helical blades shovels the dug earth. A hydraulic lever is used to elevate the main frame to control the digging depth. These levers also help to maneuver the machine while driving.

This trench cutter can be used for digging earth or trench cutting, for laying cables for electric and telephone lines and also for laying pipes etc. The device is ideal for digging narrow but deep channels. The machine can work on hard as well as soft soil. With this device it is now possible to cut a trench very evenly.

Advantages

Presently earthmovers are widely used in India for trench cutting but this is quite expensive. The earthmovers used in India are manufactured by Larsen & Toubro, Essar Group and Voltas. The earthmover currently used can dig a trench of 2 km length and depth of 3 feet in one hour whereas the main advantage of the trench cutter of Radheyshyam and Nathulal is that it can dig trenches very fast up to a depth of 6 feet 14 inches. About 20 litres of diesel is required to run the earthmover for one hour whereas the trench cutter consumes only 2.5 litres of diesel in one hour. Hence it is extremely fuel-efficient. The earthmover first digs the trench and then brings the soil up which is a time consuming and tedious exercise. The Trench digger can on the other hand dig and shovel the soil simultaneously thus saving manpower and time. So it is cost effective. The cost of laying telephone lines could be reduced by half from Rs.25/m to Rs.12/m. The cost of the currently used earthmover is about Rs10, 00,000. The Trench digger on the other hand costs Rs. 1.6 lakhs and even with the tractor and accessories it costs less than half of any competing models. Further these accessories are easily supplied and serviced locally. If there is no trenching work to be done, the tractor attached to the trench digger can be used for some other purpose. The earthmover also occupies more space thereby causing inconvenience to the public

Other innovations by the duo

Pit digging machine

Tailor and Jangid have also worked together to develop a device which performs digging,in gardens, parks etc., for planting trees, in an aesthetic manner. This device makes a two by two and a half feet hole in 15 seconds.

It can be attached to a 40-50 HP tractor. It is cheaper and faster than existing alternatives and costs Rs.55,000.

The desire to serve

"I would like to earn my living through fair means, without compromising my integrity", says Radhey Shyam Tailor. All his life, Radhey Shyam has been interested in the welfare of the physically challenged and he has been instrumental in establishing around 10 small units in Sikar district for their welfare to enable them to utilize their "different abilities." Whenever he sees some kind of disability in any person, he claims that he is also able to see some kind of ability in them and hence he tries to give them the support to make use of their potential.

"I learnt this from my father and grandfather. I have followed in their footsteps and reached this stage", says Nathulal Jangid. In future, Nathulal wants to develop a hydraulic rickshaw for the physically challenged which would take lesser effort to run. He also has ideas for a harvesting machine and a silent cooler. He reveals a mind full of ideas, that he would like to implement, to make life easier for people around him.

Novel wood screw

IDEA NATIONAL THIRD

Mahabir Choubey (48) living in Kashipur village in Purulia, West Bengal has a family consisting of his wife, two daughters and a son. Presently he earns his living from a small business of courier franchisee and battery charging. Inspite of financial hardships, he has tried to give proper education to his children-his son is doing his B-Tech in Computer Science, his eldest daughter has completed her Physics honours and his youngest daughter is in the 11th standard. He remembers that at times circumstances were so strained that he had to sell all their jewellery and mortgage their land to make both ends meet. His monthly income is Rs.1600-2000.

Address
Vill. Kashipur
P O. Panchkot Raj
Puruliya
West Bengal

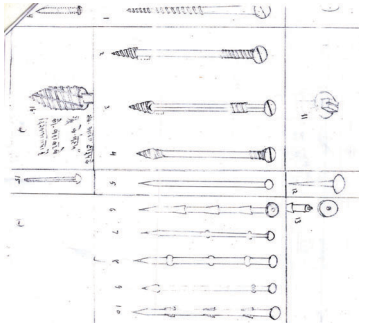
Genesis Mahabir's innovative idea is based on the elasticity of materials- wood in this case. His logic is that when a screw is driven into wood, some wood is pushed away which tends to return to its original state. This exerts an opposite force on the screw (though weak) due to which the screw gets loosened over time. This phenomenon is accentuated if the wood is in a state of constant vibration and therefore the conventional screw sometimes comes out automatically. To mitigate this 'natural' tendency, Mahabir thought of making some grooves in the screw. This would allow some wood to occupy this space thereby reducing the opposite force and rendering a locking mechanism at the place of the grooves. Mahabir felt that the screw should be made with both threads and grooves, so that it will have increased grip due to the threads that cut into the wood and the wood in the grooves would provide extra locking. Based on this idea a prototype was later made.

The Innovative idea

The innovation is a wooden screw, which has combined the features of the conventional wooden screw (threaded conical front) and metal stud (constant pitch intermediate thread). The novel screw thus comprises a head portion provided integrally with the body portion. The screw is tapered at the tip and the remaining portion possesses constant diametrical threaded pitch like the conventional metal screw/stud. The thread portion has a combination of common threads being provided on the body portion along with special kind of threads being provided at an inclination with respect to the common thread. There is also an unthreaded portion along the constant diametric length like the stud used in engine heads. The heads are slotted so that they can be driven by a screw driver. Due to the use of Seller's / ACME type of threads, stress concentration becomes less and thus reduces subsequent failure (cracks) that occurs in the wood.

Advantages

The tapered and threaded head of this screw facilitates easy movement into the work piece. This screw has an advantage of cutting its own threads when it is being screwed in for fastening purpose.Less effort is required to drive it in. Whereas



in the conventional screw, considerable force or pressure is required to drive the screw into any wooden structure. There is also greater possibility of the wood cracking around the place where the screw has been driven into the wooden structure. But in Mahabir's screw, due to the use of Seller's /ACME type of threads, stress concentration becomes less and thus reduces subsequent failure (cracks) that occurs in the wood. This novel screw will also not become loose after some time, as it is broader at its tip and the cross sectional wedges around the screw (3-4) give it a better locking mechanism or grip. On the other hand, in the novel screw, even if the head breaks, the screw can be pulled out due to modified head configuration. A combination of inclined thread provides better gripping capacity and it requires no tapping unlike conventional metal screw. In the conventional screw, sometimes the groove in the head of the screw breaks and it becomes impossible to fix a screw driver on the screw. This becomes even more irksome if the head of the screw breaks after it has been driven into the wood and then it becomes almost impossible to pull out the screw again. On the other hand, in the novel screw, even if the head breaks, the screw can be pulled out due to modified head configuration. A combination of inclined thread provides better gripping capacity and it requires no tapping unlike conventional metal screw.

Current status

NIF has filed a patent application on his behalf for the novel screw(06/KOL/2004, 06/01/2004). NIF has also sanctioned him a sum of Rs.4, 366 from the Micro Venture Innovation Fund for prototype development and testing of the Novel Wooden screw. Pull out test on this novel screw was carried out by the Applied Mechanics Department, L.D. College of Engineering, Ahmedabad and the results show that there is an improvement in this screw in terms of holding capacity (therefore there is an observed increment in pullout load) as compared to the M.S. Normal screw.

A plethora of ideas

Mahabir Choubey is a man of action with a very progressive and innovative mind. Though he has studied only till the seventh standard, he has a reasonable understanding of some of the scientific principles and technological developments. From childhood he refused to accept imposed concepts and rules unquestioningly. He had developed new ideas and fabricated some models/prototypes in the past-including an analog Robot (this analog automated device was developed by him towards the end of the 70s/early 80s when transistors and ICs were not much in use). He also experimented with running two-wheelers by Hydrogen in the mid 80s (definitely ahead of time), but couldn't pursue it further for various reasons. A serial innovator, Mahabir's mind is always buzzing with ideas and that too in diverse fields.

A number of his ideas are detailed below:

Smokeless Oven

The innovator has developed a smokeless oven with a narrow neck made of three units joined together whereby the smoke is let out through an exhaust chute without discomfiture to the user. Inlet holes for air flow and subsequent cleaning of soot and deposits are located at the bottom and the heat is captured effectively in the belly shaped pot interior. A top component with a narrow neck for guiding the heat and reducing the smoke along with a bottom stopper for the stove is provided. Locally available clay is used and the exhaust could be a tin/metal pipe. The basic unit would cost Rs 12 as per the innovator. This device would reduce the problem of smoke entering the eyes and pollution and would thus make a significant difference to the health and comfort of women who generally use the stove.

A method of minimising friction in bearings

In conventional ball bearings, steel balls are placed in the annular space between two annular metal rings. The balls are kept separated from each other and held in place by thin metal foil, called separator. During motion considerable friction occurs between the metallic foil and the balls. This raises the temperature of the bearing beyond the desired limit and it increases the requirement of lubrication. Mahabir's idea is to introduce small size rollers in place of the conventional separators.

He feels that this will reduce friction as well as lubrication requirement due to point contact between the roller and balls.

An indigenous recordable stethoscope

Concerned about the fact that medical facilities are not always easily available in rural areas, Mahabir got the idea of making a local stethoscope –using a plastic/ metal funnel with a condenser microphone installed inside it. The microphone socket would be attached to a tape recorder and the heart beat is recorded in the tape recorder in a cassette. This cassette can be taken to the doctor and the patient doesn't need to be moved. He feels that even an ECG can be taken by connecting this recorded sound to the relevant machine.

Improved bricks

Mahabir had noticed that the bricks, used to make houses in his area, are made from yellow soil with which sand and water are mixed. These bricks are dried and then baked in a furnace. But it has been observed that these bricks are not very strong and disintegrate easily. So his idea is that if soda is mixed with the raw material, the bricks will become stronger and long-lasting. He thought of this idea by looking at the method of making glass.

Spreading the innovative spirit

Such is his passion for rationality, creativity and scientific temper that he spearheaded a youth science movement in his area –mainly with his own money, despite his limited income. The main objective of this movement is to popularise science and create awareness about science among the masses. The movement is also involved in recognising young talents (in diverse fields like science, arts, sports and so on), challenging age-old superstitions prevalent in the region as well as preserving local history and culture. Mahabir has also developed a photo- archive of Jain relics and some fossils too and some of the findings were endorsed by relevant experts. Mahabir feels, "I*n villages there is no internet, modern facilities etc hence why people with ideas cannot go further*" and that has inspired him to do his bit in the service of society. His work has been featured in various newspapers such as Ananda Bazaar Patrika, Purulia Samachar etc

Mahabir also has a suggestion that there should be a fund which can help innovators when they are in dire financial crisis (not necessarily just for innovations, but for other livelihood emergencies). From his own experience he feels that such a support system is very much needed for the survival of innovators.

1.Shri Kanubhai Salvi
5, Netaji Society, Karelibaug
Opposite Bank of Baroda
Vadodara-390 018
Gujarat

2. Shri Vinayak K. Salvi
Patan Patola Heritage
Patolawala Salvivado
Patolawala Street
Patan-384 265, Gujarat

3.Shri Satish Chandra
Patolawala, Patola Bhawan
7, Minal Park
Nr. Suvidhinath Nagar
Kalikamata Rankivav Road
Patan-384 265, Gujarat

4.Shri Sevantilal Salvi
Patolawala Farm House
Outside Fatipal Gate
Patan-384 265, Gujarat

Adding life to a centuries' old dyeing art - Patan Patola

SPECIAL HONOUR FOR OUTSTANDING TRADITIONAL TECHNOLOGY

Patan Patola, a traditional form of silk textile that is more than 750 years old, is on the verge of extinction. This 'dyeing' art is currently pursued by only four families in Gujarat. Can it be saved and can production of this kind of intricate silk textile be encouraged by people living in Patan? Will the protection of this tradition under Geographical Indications help these producers in commanding a better premium in the market place and thus attract more workers and producers to this tradition? What are the problems that SRISTI faced while trying to bring these families together to protect this tradition? What are the lessons that others wanting to extend similar support to other traditional, regionally known and reputed products (agriculture or otherwise), can draw from the experience of SRISTI? Efforts have been made to address some of these issues in this article.

SRISTI initiated the process of documentation of the *patola* tradition a few years ago. Some students from IIMA also studied various implications of Geographical Indications (GI) for preserving the *Patan patola* tradition, as a part of their course. Recently, all the four families that are currently involved in practicing this art were invited by SRISTI to a meeting held at IIMA. The purpose of this meeting was to evolve an association so that they could take responsibility for protecting their traditional skills, rights and markets. Prior to this, all the documents related to GI protection were sent to them so that they could familiarize themselves with the subject. It was apparent that application of GI not only required establishing a link between the production process and the natural and human factor in the region where the tradition has evolved or continued, but also creating a body that will protect GI in future. SRISTI also wrote to the Gujarat government so that it could, if it wished, take initiative in this matter.

SRISTI would help in preparing the case and pursuing the matter with a *pro bono* legal firm willing to help in filing the GI. However, the responsibility for maintaining the tradition and enforcing GI would rest on the shoulders of the four families collectively. GI cannot be protected by one or two producers. It is a collective right and has to be protected in that manner. However, consensus on what constitutes the collective tradition of *Patan patola* and how it should be managed still remains to be achieved. Meanwhile, the Gujarat government has also shown interest in supporting the process.

Historical context of Patan patola

Patan, founded by Vanraj Chavda in 746 AD, is situated 130 kilometres from Ahmedabad on the banks of the River Saraswati. It was the capital of Gujarat

from 746 AD to 1411 AD. Three major Rajput clans — the Chavadas (746-942AD), Solankis (942-1244 AD) and Vaghelas (1244-1304AD) — ruled from here. The Solanki rule is considered as the golden age; prosperity peaked during the reign of King Kumarpal. Patan became a centre of *patola* weaving during his reign (1143-1173AD).

Kumarpal had deep respect for Jain traditions. He was very scrupulous about his attire and always used new *patola* clothes while going to temples. The '*patolu*' worn by king Kumarpal used to be specially imported from South India. One day, the temple priest barred Kumarpal from entering the temple by saying that his clothes were 'impure'. An inquiry into this led to the finding that the king of Jalna was exporting the fabric after first using them as bedspreads. Deeply offended, Kumarpal fought and defeated the ruler of Jalna and brought 700 Salvi craftsmen to Patan so that he could be assured of procuring unsullied fabrics. It is believed that some weavers also came from Karnataka in addition to those that came from Maharashtra. At a later date, Kumarpal converted the Salvi families into Shwetamber Jains. Today, this tradition is being practiced by only four families. One of them has moved to Baroda, but some of their work is still done at Patan. The four Salvi's are: Shri Kanubhai Mafatlal Salvi, Shri Satish Chandra Kantilal Salvi, Sevantilal Lehar Chand Salvi, Vinayak Kantilal Salvi

Vinayak Bhai Salvi: the family comprises three brothers, Vinayak, Bharat and Rohit and their wives, a cousin Jaya settled in Patan and children. Vinayak Bhai's son, a trained architect, has now taken to this tradition full time. They claim that they use vegetable dyes in dyeing the yarns for some colours (depending upon the demand from consumers). Since they live in the first house in the lane called Shalviwada, they attract the maximum customers.

Sevantilal Salvi: the family includes two sons, Ashok and Vijay, and three grand sons Viral, Ujjwal and Nirmal. They have been teaching the craft to people outside the Salvi community also. They have used PVC pipes instead of traditional wooden frames in their looms.

Satishbhai Salvi: the family comprises two brothers, Paresh and Satish, who get a portion of their work done by people who are not a part of the Salvi community. They claim high quality and perfection in their work.

Kanubhai Salvi: His father**,** Mafatlal, and his two daughters, Neepa and Hetal, are carrying on this tradition. They migrated to Baroda about twenty years back and have been practicing the craft since then. They claim to have the highest production among the four families, but face problems in marketing their products. The family says that it uses natural dyes.

Ikat's journey

An *ikat* is a piece of cloth woven from fibres that have been dyed prior to weaving. It is an ancient form of the silk fabric. It has been woven throughout Central Asia and other parts of the world wherever textiles are woven. It evolved in different cultures and has even migrated to different regions.

The term '*ikat'* seems to have originated from the Malay-Indonesian expression '*mangikat'*, meaning 'to bind, tie a knot or wind around', whereby a motif or a pattern (generally geometrical in nature) is dyed into the threads of a cloth before weaving it. The *ikat* or resist dyeing generally, "involves the sequence of tying and dyeing sections of bundled yarn to a predetermined color scheme prior to weaving. Thus, this dye penetrates into the exposed sections, while the tied sections of the yarn remain un-dyed. The patterns on the yarn get expressed in the woven fabric"(Ota, 2002) .

The three basic types of *ikat* that are well known are: ***Single ikat*** (either warp or weft yarns are tied and dyed.), ***Combined ikat*** (warp and weft *Ikat* may co-exist in different parts of the fabric) and ***Double ikat*** (both warp and weft threads are tied with such precision that when woven, threads from both axes mesh exactly at certain points to form a complete motif or pattern). The double *ikat* sari is so woven that the design looks exactly alike on both the sides.

Various examples of diverse *Ikat* processes have been found throughout history in different parts of the world such as pre-Columbian Peru, Ecuador, Mexico, Guatemala, Colombia, Chile, Peru, Argentina, Turkey, Syria, Egypt and Persia; throughout Central Asia, in India, Burma, Thailand, Cambodia, Indo-China, South West and South China, Laos, Japan, Malaysia, Indonesia; Africa and in many parts of Europe. In Bali, double *ikat 'geringsing'* is produced in the Bali Aga village of Tenganan on the east coast[2] and '*kasuri*' at Okinawa in Japan.

In India, *ikat* weaving is prevalent in Gujarat, Andhra Pradesh and Orissa. Many of the ancient cultures around the world weave the single *ikat*. But the more complex double *ikat* exists only in Bali, Japan and India. *Patola* is the name given to the double *ikat* silk from Patan, Gujarat. *Patola* are also called "*reshmi chir*" by Nagar Brahmin and Vora communities.

Designs, motifs and dyes

Ikat is not only precious but it is also symbolic in many ways. Certain designs have got associated with and owned by certain social or religious classes, achieving in the process, a sacred presence. Like in many other cultures where certain textiles, dyes and designs are considered appropriate for particular positions within society, *ikat* holds tremendous significance, particularly in terms of hierarchy. The patterns indicate the different situations and creativity of each country. Some of the designs were created in warp ikat (single *ikat*), some in Weft ikat (single *ikat*) and some only in double *ikat*. (both warp and weft).

Among the main designs, the popular ones are *narikunjar, ratanchawk, navaratna, voragaji, chhabdi bhat, chokhta bhat, chanda bhat, pan bhat, phul bhat, laheriya bhat, tarliya bhat, zumar bhat, sankal bhat, diamond bhat, star bhat, butta bhat, sarvariya bhat etc.* Besides saris, handkerchiefs, tablecloth, lace etc, are also prepared from the *patola* cloth.

Traditionally, pure silk and natural dyes were used for *ikat*. Before chemical colours were invented, colours were made from plants. The natural colours used include indigo, pomegranate bark, *katho, majith, kapilo, kirmaj, harsingar, bojgar*, iron rust, alum, logware and turmeric. Nowadays, chemical dyes and colours are in great use. Each region invented dyes and used them in its own way.

Red or vermilion is normally the background colour. The other colours that are used along with red are yellow, orange, pink, green, blue, purple, white and black. The most common motifs in *patola* are parrots, elephants, plants, ladies, flowers, trellis, baskets, leaves, etc. These are used in many different permutations and combinations for the body, border and the *pallav*.

Features of *Patan Patola*

- At least 500-600 g of silk is required to make one *patola* sari. The silk is bought from Bangalore or is

imported from China, Japan, Korea or Brazil. The silk costs around Rs 2,000 per kg and the dye cost (per sari) is about Rs 2,500. In the case of vegetable dyes, the cost is likely to be much higher. A single *Patan patola* sari with synthetic dyes would cost a minimum of Rs 90, 000

- Both the sides of the sari display the same design; if a sari has a geometric design, it can be worn from any of the four corners. Each sari can survive for about 300 years and even maintain the colour
- The designs are drawn on graph paper and then copied into the yarn. The number of threads required is calculated according to the design which must remain constant till the entire weaving of the sari. The measurement is made with a tape with the smallest measurement being 1/100th of an inch
- Eight silk threads are enmeshed into one. Raw silk threads are thinner than hair and hence eight such threads are woven together and bleached
- Next, they are twisted to make it strong. The process of dyeing the threads takes nearly 75 days. The dyed threads are then mounted on the loom in a sequence so that the design becomes visible. The threads of the wefts are wound on to bobbins and kept in the bamboo shuttle for the weaving process. It takes approximately 5-6 months to complete a sari with the help of 3-4 assistants. If a single person handles the entire process, it may take almost a year
- *Patolas* cannot be woven in humid climate. This is because when the humidity is high, the yarn tends to tangle. During monsoons, a heater is kept under the loom
- Starch is applied after every 8-10 inches of weaving so that the yarn does not get tangled
- The traditional loom is operated only by hand, has no leg paddle and is slanted at one end
- Maintenance of the tension of weft (*tana)* and warp *(vana*) is monitored during the weaving process
- The design is refocused after approximately 6-7 inches of weaving by tugging the warp yarn with an iron rod. The bobbin thread has to be passed from one side to the other manually at every step with the support of the *vee* made of sesame wood. The inclination of the loom makes it easier to move the shuttle.

Losing ground

Because of high cost, most people could never afford to buy *patola*. The demand for *patola*, thus, kept receding. During the second world war, as many as ten to fifteen families were engaged in making *patola* in Patan. As the raw material (i.e. silk) had to be imported from the countries like Brazil, China, Japan and Korea, the war had an adverse impact on the industry and there was acute shortage of raw material. There was a significant decline in the production. But for the efforts put in by Vijaybhai's grandmother Motiben Damodar Thakarsi and Shri Vallabhadas Jethabhai Kapadia, the craft of weaving *Patola* would not have continued. They continue to inspire the four families that are trying to preserve the art of *patola*.

Given the extreme complexity and time consuming process, very few weavers continue the practice. Those

who have continued, do so mostly out of sheer passion for their work. For preparing a *patola*, skilled labour, precision, calculation and patience are of utmost importance. At the end of the day, it is not possible to weave more than 8-9 inches of the cloth. And for the same reason, it's difficult to get persons who could be trained to weave a *patola*. Though, each member of the Salvi family is quite familiar with all the processes and do help in making the saris, yet many of the children are reluctant to earn their living through this trade (particularly after having acquired higher education).

Also, the changing times have prompted simplification of many of the intricate motifs. Due to contemporary market demands, weavers have slowly evolved their own style of motifs and designs that are being used in designing *salwar kameez, duppattas*, tie and accessories like bags, purses, file covers and home furnishings. Designers believe that such attempts will help in retaining traditional skills and also appeal to modern tastes. However, those who are familiar with *patola* believe that there is a need to rediscover and retain some of the old designs to prevent these from fading away forever.

Geographical Indications (GI): context

The Indian Law on The Geographical Indications of Goods (Registration and Protection) Act, 1999 defines GI as:

"Geographical Indication, in relation to goods, means an indication which identifies such goods as agricultural goods, natural goods, or manufactured goods as originating or manufactured in the territory of a country, or a region or locality in that territory, where a given quality, reputation, or other characteristics of such goods is essentially attributable to its geographical origin and in case where such goods are manufactured goods, one of the activities of either the production, or processing or preparation of the goods concerned takes place in such territory, region or locality as the case may be."

Relevance of Geographical Indications

"*We need to develop a brand… so that people know that they can get real patan patola only from us. Perhaps this could be achieved if government or any other institutions came forward to help us,*" says Kanubhai Salvi.

The basic idea is to encourage the producers to label their products to indicate quality and reputation that originates from that region. Consumers also benefit as they then get information about quality, authenticity and genuineness from these labels. Producers get protection from infringement and unfair competition. Nobody else can use these labels and thus mislead consumers or take advantage of the reputation of the original good manufacturers or growers. GI are part of Trade-related Aspects on Intellectual Property Rights (TRIPs) and are operational in India since September 21, 2003. However, it is important to note that an instrument of intellectual property right is valid only when it is enforced. That requires monitoring wrong use, issuing of notice to such parties and if necessary, filing cases against infringement of one's rights. In some cases, conflict may arise on account of unfair competition.

Emerging Problems

Location and production process

Each of the Salvi families would be interested in involving their family members who are staying elsewhere in the same profession. If members migrate to another place after the identification process (as part of GI), then this could lead to complications. In a recent discussion with all the four families at IIMA, three regions have been identified so far where family members of existing practitioners reside. These are Patan, Baroda and Surat.

Availability of vegetative dye plants and processes

Given the rise in demand for naturally dyed fabrics throughout the world, availability of plants for making vegetative dyes in good quantity is likely to be a

problem. Many of the processes for making such dyes also have to be revived.

Ensuring quality control

How do we ensure that, if the entire process of manufacturing Patola is shifted elsewhere, the same quality and authenticity will be retained? One option could be that at least one step in the entire process is done only in Patan. This could be the tie and dye stage or the weaving process.

Cooperation among four families

Misunderstandings are not uncommon in a family-based tradition. Salvis are no exception. Some of the less prosperous weavers feel that they have not received as much exposure as some of the others have. It was suggested that once an association came about, it could have a web site and display all addresses at one place (SRISTI has done this at sristi.org/research./ patola.html). This association could also file the GI application, monitor infringements and file cases against offenders.

Lack of trained workers

This is reported to be a major constraint in increasing supply and expanding manufacturing base. Wages have also been quite low because it takes a long time for a worker to get properly trained and master the skills. The result is that most labourers are essentially apprentices.

Variation in the tradition

Given the change in the tastes of consumers, it is important to look at the issue of how much variation in design should be considered within the boundaries of traditional repertoire.

Suggestions for keeping this tradition alive

Developing standards of authenticity: All the four families have to work together and develop minimum standards of production, colour, design, process etc., which would ensure that the product qualifies for GI.

Training of workers: Schemes that provide incentives to train new worker so that perpetual shortage of skilled workers can be avoided and emerging demand can be harnessed, need to be devised.

Demonstration of this unique tradition in various trade shows and exhibition: Central and state governments can encourage demon-strations showcasing use of the *Patan patola* tradition in both conventional products like saris and also in new products like other dress materials, scarves etc., to stimulate demand.

Exhibition in Patan as well as elsewhere: Tourists visit Patan to look at this tradition and the Salvi families have to spend a lot of time in showing and explaining. A privately managed, but publicly funded, museum could be set up at Patan. People who own Patan saris that are 100 or more years old, could be asked to display these at the museum.

We hope that with this small beginning, many more traditional knowledge-based textile, crafts, agricultural varieties, food products, beverages etc., will qualify for GI protection which could translate into increased demand for such products, encourage authenticity and quality in market place and thus help improve the livelihood of producers and give greater satisfaction to customers. Patan patola must survive, even if some of families that are trying to keep the tradition alive, are unsure of its eventual fate.

Preserving a dying craft - sâncî paat' and development of a herbal ink

SPECIAL HONOUR FOR REVIVING TRADITIONAL TECHNOLOGY

Bishnuram Handique (75) lives in Tekalagaon village, about 40 kilometers away from the main town, in Jorhat district of Assam. He studied up to the eighth standard and is a farmer by profession. He lives with his wife and two sons. His sons are unemployed and have not been able to complete their education due to adverse economic conditions that continue to be the plight of the family. Though primarily a farmer, Bishnuram was a very popular hunter in the past and is reputed to have caught six tigers. He still keeps the cage in which he used to capture tigers, in itself an antique piece.

Though age is catching up with him, Bishnuram doggedly continues working in the field of preservation and maintenance of antique pieces. His contribution to conserving our ancient culture and rich traditions, in spite of adversity, remains an example to all.

Address
Village & P.O. Tekalagaon
District: Jorhat
Assam

Scouted by
Amlan Jyoti Bordoloi, Alok Pradhan

Sâncî Paat and its journey through time

Perhaps the strangest of all of man's writing materials is the Sâncî Paat, made from the bark of "Sâncî gosh". In the Assam valley of the Brahmaputra, the inner bark of the agar or aloe tree (*Aquilaria agallocha [= A. sinensis]*) locally known as the sâncî was used as writing material. Sâncî Paat is inextricably linked to Assam's rich cultural heritage. In ancient times, Assam's monarchs employed the use of the bark of the Sâncî gosh to chronicle their royal circulars and diktats. Sheets of Agar were also used by the revered Vaishnava saint-reformer and literary giant Srimanta Sankardeva and Vaisnavite saint Shri Shri Madhab Dev for giving written expression to their sermons and sacred scriptures. Sankardeva is also believed to have said that agar and chandana are the two divine trees capable of fulfilling human desires. Religious puthis and history were also written and copied on specially treated bark of agar trees, known since time immemorial as Sâncî Paat and puthis. Numerous puthis, some dating to as far back as 500 years, are still preserved in quintessential Assamese sacred repositories such as Than, Satras and Namgarh.

Although no extant manuscript appears to be earlier than the 15th century, one of the first historical biographies in Sanskrit, the Harsha Charita written by Bana in 652 AD, chronicles the fact that King Bhâskaravarman of Assam sent 'volumes of fine writing with leaves made from aloe bark, and of the hue of the ripe pink cucumber' as gifts to the great King Harsha of Kanauj among many other gifts.

Genesis Twenty five years ago, a person named Bapuram Saikia gave some manuscripts to Bishnuram. Bishnuram did not know what these manuscripts

contained, until one day, out of curiosity, he sat down to read the material, which was in an ancient traditional language (Brajaboli). These manuscripts explained the way in which paper could be made by hand. His interest aroused, Bishnuram started experimenting with the technique. Despite initial setbacks, he eventually succeeded in gaining mastery over this dying craft. He is the only person now maintaining and preserving Sâncî Paat, otherwise perhaps an almost extinct art. He has also developed a herbal ink for writing on the Sâncî Paat. Bishnuram has also got a collection of the ancient manuscripts of the Ahom reign.

The Innovation

Process of making and preserving Sâncî Paat

For the preparation of the paper, the bark of a local tree called Sâncî gosh is used. After the bark is removed, it is dipped overnight in water and taken out the next day to dry. Wetting and drying are done at night because it is believed that if it is dried during the day it gets crumpled and the texture of the end product will not be smooth. After drying for one night, the bark pieces are kept horizontally and screwed in tightly under a paper press, which is a device of just two slabs of wood with a gap in between. The bark pieces remain like this for two to three days. After that, the pieces are dipped in water for about seven days. These are then dried again. The surface of the bark is then painted with the help of an organic dye locally called "*hengool*". These papers are not used for another 15 days. The edges of the paper pieces are painted with another organic dye known as "*haital*". The pieces ofa bark are kept like this for two to three days. In the process, the material turns grey or pale yellow and becomes resistant to insects. These sheets of bark after being suitably prepared are cut to a uniform size. The writing on these strips is done with a sharp pointed implement. Pigment is then rubbed into the finely incised lines to make them visible.

The "barks" are drilled with holes and bound on cords in the centre of the leaf, traditionally often ornamented and threaded with a string or nâdî. The Sâncî Paat leaves have a tendency to split at the edges, but are otherwise tough and durable. These barks are usually kept in piles. The upper and lower covers are usually thick leaves of the same bark, with the outer layer still on, around which are wound the ends of the string.

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Preparation of the herbal ink

For preparation of the Herbal ink, the fruit of Hilikha (*Terminalia chebula*) (100g), Bark of Jamun Tree(100g), Kehraj grass (*Eclipta alba*)(100g) and Manimuni leaves (*Hydrocotyle rotundifolia*)(50g) are ground together and mixed with pieces of rusted iron (5g). The mixture is then placed in an earthen pot to which water is added and this preparation is kept untouched for a period of ten to twelve days. When the mixture starts emitting a foul odour, cow urine is added to this mixture and it is then kept in a cool place. Earthworms are now added to impart a shining colour to the ink. The earthen pot is then kept closed. The earthen pot becomes hot due to the cow urine and the ink drops start dripping from the earthen pot. The ink is now ready for use.

Address
Vill.: Augnoj & Lapkaman
Tal.: Dascroi, Ahmedabad
Gujarat

Scouted by
Arvind Kumar Patel

Mulching *Salvadora* leaves for promoting paddy seedling growth

JOINT COMMUNITY AWARD

The villages of Lapkaman and Augnoj have been using *Salvadora persica* leaves and bark along with Farm Yard Manure (FYM) for the cultivation of paddy. They vouch that this practice facilitates faster and almost 100 per cent germination of the paddy seeds and also helps in reducing the seed rate and the time for the nursery to get ready.

Setting – Village Augnoj and Lapkaman

Augnoj is a big village with an area of 3600 acres, a population of 7000 people and 800 households. The village consists of four castes viz. Patel, Rabari, Thakur and Prajapati. Patel is the major caste with around 480 households, followed by the Thakurs and Rabaris with 180 and 130 households respectively. There are 10 households of Prajapatis in the village.

All the communities have an average of 10 bighas (approximately1.6ha) of landholding in each family. Ponds and bore wells are the major sources of water. The crops sown in the village are Paddy, Cumin, wheat and Castor. The major crop cultivated is paddy and Gujarat 17 and Gujarat 4 are the most popular varieties cultivated in the village. Share cropping is prevalent in the village and the cost and produce are divided in the percentage of 50-50, 75-25 or 70-30 between the land owner and the cultivator depending on their capacity and terms of agreement. Most of the villagers keep cattle for their own use.

Situated about three kms from the Augnoj village, Lapkaman is a village with a population of 3000 people. The population consists of Patels (40%), Thakurs (40%), Rabaris and others (20%). The crops grown in the village are Paddy, Jowar, wheat and Castor. The major crop cultivated is paddy and the popular varieties cultivated in the village are Gujarat 17, Gujarat 4, Gurjari and Jaya. The village Panchayat maintains 200 acres of grazing land and a big pond for cattle.

Practice

This practice is used to shorten the time required for paddy seeds to sprout. The paddy seeds are first soaked in water harvested from the Farm Yard Manure (FYM) pits, which helps in removing the sourness from the paddy seeds. Removing sourness facilitates the speedy sprouting of the seeds.

Subsequently, the seeds are mixed with fresh green *piludi* (commonly known as *teekhi vakhadi)* leaves (*Salvadora persica*) in the ratio of 1: 1 by weight and kept for three days. The more leaves are added, the greater is the benefit. The mixture is then placed at such a place in the house where there is no possibility of pest/pathogen infestation and this is

covered with gunny bags to create anaerobic condition.

Salvadora persica leaves help in raising the temperature in the mixture and this enhances the growth of the seeds. When the sprout is about half an inch in size, it is taken and broadcast in a nursery, which has been prepared earlier. The nursery is prepared by mulching the nursery bed with the leaves and the bark of *Salvadora persica.* The leaves get decomposed within three days. At this time, the stalk and the branches are removed and only the leaves are left in the nursery bed.

At the nursery stage, it is important that proper care is taken relating to the watering of the beds. With the rise in the height of the seedlings in the nursery, the related level of water in the bed needs to be maintained. The nursery bed is watered daily to maintain the water level.

Benefits

The seedlings are ready for transplantation in 22 days. This process otherwise requires about a month's time. As this practice involves lesser time, it helps farmers in dealing better with the monsoons, especially if they are irregular. The practice also helps attain 100 per cent germination of the seeds thereby reducing the seed requirement per hectare from 12 kg to 8 kg.

Laboratory report

The experiments on the use of Salvadora Persica and FYM to shorten time required for paddy seedlings were conducted in the Sadbhav, SRISTI Sansodhan Laboratory and the results were found effective. Percentage of germination, seedling survival and nature of plant growth were observed and seed vigour was calculated. An untreated control (seeds presoaked in un-ionized water for 24 hours and kept in BOD i.e. Biological Oxygen Demand incubator for 48hours at 32^0C.) was taken. In another experiment, paddy seeds of the same variety were presoaked in FYM water extract and kept in between the leaves of mango *(Mangifera indica)*, neem *(Azadirachta indica)* and bael *(Aegle marmelos)*.

Results of all the experiments were compared to confirm the effectiveness of the practice. The maximum seedling growth was observed in the seeds placed between the layers of *Salvadora persica* as compared to the others. This is because of the high temperature (32 ^{0}C) and humidity. The temperatures in mango, neem and bili leaves were 27, 28 and 28.5 ^{0}C respectively. The sprouted seeds were broadcast in two nursery beds (one prepared by mulching the bed with the leaves and the bark of *Salvadora* and another without mulching). The growth of paddy seedlings where the seeds were presoaked in FYM water extract and sprouted between layers of *Salvadora* leaves was found to be maximum in both the beds. FYM extract creates anaerobic nitrogenous environment which breaks the dormancy and supplies nitrogen to the seed.

Community wide practice

About 25 percent of the farmers in Augnoj village practice this method. It is well known to all the farmers who cultivate paddy, but farmers now use Urea + DAP + FYM + *Salvadora persica* for the purpose. Ratibhai Patel (a 59 year old farmer of Augnoj village of Dascroi taluka, Ahmedabad) has been practicing this method successfully for the past five years.

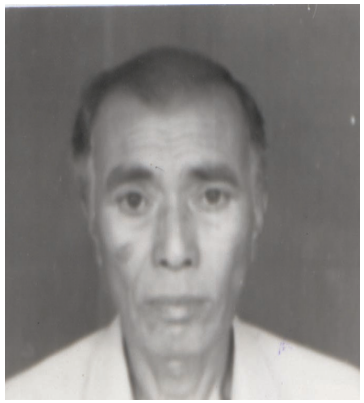
Ratibhai is known in the village as "the king of preparation of paddy seedlings". He sells seedlings to other farmers in the village. Ratibhai also takes contracts to plant them in other farmers' fields. Many farmers in his village take his suggestions for solution to new problems they face during cultivation. Ratibhai owns five bighas of land on which he grows paddy, wheat, cumin, castor, fenugreek and vegetables. Another farmer of the village, Shri Rohitbhai Dholabhai Patel has used this method in planting paddy in his 80 bighas of land. Eighty percent of the farmers in Lapkaman practise this method for quick germination of seeds and also for reducing weed infestation as well. Shri Govardhanbhai Ishwarbhai Patel, a 70 year old farmer, of Lapkaman states that almost everyone in the village who cultivates paddy uses *Salvadora persica* as mentioned above. Mukesh Kumar Patel, son of Govardhanbhai claims that it reduces weed infestation

to a large extent. The farmers in the village have been using this practice for a long time. They learnt it from their fore-fathers. They claim that the use of *Salvadora persica* makes the soil soft due to the rise in temperature. Use of this method is also claimed to yield quality crop.

Farmers of another village named Vadsar used this practice long back but at present they do not practice this method due to the non-availability of the Salvadora plant coupled with the easy availability of chemical fertilizers.

Wood-based, low-cost, environment-friendly crematorium

STATE AWARD



Kambel Chulai (64), is a resident of Jowai town in Jaintia Hills District of Meghalaya. A class III dropout, he has been an innovator right from his childhood. When he was 13 years old he was restricted from playing football and marbles with the other boys, because he had to carry his baby sister on his back. His solution was not to brood or complain but to make use of his skills to make a complete set of miniature knives and ploughs (till today they look like the work of a skilled craftsman) to play with. Due to financial constraints he had to join an automobile workshop as an apprentice in his early teens and since then he has moonlighted as a sculptor, artist, architect, jeweller, movie operator, mechanic, sewing machine mechanic, dramatist, architect/builder etc., all this without any formal training. In 1963 he manufactured a black and white camera without any reference to existing craft/ literature /model of a camera and it is still working today. Currently Kambel Chulai is pursuing the profession of a jeweller. It is amazing to note that the desire to help others becomes so strong in some people that they overcome all obstacles and limitations to realize their dreams and ideas, often inviting the ridicule of the same people that they set out to help. Kambel Chulai also belongs to this extremely rare class of people who would dare give up everything because of their strong belief in their dreams.

Address
Loompyrdi Jonigpiah, Jowai,
Dist.:Jaintia Hills, Meghalaya

Scouted by
GIAN-NE

Genesis

The seeds of this innovation were sown in 1988-89 when Kambel Chulai started thinking about the issues and problems regarding the traditional method of cremation being practised by his people: it was highly polluting, time consuming, difficult during the rainy season and more important very heavy on the pocket of the family of the deceased.

In 1995, Kambel Chulai made a model and prototype of his innovation that would eventually revolutionize the cremation scene in the Jaintia Hills. But unfortunately, at that time his idea was turned down by the people and the all-powerful religious organization. Sein Raij Jowai of the Jaintia people due to the initial cost and the fear and apprehension associated with doing something old in a new way.

Though faced with this initial hurdle, he was not deterred and kept on pressing his idea at every available opportunity. Eventually he succeeded and finally in 1999, when the progressive Mr. G.H. Barch became the general secretary of the Sein Raij , the project was given the go ahead, albeit with a lot of opposition from various sides. In 2001, a fete was organized in which the initial building cost of Rs.3, 00,000 was raised. With periodic working capital investments through contributions by individuals and the Sein Raij, work commenced in 2002 and was completed in 2003. The entire structure that houses the crematorium has been built with a cost of around Rs.15 lakhs. The crematorium

room along with the crematorium and the chimney has been built at a cost of around Rs.7.5 lakhs. All the materials used in the building have been sourced locally except for the fire resistant bricks that line the crematorium itself. These have been procured from Durgapur in West Bengal This crematorium has been installed and formally accepted in the town of Jowai, in Meghalaya in May,2003. It will be catering to the 3,00,000 strong Jaintia community there.

The innovation

This crematorium is an improvisation over the normal Open Wooden Pyre Crematorium (WPC). It appears to be "a hybrid concept" of electric and open type crematorium. By providing a small chamber and closing it with thick walls (insulator), the crematorium generates high temperature around the human body which is sufficient to turn it to ashes in an hour and fifteen minutes. The whole structure is around 50 ft in length and 30 ft in width at its widest part. It is divided into a hallway in the middle, a rest room at one end and the room that houses the crematorium itself, at the other end. The crematorium room is around 14 x 14 feet with the crematorium in the middle. It is a longish structure that is open at one end and connected to a 36 feet high chimney at the other. The chimney has a cover that can be operated from outside to control the heat and the intensity of the flames inside the oven. For the free flow of air, there are two small openings at both sides. The crematorium itself is around five feet high and eight feet long. It has a lining of fire resistant bricks and is covered with five removable iron sheets. Along the bottom there are five removable iron grills with the same number of iron plates below them. Below ground level, the space has been filled with locally sourced granite stones up to a depth of around six feet.

Process of cremation

Inside the crematorium the corpse is laid over the grill and covered with firewood. Next, the iron sheets are placed over the crematorium to cover the whole structure except at the mouth, which is kept open. After this the wood is ignited and utilizing the contraption that has been added to the chimney, the heat and intensity of the flames are controlled. In about an hour and fifteen minutes burning is completed. Next, the grill and the iron plates are extracted and doused with water to cool them down. From these cooled plates the bone remains are then separated from the wood ashes and presented to the family of the deceased.

Advantages over existing alternatives

Existing devices for cremation are the Open Wooden Pyre Crematorium (WPC) and the electric crematorium. The Open Wooden Pyre Crematorium (WPC)needs substantial logs of wood and usually an entire pine tree had to be chopped down for the funeral pyre. This would cost the family of the deceased around Rs.3000. Whereas Closed Wooden Crematoriums (CWC) like the one made by Kambel Chulai can operate with much less wood and the cost is limited to Rs.250. Earlier, the funeral pyre had to be tended for a full day while the new method restricts the time to one hour fifteen

minutes. The Open Wooden Pyre Crematorium would spew out dense noxious fumes, throughout the day, which enveloped the whole area. Kambel Chulai's innovation - by restricting the amount of wood used and the time duration - eliminates this problem by reducing the smoke and fumes by 90%. Also since it is open to the atmosphere, the temperature around the body is not as high in the WPC as in the closed one. Cremation in the CWC is unaffected by rains whereas

in the WPC operation, it can be affected by wood being soaked.

In the electric crematorium, the body burns at 700 º C temperature. Parts of the body that are not completely burned during the first process, are burnt again at 1150º- 1200º C temperature in a super combustion chamber to make it pollution free, as partially burned body hydrocarbons are not good for the environment. The cost of burning one body is around Rs.250-280 and at least 40-50 minutes time is required. Electric Crematoriums need high power installation and should have continuity of supply. Compared to this Kambel Chulai's crematorium can operate independent of electricity. The cost of an electric crematorium is around Rs.32 lakhs which includes the cost of pollution control equipment and super combustion chamber and various other features whereas Kambel Chulai's crematorium costs Rs.15 lakhs.The relevance of Chulai's crematorium being that cremation is done in a traditionally acceptable manner at minimal cost and reduced time.

Approval from the formal sector

According to Mr.S.S. Dasgupta, Chartered engineer, advisor at Indomen Engineering Service, the innovation is definitely an improvement on the conventional cremation practices followed till now i.e. burning pine wood. There is a lot of saving in consumption of wood, which besides saving costs ensures preservation of our precious natural resources.

Of great social relevance

Meghalaya, known to the outside world as the abode of clouds is populated by three major tribes; the Khasis centred around Shillong, the Garos with their centre in Tura and the Jaintias with their centre at Jowai. In Meghalaya two religions are mainly followed: Christianity and the traditional animistic religions of the Khasis, Garos and Jaintias. In all respects the people are guided by the teachings of either of these two religions and follow the rules and regulations from birth to death. Accordingly in adherence to the rules of the concerned religion, 55 percent of the Jaintias follow the traditional practice of cremation at death. Tradition dictates that the wood required for the cremation should be procured on the day of the death and this is to be followed by the cremation itself on the second day. This method has been documented right from the initiation of their history in Meghalaya, but modern times have found this method to be quite burdensome and problematic due to environmental concerns, because of the resultant depletion of forests as well as the pollution due to the emission of smoke and fumes during the entire process of cremation. The Jaintia people who practice this system had always viewed this problem as a necessary evil. Now with the innovation of Kambel Chulai they have a solution which adheres to their customs and is eco-friendly too. This innovation has great potential in that it can be adopted in any place where the culture or religion specifies cremation instead of burial.

Zero head hydro turbine[26]

STATE AWARD

Nripen Kalita (40 years) lives with his wife, son and two daughters in Jiakur Village, Kukurmara in Kamrup district of Assam. Due to adverse economic conditions, he could study only up to the Higher Secondary Level. Nripen Kalita is an electrical/electronic mechanic by profession with an experience of about 15 years in repairing Televisions. He has a monthly income of around Rs. 3000.

Address
Vill: Jiakur, P.O: Kukurmara
Dist: Kamrup - 781 134
Assam

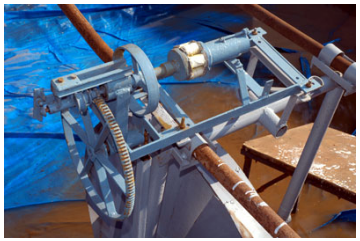
Scoutedby
Diganta Kalita

Genesis This idea first occurred to him 11 years ago when he tried to bring electricity to his own house. He worked on the basis that the conventional turbines have just 50% efficiency because of the uselessness of the upper blades, which have no mechanical output as it is a half-immersion version. Therefore he tried a full immersion turbine in which the blades were of half the area of those of the conventional device. But the mechanical output was found to be approximately twice the first version. Nripen then utilized this turbine in his generator cum pump in the river Kulashi with full submersion. At first he made the turbine with a bamboo frame and later he strengthened it with an iron one. He also increased the number of blades from eight to twelve. Nripen acknowledges that at first his family was not very interested in the idea, but later on encouraged him. He is proud to note that his neighbours have also benefited from his innovation.

He confides that making this turbine successfully has been a satisfying experience. This has also motivated him to pursue further ideas and he mentions that he is considering the development of an energy-related device. Remembering with gratitude the assistance offered by Mr. Diganta Kalita - who introduced him to GIAN- NE - Nripen calls him his best friend in his journey of innovation. NIF has filed a patent for the zero head water turbine.

The Innovation
Kalita has designed two variants of turbine and pump models. Initially in 1998-99, he had developed a water turbine using bamboo, for harnessing the flow energy from the river to pump water to his land. And later with the assistance from GIAN-NE, he has developed another version of the same turbine.

First model
The first model had a spiral offset arrangement of blades. In this the blade axis is perpendicular to flow direction. The offset arrangement of the blades provides constant thrust to the system. In conventional water wheels, the thrust is available only once when the blade is perpendicular to the flow direction. Whereas in his first model, the arrangement is similar to the multi cylinder crank arrangement in which the turbine will get thrust constantly from blades. The offset arrangement also provides sufficient clearance between the blades so that the floating debris will not



clog the blades. Since the path of the water takes a spiral shape from the entrance to the exit, the arrangement of blades acts as screw conveyor. This facilitates the debris to pass on from entrance to exit, which facilitates the smooth running of the turbine. The baffle operated pump, which acts as a submersible pump, facilitates the lifting of water. The cost of the complete system is only about Rs.3, 000 including labour cost which is quite affordable to small farmers.

Second model

The second model is an improved version in comparison with his first innovation. In this, the blades are arranged spirally and the axis of the turbine is parallel to the flow direction. This arrangement is superior in construction and operation. The spiral twist of the blades in addition to tapping energy from water provides vortex motion to the water at the exit. This feature is found to be novel as the kinetic energy of the water absorbed by the blades is regained by the water due to vortex motion. (By creating vortex in the direction of the flow, resistance will decrease i.e. water velocity will increase). In most of the existing turbines turbulence created by the wheel rotation affects the velocity considerably. This parameter is of importance when considering the performance of down stream turbines.

Working principle

The turbine is made up of steel foils with a rim where the blades are welded. The blades are welded in a four feet circular rim at an angle of 35°. The upper parts of the 12 blades are fixed in the circular rim that is four inches in width and the lower part of the turbine is fixed in an axle. A chain is fitted to the turbine axle and the drive gear. A frame is made to hold the turbine in running condition when the turbine is submerged in the water.The turbine is completely submerged below the flow of water (river). The linear kinetic energy of the water is used for giving rotational movement to the turbine. The water passing through the turbine forces the turbine to rotate with low speed but at a high torque. When the linear kinetic velocity of the water is two meter per minute the turbine starts to rotate with a speed of 20 rpm. A compound gear mechanism is used to convert the rotational speed of the turbine (20 rpm) according to the requirement. An armature coil (generator) is used to extract the electrical energy. A lever mechanism is used to control the generation of power by disengaging the driven gear where the shaft is coupled. A submersible

pump with guide blade is coupled in the turbine set for irrigation purposes. The driven gear with the help of a flat belt gives the required rotation of the pump for pumping water.

Advantages

Novelty lies in its portability and the fact that there is no need for a dam. Economically it is a better bet as construction and installation costs are minimal at Rs.8000, as compared to hydro-electric, steam or any other power plant where even a micro hydel generator costs at least Rs.40,000. The maintenance cost is also quite low compared to the conventional hydroelectric power plant. The efficiency of Nripen's machine is greater than 50%. It can also be set up anywhere be it plains or mountains. And of the greatest importance is the fact that the turbine has a very high potential in rural areas where electric power supply is not available.

Dual purpose rotary huller[27]

STATE AWARD

A.N. Manoharan (49) who hails from Madurai, Tamil Nadu symbolizes the spirit of creativity. He studied up to the tenth standard and joined the Indian Navy when he was 16 years old. He worked in the Navy for 10 years. During his service he opted for the submarine branch. He also participated in the 1971 Indo - Pakistan war and won three medals. Due to an accident he could not continue in service and therefore retired voluntarily. He worked for two years in Port Trust, Pondichery as a Morse Signaler. He is married and has a son and two daughters.

Address
67, West Ponnagaram 8th Street, Madurai-625 016, Tamil Nadu

Scouted by
SEVA

Genesis Hulling is an essential element of food processing especially in rural India. This is currently carried out manually as the available mechanical hullers are very expensive and well beyond the reach of the common people. Thus travelling miles to process food grains is a common sight in Indian villages. Manoharan, who hails from a rural background, felt the need for a hulling machine that was affordable and easy to operate and maintain.

One of Manoharan's friends, a practitioner of herbal medicine, came to him with a request to design a machine that would help him grind small quantities of different materials simultaneously without losing their medicinal properties. This motivated him to conceptualise the design and he began working on the machine at a lathe workshop near his home. He decided to use the concepts of gravitational force and kinetic energy. With his family supporting his efforts, he developed the first prototype in 1999.

The innovation
The rotary huller developed by Manoharan is an ingenious system that can be used to hull small quantities of different items simultaneously. This machine uses the principle of the inherent gravitational force of falling bodies to do the hulling, without using any electricity or fuel.

This mechanical huller consists of a circular disc, six hollow tubes with plungers, a center shaft with chain wheel arrangement, a drive shaft with pulley arrangement, a support frame and if required an electric motor (single phase ¼ HP). The six hollow cylinders with inset plungers are fixed in a triangular shape on each side of the circular disc. The hollow tubes are constructed in such a way that one end is blocked and the other end is closed or opened with a lid that can be screwed on. These are used to load and unload the various raw materials before and after the hulling operation respectively. The center shaft passes through the axis of the disc, with a chain wheel arrangement at one end of the shaft. The drive shaft is fixed to the side of the frame. The belt drive is used to transmit the power from the electric motor to the drive shaft. The chain drive is used to transmit the power from the drive shaft to the center shaft. A chain wheel arrangement is used because chains can absorb minor shocks and vibrations due

to the hulling operation. The frame is used to support the various components in the right position and all the rotational components are supported with the help of bearing blocks. The base of the frame is horizontally fixed to the floor by laying a machine foundation.

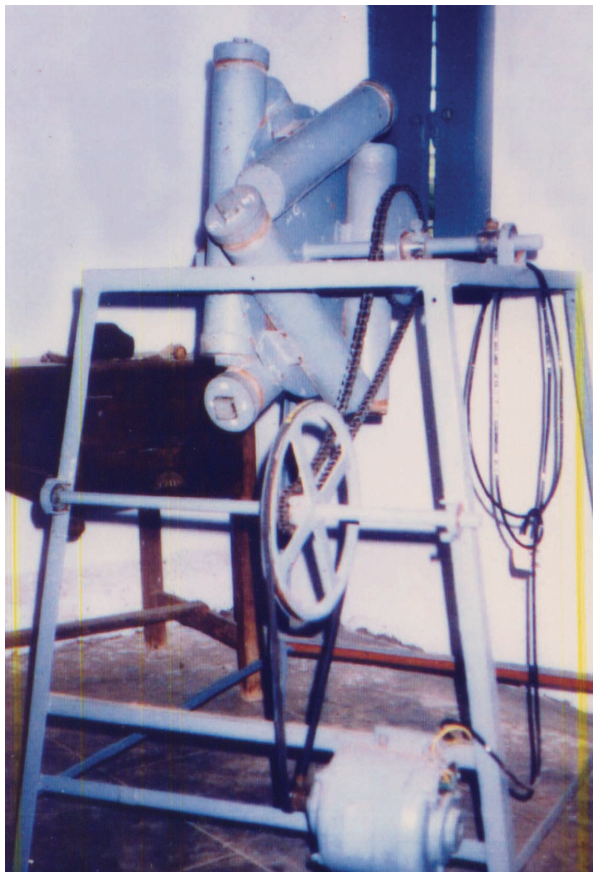
When the circular disc is rotated by hand or by an electric motor, the plungers pulverize the material inside the hollow tube. This strikes the ends of the hollow cylinder twice on one complete 360-degree rotation. On the first cycle of rotation from 0-180 degrees, when the hollow cylinder reaches a 90-degree position with respect to the center shaft, it strikes one end of the hollow cylinder due to the gravitational pull. On the second cycle of rotation from 180-360 degrees, it strikes the other end of the hollow cylinder. The momentum developed by the plunger during its travel raises the impact force. This impact force is used to pulverize the loaded material. Since the free falling plunger works on the earth's gravitational pull the speed of rotation is kept at a pace that does not overshoot the gravitational pull over the plunger.

Advantages

The machine can be operated manually as well as electrically. Since the hollow tubes are individual and discontinuous, six different varieties of items such as spices, cereals, rice and other grains may be hulled simultaneously. But in other grinding machines and mechanical hullers only one product can be ground at a time. In Manoharan's rotary huller, the hulling operation does not produce much heat so the original flavor of the product is maintained. Whereas, in the conventional grinding machines, due to high friction, a significant degree of heat is generated, which spoils the natural flavor and the chemical composition in the case of medicinal plants and roots. Manoharan's machine is easy to operate and requires very little maintenance. It has a number of applications such as, grinding herbal and non-herbal products for medicines, grinding animal waste to produce fertilizers, producing animal fodder and mixing and grinding all types of grocery items. At Rs.5000, this device costs one third of the cost of the nearest comparable mechanical huller available in the market. The output is about 3kg/hour for hard grains and 18 kg/hour for cereals. This energy efficient device is a good tool to increase mechanization in rural areas. Since it is easy to operate, women can take over the job of hulling, and eliminate the drudgery of manual hulling. The rotary huller also caters to the expectations of the consumer segment that believes in the superior quality of a product that is pounded by hand.

Current status

Manoharan has recently sold two models based on the original design and is now working on developing models of different capacities. He has also introduced a few



changes to the existing rotary huller. The machine is now able to process and discharge the materials continuously through a central feed system. Manoharan has received an order from a flour manufacturer to manufacture a 300kg/hr huller to produce flour for commercial marketing. He is now developing a multiple-compartment hexagon design rotary huller to suit this purpose. NIF has sanctioned Manoharan a sum of Rs. 26,875 from the Micro Venture Innovation Fund for prototype development of the Rotary huller to conduct a market survey. NIF has also filed a patent application (434/CHE/2004 11/05/2004) for the Rotary Huller.

Other innovations by Manoharan

Improved LPG Gas Conversion kit for automobiles

Manoharan has developed a new, safe, simple and inexpensive LPG conversion kit for automobiles. He has tested this on his Maruti Omni and found that not many changes were needed in the vehicle to incorporate this device. This kit provides multistage, pressurized fuel flow and a rich and lean fuel-air mixture to the carburetor. The resultant improved fuel efficiency and combustion provide better mileage (370-400 km) with a single LPG cylinder of 12.4 kg compared to the earlier average mileage of 220-250 kms. This environment friendly kit has great potential since many cities are now switching to LPG powered vehicles. NIF has filed for a patent (433/CHE/2004 11/05/2004) for this device.

Cell phone charger

Manoharan has also developed a charger for cell phones that uses the dynamo/ battery of the two-wheeler while the vehicle is running. It works with both AC and DC sources. In addition, the combination of IC 7805 and Zener diode at the output provides safety to the mobile phones and battery. Considering that there are more than two million cell-phone users in India who use a two-wheeler, the business prospects for such a device are promising. Some units have been sold and work is underway to develop the product further. Sustainable-agricultural and Environmental Voluntary Action (SEVA), Madurai has tried to make this device through women's self help groups, to generate local employment. NIF has filed a patent application(431/MAS/2003 26-05-2003) for this device.

Innovative solutions for industries

Manoharan has also been providing innovative solutions to various industries on commercial terms.

M/S S.A. Safiullah and Co., Pudukkottai, Tamil Nadu

One such case is that of M/S S.A. Safiullah and Co., Pudukkottai, Tamil Nadu. This company is a leading manufacturer of supari which is packed in satchets of five grams and sold in very large quantities. In the process, the company incurs about 200kg of cutting waste of the form fill satchet pocket edges. This waste which is laminated paper cannot be recycled, and it does not generate any revenue either. The company was not successful at finding a solution after repeated attempts. They then contacted Manoharan to come up with a device that would separate the PVC film from the paper. Manoharan developed a process that involves soaking the waste in an acidic solution for 45 minutes and then agitating the waste in a fresh water-bath for ten minutes where the paper gets separated from the PVC film as pulp. This pulp can be recovered using a filter of 80 mesh count. The recovery ratio is 100% for PVC film and 70% to 80% for paper. After separation, both the PVC film and the paper can be recycled and a kilo of retrieved film fetches a price of Rs12 and a kilo of white paper pulp fetches Rs.3.

The proprietor, Mr. Safiullah was very pleased with the results and entrusted him with a number of other technical problems his company was facing regarding waste management. Some of the projects on which Manoharan is currently working for the company are retrieval of aluminium foil from cutting waste of aluminium coated paper plates and manufacturing a counting machine for counting and packing of supari packets.

Sago Serve at Salem, Tamil Nadu

Manoharan has also interacted with another firm, Sago Serve at Salem, Tamil Nadu, to mechanize some of their processes. Sago Serve is a co-operative society where tapioca roots are processed into various edible and industrial products and sold internationally. But peeling the skin from the tapioca roots is a major problem faced by the industry today. Since the roots vary in size and shapes, the job is done manually and is time consuming and expensive. Due to heavy competition in marketing their products, some of the members from the society use chemicals to remove the skin from the roots. However, the residues of chemicals can remain in the by-products and prove harmful to health.

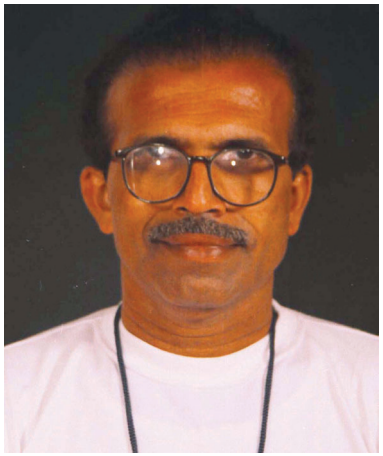
To solve this problem, Sago Serve contacted Manoharan to manufacture a device that could peel off the skin automatically. Manoharan accepted the challenge and requested the society for funds for research and development. This was approved by the governing council of the society. However, since the society's rules prevent payment to individuals for R&D work, they contacted Manoharan and asked him to work with an engineering institution. He has responded to this suggestion by requesting the society to provide the funds to a cell established by NIF at Thyagaraja College of Engineering in Madurai to enable him to do the R&D. He has since received verbal approval for this project. Manoharan is currently employed by Aarwin Technologies, Madurai for the identification and innovation of eco-friendly waste management methods. As part of his job, he has been asked to proceed to Sweden for one month for training in waste rubber disposal management at a Swedish firm manufacturing rubber crump making machine.

Mentoring

Manoharan was approached by Jayaseelan, an award winner of the second annual national competition of NIF in 2002, to make his coconut de-husking machine technically superior and energy efficient. Manoharan noted that the innovation needed significant design changes. He designed a completely new machine and fabricated it within three days. Manoharan revamped the entire drive mechanism. Unlike the old model developed by Jayaseelan, this new model works on a reduced low rpm high torque mode machine which facilitates uniform peeling speed without stopping the motor. Manoharan also introduced single feeding of coconuts from the top of the machine which makes the husking job easy, compared to the old model that needed the worker to bend to pick up coconuts for processing. Manoharan also redesigned the husk peeling knife.The knife designed by Jayaseelan had technical flaws due to which the coconut could be inserted into the machine only when the machine was stopped. But with the new knife, the inserting blade is placed in the centre of the rotating rod and this enables insertion of the coconut without stopping the spindle rod. This ensures constant speed of processing thus improving the out put of the machine.

Manual milking machine

STATE AWARD



Raghava Gowda (52) is a school teacher living in Murulya village in the South Canara district in Karnataka. He is brimming with ideas that would help solve various problems faced by members of his community. His father was also a schoolteacher. He acknowledges the support provided by his family throughout the process of innovation. He attributes his willingness to work hard, kindness and truthfulness to his parents. These virtues according to him have contributed a lot to his growth as an individual. Raghava is respected and held in high esteem in his village and his innovations are by now legendary.

Genesis Finding skilled labour for milking a small herd of cows is a problem often faced by a small-time farmer. Adding to this is the fact that milking by hand is not considered healthy or hygienic anymore. But milking using a machine is a luxury which only a large farm or dairy house can boast of, calling for a huge investment in power supply and machinery. All of these set Raghava Gowda, thinking very hard about developing an alternate means of mechanized milking which would be affordable to all farmers.

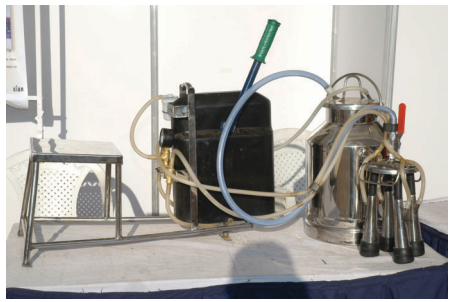
A keen observer and a fast learner, Raghava observed the working of the Gutter spray pump, used for spraying pesticides. He came up with the idea of using PVC teat cups and a plastic pipe on the Gutter pump. Thus he developed the first machine and began experimenting on his own farm. But for this the teat cup had to be moulded according to the size of the teat and he had to heat the PVC pipe. But milking using this device proved to be quite painful for the cow as an excessive vacuum was created. To solve this problem, a vacuum container was adapted. With this addition, milking could be done from four teats. Experimenting with it further he switched over to a foot press. Then he fitted the vacuum pump on a four legged fabricated frame which later was replaced by a three-legged frame to provide stability. A vacuum level gauge was provided to know the level of the vacuum generated. To reduce the strain on the operator he then tried out a gear and wheel vacuum pump set-up. A stainless steel can, lid and stainless steel junctions for the teat adaptors were also introduced. Further trials resulted in reducing the milking effort by adopting alternate pulsing for each set of two teats and by reducing stroke and diameter of vacuum pump. It took him four years of hard work and 15 models to finally arrive at the successful milking machine, which costs less than Rs.7000 and at last Raghava is satisfied that the machine is problem free.

The innovation

Raghava has developed an elaborate, refined milking machine that can milk cows and buffaloes using a set of reciprocating vacuum pumps with a vacuum gauge, a suction assembly unit and an air bubble free well gasketed milk canister to receive the milk. The suction assembly has two sub-assemblies with a set of nipples and stainless steel plate on one side and transparent conduit pipes and a regulator valve on the other.

Address
S/o Aithappa Gowda, Madhu Nivas, Pallathadka, Murulya Post & Vilage, Sullia, Dakshina Kannada, 574328, Karnataka

Scouted by
PRITVI



Each of the sub-assemblies are taken apart for cleaning before and after every milking operation.The udder and teats of the cow are also washed with cold water and wiped using cotton cloth. The hand lever attached to the pumping unit is cranked till a vacuum of 200-250 inches is created in the suction–nipple unit. This is attached to the udders and the milk gets deposited in the receiving canister via the transparent conduit pipes. When air bubbles flow along with the milk, the operation is stopped and on gently pressing the top of the teats, the teats get released. The control valve and vacuum pressure gauge, located on the main pumping unit, control the suction circuit and the milk receiving canister via the transparent conduit pumps. The four nipple suction configuration can alternate pulsations between two sets for the operation for facilitating milk flow and reducing milking time.

Advantages

The advantages of this milking machine are manifold. It is easy to operate, costs less and saves time as it milks 1.5 litre to 2 litres per minute. It is also very hygienic and all the milk from the udder can be removed. An energy-conserving device, it does not require electricity. All the milk from the udder can be removed. The machine is also easily adaptable and gives a suckling feeling to the cow and avoids pain in the udder as well as leakage of milk.

Current Status

Good publicity in the press helped and soon his phone was ringing off the hook, with frantic and urgent enquiries about the milking machine. This machine is now widely used and appreciated by small-scale diary farmers in his area. As of date he has sold 170 machines and has another ten orders in hand from states like Andhra Pradesh and Tamil Nadu also. Raghava's aim is to make his milking machine available to dairy farmers at a cheaper rate. He has got good responses from universities, banks and other government agencies. The University of Agricultural Sciences, Dharwad, had given him a certificate during the Krishimela. The Syndicate bank, Hiriyadka, also has given a certificate in appreciation of his innovation. But so far he has not been approached with any business enquiries or for licensing the technology.

Experiments at his farm

Raghava has developed a sprayer which can machine spray areca trees. This sprayer uses a gutter pump with a control mechanism in hand and costs about Rs.350. It is easy to use, assemble and dismantle and he has been using it for the last 12 years. He claims the method is cost effective and efficient and that it can spray in a 360° direction and to a distance of 20ft that can cover around 20 areca plants. He has also developed a fodder cutter that slices even hard fodder material like coconut and Areca Palms easily. He claims that the present fodder cutter is more efficient and safer to handle and that he has been using it for the past six years. Raghava Gowda also practises many alternative as well as resource saving technologies as part of his daily life. He uses solar energy to light the lamps in his house. For this he has installed two solar panels on the rooftop. He practises multi-crop farming and has 15 acres of well-irrigated farm with lush greenery. His farm consists of a variety of plants of both horticultural and medicinal importance and he claims that for the past 14 years he hasn't used any chemical fertilizers in his farm. He uses the waste slurry as manure for the plants in his farm. An advocate of rainwater harvesting, he effectively uses the run-off water to charge his own bore wells.

A life-long innovator

Raghava had started innovating at the tender age of ten when he fashioned a Spray Gun out of bamboo and a noodle-press which was followed a couple of years later by a bamboo pump. His resume of innovations also include a rotating toy using heat and light, a Gobar gas plant using plastic and PVC spares. Improving his innovations has always been a priority for him as he devised a method to improve the productivity of gobar gas using two drums and he also ran an engine using the gas. He has also won an award for creating an artificial Queen Bee and his interview was broadcast on AIR, Mangalore. At the same time,he is quite sure that he does not want to sit back and enjoy the success of his "Milk Master", but would prefer to dedicate his time to developing the following innovations which are currently in a conceptual form- easy methods of bee-keeping, a gas water heater and an automatic water dispenser for a cattle shed.

Traditional livestock healer

STATE AWARD

Becharbhai Dosabhai Parmar is a highly revered person in Rampur of Banaskantha district, Gujarat. Villagers rush to him for help particularly when any animal in the village suffers from some ailment. The *pashu vaid* (vet healer) is much in demand for almost any veterinary problem. Eighty year old Becharkaka, as he is affectionately known, can be banked upon to attend even complicated cases that formal vets find beyond their expertise. His family consists of his wife, five sons and three daughters. One of his sons is serving in CRPF. Two are involved in farming and the remaining two live in Ahmedabad.

The renowned Pashu Vaid

Becharbhai has, for the past 55 years, been practicing traditional veterinary medicine in about 60 villages in Patan, Siddhpur and Deesa talukas. Becharbhai states that he did not learn the science of healing animals from any individual. He acquired his expertise through his observation and understanding. He is adept at treating fractured limbs of any animal. Whatever be the kind of fracture, he gets the animal up on its feet in a very short time. He also treats diseases like polio, paralysis, bloat, tumour, retention of placenta, horn cancer, prolapse of uterus, maggot infestation in wounds abnormal foetal position and problematic pregnancy/calving. The most remarkable thing about him is that he never charges for his services. The client just needs to arrange for his transportation.

Testimonials

Most farmers of the area vouch for the efficacy of Becharbhai's treatment; they have absolute faith in the traditional remedies practiced by this *pashu vaid* and are usually satisfied with the resultant quick cure.

A farmer in Becharbhai's village relates an incident. A bullock had once swallowed a heavy metal object. A qualified veterinarian was called in and he recommended surgery but pleaded his inability to perform it. The next day, Becharbhai was called to attend to the animal. He fed the animal with a traditional herbal mixture and when the object stabilized at one place within the body, he removed it effortlessly. Several others in the village confirm this story.

Nathabhai Rabari of Genefaru village in Patan district recounts another case: Becharbhai had once come to treat his bullock for sprain. The farmer also showed him another bullock that he had purchased recently. This bullock ailed from swelling all over its body. Becharbhai told the farmer that it might get cured by itself but asked to be called if it happened again. After a month, the bullock developed swelling again and Becharbhai was promptly called and he removed an iron nail from the bullock's stomach, curing the animal of the problem.

Address
Vill: Samo, Nana Rampura
Tal: Disa, Banaskantha
Gujarat

Scouted by
Pravin Rohit

Some Outstanding Traditional Knowledge practices for treating ailing animals

Fracture in Animals

Whenever an animal breaks a leg, Becharbhai observes the level of damage carefully and puts the bone in proper position. Then the following treatment is done. An ointment is prepared from ash of banti (*Echinochloa frumentacea*) (100 g), navsar (ammonium chloride) (8 g) and castor oil *(Ricinus communis)*(100 g). This is applied on the affected part which needs to be subsequently bandaged using cotton gauge. Bamboo/ cane strips are used in the bandage for support and stability. After tying the bandage, the remaining paste is smeared on it. After eight days, the bandage needs to be replaced and the same method and proportion of medicine are repeated. In 15-20 days, the fracture is healed. Becharbhai also insists that a tetanus toxide injection be taken, when the injury is made by an iron implement or if the animal is weak.

Bruises on the thighs caused by thrashing with barbed wire or by hitting with an iron rod

Mix *kapur* (camphor - *Cinnamomum camphora*) (one small packet); groundnut oil (*Arachis hypogaea)* (100 ml) and water (25 ml) well. Extract juice of 250 *thor* (*Euphorbia nivulia*) leaves and add ash (250 g); *navsar* (ammonium chloride) (10 g) and clay (100 g). Mix well and add a pinch of common salt. Press the mixture, knotted in a piece of cloth, onto the wound or inject into the area of the wound. Also treat the affected area by placing a cloth pad, dipped in warm salt water, for seven days. Apply this paste from the eighth day onwards onto the wound for two days. The wound must be flushed with moderately hot water.

Retention of placenta

Mix jaggery (unrefined cane sugar lumps)(500 g), sejal (*Triumfetta rotundifolia*)(2-4 tiny branches ground into fine paste) and water (1litre). Within one hour of oral administration of the mixture, the animal will eject the placenta.

Prolapsed uterus

Thoroughly crush indigenous variety of onion *(Allium cepa)* (500 g) and add water (one litre). Filter the mixture with muslin cloth and add groundnut oil (50 g). Clean the surrounding area with the liquid and push the prolapsed uterus gently in. Boil rice (2 kg), add ghee (250 g) and feed it in the morning. Boil coarsely ground black gram *(Vigna mungo)* (2 kg), add butter oil (250 g) and feed it in the evening. Feed the animal with the preparation for two days. This helps in the formation of new muscle cells.

Alternate remedy

The ailing animal is given a mixture of Himmat powder (a small variety of myrobalam-if no powder is available, the fruit should be pounded) (10 g), coarse powder of Urad seed coat (*Phaseolus radiata*)(1 kg) and Groundnut oil (250 g). If groundnut is not used, de-oiled sesame cake (1 kg) should be used. This mixture should be administered daily till about 10 kg of black gram, 100g of Himmat powder and 2 kg of groundnut

oil are provided. Once the course is completed the ailment is cured.

Bloat
Ground ajmo (Bishop's weed-*Trachyspermum ammi*) (50 g) is mixed with juice of 1 kg of lemon and water (1litre). Once the animal drinks the mixture, its condition will improve within 15-20 minutes. Then feed jaggery (500 g) dissolved in water.

Intoxication
Groundnut oil (1 kg) and 'ijmet' (*Menthol*) 2-3 g are mixed together and fed once to the animal. With a single dose, the animal is generally cured.

Abscess in throat
The healer operates on the abscess and removes it. Then he applies the milky extract of cactus thor (*Euphorbia neriifolia*) on the cut made on the affected part. Such use prevents rapid closure of the cut and allows all the putrefaction to bleed out. This also prevents the wound from becoming septic. Then he uses an ointment prepared from ash of *banti* (*Echinochloa frumentacea*) (100 g), navsar (ammonium chloride) (8 g) and castor oil (100 g). This is then applied on the operated part. This paste is applied on the cut made previously and this is done for three days.

Ingestion of metallic object
Extract juice of Bijoru (Citron- *Citus maxima*)(500 g) and add jaggery (500 g) dissolved in water. Feed the mixture to the animal twice a day for four days. The foreign object will then stop moving within the animal's body and will stay put in one place. Then it has to be taken out through surgery

Maggot infestation in wounds
Sometimes maggots develop in the wound when the wound is not treated properly. For curing this, an ointment is made from tobacco (100 g), castor oil (100 g) and *navsar* or ammonium chloride (25 g). These ingredients are mixed well and this is applied on the wound with the help of a cotton plug. The maggots get killed by a single application of the ointment.

Worms in wounds in cattle
Worms sometimes develop in improperly treated wounds or injuries. For the treatment a homogenous mixture of smoking tobacco (100g), castor oil (100g) and Salamonic (25 g) is used. Cotton soaked in the mixture is placed on the wound and changed from time to time.

Ectoparasites (lice and ticks)
Mustard oil *(Brassica campestris)*(50 g) and a pinch of navsar (*ammonium chloride*) (5 g) are mixed together and massaged on the skin for controlling lice and ticks. The ectoparasites will fall off the animal. According to Becharbhai if the Ammonium Chloride is replaced with black soot of cooking stove (about 25 to 30g), it also gives good results.

Horn Cancer
The horn affected by cancer is removed by cutting and the wound is cleaned. Then castor oil (100 g), navasar (Ammonium chloride) (10 g) and ash of 'banti' (*Echinocloa frumentacea*) (100 g) are mixed and this ointment is applied on the wound and a bandage is tied. This is removed after five days and a fresh bandage is applied which is removed after 10 days.

***Valo* (Fever due to Rhabado virus)**
Add *ajmo*/Ajwain (*Trachyspermum ammi*), (50 g), jaggery(50 g) and ijmate (*mentho*l), (10 g) to cold water (1litre) and mix well. Feed this mixture to the animal.

Three day fever/Ephemeral fever
The animal suffering from Ephemeral fever becomes loose limbed, its body feels feverish and the skin becomes dark. For this make a mixture by adding Ajwain (*Trachyspermum ammi*) (50 g), jaggery(50 g) and ijmate (*mentho*l)(10 g) to cold water (1litre). This mixture is fed to the animal once a day for two days.

Intestinal worms in calves
According to the healer, when a young calf is born, it should not be given colostrum immediately. First it should be given groundnut oil (50 g) to which powdered

black pepper (*Piper nigrum*) (50 g) has been added, to prevent infestation of tape worm and only after this should *khira* or animal colostrum be given. Groundnut oil (100 g) and black pepper (50 g) are again given to the calves when they are two to three months old. Thus two to three doses of oil and black pepper are given to the young calf by the time it reaches the age of six months.

Paralysis of hoof

The bone of the hoof is like rubber. If a powerful blow is given to it, the veins get damaged, the blood circulation stops and clotting happens. Due to this, the hoof cannot be moved. The animal limps while walking and the upper part of the hoof loses its shining skin. Camphor (1 piece) is crushed finely and mixed well with groundnut oil (100g). This mixture is then injected to the hoof and massaging is done. The injection is given only once. After this injection, warm salt water is poured on the hoof and this is massaged on the hoof. This treatment is continued for seven days.

Washing cum exercise machine[30]

STUDENT AWARD FIRST

Remya Jose (17) belongs to Kizhattoor Panchayat in Malappuram district, Kerala. Her father is a high school teacher and her mother is the headmistress of an Upper primary school. She has completed her 12th standard in the science group. Throughout her school years, a class topper, Remya scored above 90% in her board exams. She represented her school at various science fairs and won prizes for making a still model of a transmission tower for mobile phones and for a working model of an indigenous casserole which conserves heat, thus also functioning as a thermal cooker. For her 12th standard practical examinations, she made a model of a refrigerator in which vegetables, fruits etc. would remain fresh up to a week.

Remya made this washing machine, after her board exams, when she was 14 years old. Her dream is to become a doctor and to do research in medicine. She is enrolled for coaching classes at a prestigious coaching centre in Thrissur - two and a half hours from home. She is staying away from home for the first time. But nothing can distract her from her goal.

Address
D/o- P A Joseph,
Puthuparampil House
P. O. Pandalore Hills
Via- Pandikad
Dist: Malappuram – 676 521
Kerala

Scouted
T J James

Genesis It all happened because Remya's mother fell ill during Remya's 10th standard exams and her father was undergoing cancer treatment. She had to change three buses while going to and coming from school and spend about two hours each way. As there was no washing machine at home, the chore of doing the laundry fell to her and her twin sister. So instead of just wishing futilely for a washing machine, she decided to try her hand at making one during the vacations. She had watched the functioning of an electric washing machine and thought of substituting the electrical power with mechanical power. She drew the basic diagram and her father took it to a nearby automobile workshop. He requested the workers to make it, when they had a free hour and agreed to pay. He then purchased the materials according to his daughter's instructions and supplied them to the workshop. Once she had to explain to the mechanic personally how she wanted it to be done.

The Innovation

It consists of an aluminium cabin in which there is a horizontal cylinder made of iron net wire. The cylinder is connected to a pedalling system which consists of a cycle chain, pedals and a seat. In appearance it looks like an exercycle - usually seen in a gymnasium - which is connected to a cabin. Clothes are put in the cylinder, the cabin is filled with water to the level of the clothes, washing powder is added and left to soak for at least 10 minutes. Then pedal for three to four minutes. The cylinder rotates at a very high speed with the clothes inside, cleaning them thoroughly. Soap water drains out, the barrel is refilled and the process repeated. By pedalling, the washed clothes are centrifuged and become about 80% dry.

Advantages

There are advantages galore. In rural areas electricity is always a scarcity and with revision of rates, the common man cannot afford to use a washing machine if in the first place he could buy one. In an electric washing machine if there is a break in supply - one has to repeat the entire process - but no such limitations for Remya's innovation. The manual one saves time too. By attaching a cycle-like device to it, it can be used as an exercise machine thereby serving the twin purposes of keeping fit as well as doing the laundry. It is quite cheap as costs would be limited to about Rs.2000. An added bonus- it is portable. So the innovation is highly practical for use in the rural areas and stays within the budget of the common man.

Current status

On asking her whether she would like to pursue this innovation further, she said that she would prefer not to. At the same time she remarks that changes are necessary and improvements are possible and that personally she would not mind others improving it as ultimately it will all contribute to its utility. NIF has filed the patent(643/CHE/2003, 07.08.03.)for the machine.

Her inspiration

"Whatever you have in mind, try it. Don't worry about making mistakes, they can surely be corrected," is Remya's belief. Her inspiration and constant supporter has been her father, a Hindi teacher. But her father confesses that when she first approached him with the idea of a manual washing machine, he expressed his doubts about it. He even told her that girls get married and go to a new house where there might be no washing machine, so it is better to learn to wash clothes by hand. Remya's mother recalls that she was never keen on her daughter 'wasting' her time on any of these pursuits and used to tell her to concentrate on her studies. Now she affectionately commends her daughter's achievements and gives all due credit to her husband. Remya's twin sister, Soumya, helps in her endeavours and is very proud of her. Remya also used to discuss her innovation with friends. They admit that at first they were sceptical, but her conviction and persistence convinced them that she would achieve it.

Pride of her community

Remya and her innovation are well-known in her area. Friends and neighbours have been full of appreciation for this 'little scientist' amongst them. Interviews with her demonstrating her washing machine have come in two regional newspapers – Madhayamam and Malayala Manorama. The local Church organised a ceremony felicitating her, at which the Bishop presented her with a trophy. A lot of people have shown interest in the innovation including a couple of media channels requesting to do a feature on it and an engineer from Delhi offering to help in improving it.

Modified stick for the visually challenged[31]

STUDENT AWARD SECOND

Sanket V. Chitagopakar (17) and **Prashant V. Harshangi** (17) are from Gulbarga, Karnataka. They are both in the second year of their Pre University Course. Prashant's parents are doctors and his brother is studying medicine. Sanket's father is a doctor and his mother is a housewife. His brother is studying in the tenth standard.

Genesis It was on the 17th of July, 2002 and Gulbarga city had received the first showers of the year. There were puddles everywhere and Sanket happened to observe that a blind man who was walking by with a stick fell in one. It was a sad sight. The next day Sanket discussed this incident with his friend Prashant and they conceived the idea for the stick.

Under the guidance of their teacher Mr. R. Hemant of the Sharnabasaveshwar Public School Gulbarga, they contacted Prof. Y.N. Ravindra who gave them a brief idea of the circuit and they started the project. Both relate that they faced a number of technical problems while developing the innovation. The main hitches were in fixing the circuit onto the stick and fixing the IR sensors and IR LEDS. They acknowledge the guidance of Prof. Y.N. Ravindra who gave them many useful tips and hints, which made the development easier. After days of hard work they prepared the circuit and the model. Next, the prototype was given to the local blind school for testing. The students of the blind school found the innovative stick more convenient than the existing alternative.

The Innovation

The electronic blind stick uses a PCB with a host of components including Integrated Circuits (IC 555, IR Sensor), semiconductors (Transistor-BC557, IR LED), passive components such as resistors, preset, capacitors and diodes along with headphones, IC base and the base 1" PVC pipe which functions as the stick and a separate handle. This device makes use of a total of five sensing circuits. Three of them use IR reflective sensing techniques to sense the presence of obstacles. Each sensor (IR) is individually AMV gated, stimulated by a switching circuit with assigned frequency. The principle of working consists of generating 32 KHz wave using the IC1 (555), which is fed as input to the IR LEDs emitting IR rays. These rays are reflected back from the obstacle and the IR sensors absorb these rays and activate the gated oscillator, which respectively turns the speaker on. An obstacle on the right side turns on the right side speaker; if it is on the left side, the left oscillator triggers the speaker on that same side. In case the object is in front, the forward sensor sends the signal to both the oscillators, so both speakers are turned on. The present system thus uses time decision multiplexing technique to transmit all the gated AMV frequencies sequentially. There are also moisture-sensing electrodes and micro-switches. All the

Address

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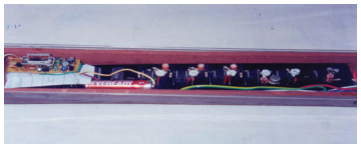
Scouted by
PRITVI



gated assigned frequencies are multiplexed and transmitted with the help of a FM transmitter. The use of FM transmitter and receiver makes a wireless system possible.

Advantages

Multiplexers are used to sense obstacles in different directions simultaneously. This means, the blind person might receive different signals on obstacles in different directions around him through the headphone. The moisture sensing electrodes sense the moist soil or stagnant water. This can be especially helpful during the rainy season. It also contains micro-switches, to detect manholes. Finally, in order to make the system more versatile, an anti-theft alarm is also incorporated to warn the user if the stick is being stolen. It is known that in most of the visually challenged, the other sense organs are highly developed. That's why the creators think the stick will effectively serve the purpose. They haven't made any move to commercialise it. This device costs Rs.800.

Social relevance

Blind people totalling over 1.5 million have difficulty in travelling and successfully sensing obstacles, manholes and puddles of stagnant water. They need support for all their activities. They need a third leg i.e. the stick to walk. One of the primary problems faced by the visually challenged is to walk freely in a public place. The outside world is rife with dangers especially when they leave their dwelling place, as they may fall down and injure themselves or stumble against an electric pillar or meet with an accident. Thus this innovative stick has great social impact as every visually handicapped is a potential user. Considering the various features and its superiority over the existing alternative even at the present cost, this stick is an essential accessory for blind people as it greatly enhances their mobility.

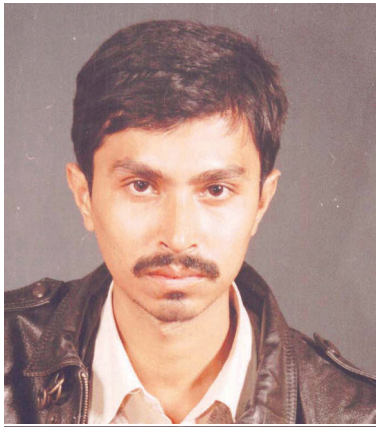
Other applications of this innovation could be its use by sewage workers, miners etc or in situations where light is dim/not available or for military applications where the need is to move around without using any light source. While such sticks are generally known in literature, the specific combination of features such as water sensor, alarms, FM transmitter etc., have not been reported in any one stick.

Pride of the family

"Till now nobody in our family has done anything innovative. But they may now get inspired from us and do something in the near future!" declare Sanket and Prashant. These young innovators have always had a tendency to try and understand everything. This tendency and flair for improvisation coupled with a curious nature played a vital role in making their innovation a success. Their family's pride in them is revealed in one sentence, *"These two have a genius dancing between their ears".* They go on to explain, "*What made us support them in this course was their attitude towards this project. It was not merely mechanical but it was for a cause- to help the blind. Of course we were a bit worried about their studies. In this competitive world we just lay stress on our children's academics. Yet, innovative thinking is necessary and there lies the real creativity of every person.*" Sanket and Prashant have also made a project titled 'Automatic dipper'- the main use of which is to automatically dip the headlights of the vehicle at nights on highways. Many accidents are caused, because of bright light. So this innovation helps in avoiding such accidents. Currently Sanket and Prashant aren't working on any other idea. These students are grateful for the considerable encouragement they received from their family, friends and teachers. They have exhibited this innovation in the Intel Science Talent Discovery Fair- 2002 and won a prize. After this it was covered in a number of newspapers. They also recall with happiness, the fact that the community had rained applause and appreciation on them in the wake of their innovation. On asking about their dreams for the future, Prashant explains he would like to become an engineer in the stream of either electronics or automobiles. But Sanket is categorical in stating that he doesn't want to reveal his future plans to anybody, as yet.

Innovative technique to transmit music through electrical wires in buildings[32]

STUDENT AWARD THIRD



Trailokya Bora (23 years), an unemployed Arts graduate, has been tinkering with electronic parts, since childhood and wants to come up with something new. With his unique ideas he has often succeeded in developing various innovations which are cheap, efficient and simple. This attitude of his has also influenced his younger brother **Champak Bora,** (20 years) a first year student of Diploma in Civil Engineering. Champak helps his brother in the practical aspects of developing the products or prototypes. Over the years the Bora brothers have acquired the skills to try out any experiment that they set their mind to. Trailokya and Champak hail from Mazgaon, in North Guwahati, Assam. They belong to a middle class family comprising their parents and two sisters.

Genesis Trailokya and his brother wanted to hear the same song at the same time. But as they were in different rooms and the deck cable was short, they couldn't shift the speakers to the other room. At this juncture they thought about transferring signals to the other room and it struck them that they could use the existing electrical wiring system. After several attempts they succeeded in transferring audio signals from one room (with a tape recorder) to another (with a speaker) on 1st January 2002. Their mother was the first to be told and later all their friends came to know. They remember everyone appreciated their innovation. The system has been incorporated in two other houses apart from their own for transmitting audio signals.

Eventually with the assistance of GIAN-NE they got an opportunity to visit and discuss the innovation in IIT –Guwahati. They confide that initially they thought of their findings as small, but after the meeting in IIT, they understood the value of their work and felt at peace with themselves.

The Innovation

In general, the electrical wiring system in a house consists of an active, a neutral and an earth line. Trailokya and Champak have developed an adopter through which the neutral line and earth line of a general electrical system are used to transmit audio signals within the house.

Using this technique, audio output from a tape recorder or radio is connected to a plug adapter in which the live point is disconnected. Now the audio signals are available in the neutral and earth wires. The output of the audio signals is collected through the adapter and connected to the audio output device like speakers at any other location within the house i.e., the output of the music system is inputted in the earth and neutral sockets. In whichever room one wants to hear the music, one can insert the two wires into the plug points and the speaker into the earth and neutral socket.

Advantages

The advantage of this technique is that the investment required for communication purposes will reduce drastically. The total cost for re-wiring of audio transmission is reduced and the cost of the adapter is only Rs. 15.This innovation has the potential to offer a new low cost solution to related issues in communication technology.

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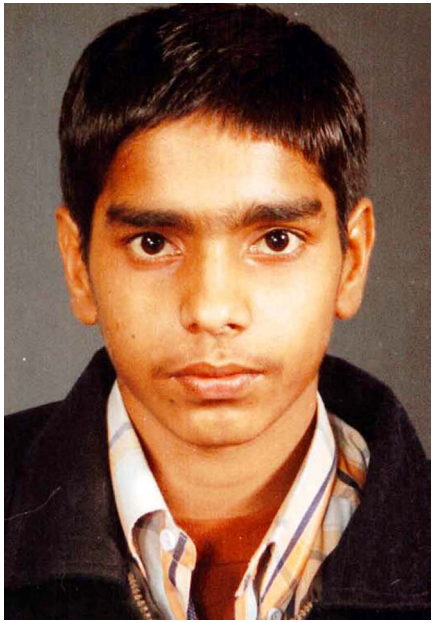

Kerosene and steam heated stove[33]

STUDENT AWARD THIRD

Vyasji Mishra (16) is an extremely talented student with a penchant for science. Vyasji lives with his parents, his elder brother and a sister in Devsar, Madhya Pradesh. Presently he is studying in 11th Standard. His father has done his B.A. and works as a clerk in the Devsar Tehsil Office. His elder brother Pawanji Mishra is a first year BCA student. The household income of his family is Rs.60000 per annum and comes solely from the income of his father.

Vyasji developed a keen interest towards science and its various applications from his very early childhood and has also developed a number of products having a strong scientific basis. He also actively participates in various science competitions. Vyasji admits the exigencies of reality: "I am a student, and my father is a clerk. Since our financial condition is weak I don't have most of the required equipment with me." Still he doesn't give up hope,"But I have a great wish to become a scientist."

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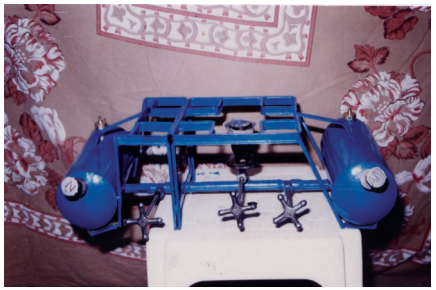
Genesis Vyasji's elder brother Pawanji Mishra had developed a model of a similar kind of stove for a science fair in 2001-2002, which was not successful. In 2002-2003, there was a science exhibition held in his school, Utkrishta Vidyalaya, Sidhi in which there was a section called '*Sources of Energy*' and Vyasji wanted to take part. Both the brothers together created the stove by joining two kerosene stoves together and using three regulators - one for the kerosene, one for the water and a third for switching the burner on and off. While developing this stove, the major problem he faced was the control of kerosene and water flow, but he was able to rectify this to some extent by using three regulators. This device took approximately six months to conceive and manufacture.

Vyasji's family gave him moral support throughout the course of development of the innovation. He acknowledges that it is because of the constant encouragement and financial as well as technical support provided by his elder brother, Pawanji, that he was ultimately able to successfully complete the innovation.

The Innovation

This is a hybrid stove powered by kerosene and steam. The stove has been prepared by joining two conventional ones and has two tanks, one burner and three regulators. The two tanks are filled with kerosene and water respectively. Both the tanks are connected to the common burner. A pump is provided with each tank for creating air pressure therein. Pipes are secured to the burner for conveying kerosene and water to the burner assembly.

The stove is started with kerosene as usual. After some time kerosene valve is partially closed (i.e. 80% open). The water valve is slowly opened and kept open between 0-20 per cent. Now, both the kerosene valve and water valve are



partially opened and the mixture of kerosene and water is admitted to the burner in the maximum ratio of 80:20. Mixture of hydrocarbon and water as fuel has been very well known in the art and maximum permissible mixture ratio for the optimum one will be 80 to 20.

It would cost around Rs. 600 in the market. But one has to observe the following precautions: when the water regulator is opened, the kerosene regulator must be shut. When filling the tanks special care should be taken to see that there is no dirt.

Advantages

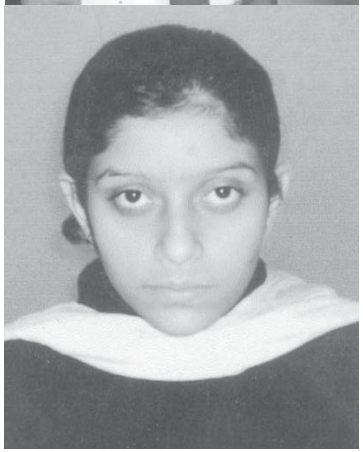
Less smoke is produced and it is therefor friendlier to the environment. This innovation is of great benefit to especially the poor who are the major consumers of kerosene. It also gains significance in the light of the increasing fuel prices. There is also potential for future applications of this concept in glass and toy factories, laboratories and small-scale establishments.

Current status

Vyasji has displayed this stove in various science exhibitions. It also got coverage in the newspapers in February 2002. He was awarded the first prize for this innovation by the education Minister - Indrajit Kumar Patel at a Science exhibition held in 2003. Apart from this stove Vyasji has also developed a model of a drip irrigation system, which got the first prize in a science exhibition in 2000. With the attitude of a researcher, Vyasji is able to appreciate that his stove needs to be improved. He points out that as it uses water, after some time the burner becomes cold and stops and he talks of the need to think of some way in which it will work continuously on water without stopping unless switched off. However, much more research remains to be done. The Indian Institute of Petroleum, Dehradun had reservations about this concept but IIT Guwahati tried to optimize the working of the stove and found that it could save about 20 per cent kerosene with proper calibration. NIF in coordination with the GIANs has sanctioned an amount of Rs. 37, 250 from its Micro Venture Innovation Fund for prototype development for market research of the water-kerosene stove and three other innovations.

Earlier, a similar stove developed by Rajiv Agarwal had been awarded by NIF. The key design difference of Vyasji's stove with that of Agarwal's steam operated stove is the following:

In case of Agarwal's stove, the steam is injected to hot burner. Mixing of steam and kerosene takes place at the point of flame. Whereas in the case of the modified operation of Vyasji's stove the mixture of kerosene and water is injected into the burner. Mixing of kerosene and water takes place before the burner (at the entry of the burner) and the mixed hydrocarbons are responsible for the continued burning and fuel saving.



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Scouted by
Dr Nilotpal Kakoti

Herbal mosquito repellent

STUDENT AWARD THIRD

Leena Talukdar (16) is from Morigaon, Assam. She is in the 11th standard. Throughout her school life, Leena has always excelled in academics. She has represented her school at various science fairs. She had won the Best Affiliated Science Fair Award for her model of a Cold Storage System at the Intel Science Talent Discovery Fair held at Mumbai, 2003. An all-rounder, Leena has always taken part in various extra-curricular activities such as skits, drama, quiz, recitation and painting, winning prizes at the school and district levels. Leena aims to be a computer engineer and her dream is to study in one of the IITs. After her father's death, her mother has been her constant supporter and inspiration for all that she has done. Leena's mother is an employee of the Lakhimi Gaonliya Bank, Assam. She has a younger sister who studies in the 2nd standard.

Sushanta Mahanta (16) is also from Morigaon, Assam and is in the 11th standard. A very shy girl, Sushanta rarely takes part in extracurricular activities. However she takes keen interest in science related activities and takes part in various science fairs. Besides this mosquito repellent Sushanta has also developed a dantamanjan (toothpaste) by using indigenous plants like neem, soura, bhut aera, etc., which was exhibited in a National Level exhibition held by NCSC at MIT, Pune. Sushantawants to be a doctor and advises young innovators to have faith in themselves and to keep trying. Her mother is a lecturer in English at the Morigaon college and her father is an ex MLA and a social worker. She has an elder sister who is in the 2nd year of her graduation.

Genesis Jag is the Assamese system of burning mixtures of cow dung, plants and garbage etc., in heaps so as to purify cowsheds. The most common way among the villagers to make a *Jag* is to make a heap where paddy straw, dried garbage, paddy husk and some medicinal plants are piled up and then burned. Usually the following medicinal plants *Bihlongoni, Neem, Bahaka, Aakakhilata, Meteka, Makhi-lati, Maralia, Gundhua –Ban, Pachaliya, Tulsi, Palas, Citranella* etc., are used in the *Jag*. It is generally made in front or behind the house or near the cow shed. The *Jag* serves two purposes–it is a conventional way of getting rid of the garbage as well as a means of repelling flies and mosquitoes from the cow shed. Though the villagers have been using *Jag* traditionally, they are not particularly aware of the usefulness of Jag and no scientific studies have been done on it.

So when the opportunity arose, Leena and Sushanta who were studying in their eighth standard at Muhila home Model School, Morigaon, decided to study the effect of Jag, and particularly of the plants used in it, for repelling mosquitoes. So they undertook a project under the "National Children Science Congress, 2001" with the theme of "Indigenous Scientific Knowledge for a better tomorrow." Leena and Sushanta selected a subject under the heading of "Health and Hygiene" which directly comes under

the focal theme.The subject of their project was "Study on the use of medicinal plants, as mosquito repellent in Assamese society with special reference to Jag." The main objectives of their project were to examine whether the medicinal plants used in Jag have any effect to repel mosquitoes and to see whether these medicinal plants can be used inside the house.

After selecting the subject, their teacher (guide), Bhagya Bhanu Goswami, advised them to select a village. They selected "Sapmari", a very backward village, 10 km away from Morigaon town. The majority of the villagers are poor peasants. Out of the 120 families of the village, they selected 50 for the survey and circulated a questionnaire among the villagers. From the survey they were able to find out that traditionally all the people of Sapmari are accustomed to using *Jag* and they also found out which plants were used in the *Jag.*

After obtaining the information they wanted, they experimented with coils produced from the various medicinal plants mixed in different proportions and found that about 90% mosquitoes can be repelled by using these plants. The team concluded that the coils produced from *Flemigia Strobillifera* plant, locally Makhioty is very effective in repelling mosquitoes and is comparable to the repellents that are currently sold in the market. The other results of the study were that the use of dry leaves (powdered) instead of raw leaves in Jag will produce less smoke and that these medicinal plants could be used as an alternative for coils, mats etc.

To check the effect of the smoke that comes out from the bowl, they applied a little Vaseline on a tissue paper and then kept it over the smoke for five minutes. In order to prove the effectiveness; they made a comparison between their home-made sticks and the ready-made coils. They took each one of them and burnt them in two separate rooms to see which one is more effective and also to see how much they burn in five minutes. They also contacted the director of Regional Research Laboratory (R.R.L) Jorhat, to find out how to keep the coil burning for a long time as currently the coil only burns for a short period. NIF has filed a patent application for this.

The method for preparing the repellent

At first the leaves of the medicinal plants are dried in the sun for five days. After drying the leaves, they are ground into powder. The dhuna is also ground into powder and one teaspoon each of the powders is mixed. This mixture is put over a layer of coconut fibre in a bowl and then lighted with fire.

The essential ingredients of the formulation namely *Shorea robusta, Polygonum glaborum* and *Flemigia strobillfera* are powdered and mixed with binders and fillers to increase the efficiency of the formulation. The formulation may be made in various physical forms such as mosquito repellent coils, sticks, solutions, emulsions etc. Perfumery oils may also be added to the formulation. The appropriate amount of the respective ingredients will vary and may be readily determined by a person, skilled in the process, at the time of making the formulation in its different physical forms.

Advantages

The formulation is safe, eco-friendly, cheap, easy to use and has maximum repellence against mosquitoes. In addition these home-made herbal repellents are less harmful to our health than the coils available in the market. It can be prepared at home as it does not require any heavy infrastructure and investment as compared to coils and mats. A mosquito repellent incense stick prepared by this formulation burns for nearly four and a half to five hours with its effect lasting for three hours.

Relevance

Mosquitoes are known to transmit many diseases such as malaria, dengue, yellow fever, filariasis and Japanese encephalitis. Approximately 40 million people in India suffer from mosquito borne diseases annually. But the widespread use of mosquito repellents and insecticides in public health programmes has caused severe

environmental pollution and potential health hazards. The introduction of new and more toxic and rapidly disseminating mosquito repellents/pesticides into the environment has necessitated accurate identification of their potential hazards to human health. Many of them are extremely toxic to mammals/and or other non-target organisms. Thus one realises the need for a safe and eco-friendly mosquito repellent based on herbage.

Contribution to society

Leena and Sushanta feel that there is a need to create greater awareness about the usefulness of *Jag.* In view of the potential demand, they see a need for some small scale industry to be established for producing these repellents. This could also address the problem of unemployment to some extent. These students also consulted the District Industry Officer, in this regard, and he praised their effort (project) and assured them that he would seriously consider their suggestions regarding the establishment of some small scale industry. To ensure widespread use of these herbal repellents, Leena and Sushanta took the initiative for organising meetings with the Gaan –Buras (chief of the village) of Sapmari and Charaibahi villages and held discussions with them on the usefulness of Jag. A large section of the total population of these two villages said that they had benefited by following their suggestions. What is all the more remarkable is that these initiatives have been taken by two young girls of just 16 years.

Modified design for air blowers[35]

CONSOLATION

Yagnesh Mehta (39) hails from Ahmedabad, Gujarat. He did his B.Com from LG College of Commerce in 1986. His family consists of his wife and son. His father was director, Land revenues in the state government. After completing graduation Yagnesh joined a company called Magnet Duplicators, manufacturing Cyclo-style machines. He worked in that company for about two years and in 1988 he joined another company called Seagon Systems. He joined this company when it had just started manufacturing air curtains. So he was able to learn the manufacturing process during his tenure with them.

In 1989 Yagnesh left Seagon systems and started his own concern in partnership with a friend. His company was called Natural Environment Control Systems. He was assembling air curtains and selling them through this concern. His partnership did not last for long and in 1992; he started an independent company called Natural Environment Controls (NEC).

Today he has an office and a factory. He invests whatever he has into his innovations. Some of his other innovations include an improved hand-disinfector with micro-processor control which he has started selling and electro-magnetic locks.

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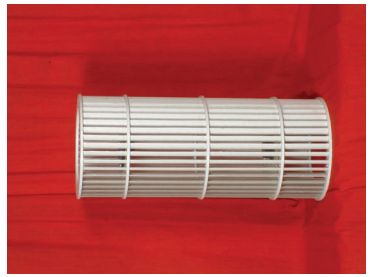
Scouted by
Shriraj Amin

Genesis Till 1992, Yagnesh did not manufacture the blowers used for air curtains but used to get the fabrication done from outside. He purchased the motors from the market and used to design and assemble air curtains.

But the air curtains he used to sell had a lot of defects. In these the fins made of aluminium were joined with the ring and then the blowers were joined with each other. Yagnesh observed that because of too many joints, the air curtain was making too much noise while rotating due to loosened blades, the joints would sometimes come off, they used to slip, etc. In addition since the fins were made of aluminium, they used to bend very easil and part of the aluminium used to get converted into powder dust form due to certain chemical reactions. Also as the fins were 1.8 micron in thickness, when the air stroked the edges of the fins, due to the thickness, backpressure was generated. This sometimes caused the bending or breaking of the fins or the burning of the motor. Due to these problems, his customers used to complain and this affected his goodwill.

So Yagnesh started searching for an alternative in 1993-94. At that time, he came across an imported wall-mounted air-conditioner manufactured in Japan, in which the blower was made of plastic. Yagnesh then imported a blower from Hitachi, Japan to study it. He noticed that this blower was made of multiple pieces joined together, but that at high rpm it would break off due to lack of strength. Yagnesh then got the idea of using plastic



and decided to start working on the plastic fins. The main problems were that the fins were irregular in dimension because of the moulding procedure and there was no adhesive available which could add to the strength of the blower. Searching for some solution, Yagnesh contacted CIPET (Central Institute for Plastic Engineering and Technology) but was told that it was very difficult to extrude aerofoil shape from ABS plastic. Around this time, Yagnesh contacted Mr. Parera (an expert in the field of plastics) who told him that he already had a similar concept based technology with him. But to test that, a die needed to be made. He offered to take up the project with Yagnesh, if he was willing but warned him that risk was involved. The project cost was estimated at two lakh rupees. At that time, Yagnesh was already struggling under a debt of about 6-7 lakh rupees. Still he borrowed money from lenders on interest and invested it in this project. After six months the fins were ready but not the outer ring. So Yagnesh got a die made for the outer ring according to the newly designed fins. Now the problem was how to join the fins to the outer ring so that the blower doesn't break. Yagnesh contacted Bayer ABS, manufacturers of plastic granules and got to know about the ultrasonic welding technology. But the machine used for this was very expensive and Yagnesh could not afford it.

After about two months, he got to know from Bayer that a particular chemical could be used as an adhesive. But they were not so sure about the chemical reactions. Yagnesh did a test experiment and found that when put into this chemical, ABS melts in about twenty four hours and results in a paste, which can be used as an adhesive. With this adhesive he joined the fins with the outer plates. This was in 1998-99.

The Innovation

Yagnesh has made an innovative design for the blower using ABS plastic material. He has been able to extrude ABS plastic and make fins out of it for the blower. The fins he made are of aerodynamic profile with the edges being narrower than the middle portion. Due to their aerodynamic profile, there is low obstruction to air flow as compared to aluminium/stainless steel fins which are flat and rectangular in profile. He uses a special chemical mixed with ABS plastic as adhesive for his blower. This adds to the strength of the blower.

Advantages

This blower would be cheaper than the aluminium/ stainless steel blower. Power consumption is reduced in this blower as the backpressure is reduced on account of the aerodynamic profile of the fin. The strength of the modified blower is more than the conventional aluminium blower thus cutting down on maintenance costs. There is negligible noise and vibration as compared to aluminium blowers. Other existing plastic blowers which are used in Window and split Air conditioners have joints and are not suitable for high static pressure applications such as in package units of A/c plants. This is what Pankaj R Dhirkar, Executive Director Dikshit Consultants and Engineers Pvt. Ltd and past President, Indian Society of Heating, Refrigerating and Air Conditioning Engineers, has to say about this blower:

"This has all the advantages of a metal blower as well as that of a plastic one. It will solve the problem of using a large sized blower as in the case of a metal one and besides will not face the problem of corrosion or powder separation. ABS plastic blower will be more durable as compared to a metal blower but will have equal precision… The power consumption would also be reduced due to this innovative design."

This innovative concept can also be used in industries dealing with the manufacturing of axial fan, continuous grill etc and many more where single mould is not applicable or product strength is essential.

Negotiating with the formal sector

With this prototype, Yagnesh contacted Amtrex Hitachi in Kadi. At that time, Hitachi had a requirement of about 1500 blowers per month and was purchasing blowers at the cost of Rs 1200 per blower. Yagnesh offered to sell them his blower at Rs.700. But for manufacturing these blowers a die was required which would cost one lakh rupees. Yagnesh made a proposal to Hitachi to share the cost of the die on 50:50 basis. But Hitachi

took six months to consider this and still reached no conclusion. So Yagnesh decided to go for it himself.

Well deserved success

In 2001, Yagnesh opened a new firm which he named Sri Aerodynamics products and started manufacturing air curtains. He started assembling the blower himself in the hall of his home (of which one room was rented and his family was living in the second). He and his wife were the sole employees. He got his first order on 14th Jan 2001 and he made the delivery on Jan 18th. Since then Yagnesh has not looked back. He is just relieved that his bad times are over. He recollects some of his struggles during the process of developing this innovation. There were times when he had no source of income. He had to manage the household on whatever past savings he had. To bring in some cash, he even rented the master bedroom of ahis two-room house. Yagnesh acknowledges that he was able to get through that bad phase only because of his wife. She has been his constant support and source of inspiration while going through the ordeal.

Future Plans

Yagnesh Mehta wants this innovation to contribute to the air conditioning and AHU market worth more than Rs. 50 crores in India which is currently dominated by imported blowers manufactured by EBM, Nicotra, Nadi and PUNKER. He feels that we have not succeeded in this market because we do not have facilities for laboratory testing for providing technology feedback. *"Whatever is with you, share it and learn from others - you can even reach heaven this way,"* is the belief that guides Yagnesh.

Anti-bolting device[36]

CONSOLATION

A commerce graduate, **Gobinda Chandra Gogoi** (68) hails from Rajgarh in Assam. His family comprises his wife, son and three daughters. He worked as Asst. Superintendent in the Directorate of Small Savings, Govt. of Assam till his retirement in 1996. He was also running a small printing press in his wife's name till 2000.

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Scouted by
GIAN - NE

The genesis Gobinda developed the idea of the L-drop auto protector in the year 2000, after reading about a reported case at Guwahati, where burglars locked inmates within a room (having L-drop) from outside, while ransacking the house. To overcome this problem he thought of designing an anti-locking device to prevent unauthorized locking of the door from outside when a person is already present in the room and vice-versa. This was all the more important as there was no two-way anti-locking device available in the market. Accordingly he took two days to make the device and fixed it on his bedroom door. His family at first found the experiment annoying as his bedroom was converted into a workshop and even found it childish and funny, once it was installed. They requested him not to install it on their doors. But after the visit by officers from GIAN North East, they revised their opinion and realize that the innovation has some purpose. At present the device has been fitted in four houses and has been found to be eminently useful. NIF has filed a patent application on his behalf.

The innovation

This anti-locking device for the door has a base plate adapted to be secured with the doorframe. A movable lever is attached to the base plate by means of riveting or fastening. A flap is provided integrally at one side and towards the top end of the lever and another is provided at the other side and towards the lower end. During the operation of the device if the person is inside the room, he locks the door from inside by moving the lever up or down with the help of the flap depending upon the position of the L-drop, provided with the door, and thus the outer flap comes in front of the slideable rod of the L-drop and prevents the door from being locked from outside and the same process is applicable when the door is locked from outside.

Advantages

Gobinda Chandra Gogoi has solved a problem that many households face either due to pranks by children or as a safety hazard. Sometimes when people are inside a house, the latch is bolted from outside and the inmates have to call somebody to open it from outside. With the device developed by Gobinda such will never be the case. This low cost device prevents the door being locked from outside or from inside depending upon the user's wish. It can be used by a person whether he is inside or outside the room and can be adaptable for all types of doors. Another point in its favour is that it

is suited for the rooms/ toilets used by mentally challenged patients and persons suffering from epilepsy as unauthorized/accidental locking can be prevented.

A free spirit

After retiring from government service , Gobinda has devoted his time to creative works. The lack of interest of his family has not dampened his enthusiasm as he confides that when he starts a journey he is always determined to reach the goal. He is also the author of a book "Phrases and Idioms" which took him five years to complete. Most of his annual pension of Rs.48, 000 goes into experiments conducted in a small tool room at his house. Some of his other innovations include several small attachments to his cot which facilitate reading while lying down and some changes to his gate-locks which are now maintenance free in nature. He hopes that the L-Drop auto protector will be manufactured and used widely not only in India but also in the rest of the world. At the same time , he stresses the fact that he is an innovator and not a businessman and hence has left manufacturing to others. Expressing his desire to be free in all respects, he quotes a line from the poem, 'Miller of Dee'-… "I envy nobody and nobody envies me". He goes on to say "Like the Miller, now, I am also a happy man without anxieties"

Water-lifting vane pump- the 'HYDRO-GEN'

CONSOLATION

Imli Toshi (22), hails from Mokokchung, Nagaland and has done his BSc and also obtained a Post Graduate diploma in Computer applications. Hailing from a farming background, Imli has also got hands on experience in some of the problems faced by rural farmers. Currently unemployed, he has always had a keen interest in machinery and automobiles and his other innovations include an innovative egg-boiler and hot-water filter.

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Genesis The idea of this innovative pump came into his mind while he was washing his car at home. For this he needed to go to the water fall just near his house for filling up his bucket with water every time. Then he thought of the possibility of diverting the water to his car-washing place with a certain height. These thoughts resulted in the development of this innovative low discharge energy pump.

The Innovation

The innovation is a horizontally submerged centrifugal pump which works without the help of electricity or any fossil fuels (petrol, diesel) to power the motion. It is a novel combination of a Vane pump and spiral bladed water turbine. The vane pump offers the best combined characteristics of sustained high level performance, energy efficiency, trouble-free operation and low maintenance cost and Imli Toshi has managed to drive such a pump using the natural flow of river/ dam water.

The innovation consists of the following main parts namely PVC casing, two supporters, shaft with spiral blades, Ball (used as a bearing), Thrust bearing and three levers for supporting the shaft, a circular wooden block, three flat blades and Delivery pipe.

The pump is completely submerged in flowing water and the linear velocity of the water is used to drive the spiral blade shaft that is coupled to the pump and this provides the rotational velocity of the pump. This pump can lift water up to a height of one meter.

Advantages

This compact device can develop a good vacuum and does not require very high water velocity to run the turbine and thus it can be used in small channels or rivers. Continuous water supply and the uniform load distribution on the motor throughout the cycle due to the balanced system are some other salient features. This pump costs about Rs.800 which is much lower than the investment required for conventional pumps. As no electricity is required the operating costs are minimized. Whereas in a conventional pump set used for irrigation in the agricultural fields, at least around Rs.300/- per day is required. Installation costs are also eliminated as this pump just needs to be set in the water channel one night before the required day, as discharge rate is very slow. The maintenance cost of this pump is much less and there is no problem of rusting. Further it is light weight and hence portable and easy to handle.

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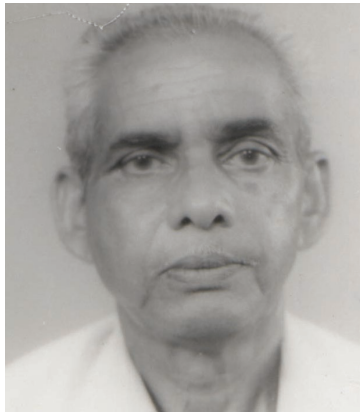
Test Report

The first model of the pump was tested in NERWRI (North Eastern Regional Water Research Institute). When the water speed was one meter per minute(3.3ft/minute) the speed of the shaft was 5 r.p.m. and the discharge from the vane pump was noted as one litre per 40 seconds (90 litres per hour) at one metre head and one m/s velocity of water. It operated at low cut-in of two feet per second.

Of great rural relevance

This pump is cheap and runs on its own. It is a low cost, self generating water pump which can be used to pump water from a feed water channel to the crop field. This could also be used in remote mountain areas where it can be used just to raise water from a river on to adjacent areas. This rotating unit can also be used for generating power or used for any other secondary agrarian mechanical operation.



Potato cultivation in hay sacks

CONSOLATION

Lingaraj Pradhan (64) is a matric trained certified school teacher living in Jakeikala, Sundargarh district in Orissa. He teaches Oriya, English, Maths and science. His family consists of his wife and two sons. His elder son is a social worker. The younger son is self employed and runs a small rice mill. His sons also help him in cultivation and his family has supported him in all his endeavours. A self motivated man he also tries his hand at repairing agricultural implements and other machinery at home.

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Scouted by
Balaram Sahu

Genesis After teaching in a school for 38 years, Lingaraj has been pursuing his interest in gardening after his retirement. About four years ago he started thinking about using the limited land surface available for agriculture with greater efficiency by growing more plants on less land. Thus he came up with the idea of cultivation of potato in hay packets. He first implemented this idea in 1999-2000 in a small hay made packet. At first he could not make the perfect hay made packet. But with continuous efforts he succeeded and now he is doing the same repeatedly with success.

The method

The method developed by Lingaraj consists of cultivating potato in sacks made from the ropes of paddy hay. Like knitting a bamboo basket, a packet of hay is prepared in which mounds of soil and compost are put. The mound of earth in this hay pack is kept in place with the help of hay ropes.

These hay made packets are called 'Pura', 'Puruga' or 'Olia' in the local dialect. These hay made packets are generally made by farmers to store seeds and grains in villages. Now Lingaraj is using this technique for potato cultivation.

Lingaraj has modified these hay sacks for potato cultivation by filling these packs with soil, cow dung and compost and binding them with ropes. In between two adjacent ropes made of hay, at the periphery of the packets, pre-prepared potato buds are placed. Leaves of the young plant come out from the junction of two ropes and the roots spread into the soil inside the packet. For watering these plants, he reuses water that has been used for domestic use. The crop takes the same time to mature in the hay packs as in the farm. Lingaraj now proposes to keep these packs 0on wheeled iron racks, one over the other, so that they can be put in the sun easily.

Advantages

This method of cultivation is a boon for landless farmers especially as it needs no land and reuses water. Other points in its favour are the fuller utilization of natural fertilizers. Labour is saved in weeding since there are practically no weeds and

hardly any need for pesticides. Each sack gives a yield of about 10 to 15 kilograms.

Recognition

Lingaraj has not sought publicity for his practice or any help from government agencies but those who have heard of it and visited his garden, are full of appreciation. This method is currently being practised in four nearby villages. Lingaraj acknowledges that his peers and villagers have fully supported him. This innovation had been featured in the weekly Gramin Sambad and the daily Pragatibadi.

Treatment for in-plant germination of sugarcane

CONSOLATION

Beni Singh (77) was born in a poor farmer's family in Rohtak in Haryana. He has studied up to the higher secondary and spent his childhood in the village, helping his father in the fields and in cattle rearing. After his father passed away, he discontinued his studies due to circumstances at home and then went on to Paliya in Lakhimpur Khiri, Uttar Pradesh, where he bought two bigha of land and started cultivation. A highly respected person in Paliya, he was sarpanch for fifteen years in twenty villages of his area. He is very fond of reading and writing. Realising the fact that there was no doctor in the entire area, he concentrated on obtaining knowledge in Ayurveda and brought books from Delhi and Ayurvedic and Homeopathic medicines from Lucknow and subsequently opened his clinic and started serving the poor. He is famous by the name of 'Dr.Beni Singh' in the entire area. Singh has three daughters and two sons who are all educated. One of his sons is the sarpanch of the village.

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Scouted by
SRISTI GYAN Kendra

Genesis Sugarcane is one of the most important crops in India and increasing its production is every farmer's dream. One nagging problem that sugarcane farmers face is the delay in planting fresh seedlings and harvesting of previous crops. There was no available technology for developing of sugarcane nurseries. Beni Singh was constantly involved in trying to increase the harvest of sugarcane as well as reduce the costs involved in cultivation. He thought of the new method of sugarcane germination after facing difficulties due to low crop production. One day, Beni Singh observed that buds on the sugarcane get germinated on the standing cane plants when they are exposed to light by removing the sheath. It is a common and well known phenomenon. But its application in preparing a cane nursery had not been hitherto tried. Beni Singh felt its potential in terms of saving precious time for farmers. Now farmers of nearby villages have adopted this method. In all his endeavours, his wife was a constant pillar of support and his sons also helped him. He also remembers with gratitude the help offered by Ganna Singh Goha.

The technique
Beni Singh's idea in a nutshell is that instead of sowing sugarcane setts (nodes) and then letting them germinate, one can induce the bud germination on the plant itself, cut the setts and sow the early germinated nodes.

The entire procedure is as below:
First the healthy canes are selected and the sheaths around them are removed. The buds are then exposed to light till they germinate. Following this the land is prepared. In 25 days the buds grow up to one and a half feet and then the cane pieces are cut by the farmer carefully, leaving six inches on both sides of the node. A mixture of gomutra (cow urine-100 litres), red chillies (2 kg), Datura seeds (*Datura metel*-5 kg) and crushed *Aak* leaves (*Calotropis gigantean*-5 kg) is

prepared and the pieces of cane setts (nodes) are dipped in this mixture. This protects them from various pathogens and pests like termites.

Advantages

The survival rate of sugarcane is almost 100% because the seeds have already germinated and the cost is reduced as uniform plantation is done. Dependence on chemical inputs is reduced because the sugarcane is planted when it is already one foot long. At least one month or more can be saved in the crop cycle which saves costs. Due to reduction of the crop cycle, labour charges are also saved. The yield is improved up to 10% due to uniform plantation and this results in uniform exposure to sun and air. Turn around time can be shortened. With this technique, good quality seeds may be produced at lesser cost.

In constant pursuit of innovations

Beni Singh's contributions to the sugar cane industry are numerous. He has also succeeded in using organic methods in the cultivation of sugarcane. And adding lustre to his achievements, his experiments are not limited to sugarcane; he has also developed some remedies for illnesses affecting livestock. He has also developed a new high milk-producing breed of cow. Some of his significant innovations are given below:

21 feet tall Sugarcane without using any fertilizer, herbicide or insecticide:

Beni Singh found out that if sugarcane stalks are tied at the right time then there is a great chance of considerable increase in length. When the sugarcane is four feet high, the sugarcane of adjacent rows are tied. The second knot should be made two feet above the previous one and when tying the third knot the first one should be cut open. The third knot is made amongst sugarcanes of adjacent plots. On making the fourth knot the second one is cut open. Thus the sugarcane plants are arranged is such a way that a square is formed.Some of the advantages of this technique are the sugarcane becomes tolerant to lodging, there is greater growth, early ripening and due to better exposure to sunlight and better elevation there is an increase in sugar content. The formation also provides protection against damage by wild animals.

Selection and treatment of Sugarcane Seed (setts)

According to Beni Singh the upper portion of the sugarcane stalk should be used for making seeds as the lower portion is not rich in sugar content. For this 1.5 ft long sugarcane stalks are cut and these are left for drying in the sun till the water evaporates. Then a pit of 1m X 1m and three feet deep is dug. Polythene is spread in it and it is filled with 10% solution of cow's urine, so that the urine solution penetrates the sugarcane stalk.

Traditional remedies

- When cows or buffalo calves eat rotten fodder, they suffer from dysentery and they start passing blood in their faeces. Under such conditions ground and filtered *asode* leaves in the juice of sugarcane should be fed.
- Cow or buffalo calves sometimes suffer from intermittent cough or irregular breathing. For treatment, take ash of dry banana leaves (5 g), mix in clarified butter (25 g) and then add raw milk (250 ml). Feed this mixture to the calf.
- If wounds are kept open and not washed, then fly tacks lay eggs over it and then there are chances of insect infection in the wound. For treatment, the wound should be washed with water to which potassium permanganate has been added, then filled with grounded Kadui bach (*Acorus calamus*) or with a mixture of warm turpentine oil and camphor or a paste of dry tobacco leaves and alum could be sprinkled over it.

Accolades and awards

In 1984-85 he got a gold medal for producing 250 tons of sugarcane per hectare and he was honoured for coming first in his region. In 1985 he got an opportunity to visit Philippines and Australia along with a farmer delegation of the Uttar Pradesh Government. In 1987 he got a yield of 300 tons per hectare with each sugarcane stalk weighing an average of eight kilograms and having a height of 21 feet, for which he was honoured in Coimbatore. From 1987-1990 he was featured on Doordarshan New Delhi five-six times and also on Lucknow All India Radio.

Use of buttermilk as a coagulant for rubber latex

CONSOLATION

Shankara Patali, a 41 year old rubber planter, hails from Puttur Taluk of South Canara District in Karnataka and has been engaged in farming for the last eight years. A tenth standard pass out, he has always had the urge to do something different. He lives with his family consisting of his wife and two children. He has a monthly income of Rs.5000.

Shankara spends his spare time very constructively. He takes part in various gatherings and meetings related to agriculture like Krishimelas. Another interest of his is grafting different varieties of high quality Jackfruit, cashew-nut and mango saplings. Collecting different types of herbs is also a hobby. He loves to experiment a lot in the field of agriculture with whatever knowledge he has.

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Karnataka

Scouted by
PRITVI

Genesis

Shankara Patali has found that buttermilk has proved to be the "better" milk option and is better than formic acid or acetic acid for the coagulation of natural rubber latex. Usually acids are used to coagulate rubber latex into rubber sheets but some people are allergic to acids and transportation and handling of acids is hazardous. Once while discussing the problem with his colleague he came to know about the danger of acid burns caused to the men working on the sheets. This made Shankara think of a safe option. The ubiquitous buttermilk as a replacement for chemicals was an idea that came to Shankara Patali one day as he watched the latex "curdle" on addition of formic acid, pretty much in the manner that milk gets converted into curd. Then he thought of using natural products that showed acidic properties.

Shankara lost no time in putting his theory to test and tried various combinations and proportions of buttermilk, tamarind juice, toddy and limejuice. Initially the rubber was not coagulating properly because the buttermilk used was not very sour. Then he tried buttermilk which was very sour, and got good results. It took him nearly one year to arrive at the right kind of buttermilk to use in order to make good quality rubber sheets. The latex was just as responsive to buttermilk as it had been to formic acid. Shankara has been using this method for the past two years.

The method

Rubber is usually sold in the form of sheets. The first step in rubber making is tapping latex from rubber trees. This latex is then poured into trays and according to the density of the latex, water is added to form a solution. This solution is coagulated into thin slabs of coagulum for which chemicals such as acetic acid or formic acid must be added. Depending upon the density of latex, climate, water content and the weight of the solution, these acids are used. Normally to make a

rubber sheet weighing ½ a kilo, 100ml of formic acid (5%) is used. These slabs are then converted to sheets through rollers.

In Shankara's technique, on the first day of preparing rubber sheets, 250 ml of water and around 150-250 ml of sour buttermilk is added to two litres of filtered latex in the tray and is churned well till the froth is formed .The froth formed is then removed immediately. The same procedure is followed for the first four days. On the fifth day the sheet is passed through the rollers so that the sheet becomes thin and extra water is drained out of it. This water is collected and kept aside for three days so that it gets fermented. This step should be followed regularly. Then on the fifth day, the use of buttermilk is discontinued and instead of it the fermented liquid is used. The amount of this liquid, to be used varies from season to season i.e. 300-500 ml in winter and 150-250 ml in summer. This is done because the density and consistency of latex varies according to climatic conditions and time period. While processing grade sheets, the drained fermented water should be thoroughly strained and used. If the process requires making sheets on the same day, fermented water should be added twice more than the normal quantity and less than 250ml or no water must be added.
If the latex is being processed once in two days, it is advisable to use the drained water as such without allowing it to ferment- during winters (250-300ml) and during summers (150-200ml) on the same day. The quantity of buttermilk to be used will to some extent depend on the seasonal variations, temperature, and the latex quality. The older the buttermilk or fermented liquid the greater the effect and lesser quantity needs to be used.

Advantages

The rubber sheets made in this manner are of superior quality and better colour and fall in the top RSS-4 Grade. Buttermilk being a totally organic product, there are no side-effects or allergies for people handling them as in the case of acids or chemicals. This treatment also reduces the fungal attack on sheets. Buttermilk is available at home itself where as acids must be bought from outside. It is economical as the farmer saves Rs. 500 per acre per year by using buttermilk. The fact that this development, using a locally available substance, helps reduce processing costs by 80% makes it an idea whose time has come. The process is simple, less expensive and water is also conserved.

Peer appreciation sustains the spirit

Several farmers around Puttur and Sullya have now started using buttermilk and for them, it's a win-win situation all the way. All those who came to know about it are adopting this technique. Shankara Patali describes his brush with innovation as a fantastic experience. Especially in the light of the appreciation he received from neighbours and various organisations for this innovation. Throughout the process of innovation, he received full support from his family. Banks and Agricultural universities also responded well and he was awarded a certificate by the Syndicate bank, Badhiyadka during a "Krishimela".

Scientists claim that the use of organic substances for coagulation has been known in literature, but no recommendations were made because standardization of such substances might not be possible. They do appreciate the spirit of experimentation, however.
At the same time, not willing to rest on his laurels, Patali is clear that further research should be done on this procedure. Enthused by this experience he wishes to make more innovations.

Shankara feels that organisations like NIF are doing exemplary work in identifying and encouraging people at the grassroots. Especially as he considers that politicians and huge companies do not encourage such ideas as these would harm their personal interests.