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Gujarat





Cotton boll picking machine

State Award – Gujarat; Scout: SRISTI

Dry land cotton is well adapted in certain parts of Gujarat. But cotton bolls do not open in certain varieties and hence cotton cannot be picked up directly. Extracting the cotton seeds and picking the cotton bolls is a tedious job and requires a lot of labour supply. Natubhai, a forty year old farmer from Erawada (Surendranagar district, Gujarat) brought a sustainable solution to this with his tractor drawn mobile cotton boll picking machine which takes the drive from tractor PTO. This machine not only plucks the cotton bolls but also separate the cotton from the bolls.

Natubhai Ratubhai Vader family's comprises mother, wife and two children. Youngest of the six children, Natubhai was pampered a lot by his parents and siblings. As a child he was very curious to know how different machines worked and in the process had spoiled many. It is this fascination along with the understanding of inner working of machineries made him invent the cotton boll picking machine.

The custom of child marriage is prevalent in the Naroda Rajput community like many other communities in India and accordingly Natubhai was married to Puspaben when he was in his early teens. After one year he was sent to a boarding school at Kadi,

Mehsana district where his son Dharmendra is studying now. Meanwhile his elder brothers got job and shifted out from the village. The elder one is a contractor and running a business in Ahmedabad while the younger one is a primary school teacher in Dasada. After they moved out, it became difficult for his father to manage farming activities on his own. He then asked Natubhai to join him and the obedient son complied and discontinued his education. His father believed that the sole intention of education was not to get an employment rather it is a value addition to an individual. Natubhai believes the same. Natubhai, father of Natubhai was a respected person in the village and had a land holding of more than 150 acres. *“Because of his good rapport, the labourers were loyal to him and thus some worked with him throughout their life”*, says Natubhai. For him, agriculture is more profitable than other employment and this was another reason why he took farming as a livelihood option. Natubhai shares that he is earning much better than his brother who is a teacher. The ancestral land was divided among the brothers when his father passed away and Natubhai received 60 acres of land. He also works as a real estate broker. After the farming season, majority of the villagers sit in the *Ram* temple and talk over the various issues. Often they discuss on the crop patterns of the year. Natubhai shares this as a good platform for social exchange.

Genesis of the Cotton boll picking machine

Cotton is one of the main crops grown in the Surendranagar, Ahmedabad and Randhanpur districts of central Gujarat. Due to the water scarcity and other geographic features prevailing in the area, local variety of cotton named Kalyan-V-797 also called as Shankar is widely grown in the belt. Erwada, Natubhai's village, too follows the same pattern. The crop is rainfed and takes about nine to ten months to grow. The seeds are sown during monsoon and the harvesting is done around March to April. Once the crop is ready, labourers are to be employed to pluck the cotton from the fields. This is a very labour intensive activity and often farmers and their families also join the labourers to pluck cotton from the fields. Since harvest time in the entire region falls at the same time the demand for labourers during this season is also increasing. It is very difficult to get labourers in the village and if cotton is not plucked in time, the crop gets wasted. Workers often demand more wages and are not ready to work for a smaller duration of time. Now day's industries started establishing in this area and because of the better salaries labourers preferred to work there rather than in the cotton picking farms. Farmers having small or medium sized land holdings often find it difficult to pay higher wages and bring labourers from outside. Since this is a onetime earning for the farmers during the year they have to get the cotton plucked by some or other means.

Natubhai's father had eighty acres of land. It was difficult for him to employ labourers for the entire farm and hence Natubhai used to support the labourers in plucking cotton from the fields. He noticed the labour shortage during the cotton picking season despite having a big team of sincere and committed labourers. Once while doing his work, the idea of making a machine to do the job crossed his mind. Natubhai says, *“I could not bear to see the problems of my father and other villagers. A lot of cotton use to get wasted. A machine would certainly make the job easier.”*

While Natubhai was conceptualizing his design, he lost his wife in an accident. This caused him tremendous agony. Later his family got him married to Nabuben, a widow

from the same community. She took care of Natubhai and young Dharmendra and after a few years, Ravina was born to the couple.

Meanwhile Natubhai heard the news of *Chetak* - the automated cotton stripping machine made by Mansukh Patel, an innovator (supported earlier by Honey Bee Network through GIAN) from a nearby village which had revolutionized the cotton industry in the region. His success made Natubhai's conviction stronger that his machine will pick the pods one day. He recalls, '*mara biswas drad thai gayo ki mhari machine kaala bins'* (This made my conviction stronger that my machine could pick cotton bolls). When he invested his savings year after year on designing this machine and not getting good results, his wife started complaining. Natubhai spent almost 10-12 lakh of Rupees in research and because of this he was not able to pay any attention to his family's needs. When the first model failed to perform, his wife objected and advised him not to invest further. She wanted him to think about education and future of his children. Natubhai recalls, "*Sometimes, I start from the house saying that I am going out to grocery shop for purchasing oil. However, I would return bringing some iron parts for the machine.*" But this could not last for long. He had already invested more than ten lakh rupees and there was no guarantee that he would succeed. Tired of family's criticism, he stopped working on this machine for about three years. In 2004, SRISTI decided to fund his endeavour which refuelled his ambition. Subsequently NIF/GIAN increased the grant to Rs 1,50,000. He upgraded this machine subsequently.

Natubhai did not have the technical knowledge to design a machine. However he was very determined and believed in learning by doing. "*I believed in the fact that if one wishes to do something sincerely, then he surely finds the ways to learn it. For hours together, I would sit in the field and think about what kind of force can segregate cotton boll from its stalk. Later, when the idea became clear in my mind, I prepared the drawings. I brought some cuttings, drilling tools etc and started working on the design*" shared Natubhai. While working on the field he realized that a vibration action would be needed to make the bolls drop of the stalk. To test his hypothesis, he tried various ways of hitting the plant and finally concluded that a set of vibrating sticks would perhaps serve the purpose. Gradually, he started getting the equipments that he needed to make the machine and opened a private workshop. He has created most of the machine parts in his workshop only. He adds, "*Since I do not have all the equipments in my workshop, I got certain parts fabricated in GIDC cluster. I instructed the workmen there and gave them my requirements.*"

Natubhai also took an assistant for contract to help him which he calls him on the need basis. "*It is good to have someone with you as it keeps one going. Whenever I get stuck up, I can discuss the problem with him*" says Natubhai. He also got suggestions and help from his friend Yashinbhai. It took him two years to improvise the machine substantially.

The Cotton boll picking machine

The cotton boll picking machine is a self propelled one in the form of big chamber that removes cotton bolls from the plants. This was developed to suit the varieties of cotton generally grown in country which does not ripen at same time and is available at the affordable cost.

This tractor mounted machine takes the drive from tractor PTO and can be raised or lowered to a desired height from ground level through hydraulic system. It can be easily attached to a tractor and taken to the field and comprised of four parts namely the vibrator, conveyer tray, suction pump and storage cabin. Every time that the vibrator discs revolves, it gives a strong jolt to the plant and the cotton bolls dropped on the conveyer which collected them and drew to it to the back of machine from where the suction pump sucked these for storage in the storage box. When the tractor moves forward, the cotton plant comes in between the guides which forward the plants towards the plucking unit. The cotton bolls are plucked by rotating the star wheels (3-4 on each shaft) mounted on inclined shaft. Rolling rubber belts are provided on both side of the row beneath the plucking mechanism to carry the bolls towards Suction pipes on both sides. In addition aspirators are also there to suck the cotton bolls through suction pipes. The performance of the machine is found satisfactory.

The machine can be operated with diesel and the fuel requirement for one *Bigha* is one liter. For the operation purpose, the machine does not require any additional power. It can be attached to the tractor. Natubhai says, "Generally tractor requires about 10k HP power after joining this machine an additional 5HP power is required which can be managed with the fuel used for operating the tractor."

Functioning of this machine has been tested by the department of Agriculture and food, IIT Kharagpur and presently the work is in progress on the recommendations. Prior art search reveals that the Cotton boll picking machine developed by Natubhai is different in its concept from those available in market and believed to suit the local conditions. Patent is filed by NIF in the name of Natubhai.



The present model is cost effective in comparison with the existing models. While discussing about this Natubhai says that by attaching this to the tractor he can pick cotton from 3 *bigha* in an hour with one liter of diesel costing about Rs 40 i.e. he can pick approximately 600 kg of cotton bolls whereas, manually a man can pick 100 kg of bolls in a day costing about Rs 30-40 per 20 kg. Hence this machine claims to reduce the cost of harvesting in terms of time and money. Natubhai says that the attachment can be made with Rs 60000-70000 per piece and it should be a fair deal for the farmers. Affluent farmers can have a personal one, others can share or hire as in the case of tractors. He thinks that with a little modification it can harvest Bt cotton also. He says, “*Dimag main to hai, karna padega*”.

Support and Recognition

Natubhai and his cotton boll picker gained attention among media, government officials as well as the public. In 2005 he was felicitated by *Uttar Gujarat Naroda Rajput Samaj* recognizing his efforts to make the machine. In 2006, he received *Sardar Patel Krushi Award* for being the most progressive farmer in the district. In 2007 he received *SRISTI Samman* for his innovations. He also participated in *Baisakh suth teej* where a programme was arranged before the rains for the farmers to meet, interact and learn from each other. He also had a meeting with *Dilip Sanghani*, representative from the Gujarat Chief minister’s office where some scientists were also present. They assured him the provision of subsidy from the state government on the successful manufacturing of the machine.

During the time when Natubhai’s work was stopped because of the financial crisis SRISTI, an organization working for grassroots innovations in Gujarat came forward to support him. In addition he was also supported technically and financially by GIAN/NIF. After the grant was approved, he has upgraded the machine by introducing two



way hydraulic gear system. Natubhai says that most of the grant money has utilized in up gradation of the machine.

People from the nearby villages are aware of the cotton boll picking machine innovated by Natubhai. His community members recognized his contribution and felicitated him with various laurels and awards. Since Natubhai was facing financial difficulties his community members offered him help. He wants to keep his respect and dignity intact and hence has politely refused the financial help from his community. As the news about his innovation spread in the region many expressed their interest in buying the machine. One of the community member of the village said *“Picking cotton is one of the main issues of the farmers here and we have to spend a large amount of money on labourers. We will purchase it even if the machine is bit expensive it as it will save our money over the period of time.”* An elderly members of his village remarked *“Making the machine is a very difficult task and it requires a lot of dedication and application of mind. In the entire village only Natubhai has the talent to create such a machine.”* While discussing about the feedback on the machine, Madebhai Vadher, another senior from the village shared *“mehnat bau kareche, thai ja se”* (If one puts in a lot of efforts, the work is completed). He further added when machine for reaping, drilling, cotton stripping etc has come, why won't cotton boll picking? It has no reason not to succeed and everyone will come to him asking for the machine as the demand is high. In a way Natubhai was creating market for his 'virtual machine' which is yet another step ahead.

Prakashbhai K Dodhiya, the dealer and supplier of Fergusson tractors in the whole district informed us that people are willing to pay around 1.5 lakh or more for the machine. He said that the when farmers can pay 1.25 lakh for a thresher then for this they can pay anything around 2-2.5 lakhs because it will be a dream machine for them. The cost will be recovered from the saving on the labour cost.

Way Ahead

Once the machine design is complete, Natubhai has plans to start a manufacturing unit at his village. Since he has a lot of land and electricity is not a problem he finds it convenient to start the unit in his village. He is also thinking of adding a cotton storage area in the same machine. He also aspires to make a vehicle runs by magnets, which Natubhai assures will be done soon.