

Innovation Incubation at Grassroots

# Groundnut Digger cum Separator

Yusuf Khan, Rajasthan, India



## A Case Study

By

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## **Executive Summary**

Yusuf Khan, an innovator from the soil of Rajasthan, India who traveled across the globe to settle down but could get settled only on his motherland because the destiny wanted him to serve his village and solve the local needs through his genius. He run a general store when he was 13, operated a flour mill too, got into building contractor ship, trading of old vehicle but ultimately found peace in the execution of creativity that was within himself.

At 25 he observed the local problem of groundnut farmers at Sikar in Rajasthan, India and the innovator started working out a solution. The problem was of picking up leftover groundnut pods under the soil which are picked up manually consuming lots of labour and time. At times in the labour constraint, the crop gets spoiled and the next crop also get affected. Yusuf worked out a mechanism to automate the process and soon he could come up with a working prototype of a groundnut digger cum separator which could be operated with the help of a tractor. This model had several lacunas which were rectified over a period of time and finally in 2002 the final version of the device was developed which was well accepted by the users.

Yusuf got linked with the Honey Bee Network whose prime motive was to get due recognition to the unsung heroes and heroines of India society who were under privileged in terms of formal linkages but were knowledge rich. His efforts got recognized and he was honored with National Award which was conferred by the Honorable President of India. It was like his dream come true and he decided to link more of his kind with the network and help as many people as possible to reward their creativity. This synergy brought him name and fame not only at village and state level but he got recognition at National level.

He extended his business with the help of other network partners who helped him financially as well as by providing formal linkages with the Universities and Institutes to get his efforts attested. His technology found applications in other products to make them more efficient and economical and entrepreneur from other part of the country got inclined to tie hands with Yusuf. Even the Scientific and Industrial research Department under Government of India came forward to support the development of a new product using this technology.

Today Yusuf is quite satisfied with his work and is mainly focusing in shaping the career of this children. He still has regret for not studying beyond seventh which kept him away from many opportunities and wants that his children should not have this obstacle.

### **Background**

The innovator, Yusuf Khan was born in 1973 in a village called Jeweli in Sikar District of Rajasthan. His father was a policeman and normally use to be away from home. He was youngest among the six brothers and three sisters. He studied till seventh and was inclined towards the machinery work since his childhood. At the age of 13 he opened a general store and a flour mill in the village and moved to Kuwait in 1990 when he was 17 where his elder brother were already engaged in business. In Kuwait he was mainly working as a building contractor in the initial years and later on switched to the trading of used vehicles. He made money and came back to India in 1998 and setup a mechanical workshop for manufacturing and repairing of agriculture implements in Sikar. In parallel he was also involved in trading of used tractors.



Yusuf has three sons and one daughter who are currently engaged in studies, the elder being of 16 years and the younger being of 6 years.

### **Genesis and details of present innovation**

Two-thirds of Rajasthan has sandy soil and groundnut is grown all over the state. The process of groundnut digging involves digging up the ground and separating the pods from the soil. But normal groundnut harvesters fail to dig out all the groundnuts from the field and many pods still remain in the ground. These have to be manually extracted by laborers. The work is not just strenuous and time consuming, but also costly for the farmer.

The manufacturing and repair of agriculture implements and trading of old tractors linked Yusuf to different farmers of the region. While interacting with the farmers, Yusuf noticed that many time the harvesting suffers due to labour constraints. The problem got latched in his mind is he started thinking a solution. During a tractor deal he saw a big groundnut picker with a farmer who was not using it due to its cumbersome size. This gave Khan the idea of mechanizing the whole process and led to the development of this unique machine that meets the needs of the farmers and saves a considerable amount of money, time and effort. He developed the first prototype in four months but it took him four year to come up with a better version of the groundnut digger developing several versions in the durations. In 2002 he could modify the unit to the level that it became trouble free and was well accepted by the farmers.



The groundnut digger is a tractor mounted device which is used to dig and separate the left over groundnut pods from the soil.

#### Development stages

- 1998 - Problem was identified while interacting with farmers
- 1998 - Idea for groundnut digger cum separator was originated
- 1999 - Successful development took place and units were sold to farmers. The unit showed some mechanical problems and needed maintenance frequently.
- 2002 - Trouble free unit was developed. By the end of the year he sold a total of about 35 units in various parts of Rajasthan.
- 2003 - The technology got diffused and some other local manufacturers also started manufacturing the same unit.





### **Introduction with Honey Bee Network (Scouting)**

In the year 2003 Sundaram Verma, a Honey Bee collaborator for Rajasthan visited Sikar to his relative. While discussions he came to know about Yusuf Khan's work. He visited his workshop and discussed his work in detail. Sundaram submitted these details with National Innovation Foundation (NIF) in the third National Competition on Grassroots Innovations. On evaluation by the experts it was found that the work of Yusuf Khan is one of its kind and useful.

### **Recognition & Award**

He was awarded first by NIF under the National Award category in the above said competition in the year 2005 and Honorable President of India gave away the award. This was the prestigious movement for Yusuf Khan as he never thought that he would be awarded one day for this work.



Apart from this Yusuf Khan has also been nominated for the Asian Innovation Awards 2005 and has qualified among the ten finalists.

He has been honored in several district level events and has gained name and fame after introduction with the Honey Bee Network.

### **Extension of support by network partners**

- After the work of Yusuf Khan got recognition, it was supported by GIAN-North for getting formally evaluated by organized sector. The details were submitted to Rajasthan Agriculture University. They appreciated the work and took it as a project for further testing and evaluation. The detailed formal testing and evaluation has been conducted and this innovation has been found fulfilling its task satisfactorily.
- Further the innovator was supported financially through Micro Venture Innovation Fund to enhance his business in 2005.
- The patent for the innovation was applied in the year 2004.

- The expert involved in the testing and evaluation has also co-authored himself with the innovator to write a paper for a National Journal.

## The product

### Abstract

This sturdy rugged desert unit is retrofitted on a 35 HP tractor or more and is powered by the coupler from the tractor unit and has an elaborate system of crankshafts, flywheel, connecting linkages and rotating vanes on a shaft. A sieve is provided with a vibrating mechanism to filter the groundnut from the soil. As the tractor moves forward, the vanes rotate and dig into the ground, scoop and drop the soil-groundnut mixture into a vibrating storage unit with a sieve base. The system of linkages and drives vigorously vibrate the entire unit to shake the soil loose and the groundnuts stay trapped at the top in the central storage unit as the soil gets sifted out onto the ground. A window hatch is provided at the back that can be lifted and the groundnut taken out by a person into a basket. The process also prepares the soil for next crop. The unit consumes four liters of diesel per hour and completes digging one hectare full of groundnut in one day. It weighs 300-400 kg and costs Rs. 55,000.



### Salient Features & Advantages

- Performs digging and separating simultaneously
- Can be directly operated with any tractor of 35HP capacity or more.
- The device do not harm the pods in any way.
- Save time , money and labour
- Very little maintenance
- Efficient way of harvesting the groundnuts

- The picking is superior to manual method in terms of time, money, effort, efficacy and completeness of collecting all groundnuts 6 inches into the soil
- While harvesting, the device prepares the soil for the next crop simultaneously
- Completes digging 1 hectare in 1 day taking out all the groundnut, consuming 4 liters of diesel per hour.
- Removes drudgery of using 100 laborers to sift through the sand and remove groundnut one by one.
- The cost of the machine is recovered within a season

#### **Comparison with available alternatives**

There is no available alternative for this device. If this machine is not used, the task is executed manually consuming lots of manpower and time.

The machine developed by Khan is an excellent way to improve productivity, cut costs and address the labour shortage. Some of the farmers who have bought this unit also loan it out to others at the rate of Rs. 5000 per hectare, thus making a handsome profit. For the other farmers also, it is a good bargain as they spend only Rs.5000/- instead of Rs 8000/- that they would have to pay to the labourers (in addition to the cost of getting this labour and other daily expenses). Moreover, there is always a limitation with manual labour of missing out some groundnuts under the ground.

#### **Techno-economics**

Md. Yusuf has addressed a pressing problem that groundnut farmers in the harsh desert climates of Rajasthan have faced. They do not have an efficient way of harvesting the groundnut beneath the soil that ranges between 15% to up to 30% of their harvest. Losing even an average eight quintals under the soil which is 25% of the harvest per hectare, means a loss of about Rs 15,000 (@ 1900/- per quintal), which is a huge amount for any farmer. Harvesting takes over 100 people working at Rs.80/day to remove the groundnuts in one hectare in a day. Labour is both scarce and expensive in the desert area and the operation is tedious as the soil has to be sifted and each groundnut has to be picked by hand. Most farmers have large land holdings in the area (greater than 2 hectares and going up to 50 hectares) and there is a need of completing the harvest as fast as possible in October so that sowing can be completed for the next season, which starts immediately. During personal interactions, people from Sikar, Rajasthan region who are using it have shown satisfaction about the performance.

#### **Broad Specifications:**

This machine is capable of separating the pods from the soil that comes in the path on which it is moving, digging and filtering all the soil in one go.

1. Traction vehicle:- A tractor (35HP or more)
2. Working width - 6 feet
3. Working Depth - 6 inches
4. Size - 4ft x 6ft x 6ft
5. Weight - approx. 300 - 400 kg.
6. Container Capacity - 4 cubic meter

### Business Development

- Market Research has been conducted with the help of a group of students from a management institute. The report showed the potential of the innovation and confidence to support further.
- Business Planning was done by National Innovation Foundation and GIAN-N and Yusuf Khan was supported venture funds to expend the business.
- Yusuf has also been given the opportunity by GIAN-N and NIF to showcase his work in various National and International Exhibitions and Trade Fairs to create new opportunities.
- The basic technology of the groundnut digger has also been licensed to another company for application as a sea beach cleaner.

### Technology Transfer

The technology of Groundnut Digger cum Separator has been transferred to ARDEE group of Companies, Visakhapatnam, India for application in Sea Beach Cleaner. An agreement with ARDEE group has been signed according to which, entrepreneur shall pay:

1. First Down payment of Rs.100000/- (Rs. one lakh only) after the agreement and payment of Rs. 55,000/- (Rupees fifty five thousand only) along with first down payment for delivering one unit of groundnut digger of present model by innovator.
2. Payment of another Rs.100000/- (Rs. one lakh only) on the date of delivery of the advanced prototype (developed by entrepreneur with consultancy inputs from innovator and GIAN-N).
3. An amount of 4% royalty on the sales of the Groundnut digger/sea beach cleaner for a period of 5 (five) years after market launch of the product.

The Department of Scientific and Industrial Research, Government of India has also come forward to fund the development of new product using the base technology of Groundnut Digger.

### Other Innovation

Apart from the groundnut digger, Yusuf has also developed the modified version of Trench digger which is capable of digging trenches upto 6 feet deep and 1 feet wide. These devices are also used as an attachment to the tractors of 40HP or more capacity. Some modifications are required to be made in the tractors to match the speed of trench cutting and forward motion of the tractor. The similar devices which were available at the time of this development were having limitation of permanent modifications in the tractor which was limiting its speed of motion. Users were facing the problem in transportation of this system to the work site and the complete unit was to be loaded to another vehicle for transportation. Yusuf modified the gear mechanism in such a way that the speed is restricted only till it is used as a trench digger and in normal operation/ transportation tractor can be operated at its normal speed.



The other alternative standard equipments available to perform the similar task are very costly and not afforded by small contractors. His device is the first preference of small and medium contractors for underground cable and pipe laying.

This device of Yusuf also gained recognition by NIF for this modification.



## Future plans

Yusuf after getting introduced and recognized by the Honey Bee Network has linked many more grassroots innovators to the network. He is also helping the grassroots innovators to gain recognitions by providing social linkages and also helping them in diffusion of their technology to masses.

His dream is to bring forward as many as possible, the hidden grassroots talent before the world and link them with the formal world through NIF and GIAN. He want that more and more people from his village should get recognition as has gained. At the same time he wants to make his innovations more popular in other parts of the country. The business of trench digger has gone down due to the up coming of wireless technology, thus he wants to focus more on Groundnut Digger. He is also working for the developments of an onion planter.

Yusuf's philosophy is that *"You help the poor and the God will help you"*. One should never feel proud of what one has gained but should always share the sorrow of the person who is sad and the sadness will never come to him.



*Yusuf with his family*