Shivraj multipurpose equipment[1]

Farm Machinery

National First, Lifetime Achievement Award

Shamrao Parhate

Pandhurna, Chinndwara, Madhya Pradesh

"*Mere haathon se hamesha kuch naya hona chahiye*[2] ", observes Shamrao, with a restless tone.

Shamrao Parhate (76), a fabricator-cum-mechanic, is a multidimensional serial innovator par excellence who over the years has produced numerous useful innovations. Shivraj multipurpose agricultural equipment is one such implement, which shows his immense talent to fabricate things as per the users' needs and requirements.

He is the patriarch of a family of thirteen including his wife, sons and their families. Two of his sons run a fabrication workshop while the third one works in a company exporting small rubber items used in medicinal packing. The agricultural equipment developed by him, is named after his son, Shivraj.

Due to financial constraints, Shamrao could not study beyond fourth standard. He learnt 'watch repairing' from his father at a young age and started assisting him. Since there was not enough work for both of them, he started taking training in photography at the age of 22 and thereafter started working as a professional photographer. He had to travel extensively for work. He felt fatigued as the traveling increased and finally stopped photography, to start a radio workshop along with his watch workshop.

Over the next few years, he worked in his 10' by 20' shop engaged in watch and radio repair, wishing to start a workshop of his own. Recognizing his keenness, a local businessman, Sardar Satwant Singh helped him by loaning him the equipment. Despite not having any formal training, he developed his acumen by working on diverse kind of machines.

He worked round the clock in his shop for about 16 years. Owing primarily to his efforts, in 1969, the government sanctioned a large plot for an industrial cooperative. Parhate started his workshop there, initially on a smaller portion of this plot.. Now, he has two workshops under the banner of Parhate Engineering Industries in the same area.. His sons have joined him in running it.

In 1974, an American Educational Institute presented an X-ray machine to the Vidharbha College, Amravati in Maharashtra. During transit from Mumbai to Amravati, the water circulation force pump from the machine was stolen. Nobody knew about this and when the machine was started in Amravati, the X-ray tube worth approximately Rs. 10,000 got destroyed. When they went through the operating manual they found that a pump was essential for proper functioning, which was absent. A letter was dispatched to the same company in US for the pump and the tube. The US Company was able to provide a new X-ray tube but could not send the pump. However, they sent the technical design of the pump with special consideration. The design was sent to many companies but nobody could make it.

Finally, Dr. Poddar, in-charge of Physics department in the College and a friend of Parhate, wrote a letter explaining their requirement and also sent technical drawings to him. He studied the drawings and then submitted a quotation to manufacture it. Within

[1] Case study being pursued by Ms Riya Sinha, Sr Advisor, NIF for her Ph.D. studies at University of Wageningen is gratefully drawn upon in this profile.

[2] Something new should be done by me.

three months, Parhate readied and tested the pump, took it personally to Amravati and demonstrated it successfully in front of the Professors. This was his first success.

In 1980, while working in his workshop, he met with an accident. He hurt an eye while welding, and had to undergo medical treatment for a few months. While recuperating he started working on developing a welding spark protector/welding helmet. After some work for a couple of months, he succeeded in making an automatic spark protector.

He wanted to patent it but did not know how to go about doing so. He went to a patent attorney who asked for a sum of Rs. 2,000 for filing patent, which he was unable to pay. He got a book on Patents and with the help of a friend read the relevant portions and based on the sample patent application forms, he submitted an application to the patent office in Mumbai in 1985. Due to his inexperience in drafting and language skills, the process continued with numerous correspondence letters seeking clarifications. Following this chain of communication between him and the patent office, he finally succeeded in patenting his device in April 1987.

While exploring the possibilities of commercializing this innovation, he learnt about a Taiwanese company, which manufactured such helmets, but their helmet was semi-automatic. When approached by him, the company got interested in buying the technology for Rs. 5,00,000. The deal did not get through as he realized that much of the money coming in would have to be deposited as tax to the Government. He finally settled for a lower amount by transferring the technology to a Mumbai based company.

Similarly, in 1988, when a Soyabean processing plant was set up near Pandhurna, a particular component–the rotary connector of a device 'Swip Agar' failed and the company's engineers approached Parate. He made the component with such efficiency that it worked better than the original ones made in Japan.

After this, Pune based company Thermax, who have installed a plant in Pune along with other countries like Bangladesh, Malaysia, Pakistan *etc.*, gave him bulk orders to manufacture this component for installation at various sites. He supplied the components to Thermax till 1993.

Parhate has led a life of constant exploration. His other innovations include technique to stop wobbling of wheels in four wheelers, modified drip irrigation system, energy generation through transportation, seed planter, welding rod holder and the versatile 'Shivraj' multipurpose device along with customized farm implements. In addition, he has developed an idea to generate electricity through unconventional means about which he refuses to divulge more until he has a patent for it.

Having a long development experience, he has this to say: *"Research karna hai bhai to himmat rakho. Asambhav ko sambhav banane mein kharcha to hota hi hain. Seed planter ka ek component jo teen rupaye ka tha, use banana ke liye, die ka kharcha sare barah hazaar aaya"*[3]

Genesis

The innovator, living in the soyabean and cotton belt of Madhya Pradesh, observed that sowing, intercultural operation, weeding and harvesting were labour intensive agricultural operations. Scarcity of labour and high cost of operations done by mechanical power posed difficulty to small farmers. To address this issue, Parhate developed 'Shivraj' – the multipurpose agricultural equipment in 2000. Being priced at Rs. 15,000 the machine could not find any takers.

Based on user feedback and his own insights, Parhate modified the design and came up with another prototype in about a year's time. Since then he has been constantly modifying design, as and when people come to him with specific demands. This effectively led to the evolution of the machine, 'Shivraj'. The present machine is the third version

[3] If you have to do research then you must keep faith. It takes resources to convert the impossible to possible. While the component cost of a seed planter was just three rupees, it took twelve and half thousand rupees to make the die for it.

resulting from his constant effort for developing a suitable product.

Innovation

The 'Shivraj' is a multipurpose tool frame drawn by paired bullocks. It is lightweight and can perform up to six agricultural operations. Different accessories can be attached to it for different operations like shallow ploughing, interculturing, weeding, sowing, residue collection, groundnut digging and soyabean harvesting. With modifications, it can also be used for spraying.

It consists of a multi-purpose tool frame mounted freely on the central shaft of ground wheel to which accessories can be fitted: for example, the seed drilling attachment can be replaced by a sitting attachment.

The field capacity of the equipment is 0.27 hectare/ hour and the cost of this product with attachments for seeding, ploughing and interculturing is around Rs. 12,000.

The concept of multipurpose toolbar/frame used for ploughing, harrowing, sowing and intercultural operations for agricultural machineries, is well known[4]. IARI, New Delhi, has developed an integral tool bar that can do five operations *viz.* ploughing, harrowing, bund forming, ridge making and sowing and costs Rs. 3,800/-[5].

Similarly, *Tropicultor* developed by ICRISAT, Hyderabad can be used for ploughing, stubble removing, planting and fertilizer application, interculture operation and harvesting of turmeric and groundnut. It has a mechanical linkage to lower down or raise the attachment during turns or

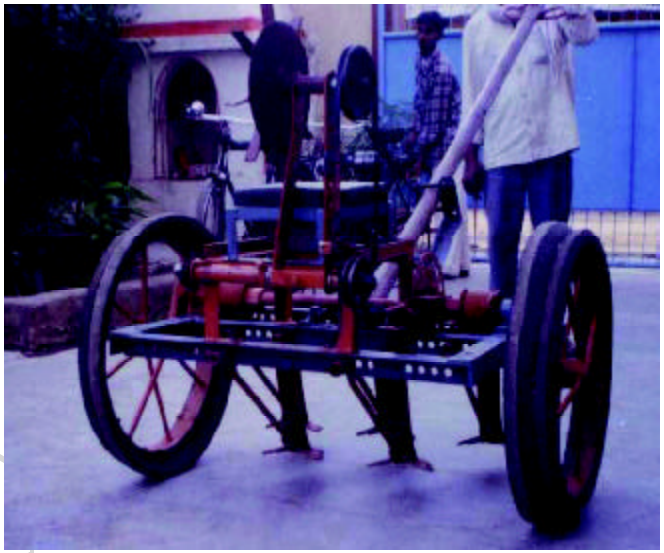
wherever required and costs about Rs, 40,000/-[6]. US Patent No. 5267517 (Dec. 7, 1993) describes a multi-function tillage or planting implement, which can be used for leveling, planting, compacting and chemical application in single pass.

However, 'Shivraj' has many innovative features:

- It has a provision to vary RPM of the seed-metering unit and thereby allowing different seed rates and desired plant-to-plant spacing.
- A thoughtful provision has been incorporated to disconnect seed metering drive using locking lever to avoid seed losses while taking a turn in the field.
- Provision has been made for changing the angle of penetration of soil-working tool during ploughing.
- Another feature is a freely mounting frame on the central axis that allows lifted up of the device at turnings.

Specially built tyne type plough are provided. Three plough bottoms can be attached all at a time, full weight of machine is put into ploughing process and the angular back support ensures that plough does not bend when in use.

Harrowing is done by steel tynes, which break the upper crust of the soil, uproot weeds, and pulverize the soil and mix soil and weeds. Residue is collected by a special attachment operated by a



hand lever at the rear of this equipment. When the vehicle moves forward, it collects uprooted stalks, weeds and crop residue. When the lever is lifted, the collected material is dropped in to a heap to be carried away or burnt.

The seed drilling attachment consists of seed box, drilling unit, seed conveying PVC tubes and furrow openers. The drilling unit gets the drive from central shaft of driven wheels through belt and pulley mechanism. It can attach two to five furrow openers, as per need. Plant-to-plant distance can be varied from 4 to 20 inches (10 to 50 cms), by varying RPM of the drive and row-to-row distance can also be adjusted similarly.

Because of its high efficacy, cost of seed drilling using 'Shivraj' is less than half that of conventional bullock drawn seed drills.

Weeding and intercultural operations are done by fixing suitable blades according to the need of crop being handled.

For groundnut digging, the groundnut-digging blade enters four to five inches deep in the soil, cuts the roots allowing the pods to be retained along with the plant. The working width of groundnut-digging blade is 8 inches (20 cm) and it covers one row in single run with facility to adjust angle of penetration of soil working tool.For soyabean harvesting, an attachment drops the cut crop to one side for manual collection.

A series of trials have been conducted on this equipment, which has evolved over the years to deliver multiple functions seamlessly, and many units have been sold in the districts of Chhindwara, Nagpur and Wardha in Maharastra. The innovator has filed a patent application for this innovation.

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4 http://www.ciae.nic.in, reference available in various textbooks and at CFMTTI Budani, IIT Kharagpur, *etc*.

5 http://www.iari.res.in/krishisewa/specialpublication/urja_daksh_web/page36.htm

6 http://www.mekins.com/tropi1.html, http://www.blonnet.com/2002/09/21/stories/2002092102381700.htm

Motek treadle press: rejuvenating old letter printing press

Mechanical/Electronics
National First

Satish Deb

Durg, Chhatisgarh

Background

Satish Deb (28), has devised a technology that has the potential to rejuvenate the almost dead and obsolete treadle printing presses and convert them into screen printing presses.

Satish comes from a modest background. He lives with his parents, wife and a younger brother who works in Mumbai. He was born in Raipur in 1978 but moved on to Bhilai along with his family when his father got transferred in 1980.

They had a treadle printing press at their home. He and his brother used to work on it since their adolescence. Growing up in this environment, they learnt about various aspects of the printing process.

Genesis

The year was 1996 and Satish was in class twelve, preparing for his engineering entrance exams. An uncertain future closed in on him when due to certain problems, his father's company did not pay his salary for many months. The income from their small printing press was irregular and meager and they began to live off their small savings.

A dream died. Satish abandoned his plans of becoming an engineer, discontinued his studies and joined family business of printing. In his spare time, Satish started thinking about ways to revive their treadle press and increase the family's income.

But time had changed with the arrival of computers. There were new printing technologies, which were comparatively simple to operate and produced output of far better quality in colour. The treadle presses, using letterpress types based upon the 'Platen & Bed' theory, were slower and produced poorer quality printing.

His lack of knowledge, training or experience did not deter him as he went about painstakingly developing the Motek printing press, conceiving and optimizing all components.

In 1997, it occurred to him how he could convert his treadle press to deliver offset class output. He spent an entire frustrating year developing his novel kit, searching in local markets and incessantly trying out different chemicals and polymer sheets to deliver the desired quality. He tested the product and also tried out impressions on paper, board and plastic. Finally, he succeeded in 1998 when he standardized its parts and working.

Having his product ready, he incubated it for another year (1998-99) for further testing and simultaneously applied for patent. His first patent (No. 189882) was granted on March 10, 1999 and till now he has five patents for various versions of his machine.

He has always had support of his family while facing various troubles in developing this Motek treadle press, jointly. His father helped him with technical inputs while his brother helped him with paper work and his mother remained a constant source of inspiration and a pillar of strength.

The process of development and the filing for patents proved very costly for him and he invested almost all of his father's savings. At a later stage he took a bank loan also, which the family is trying to repay gradually.

Innovation

Motek India printing technology is a low cost, cutting-edge, upgradation tool for most printing machines, which use conventional treadle press and are unable to deliver quality output.

A number of devices and techniques have evolved since the invention of printing. US patent No 7021213- April 2006 describes a printing method comprising the steps of mounting an underlay sheet on a plate cylinder of a printing press, and providing, on the underlay sheet, a printing plate material comprising of a plastic sheet support, and provided thereon, a hydrophilic layer, an image formation layer and a backing layer.

Here in this Motek India printing technology, the innovation lies in the unique technique of registering computer printed images using an exposure unit onto a screen unit. Printing material is pressed by an inked custom-built polymer sheet holder, fitted into existing treadle press. It enables printing on various media by impact action. Mono or multi-colour half tone output can be generated using existing treadle press inks.

The attachment kit is convenient, user-friendly, requires very little maintenance and can be added to any working treadle-printing machine to get results comparable to desktop publishing up to the range of 300 to 450 dpi. The cost per print is also lower than screen-printing and offset processes.

Other important features included are that it can be operated by pedal or motor, can handle any paper size and can also be used to print on plastic surfaces such as polybags.

This kit also offers multifunction facility *i.e.* one can use both letterpress types as well as Motek India printing kit at the same time. Another important feature is that a single operator can get all the jobs done on the machine.

The Motek treadle printing press uses 'butter paper' as the image-carrying medium against the 'polymaster' being used in baby-offset printers. This is what lowers printing cost *i.e.* Rs 1.50/- per sheet as against Rs. 15/- per sheet for baby offset printing.

The cost of the retrofitted Motek India Treadle press kit is about Rs 25,000 against Rs 1, 25,000, cost for installing offset printing press. The retrofitting increases output of conventional treadle press from 12,000 sheets/day to 70,000 sheets/day. Baby-offset printers can print about 5,000-10,000 impressions/day.

The technology of this kit has been approved and certified by The Northern Regional Institute of Printing Technology, Allahabad (U.P.), which is India's first and premier printing technology institute.

NIF, through its regional cell, GIAN NE, has facilitated a distribution license for the Motek kit in Assam. Since 2005, a large number of unit sales of this kit have been through this dealership, which forms a substantial part of their small income. He was also supported under the MVIF scheme for the diffusion of his technologies in four printing clusters of India, which elicited a very good response from the market.

Satish was invited by NIF to the Inventors of India Workshop at IIM, Ahmedabad in October 2006 to give a presentation about his technology to fellow innovators. An article on his Motek treadle Press, published by Enadu daily, Hyderabad in October 2006, was very well received and generated many product inquiries. Lots of market enquiries are still pouring in from different parts of the country.

Presently, he is developing an automated version of the machine, filing additional patents and arranging finances for capacity expansion to deliver to the exploding demand for this product.

Phone operated switch

Mechanical/Electronics

National Second

Prem Singh Saini

Ambala, Haryana

Background

Born in 1978, Prem Singh, a prolific innovator from Haryana, has made a phone operated On/Off switch, which can operate any electrical device remotely, thereby enabling optimal use of the device and electricity.

Being a youngster in a family is always a privilege; one can usually get away with mischief. Second youngest of six siblings, Prem was no exception to this rule. He was a very naughty child. His mother used to tie a rope to his shirt and secure it so that he did not run away. She was as not worried about him getting into mischief as about getting hurt in the process. However, Prem always found ways to untie the rope and slip away to play with his friends and then come back and sit down quietly after retying the rope.

The seeds of his multiple innovations were sown at a young age when he skipped school to tinker around in his elder brother's electronic repair shop.

Tinkering with ICs, circuitry and electronic components, he began to mend small gadgets such as radios by himself. By class six, he had already devised many equipments including a mini radio station with a range of up to two kilometers radius.

Setting up his own workshop in 1992, at age 14, he continued innovating and independently started developing circuits and product assemblies. By this time, he had dropped out of school as he was fully immersed in his journey of innovations.

Since he was always busy at work, he did not interact much with fellow villagers. They considered him crazy. For many years, Prem went around various colleges, institutions and organizations trying to explain his innovations and seeking support. He faced indifference, ridicule instead of appreciation, but he always put up a brave front, and with or without support he never let go of his dream of innovating gadgets. By 1996, when stories of his innovations started reaching people through newspapers, they began to acknowledge his skills and talents. There were some in whom the appreciation transformed into jealousy.

He spent the following few years in laboriously building a multi functional electronic robot called "BSF Robot", which could move independently or be remote controlled. It had many features including ability to transmit images using video cameras to TV screens. Emergency search & rescue teams as well as defence forces could use this robot. This innovation got him the National award from National Innovation Foundation in December 2002 and he stepped into the big league.

The list of Prem Singh's innovations is as interesting and impressive as his personality. Some of his notable works include a hand operated dynamo for radios to work without batteries, heartbeat amplifier to send patient's heartbeat signals to a remotely located doctor, anti-collision device for trains, bomb disposal kit, salt regulation meter, cycle rickshaw operated mobile battery charger, automatic tea maker with alarm, automatic water level indicator and a wireless cable TV system for broadcasting audio-visual programmes without linking cables between houses.

He is one innovator who designs what appeals to him and in his own words, *"Main kabhi market ke liye product nahi banata. Main wahi innovations karta hu jis se ki logon ka bhala ho sake. Kuch*

innovations market ke liye achche ho sakte hain lekin samaj ke liye sabhi achche hain. Kisi bhi cheez ko banana mushkil nahi hai. Chahiye bas ek jazba kuch alag kar dikhane ka aur ek nazar jo kamiyon ko pehchaan sake"[1]

As early as 2002, when the concept of mobile telephony was not widespread in India, he had the vision to deploy it as a means to work as a "remote" to control devices from long distances.

Genesis

Coming from an agricultural area, Prem observed the difficulty of farmers faced at night being when they had to go far from home to faraway fields to switch on or off the pump used to water the fields.

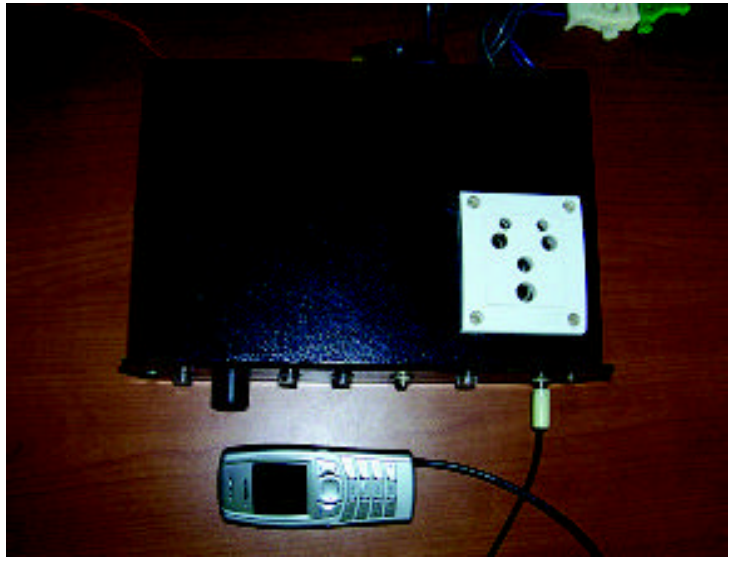
The farmer also needs to know, sitting at home, if the power supply is on at the pumping station so that he can decide whether to switch it on or cut it off if it is running.

The mobile phone operated switch he has designed, addresses all these requirements by enabling farmers to know the electricity status and remotely switch the pump as required, from the comfort of his home and that too without spending any money.

Innovation

The mobile phone operated switch is an instrument with an attached mobile phone and modified circuit, which can toggle a device between switch-off and switch-on conditions and also be used as a conduit to know the status of a remote operating device.

In addition, it allows only authorized users using the specific mobile number to operate the system. It can operate the switch from far off places using GSM/CDMA network. No call/SMS charges are applicable as the control functions by the phone ring. The switch can operate devices ranging from 100W to 1000KW and from 1.5V to 11,000V AC/DC.



The scope of this mobile remote operated device is immense in areas ranging from home appliances (managing devices at home such as microwaves), security (controlling access to buildings) to transportation (controlling car door locks) to industrial applications (such as remotely monitoring equipment in chemical plants.), *etc*.

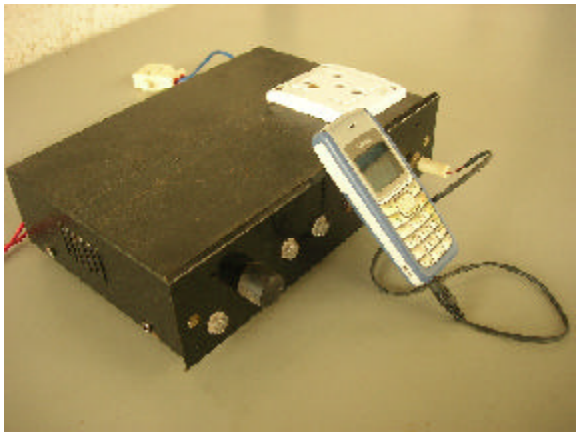
The memory in the mobile attached to the switch ensures that the switch will remain in the functional state as dictated by the designated mobile unless it is changed

The device is a retrofittable kit made up of amplifier, electronic counter, switching unit, relay switch, power supply and timer circuits, which give signal to the mobile phone's inbuilt PCB and completes the operation. The electronic counter counts the number of rings, takes appropriate action according to device status and sends specific signal to the user. In addition, the gadget is able to inform the user whether the device has been switched on/off or the electricity is there or not through a feedback signal.

Infra red and FM operated switches have been available in the market since long and were primarily used by the military. Telephone operated switches are also available in the market[2]. ONGC (Nazira, Assam) has installed one such system to keep a check over pumps' functioning. Recently Nirma Labs (Ahmedabad, Gujarat) students have also come up with a SMS operated switch.

A patent search for similar devices yielded the following relevant patents. A system and method for communicating with a remote location to monitor the device, the system includes a calling transceiver, a central transceiver, and a satellite described in US Patent 5,588,038 dated 24 Dec. 1996. A secure entry system, which uses radio transmissions to communicate with locks, keys, and related components throughout the system US Patent: 6,072,402. dated 6 July 2000 and a method and a device for utilization of mobile radio telephones for surveillance and/or control purposes (US Patent:

[1] Well, honestly, I have never been inspired by the market. I design only those products that I feel will make the life of thousands of people easier. Some of the products may be market friendly but all of them are human friendly. It is not difficult to develop anything. What you require is the desire to do things differently and also the eye to detect the faults.



7,031,665. 18th April 2006).

(Managing devices at home such as microwaves), security (controlling access to buildings) to transportation (controlling car door locks) to industrial applications (such as remotely monitoring equipment in chemical plants, *etc.*)

Currently, standardization of the design is under process to use standardized components including suitable mobile phones /circuitry and reduce cost to suit rural markets.

Variants of this system are also being developed suiting multiple applications under urban and lifestyle categories. The provisional patent has been filed for this application.

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[2] Remote Control via Mobil GSM Phone system with LDR application and GSM SMS on/off systems exist in art. (www.apogeekits.com/remotecontrolviacellphone.htm).

Remote control by cell phone kit is available at www.neropoulos.com. One can stop and begin an electrically driven irrigatory group from distance with this remote control appliance.

http://www.oskando.ee/eng/products mentions about a GSM/GPS-based comfort and security devices for vehicles. http://www.vellemanusa.com/us/enu/product/list/?id=342514 lists many devices, which facilitate remote operation. A remote control system, which does not require authorization from network operators, as there is no connection to the telephone line, is available at http://store.qkits.com/shopping/basket.cfm?Product_ID=284. This kit makes it possible to turn up to three devices on or off over the telephone.

Dual security alarm

Mechanical/Electronics

National Second

Mohammad Aminuddin Ahmed

Sibsagar, Assam

Background

Mohammad Aminuddin Ahmed (30), an illustrious innovator and a man of many interests refers himself as a "Foot path Engineer". He made an audio-visual security system for industrial establishments, which has been well received by commercial corporations such as Oil and Natural Gas Corporation (ONGC).

He is self-employed and lives with his mother and elder brother's family. All members of his family are well educated though he has studied up to Higher Secondary level only. His father, late Mohammad Nizamuddin Ahmed, was a Junior Engineer in Public Works Department (PWD). All his brothers are well settled.

As a child, he dreamt of being an astrophysicist. With growing age, he developed a fascination for machineries. These fascinations made him tinker and develop a lot of innovative devices over time.

At a very young age, he successfully developed a pounding machine to replace conventional machine called "Dheki[1]". He modified it such that it could work with four pestles and also hull paddy more efficiently. This pounding machine won him first prize in a state level science competition.

"Ae machine to bonwar khamoyot moi prathambar trigonometric formula byabohar korisilu aru bostutuwe mok bohut aakorkhon korisil" [2] recollects Aminuddin.

The zeal to master technologies made him spend time and effort at his brother's refrigeration repair shop and very soon, he was repairing electrical gadgets at home. Soon he started troubleshooting and fixing gadgets for everyone in the neighborhood.

Undeterred by the lack of qualifications or training, he persevered and mastered the functional intricacies of many products. Once he spent two and a half months just analyzing and then could finally repair a black and white television set, all on his own.

Being from the minority community, his innovations and intentions were sometimes misunderstood. He once faced such an incident where police took him under custody for two days, as a result of which he suffered with mental tensions due to public denigration. He was let off only after the intervention of NIF, who established his bonafide.

Today things are much calmer and he is now a well-known figure. He is sought equally by people from other communities also who want him to repair a radio or television. He is in demand especially by ONGC officials who need him to troubleshoot larger problems at their installations.

Genesis

Every innovation starts with a pressing need and this was no different.

ONGC and its Security service group, CISF, were looking for a simple security device to communicate effectively among security guards in their oil drilling sites. During full phase drilling process, the

[1] A wooden device for husking paddy

[2] While making the machine I used the trigonometry formula for the first time and that was very interesting

generator and drilling machines produce a loud and deafening sound. In such condition, normal voice or telephone communication between security guards and control room becomes difficult and even in emergency security guards often fail to communicate quickly with one another.

Aminuddin had occasionally worked for ONGC as a power and electronics repair man in the past. Knowing his expertise, he was asked by the concerned officers of ONGC to come up with an alarm system that would work in such conditions.

Innovation

Initially, he came up with a simple system with a one-way alarming signal system, which connected the sub-station to the control room. The system was installed at one of the units of ONGC in Sibsagar. This model was perceived to have some shortcomings such as, inability to give alarm signal to other sub-stations and not being able to acknowledge the receipt of signal by the control room.

It was necessary to develop an improved version that could enable all sub-stations to receive the alarm signal simultaneously and get alert. Also, to enable the control room to send a return receipt signal to reassure the security personals that their message has been received and help is on the way.

Aminuddin finally designed a new type of security alarm device called 'Dual Security Alarm'. In the new system, alarm signal from a sub-station goes not only to the control room but also to each of the sub-station and to a remote speaker, which can be placed anywhere in the barrack or the hall. Secondly, once the alarm is set off from a sub-station only the operator in control room can switch it off thus indicating receipt of message. Thirdly, control room can also give alarm signal to all sub-stations and to a remote speaker with the press of a single 'Alarm to All' switch.

The new model was designed for one main station unit and three sub-station units. The number of sub-stations could be increased or decreased as per the requirements.

In the main station unit, there are three indicator bulbs, one for each sub-station units. This indicator light is to locate the source of incoming alarm by the control room. A reset switch is used to acknowledge and stop the incoming alarm.

The sub-station unit consists of one speaker, one LED indicator lamp and one push-button switch by which the security personal can pass the alarm signal to the main station and to other sub-stations.

The improved model was again installed in one of the drilling sites of ONGC. After a performance validation by CISF and ONGS staff, the improved model was given a green signal for its installation in all the drilling sites and in the DIG's office as well.

The ability to control "one to one" and "one to many" emergency communication channels with loops built in for signaling from substation to main station and vice versa is the novelty of the innovation.

Most of the alternative systems presently use expensive IR, FM, or GSM technology for surveillance systems[3]. This current product uses transformers and simple electronic devices, which makes it simpler and cheaper as compared to its market competitors. There is also no chance

of failure of system due to congestion of networks, which evidently is the biggest problem these days.

One similar innovation, processing apparatus, portable transmitter and remote operation system (US patent No. 20050164728-June, 1987) uses a judgment unit that judges whether a response signal transmitted from the processing apparatus in response to the instruction signal has been received. Personnel property security device (US patent No. 6864789-March, 2005), dual mode panel (US patent No. 6380850-April, 2002) and dual-mode ski alarm apparatus (US patent No. 5260689-Nov. 1993) use electronic circuitry and a wireless transmitter/ receivers. But none duplicate what he has done.

Till now Aminuddin has installed twenty-one Dual Alarm Systems in different drilling sites and offices of ONGC and all of them are working well. Complete patent application has been filed in his name for the innovation with the help of GIAN cell of NIF at IIT Guwahati. He has also been provided risk capital support from Micro Venture Innovation Fund (MVIF), at NIF to complete his first commercial order even though the order was not in his name (due to his technical limitations). This had posed a dilemma to colleagues at NIF but then they took the risk to

help him and the results have vindicated their faith.

This product can be used in almost any factory and organizational establishment, which needs this system for similar security, work status or emergency communication.

His motto for life is *"Jisne thokar na khai nahin jeet uski, jo gir ke sambhal jaya hai jeet usiki"*[4].

[3] Remote security alarm systems are available *viz.* video surveillance systems (www.securityalarmsystems.com), SATELLINE Radio Data Modems (www.satel.com), Alarm/ Remote Start System with two-way communication (www.audio-n-more.com), two-way voice monitoring (www.monitronics.com), Central Security system (www.centralsec.com), Security Alarm Systems (www.securityalarmsystems.co.uk). Most of these alarm systems are primarily based on wireless or CCTV based surveillance system and operated with the use of computer terminals and use high order integration.

[4] Those who do not face hardship do not win; those who persevere after stumbling always win…

Automatic Saree Border Weft Insertion

Mechanical/Electronics

National Third

P. L. Banumurthi

Thiruvannamalai, Tamil Nadu

Background

Bhanumurti (50 years), is an innovative weaver of handloom cotton sarees and has made an attachment to the existing handloom systems to simplify the automatic saree border insertion.

Second eldest among five siblings, Banumurthi did not have a simple childhood. His parents struggled to make ends meet, both weaving on two looms they possessed, and tried to make a living for their family. When he was just thirteen years old, he lost his mother because of which, he had to discontinue his studies and had to start learning weaving to support the family. By the age of sixteen, he was earning bread for his family by weaving.

After his marriage in 1977, he separated from the family and started his own work. He got orders from Chennai and made cotton sarees, jacket pieces, chudidar sets *etc.,* using Jacquard box.

Genesis

Traditionally, all the weavers in his village had the knowledge of weaving in sets only and not *korvai* loom weaving. *Korvai* or 'contrast' weaving involves intricate weaving where the design and often the colour of the borders are different from that on the main body of the cloth. Three shuttles are needed: weaver operates two having an assistant on third.

While Banumurthi was happy receiving orders from Chennai and supplying new designs and varieties in clothes, he still fiddled with ways to improve productivity by using the loom effectively. He wanted to incorporate automatic *koravi* border insertion so that requirement of an assistant can be eliminated.

He worked for a couple of months and in 1985 came up with his automated version on which only simple *koravi* weaving was possible.

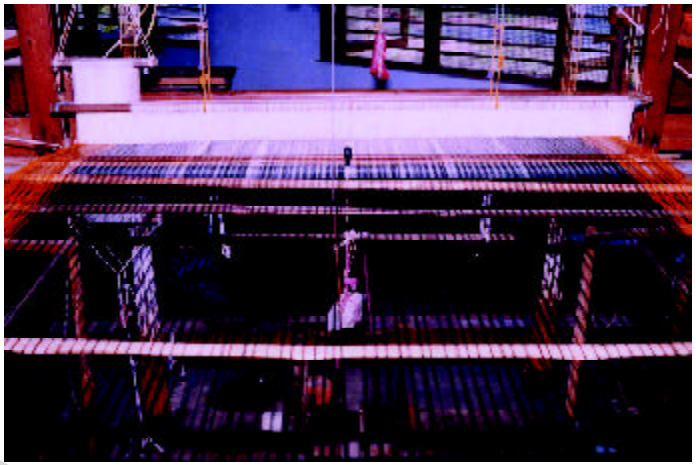
His restless mind did not seek peace with this success and he went on to make a fully automatic *korvai* loom in 1992, after a dedicated work of three months. This machine enabled him to do body weaving and border weaving uniformly apart from giving him the flexibility to weave borders ranging from 1" to 15" in width. Besides, as in modified handloom '*korvai looms*', rakes of all types (Thazampu rake, Sheet rake, Pillaiyar- moku) can be woven on his machine.

Innovation

His automated system is somewhat similar based to the "Catch Cord Technique drawing device for looms" (United States Patent 4616680, 1984) though he was not aware of it. No assistant is needed and productivity gets increased.

In this technique, "Multi Catch Cords" are used to make "Temple Borders". The number of catch cords is equal to the number of steps required in the Temple borders. Each step in the Temple Border is controlled by a separate Catch Cord and is individually operated by Dobby or Jacquard. In this technique, the picks per inch and the weave in temple border and the body of the sari are equal.

This technique does not employ the "Three/two cut shuttle" style and thereby eliminates an additional manpower requirement. The steps of temple border are formed automatically by the operation of catch



cords arranged at different places through Dobby or Jacquard. This results in uniform height of steps and reduces physical and mental strain to the weaver.

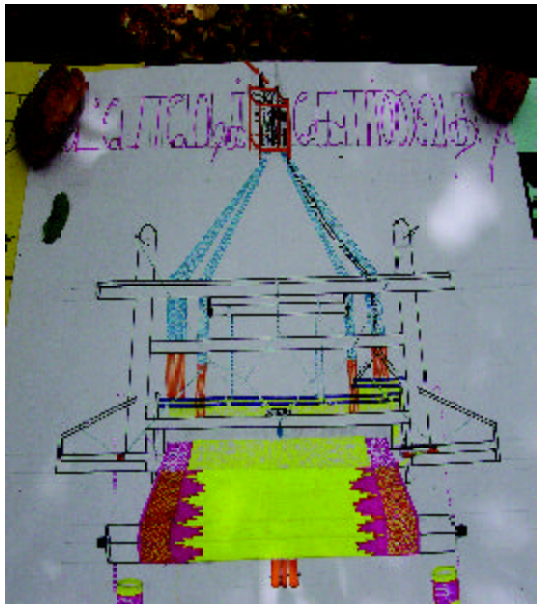
The border warp threads are controlled by Healds, which give perfect/clear shedding and avoid mistakes in the interlocking. Of course, each pick is in two-ply and requires double time in picking to complete, which slows down the rate of production.

On an average, when this innovative technique is used, the production is on higher side when compared to the traditional three-cut shuttle weaving.

Banumurthi has installed one such device in Ramanathpuram village of Madurai district and trained about fifteen women weavers with the help of SEVA, Honeybee collaborator from Tamil Nadu. A couple of years ago there were about 300 families involved in handloom weaving in this village but due to the inadequate income, about 200 families migrated to nearby Tirupur Banian (vest) Factory for labour.

After the installation of this device, response from people has been very good and they are hopeful that those who left the village would be willing to return and take up again, their traditional occupation.

Indian Institute of Handloom Technology has commended this technique and suggested that it may be well adopted in handloom clusters, where Temple Borders are produced. GIAN Cell (Karnataka) is planning to conduct a training programme for handloom weavers in Karnataka region under Technical Education Quality Improvement Programme (TEQIP) of SSIT, Tumkur. Banumurthi was earlier felicitated with the SRISTI *samman* in 2006 for his innovation and contributions to the weaving society.



Conversion of plain power looms into continuous weft feeding looms

Mechanical/Electronics

National Third

S. Shanmugam

Salem, Tamil Nadu

Scout: SEVA

Background

Shanmugam (26 years) is presently in the third year of Diploma course in Textile technology specialising in Weaving at SSM Institute of Textile Technology in Namakkal, Tamil Nadu. He developed a technique to convert plain power looms into continuous weft feeding looms, without changing the pirns frequently. He got admission directly in second year of this course and that too because of his innovations, which started when he was still in school. There are not many examples of this kind that have to come to NIF's notice so far in the country.

Shanmugam belongs to weaver's community. Around two hundred families living in his village earn their living by weaving and agriculture, growing cotton, sorghum and millets.

He is the second child of his parents and has an elder sister who is married and a younger brother who is studying in second year of Diploma in Textile marketing management, in the same college as Shanmugam.

Since childhood, he had active interest in reading books rather than playing games and spent most of his time in the village library. It was here, while in class 12th, that he read an article on NIF in a magazine and got interested in the campaign and later submitted his entry.

Genesis

After completion of his studies, his parents coaxed him to work in his uncle's power loom centre as a daily wager. There he observed the wastage of time and requirement of manpower in changing the pirn windings in power loom systems. He started thinking of new ideas to over come these problems.

To begin with, he secretly started experimenting at his uncle's power loom without being noticed. Though he met with failures, he made sure that the productivity of machine was not compromised because of his experimentation.

As he was interested in learning advancements in the textile industry, he grabbed on an opportunity to take free classes on yarn dyeing, offered by SSM Institute of Textile Technology. It was offered for duration of six months under the "Community Polytechnic Scheme".

There he discussed his ideas with the faculty and the principal, who initially laughed away at his suggestions. Some how, he convinced the principal to give him a try. Having gained permission, he successfully proved his technique.

The dobby systems in power looms are being used only for making border designs but he proved that dobby systems could be used for weaving of fabric with multiple colours. This, he displayed by making slight modifications in shuttles and the dobby.

Acknowledging and appreciating his innovative thinking, college authorities offered him direct admission in the second year of diploma course in textile technology. Pursuing his second year courses, he was also allowed to keep his innovation going as a curriculum based project work, which otherwise is allowed for final year students only.

He also had his innovation published in an article

in a bimonthly magazine, published by Tamizham Textiles, Mumbai in October 2005.

Innovation

All shuttle looms can be modified in such a way that weft can be inserted continuously without frequent pirn change. This method can be used in all types of plain looms attached with dobby and also with drop box/under pick/pick and pick mechanisms.

In ordinary weaving, one has to change the weft yarn during a weft pirn exhaust. In this new method two weft cones stands are provided at sides of the loom and they are specially arranged so that they have the capability of controlling yarn tension and electronic weft stop motion. The yarn from the pirn is only used to bind the weft taken from the cones. By doing so, expense on pirn winding is reduced.

This method of weaving takes place by two weft threads so that the fabric is dense and with good cover. One has to change only cones here unlike rapier looms, where frequent change of pirn is required. This can weave up to one thousand meters thereby reducing manpower and time.

Fifty percent of the total warp threads are lifted at a time and the remaining are kept down for the first pick and for the next pick the system is reversed. To enable this, the heald frames are connected to dobby in such a manner that there is no collision in between the healds.

The dobby mechanism can be used to select the weft colours as and when required. A special mail eye is fitted in the dobby and they are lifted so that the required colour weft can be drawn through a particular mail eye. An additional hole has been made in the shuttle to give proper tension of pirn threads, which interlock the pirn from the cones.

With this system one can weave half of the fabric with one colour, another half with a different colour by keeping two different colour threads in both sides of the cones. By providing more number of cones of different colours at the feeding end (selection of weft colours by dobby) one can weave stripe or check patterns without drop-box mechanism.

The advantages of this system are numerous. For wider width looms this method is very much suitable. Small sectors in the country can increase their fabric production without any additional expenses. Using this method one can weave fabrics like cotton, rayon, polyester, silks using normal plain power looms.

The electronic warp stop motion and electronic weft stop motion on these looms give a fault free fabric. The system is less expensive and easy

to maintain. The productivity improvement in terms of saving of time for weft replenishment is from fifteen to twenty percent. Further fabric quality obtained from this innovation is quite good due to very few stoppages for weft replenishment.

In the preparatory operation, the weft winding, which includes a separate machinery and manpower is practically eliminated. It results in a considerable saving in terms of manpower, machinery and floor space.

In praise of Shanmugam's innovation, the Principal of SSM Institute of Textile Technology says, "this innovation will lead to significant improvement in productivity in the existing low-cost conventional power looms. It can be readily applied in almost all the power loom weaving clusters. Also, it results in a considerable saving in terms of man power, machinery and floor space."

Coming from a weaving background, Shanmugam wants to develop low-cost technologies for traditional weaving community so that they can upgrade their life style.

Retrofitted car for physically challenged

Transport

National Second

Mujib Khan

Jaipur, Rajasthan

Background

Mujib Khan, born in January 1974, is an automobile mechanic from Jaipur. Being handicapped himself, he understood the problems a disabled person faces, when it comes to mobility and has developed a technique to retrofit any car with attachments, making it disable friendly.

Presently, he lives with his wife, and four children. He had an attack of polio at the age of two years. Since no one could diagnose it then, proper attention could not be given, the condition deteriorated, and after a bout of fever, his lower limbs became dysfunctional. Then he was taken to a doctor, who diagnosed it as polio. After starting medication, which continued for years, his physical condition improved slightly. Presently, his left leg is functional and the right one works above the knee, while his hands work normally.

Due to his disability, he had great difficulties in going to school; first, he tried studying at home, then later when he was in class fifth, he took the help of his brother who carried him to school on his back. Afterwards as he grew a bit older and stronger he started going to school on crutches and later, both the brothers started using a moped for traveling.

Though physically limited by his condition, he was not a man to sit at home and rue his fate.

In the 1990s, he started his business of making bedsheets on order and selling them to exporters. As the export market became dull, and objections rose over use of certain dyes in the material, he had to change his line of work. With his keen interest in mechanical things, he then started a scooter and motorcycle-repairing workshop at Jagatpura crossing in the city, few kilometers away from his village. In this small 5' by 5' workspace, he did all types of work on two-wheelers including repairing, tinkering and painting.

In spite of his handicap, after a lot of trial and error, he developed the hand-operated car and showed the way to be independent. This made Mujib a hero of sorts and a role model for the youngsters in his area. All the people in the locality, especially the kids, take pride in the fact that he lives there. Though people made fun of him earlier, now they see him for what he is-the beacon of innovation who changed his life and that of others.

On the road, people and traffic police officers get into a state of disbelief to see Mujib stop and get out of his car on crutches. Difficult for them to imagine a man with impaired limbs, drive on the main highway!

Mujib has this take on life, "*Viklang aadmi bhi kisi se kam nahi hai wo bhi sab kuch kar sakta hai*"[1].

He feels through his work, he wanted to prove this to everyone and show the way to others like him so that they can believe in themselves and start living with self-respect. This, he feels will make them less dependent on others, give them confidence and help gain social respect.

Genesis

Though they had a Maruti van at home, which was used by his father and brother, Mujib regretted the

[1] A handicapped is in no way inferior to any other normal man and even he can do everything himself.

fact that due to his disability he could not drive around.

Hiding from the family, he started his work on the car. After initial experimentation, he attached a rod to be able to operate brake and accelerator and drove the car in the absence of his parents and once even got caught by his maternal grandfather. After listening to his story and acknowledging his zeal to be independent, his entire family appreciated his efforts.

Once he had completed his initial modification, he slowly started to learn to drive the vehicle. In about a couple of month's time, he had perfected his driving. No body helped him at any stage and he learnt all by himself. Then he took his van to his workshop to incorporate a system wherein both normal and modified mode of driving can be fitted.

He worked on it for six months, still the modifications in the car were looking like jutting intrusions and not blending with the vehicle dashboard, facia and controls. However, slowly people started acknowledging his efforts, the process of evolution continued, and he started making the attachment commercially. After modifying dozens of car, he at last became successful in developing such a retrofit, which perfectly blended with the car interiors.

He modified the existing Maruti 800, Mahindra Scorpio, *etc*. to make it suitable for people with lower limb impairments. The modifications were made in brakes, clutch and accelerator. All these controls were modified in such a way that hands can operate these. For the person with one leg, the clutch remains at its original position while the other controls are modified to be operated by hands.

These modifications were made in such a way that a normal person could also use the cars in the conventional fashion.

Innovation

The innovation lies in the modification to accelerator, brake and clutch arrangement for operation by hand. Comfort, simplicity and ease of operation are other features embedded in the controls.

There are references in literature for modifications in cars to suit handicaps[2]. Most of them have the telescopic mechanical members for actuating brake and accelerator pedals. Mujib has used parallel system for hand-operated controls, which enhances safety.

The principle consists of modifying the driving actions so that the controls are transferred to hand by use of leverage, wires and linkage mechanism.

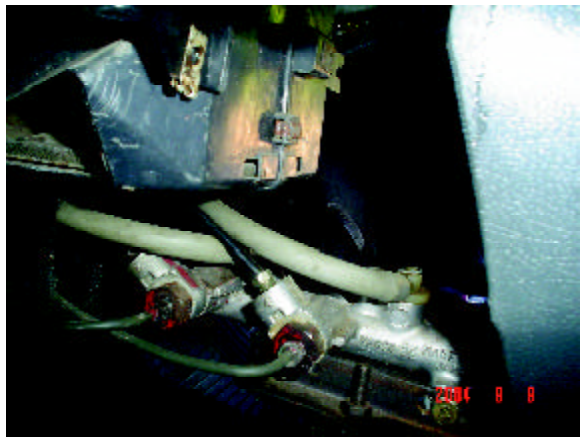
Brake pedal is activated either by mechanical arrangement made of linkages or by using an additional hydraulic cylinder arrangement.

Using the push-pull type switch, installed on the dashboard, the accelerator gets activated through a wire connecting it to the engine.

The clutch wire is connected to a semi-circular hand steering element, which is connected through the steering assembly to the clutch plate to operate the clutch.

Currently, the design is adapted for Scorpio and Maruti, and has to be standardized for any other vehicle. The innovator wants to modify the kit to meet the needs of physically challenged users with one hand and one leg and reduce the cost.

This kit is especially important, as many car companies have discontinued the expensive custom solutions that they had earlier introduced for physically challenged people.



Mujib works on a single car at a time and it takes him around 3-4 days to work on it. The price of attachment varies from model to model. The kit for a Maruti 800 costs around Rs. 10,000 while a similar one for a Honda City could cost anywhere between Rs. 15000-20000.

His first commercial kit was made for Mr. Chandra Pal Singh, SMS Hospital, Jaipur in the year 1995, who was really satisfied with his work and helped him get orders to modify another 15-20 cars. Now after modifying around 70-80 cars, his kit has blended ubiquitously with the existing car interiors like an 'invisible presence' in the cars that help physically challenged people with non-functional lower limbs.

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[1] A handicapped is in no way inferior to any other normal man and even he can do everything himself.

[2] Automatic/manual transmission for hand operated bake, accelerator and clutch (http://www.handicappedpeople.com/faq.htm#one), manual hand operated brake, clutch and accelerator controls in the car for handicapped (Rajesh Sharma, Biju Varghese, Vaghaji bhai, Vinod bhai Panchal, Ninny-NIF Database), fully hand-operated manual transmission fitted with a vacuum-clutch (developed by Mr. Ferdie, Mumbai. www.indiacar.net). Brake and accelerator controls for handicapped (US Patent No. 5,103,946 - Apr.14, 1992), dash mounted throttle and brake control (US Patent No. 4,436,191 - Mar.13, 1984), engine throttle and brake control mechanism having a hand operated input lever (US Patent no. 4,627,522 - Dec.9, 1986), a hand controlled apparatus for the controlling of a brake pedal and accelerator pedal (US Patent No. 4,998,983 – March 12, 1991), device for manually operating the brake and accelerator pedals for a vehicle (US Patent No. 4,946,013 - Aug. 7, 1990), hand operation of throttle & brake pedals (US Patent No. 4,788,879 – Dec. 6, 1988).

Retrofitted car for physically challenged

Transport

National Third

Biju Varghese

Mukkuttuthara, Kerala

Background

The story of Biju Varghese is one of inspired determination, courage and battle for self-reliance and compassion for others. By making the retrofit kit for cars rendering those disabled friendly, he has become an example for society that obstacles for physically challenged people are not merely challenges but stepping-stones for success.

Biju's family consists of his father, mother, younger brother and five sisters. All the sisters are married and settled. Thirty years back his family migrated to present place of Mukkuttuthara.

Being a hands-on person since childhood, with little interest in studies, he could only manage up to 10th standard in the local school and then joined his brother in law, an electrician engaged in repairing electrical and electronic goods, in his work.

Excelling in this profession, he prospered and had a busy life from morning to late evening till the fateful Friday.

Genesis

On that fateful day, life took a decisive turn, which sent him into a tailspin. He still remembers the 'unfortunate' incident that taught him bigger lessons in his life. On that black Friday in 1997, the happy 20 year old, sitting on the backside of his friend's bike was returning from Kottayam.

Hit by a speeding bus, thrown in the air and falling a few meters away in the main road, he ended up with a damaged spinal cord. He spent three days in coma and one frustrating year in the hospital with both legs totally paralysed. Fervent worship did not alter his condition and he came out in a wheelchair and became an object of sympathy for everyone. All this added to the frustration of a once energetic efficient technician.

Not to stay idle, he remained in the bed by spending time watching T.V. and radio. One day on National Geographic channel, he saw the huge sophisticated US President's plane being navigated by the pilot just by using his hand.

He observed that mere fingers controlled all the major operations.

An idea sprouted in his mind.
Why can't I use a similar mechanism in the car by which all operations can be controlled by hands?

He concluded that if he were to do so, he could move anywhere he pleased without any body's help.

Interacting with car mechanics and encountering much skepticism, he built a series of prototypes while improving on his basic idea, finally getting it right. It was quite a journey chasing utility and comfort using one hand to drive a car.

The initial attempt was not a great success. Clutch, brake, accelerator and gear were close and it was very difficult to move clutch with mere fingers. Next, he made changes in the clutch and more leverage was given to it. The application was transferred to upper thumb and fore hand.

He was filled with joy that it was working. Still it needed more improvement. He felt pain in the left

hand by using this system.

He then made five prototypes and spent more than fifty thousand rupees. Finally he succeeded. He traveled in his retrofitted car for the first time alone from Erumely to Mundakayam. This boosted his confidence.

Those who looked at him sympathetically then started to admire him.

He then brought a new 'Wagon –R' car and incorporated this system in the new car successfully. He mentions that this system can be installed in any car, which is using power brake.

Innovation

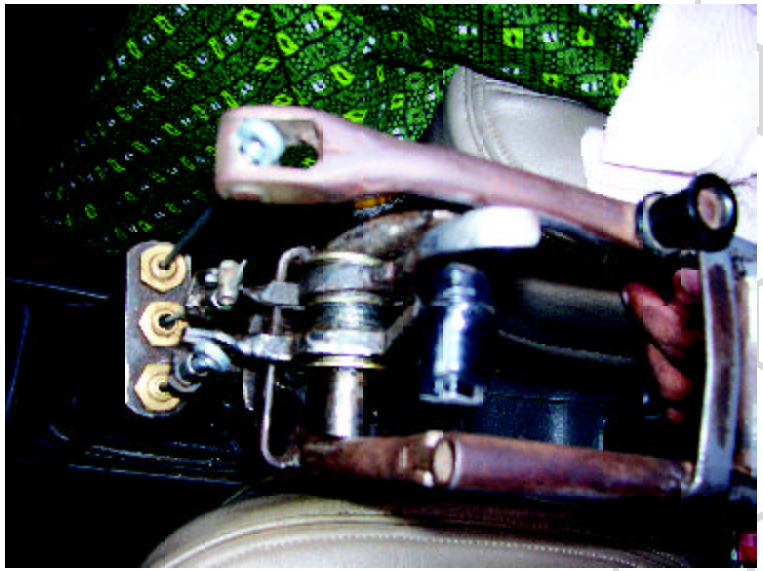
The innovation is a modification kit that can be fitted to cars for lower limb physically challenged. With the retrofitting brake, accelerator and clutch controls can be actuated with a single hand. This fitment can be retrofitted in any vehicle with a power brake. Specific illustrations are already there in art.[1]

Physically challenged people who do not have one or both legs can use this car efficiency. The modifications made are in brakes, clutch, gear and accelerator. All these controls are modified in such a way that hands can operate them. Controls are transferred to hands by use of leverage and linkage mechanism while using the power transmission of existing system.

The modified brake is operated by the middle as well as adjoining finger by pushing the brake lever downwards, which is connected to the brake pedal of a car by the two-wheeler brake wire, as a connecting mechanism.

The clutch is operated with the palm. When clutch lever is pushed downwards, the clutch pedal is pushed and disengagement of clutch takes place. To engage the clutch, lever has to be released gradually. This action is also transferred by use of two-wheelers brake wire cable.

The accelerator is operated with forefinger by pressing the accelerator lever downward similar to hand operated brake level.



The system can be fitted into any model of car and the incorporation cost ranges between Rs 4000-4500/-. The repair kit for the system is quite easy and ergonomically also the system is comfortable.

Having perfected the unit satisfactorily and installed in his Wagon-R and driven over 50,000 kilometers using his left hand, he has become a role model in society and been transformed from an object of sympathy to an object of admiration.

Now he feels peaceful that he confidently "standing on his own legs". He is running his own shop selling and servicing electronic goods with lot of satisfied customers. He also repairs and assembles stabilizers, invertors and mobile phones. He is also well versed in plumbing. He himself acquired all his skills, without any formal training.

Social impact

He feels that depression is the major obstacle for handicapped people who cannot lead a normal life. To instill hope and self-confidence in them, he has made it his mission, to take out his car, driving himself and visiting them and showing them his achievements to convince them that many things are possible for handicapped persons and advising them to *'wake up'.* He has already developed a big network of handicapped persons.

In many ways, he feels that accident has given him the power to expand and discover his own abilities.

He also acknowledges that the presence of close friends is his strength. He feels he owes his successes to the timely support of his friends. His friends help him to get into car and also for getting out every day. At the initial stages of development of this technology, his friends were the main supporters both morally and physically.

He also feels some slight improvement in sensation in his paralyzed legs and feels this may be due to his increased confidence affecting body healing.

He considers the appreciation he received during the Shodh Yatra in December 2005, one of the most memorable recognitions he got. After this recognition, the broadcast media has given wide coverage for this innovation.

The local handicapped association in 2006 also honored him with the '*Vikalanga Sangam*' Award with the award given away by the state minister CF Thomas.

There have been a lot of queries for his innovation from all over Kerala and most of them were from disabled people.

These phone calls convinced him the widespread need of this device.

He is interested in licensing the technology to any entrepreneur or industry. He feels that he should license the technology, as with his physical condition, he will not be able to run an industry himself.

His advice to fellow innovators is not to loose confidence and to remember *'where there is a will, there will be a way'*.

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[1]Automatic/manual transmission for hand operated bake, accelerator and clutch (http://www.handicappedpeople.com/faq.htm#one), manual hand operated brake, clutch and accelerator controls in the car for handicapped (Rajesh Sharma, Mujib Khan, Vaghaji bhai, Vinod bhai Panchal, Ninny - NIF Database), fully hand-operated manual transmission fitted with a vacuum-clutch (developed by Mr. Ferdie, Mumbai. www.indiacar.net). Brake and accelerator controls for handicapped (US Patent No. 5,103,946 - Apr.14, 1992), dash mounted throttle and brake control (US Patent No. 4,436,191 - Mar.13, 1984), engine throttle and brake control mechanism having a hand operated input lever (US Patent no. 4,627,522 - Dec.9, 1986), a hand controlled apparatus for the controlling of a brake pedal and accelerator pedal (US Patent No. 4,998,983 – March 12, 1991), device for manually operating the brake and accelerator pedals for a vehicle (US Patent No. 4,946,013 - Aug. 7, 1990), hand operation of throttle & brake pedals (US Patent No. 4,788,879 – Dec. 6, 1988).

Power tiller operated stubble shaver, Sugarcane trash grinder, Tractor operated stubble shaver

Farm Machinery

National Second

Ganesamurthy Asari

Cuddalore, Karnataka

Background

Owner of an agricultural repairs shop, Ganesamurthy (47), has come up with these three useful implements to help farmers in their agricultural work.

In his native village, agriculture is the main source of livelihood for most of the people, with sugarcane being the major agricultural crop of this area. Initially, he engaged himself in agriculture but later joined his father in his repair shop and learnt some of the basic techniques in cart making from his father. Being inquisitive, he explored and mastered details about the working of tractors and farm implements and went on to establish a tractor repair shop.

In his family, Ganesamurthy has a wife and two sons. His sons have completed their studies upto the secondary standard and they are now managing his father's workshop. Ganesamurthy on the other hand studied only upto sixth standard and had to discontinue his studies in order to assist in his father's bullock cart repair shop.

Genesis

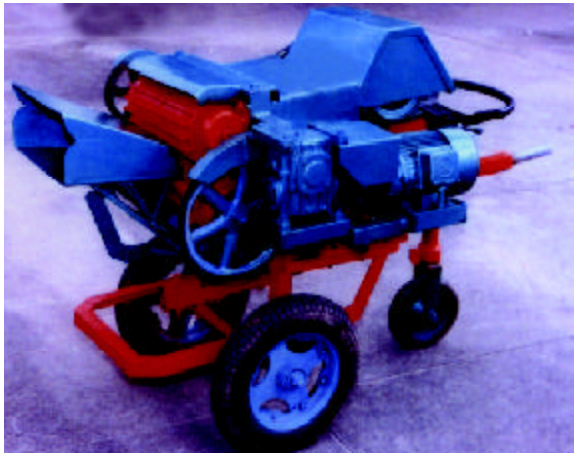
His village was surrounded by sugarcane fields, and growing in this environment, he could relate to the problems associated with sugarcane harvesting and the effect of shortage of labor to do all the required tasks in time.

Therefore, in his workshop, he started designing and building customized implements such as stubble shavers, the tractor operated off baring plough, which can be fitted on to tractors and tillers. The agriculturists in his locality accepted these options, since they were practical, effective and were able to solve their local problems.

The story of the development of the sugarcane trash grinder, one of his innovations, is quite interesting. It started with his belief that chemical fertilizers affect the agricultural land adversely and in order to maintain the fertility of the soil, something natural should be used instead of the chemicals.

Since sugarcane leaves were aplenty, so he thought of using them as an alternative source of organic manure for agricultural crops. However, he later realized that the usage of sugarcane leaves would be practically difficult in the field.

Hence, he developed the sugarcane trash grinder to create compost and cattle feed and progressively refined the product and sold it locally. Similarly, for the other two products, he felt that the existing options did not give enough help to the farmers so



he came up with his own solutions.

Innovation

Power tiller operated stubble shaver

Sugarcane stubble shaving has to be done immediately after harvesting, before it becomes dry. The manual methods employed are tedious and impractical and affected by labour shortage.

This machine is a power tiller operated sugarcane stubble shaver and helps in good ratoon management. The cutting mechanism is rotary on a horizontal plane and unique as compared to swinging blades available in most of the alternatives[1]. This enables fine and closer depth of stubble cutting.

It can also be used as a vertical axis rotary tiller for weeding and intercultural separation in sugar cane cultivation. This attachment can be fitted to all kinds of power tillers.

The disc blade is used for stubble mulching and intercultural operation for row crops. The fuel (diesel) consumption is around 3.7 liters/hectare and the field capacity is 0.4 hectare/hour.

Tractor operated stubble shaver

Similar to the power tiller operated stubble shaver mentioned above, this device is a tractor PTO operated rotary horizontal disc type stubble shaver, provided with a depth wheel to control the depth of operation. The unit can be fitted with a 35-40 hp tractor through a three-point linkage mounting.

It can work in a single row for stubble shaving and achieve better crop management in sugarcane cultivation. The unique innovative rotary cutting mechanism is able to give fine and closer depth of stubble cutting as compared to swinging action of conventional cutters[2] (rotary slasher/mower, shrub-master, stable shaver, *etc*).

The fuel (diesel) consumption is estimated to be about 8.6 litres/hectare, with a field capacity at 0.8 hectare/hour.

Sugarcane Trash Grinder [3]

The innovator lives in the sugarcane belt where the composting process took many months because of the large size of the organic feed. To bring down this time, it was felt necessary to reduce the sugarcane trash feed to smaller sizes by using this machine to crush it to sizes ranging from 2-20 mm.

The sugar cane trash grinder, which can handle both dry and fresh sugarcane trash, has a safe feeding chute with rollers that take in the input and then it moves on to a heavy duty grinding drum powered by an 3HP electric motor and the size reduction up to two mm is done by the crushing action.

The machine can grind dry sugarcane trash up to 350 kg per hour and is useful for compost preparation and to prepare cattle feed as well. The whole unit is mounted over a trolley with wheels so that it can be easily shifted anywhere.

Apart from selling them locally, he has also sold his machines to EID Parry, a large engineering conglomerate. The company has appreciated his innovative efforts in developing these machines. He wants to patent his innovations so that his sons can enjoy the commercial benefits. Patent for the same has been filed by NIF on his behalf.

1 Power tiller operated implements for weeding and land preparation is known in the art. Light weight power tiller (http://agricoop.nic.in, www.icar.org.in), Power tiller operated rotary tiller (www.indiamart.com, www.indianindustry.com, www.sasmotors.net, www.kubota.com, www.vsttillers.com, text books on etc), Mini power tiller for weeding (www.indiaagronet.com), Garden Tillers & Soil Cultivators (http://www.hoffcocomet.com) etc. The tractor operated implements which are being employed for stubble shaving are rotary slasher/mower (www.jaikisan.org, www.shanasheel.com),

shrub-master (http://agricoop.nic.in), stubble shaver (http://agricoop.nic.in), etc. The shrub master, rotary mower and the stubble shavers has the swinging blades for cutting stubble/shrubs/grass. Weeding can also be practiced using these implements.

[2] Sugar cane stubble shaving (causes better ratooning) is well known practice. The implements/machines which are being employed for this job are rotary slasher/mower (www.jaikisan.org, www.shanasheel.com), shrub-master (http://agricoop.nic.in), stubble shaver (http://agricoop.nic.in), etc. The shrub master, rotary mower and the stubble shavers has the swinging blades for cutting stubble/shrubs/grass.

[3] The chaff cutters, forage chopper and grinders have been available for many years (text books, www.indianindustry.com/agriculturalmachinery, www.indiamart.com/damil-engg, www.kisancom.com, www.icar.org.in, www.agricoop.nic.in, www.indiamart.com/bansalironfoundary, www.aureka.com). US patent No. 5,199,653 (Nov. 1991) described a shredder/chipper discharge assembly for varying size of the shredded materials. US patent No. 5,605,291 (April 1994) described a disc type chipper/mulcher having multi-blade flails; a screen for governing the size of the processed materials. Some of these are motorized and the others are manually operated. They are used for chopping green grass, forage or plant leaves and the shredded particle sizes in the range of 5-20 mm.

Whole stalk paddy thresher

Farm Machinery

National Third

Late Shri Dilip Sinh Rana

Surat, Gujarat

Background

Late Dilip Sinh Rana thoughtfully developed the paddy thresher, where the stalk of the paddy does not get broken during the threshing process.

Dilip Sinh's family originally belongs to Unchedia village of Bharuch but he had to shift to his father in law's place after his marriage in 1974, as his father in law did not have anybody to help him in his work. He completed his education till class tenth and then started his diploma in mechanical engineering but unfortunately had to drop out in the first year itself. Since then he had been involved in farming until his untimely demise in March 2006.

He is survived by his wife, three daughters and a son. His son, who is 20 years old, has taken care of the farm after the death of his father. The family owns around twelve acres of agricultural land and produce paddy, sugarcane and other vegetables.

Since his childhood, he possessed leadership qualities and his friends and others used to come to him to get help and seek advice. While in his teens, he made a projector all by himself on which he used to show movies to the children in his area.

He was always ready to help others. Instead of waiting for things to happen he believed in working and making things happen. Without having any technical knowledge he was able to mend electricity connections, machines, automobiles, *etc*. He never said no to any one who approached him for help and tried to help in whatever way he possibly could. Since he was a farmer, he always thought of ways to make life easier for them, without thinking of getting any financial support or recognition in return.

Genesis

Traditionally paddy is threshed by beating followed by winnowing and cleaning by the fan. Paddy stalks are the main source of fodder for the animals in the region and in addition they are the raw materials for paper industries. There was shortage of labour and hence the labour charges were quite high too.

These constraints were the basic ones when he planned to make such a machine. To overcome this labour intensive paddy threshing and to conserve the paddy strains, Dilip Sinh developed paddy thresher where the paddy grains and stalks are obtained separately at the end of the threshing process.

He conceived the idea to develop this machine sometime in 2003, after which he made elaborate diagrams on paper. The same were presented before GIAN- NIF during his visit in early 2005, after which some financial support was provided to him to develop the machine. The development of the present machine took seven to eight months.

Innovation

The proposed innovation is a hybrid product of two well known concepts *i.e.* threshing by beating and retaining the whole stalk and is a pollution free and environment friendly technology.

The concept of rubbing the crop in between threshing drum and concave and obtaining the whole stalk of the paddy while threshing is in use[1]. US patent nos. 4185642, 3963032, 4174718, 4821744

and 4489735 describe the threshing mechanism for paddy, wheat and similar crops. In all these mechanisms, threshing of the crop is achieved by rubbing of the ear-heads in between the threshing drum and the concave. No whole stalk of the paddy is retained in these threshers and is blown out in the form of chopped material called *bhusa* (husk).

However, the proposed innovation is different from the threshing concept, here threshing is achieved by beating action, which is mechanized by using tractor power through PTO.

It consists of self-made frame, feeding mechanism, threshing mechanism, and cleaning mechanism. A pair of pneumatic wheels is provided for transportation purpose. In feeding mechanism tray type hoppers are provided to keep the paddy bunches. Paddy bunches are moved forward through conveyer belts on either sides of the thresher.

The upper and lower conveyer belts are made of thick cotton threads and rotate in opposite direction. The conveyer belts pass the paddy bunch for 1.5 m length during which only ear head portion gets threshed. In this thresher, the paddy is threshed by beating. Four beaters are provided on the central shaft.

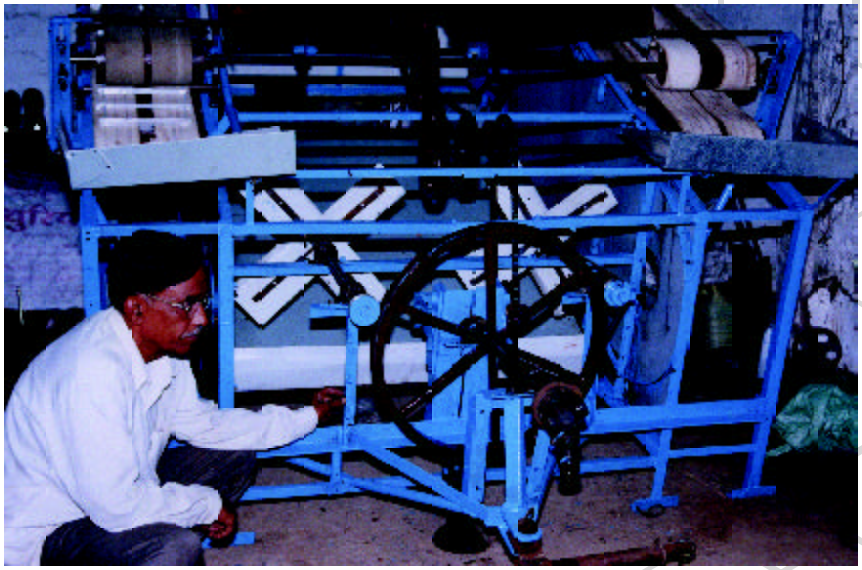
To remove the light foreign material and straw from the grain, two fans (self-made) are provided. The heavy foreign material and stalks of the paddy, which fall with the grains, are thrown out with the help of vibrating elevator, which runs beneath the fans. These fans and the elevator get the drive from PTO of the tractor.

To collect the clean grain, two grain outlets on either side are provided. Three labours are required to operate this thresher apart from the tractor power (it can run even by 2 HP motor).

Since this thresher does not produce husk, it is environment friendly and region specific technology. The cost of the thresher is estimated to be around Rs. 55,000.

Using this machine, whole paddy stalk is obtained instead of chopped pieces, which are the main source of fodder for animals in the area. In whole stalk the nutritional value is conserved, it is easy to handle and very good raw material for paper industry also. The stalks of the paddy yield the income of about Rs. 4000/- per ha.

His son is now making efforts made to double the capacity per unit time as compared to the conventional threshers.



[1] Threshing concept of rubbing the crop in between threshing drum and concave is known in art (http://www.maneklalexports.com/English/AgriEquip/RiceThresher.htm). Moreover, the concept of obtaining the whole stalk of the paddy while threshing is in practice (http://nerdatabank.nic.in/csirfarming.htm, http://www.ficciagroindia.com/technology-options/paddy-thresher.htm, http://www.bossmachines.in/fourbrothers/Agricutural.html) but the threshing concept is shredding by the rotating drum.

White flowered cardamom variety

Plant Variety

National First

K. J. Baby

Puliyanmala, Idukki, Kerala

Background

K.J. Baby has developed a white flowered variety of cardamom, which has higher yield, oil content and recovery ratio than the locally popular varieties.

Presently residing at Puliyanmala, Baby is the native of Ettumanoor. It was here where he was born in a farming family along with three brothers and two sisters. As a child, he was always interested in sports and had a special liking for football. Later when he was sixteen years old, his interest switched over to stitching, as he wanted to develop this skill. He continued this till getting married at the age of 24 years and then he took up agriculture as a profession.

Baby, who studied up to class eighth, is 66 years now. His family consists of his wife, three sons and a daughter. Two younger sons (36 and 34 years) assist him in agriculture while the elder son (39 years) is a cardamom state manager elsewhere; daughter (41 years) is married.

Puliyanmala is a small town, having around 60 per cent Tamil and 40 per cent Malyalee population chiefly comprising of agricultural labourers. The agricultural crops cultivated by the farmers in the region are cardamom, pepper, coconut and on a very limited area, arecanut, banana and lemon are cultivated.

In 1965, when their land in Ettumanoor was bought by the government for establishing industrial estate, Baby's family shifted to Puliyanmala and bought a cardamom estate of around 5 acres. At that time, the climate at Puliyanmala was colder and hostile so cultivation of pepper in this region was not feasible and so the family opted for the cultivation of a local variety of cardamom. It was in late 1970's that the climate began to change to be a bit warmer so along with cardamom they started coffee and pepper cultivation.

In 1982, he added 2.5 acres of land to his total holding through purchase and started growing cardamom. Somewhere around same time the prices of cardamom started to rise hence to maximize his profits, he also started making selection of cardamom so as to develop selections/ varieties that would yield higher. Their family is a joint family and the total land holding now is close to 20 acres. All of their land is under cardamom cultivation, white flower variety covers eight acres, while remaining area is under high yielding *Njallani*, which covers six acres while another new variety, which he claims to have developed recently covers remaining six acres.

Genesis

In 1996, for the first time, he observed a white flower plant in his cardamom garden, which he had never

heard or seen, and so he isolated it and multiplied it by vegetative propagation. At that time itself a lot people showed interest in it, but he did not want to distribute it, as he wanted to observe the results over a period. By 2001, he had raised around 800 plants, which were similar to the mother plant and bore white flowers. Same year, when experts from Indian Institute of Spice Research were visiting his area to inspect pepper, he invited them to his farm to have a look at his variety. They appreciated him for his efforts to develop this variety. Thereafter exposure in media started and subsequently he started selling his seeds 2003 onwards.

Being financially sound Baby did not face any major problems and always had the support of family, friends and relatives. His wife and daughter-in-laws took personal care of the plants, from irrigation, manuring to performing associated farm practices. His wife specially likes this particular variety because of the enhanced taste and flavour. His three sons have been much interested in evolving a variety out of the white flowered mother plant and their involvement, interest and hard work has been instrumental in the evolution, multiplication and dissemination of this variety over the years.

Innovation

The cardamom variety developed by Baby, belongs to *Vazhuka* type cardamom cultivars bearing purely white flowers, has high productivity than other cardamom plants and can be grown in waterlogged areas as well. The variety has wider adaptability to different shade conditions apart from having high production with good quality that is even higher than other *Mysore* and *Vazhukka* cultivars *viz.*, *Njallani*, *Green-bold*, *Palakkudi* and *Veeraputhara* varieties, which are locally popular. It has sturdy plants, robust tillers and deeper root system, which makes it resistant to various biotic and abiotic stresses.

The prominent features of the variety developed by Baby are (a) single tiller planted in the nursery giving rise to 30 tillers, (b) variety having seed last ratio of around 23-26, (c) recovery ratio of one kg dry cardamom from four and half kilograms of green cardamom (d) single plant yielding nearly 4 - 5 kg dry cardamom with size varying from 6 mm to 8 mm and (e) the oil percentage being 8.9 percent as against 6-7 percent in common varieties.

The distribution of this variety started in 2003 when seeds were provided to 200 to 300 farmers from Idukki and surrounding districts of Kerala and border districts of Karnataka covering about 1000 acres of land. As a result, it has now diffused in Idduki, Wayanad (Kerala) and Chikmangalur (Karnataka) and some parts of Tamil Nadu.

This variety has aroused the interest among the researchers, as it was believed that the peculiar color of cardamom flower attracts the insects for pollination, but now presence of white colored flower of Baby's variety negates the whole concept.

Awards and Appreciations

Baby received a 'Certificate of Merit' for being the "Best Cardamom Cultivator" in the public function conducted in Kattappana Fest 2004 by Kattappan Gram Panchayat. He has also received a certificate of Appreciation from Asst. Director of Agriculture, Kattapanna for the new high yielding variety developed by him. Spices Board, Government of India has given him a certification mentioning the presence of white flowered characteristics is unique to farmer-bred variety.

Baby, who has rich experience in plantation crops, desires to share his knowledge with the community. He mentions that '*as far as agriculture is concerned the selection of best quality seeds and technical inputs from research and development institutions are sufficient to prevent losses for the farmers*'. The innovator's ambition is to identify superior characteristics in cardamom plants and evolve newer varieties, which can be popularized to benefit the larger interests of the cardamom grower community.

PNS VAIGAI (Vazhukka) - A New Cardamom Variety

Plant Variety

Naional Third

P. N. Surulivel

Theni, Tamil Nadu

Scout: SEVA

Background

Surulivel (70), a progressive farmer, has developed and propagated a variety of cardamom having the qualities of high productivity, large sized capsules and high growth rate.

His family comprises his wife, son and two daughters. He has been cultivating cardamom and coconut on the 30 acres of land he has in Kerala for the past 40 years.

With plans to start cultivation, he bought a piece of dry rocky land in 1969. The land was mostly covered by weeds like *Pterolobium hexapetalum* and *Lantana camara* and was not suitable for cultivation.

Toiling hard, he moved the big rocks and used them for building rock bunds, which were incorporated with native soil, cow dung and dried leaves. This prevented soil erosion and improved its fertility. As he found the land suitable for cardamom cultivation, he planted many varieties in it.

Since cardamom plants require more shade, he planted *Artocarpus heterophyllus* (Jackfruit[1]) trees between the cardamom saplings.

Genesis

In late sixties, Surulivel started cultivating cardamom (Mysore type) on his farm. Then in 1986, he came across some other varieties, which grew well in both drought and water logged conditions.

His wife who has been quite observant pointed out two plants that outperformed others in the field. He noted the quantitative and qualitative traits of these plants such as growth, yield, and resistance to pests, diseases and abiotic stress *viz.* drought tolerance, water logging, aroma, oil content, *etc.* over the next five years.

A senior scientist of Indian Cardamom Research Institute, visited his field, appreciated his efforts and encouraged him to mass-multiply these two plants by adopting propagation techniques. The words of appreciation from an expert egged him and he started preparing clones of the plants to use them as planting material in his own estate.

He isolated and planted this variety in one acre of land in 1991. He multiplied the selected lines by vegetative propagation. The planting 3 x 3 x 2 feet pits were filled with lime powder, compost and top-soil. The split suckers were planted in pits and protected from wind by supporting the plants with stakes. Dried leaves were used for mulching to prevent soil erosion and to conserve soil moisture. Then organic manure was applied at three months interval.

Five years later in 1996, the plants started yielding. He named the variety as 'PNS- Vaigai', PNS standing for his name (P.N.Surulivelu) and *Vaigai,* which is the name of the river flowing nearby in the Cumbum valley.

Innovation

The PNS- Vaigai seed size is large compared to the local variety *Njallani*. The yield is higher and consistent: 900-1400 kg/acre from 1996 till date. The number of internodes (average 40-45) is higher than in the locally popular varieties. The rhizomes are bigger, bolder bearing 3-4 inflorescences each, which in turn bear around 25-32 racemes each. The rind (skin of capsule) is thin and hence the recovery percentage is higher than *Njallani*. In addition, there is no difficulty in post harvesting. In fact, the driage recovery has been higher than in the local variety.

The market response for it has also been very encouraging and it has been commanding prices, at least 15-20 percent higher than other local varieties. Since 60-70 percent of the produce is 7 mm and above, the income from per unit of land is also higher than other local varieties.

So far he has sold 2,50,000 sapling to many farmers of the region. Now most of the cardamom growers in his area have started growing PNS-Vaigai and a vast area under cardamom cultivation is covered by this variety alone.

Apart from receiving public recognition at local level many times, Surulivel also won ICAR Spices Board's (Kerala) first prize for achieving the highest productivity in cardamom (3250 kg of dried capsules/ha) during the year 2002-2003. High yielding planting material, maintenance of soil fertility through judicious application of organic manures and systematic soil and moisture conversation practices helped him in reaching the top position among cardamom growers.

Given his vast experience and expertise in agriculture, he was invited to NIF's informal Research Advisory Committee meeting in May 2006 to meet fellow innovators and also participate in the traditional food festival, *Saatvik,* organised by SRISTI-NIF in November 2006, where the response to his cardamom variety was overwhelming.

[1] Jackfruit is an evergreen tree, having smaller root zone and provides more leaf litter as compost for the cardamom variety.

Papachchan style of pepper cultivation

Farm Practice

National Third

Francis PA

Payavoor, Kanuur, Kerala

Scout: K. Georgekutty Mathew

Background

Papachchan who had to leave Chakatabara village in Kayanna, Khozihode to settle in Payavoor when foot rot disease destroyed his pepper crop has come up with a very innovative method that promotes sustainable production of organic black pepper and has become a model towards control of the dreaded foot rot disease.

Chakatabara is a densely populated village where rubber, coconut, arecanut and pepper cultivation is the main occupation. From here thirteen years ago, Papachchan (51) and his wife (46) shifted to Payavoor after his crop at his native place was destroyed by the root wilt. His son aged 18 years, is studying at his native place.

Pappachan has studied up to class four and his wife has had some basic education. He is a cultivator and owns three acres of land in all, one acre in his native Chakatabara where he grows pepper and two acres at Cheruvavil, where he grows pepper in 1.3 acres and rubber in the remaining. As a child, he was fond of reading newspapers, magazines and storybooks. At twelve years age, he started working in his father's farm.

Genesis

When he started cultivation independently 1980 onwards, he started closely observing his plants' health; some plants died early while some had a longer life span. He started weighing the situation to figure out how to protect the weak plants.

He believed that heavy rains had something to do with the wilting of roots. To some extent, root wilt was controlled by pesticides and by having proper drainage. This prompted him to develop a natural method of controlling this root wilt.

It took him three problem-filled years and numerous trials before he could refine a process of pepper protection. Since he had limited amount of land, which he had to use both for earning his livelihood as well as for his experiments, he had to be careful as he was much constrained.

Due to frequent changes, the cultivation he incurred financial losses upsetting his family members including his wife, who (fearing the failure of the crop) ridiculed him as he experimented with what was the only means of income. But he was confident that he would come up with something useful for others and that was his driving force.

Innovation

In Papachchan's agronomic practices adequate natural drainage is considered the best for pepper cultivation. He prescribes a two feet deep and one-foot wide trench along the border for isolating the pepper garden from other trees. No pits were taken up for planting.

Pepper is grown as a pure crop in order to avoid intercropping losses. Planting material is prepared by cutting runners just below the nodes to restrict the plant to a single root. Jackfruit is considered as the best of the standards due to its timber value and manorial value of leaves.

Saplings are planted close to standards so that the collar region is about three inches above the ground and is exposed to environmental conditions from the tender age so that the plants develop in-

nate resistance. Mulching is used to reduce the erosion effects of raindrops and to conserve the soil. Mother vines are selected very carefully based on the past performance so as to obtain regular good yields, better growth and pest free cultivars.

The saplings are planted after the start of south-west monsoon rains. *Mucuna_bracteata* is raised as a cover crop, to improve soil fertility and to maintain suitable soil environment for the growth of root system. No tillage is done.

Irrigation is not required under normal circumstances, but if a monsoon break extends beyond 15 days, the field has to be irrigated. The yield potential is double in this method (0.7-1.2 tonnes of dry pepper/acre) compared to conventional farming methods (0.3-0.5 tonnes). In addition, there is no need of weeding, as no weed grows due to the standards and the resistance to foot rot disease is more.

Indian Institute of Spices Research has the following to say about his practice, '*The system developed is unique and no parallel has been reported from elsewhere and the contribution of the farmer is unique and outstanding*'.

Now, his family has become indifferent and they have left him to do whatever he wants and do not pester him with questions. Some family members including his brother and some friends have also adopted his technique of cultivation. At a time when everyone else around has shifted to more profitable rubber plantations, Papachchan is adamantly determined to continue his pepper cultivation his own unique way. *"Arogyamulla krishiyidam, athu vazhi arogyamulla manushiya samoohavum sadhyamanu. Ulpathanum mechapeduthuvan randu margangul mathramanu ullathu, vitthukallude shariyaya theranjudukalum, anuyojeyamaya sthalavum"*[1], says Papachchan.

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1 It is possible to cultivate healthy plants and thus make every human being healthy. There are only two ways to a better yield- proper selection of seeds and the proper selection of the area based on the altitude