

# Groundnut Sheller Machine

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**Abstract**— Groundnut are produced in farms largely in the Southeast and Mid-South regions of the nation. Gujarat and Maharashtra are the preferred locations in view of good quality peanuts cultivated in Gujarat and two well-developed ports being available for exports. Peanut or groundnut is one of the major oil seed crops of the tropics and subtropics, although it is cultivated in the warm areas of the temperate regions. It is a valuable source of edible oil (43-55%) and protein (25-28%) for human beings, and of fodder for livestock. About two thirds of world production is crushed for oil and the remaining one third is consumed as food. Main issue regarding groundnut is to remove its shell. It takes lots of human power and time. The purpose of this work is to design and development of mechanism of Groundnut Sheller machine. The design is an environment friendly and uses simple mechanism properties such as shelling system, oscillating mechanism and automation separating system etc.

**Key words:** Groundnut

## I. INTRODUCTION

Groundnut is the sixth most important oilseed crop in the world. It contains 48-50% oil and 26-28% protein, and is a rich source of dietary fiber, minerals and vitamins. It grows best on soils that are well drained, loosely textured and well supplied with calcium, potassium and phosphorous. Over 100 countries worldwide grow groundnut. Developing countries constitute 97% of the global area and 94% of the global production of this crop.

The production of groundnut is concentrated in Asia and Africa (56% and 40% of the global area and 68% and 25% of the global production, respectively). Shelling is the removal of grains from their stalk, pod or cub, either by stripping, impact action and rubbing or any combination of these methods. The most popular method of shelling which is still widely used in the northern part of Nigeria is the method of crushing or pressing the pods between the thumb and the finger to break off the pods and release the seed. This method has low efficiency, it is time consuming, and has high demand of energy. In addition, the output per-man hour is as low as 1-2.5kg of groundnut. There are different methods of shelling and different machines have been fabricated and used to shell wide variety of crops under different conditions.

The peasant farmer cannot afford these machines because they are too costly and complex in operation and maintenance. Also the operator had to be trained and spare parts imported. These factors increase the overall cost of production which does not make any economic sense to the farmer. Hand operated shelling machine which is of concave or semi-rotary design is widely used locally. It had no expelling unit; hence separation is achieved by winnowing.

This project is mainly about generating a new concept of groundnut shell (crush) that would make easier to bring anywhere and easier to crush groundnut. After the design has completed, it was transformed to its real product.

## II. OBJECTIVES

- 1) Design and manufacturing appropriate type of shelling machine with high productivity.
- 2) Shelling the peanut seeds without crushing and produce the product with high quality.
- 3) Despite its high potential for improving the incomes of the rural poor, the crop has not been fully exploited. Several factors have contributed to this. Insufficient seed production and marketing systems that limit availability of quality seeds of improved varieties to smallholder farmers is a major limiting factor for adopting new varieties.
- 4) Achieving the maximum percentage of uncrushed peanut seeds.
- 5) A systematic analysis of the value chains is therefore needed to understand the various factors inhibiting the growth of value in groundnut crop.
- 6) The performance of shelling mechanism is measured by shelling efficiency, separation efficiency, the amount of seeds damage and the amount of straw breakup.
- 7) Source of some important vitamins, metals and acids which human body needed.
- 8) Peanut seeds inter in many industries after salted and acidification such as Sweets and butters.
- 9) Helps in improve and restore soil fertility by supplying the nitrogen and organic materials if you enter in the agricultural cycle of the land, especially after the cultivated stressful crop.

## III. DESIGN OF MACHINE

### A. Design of Machine

There are different methods of shelling and different machines have been fabricated and used to shell wide variety of crops under different conditions. The design is so done that the knowledge of designing, mechanism and forces are increased. This project consists of designing and fabrication of an automatic groundnut Sheller machine considering various important parameters. In this project, designing & development of a machine to crush or shell groundnut so the farmers can gain high profit by selling groundnut direct in market. As well as the study of manufacturing was very important in order to carry out this project to ensure that what are needs to do. This project involves the process of designing the different parts of this shelling machine considering forces and ergonomic factor for people to use.

Part list and dimensions of Groundnut Sheller machine

1	Brushes or beaters dimension cm	Length =207mm Width =45mm Height=60mm
2	Handle length in cm	41cm
3	Sheet of metal width * thickness	510mm *260mm*515mm(l*b*h)

4	1 inch angle rod	2 meter
5	2 inch angle rod	3 meter
6	Slotted net of sheet feet	2 feet
7	Nut and bolt Diameter* length	10 mm Diameter & 60 mm
8	Peddle of chain and cm chain wheel Sprocket distance	Standard bicycle chain drive
9	Bearing ID*OD	6200 , OD=30mm, ID=10mm
10	Metal Disc Diameter cm	30 cm
11	Metal pipe length m	1 meter

Table 1:

As this is the prototype model most of the parts used are obtained from scraps, but are of designed dimensions. Brushes, Sheet metal, bearing, slotted net and nut bolts were purchased whereas rest of the components were taken from scrap materials.

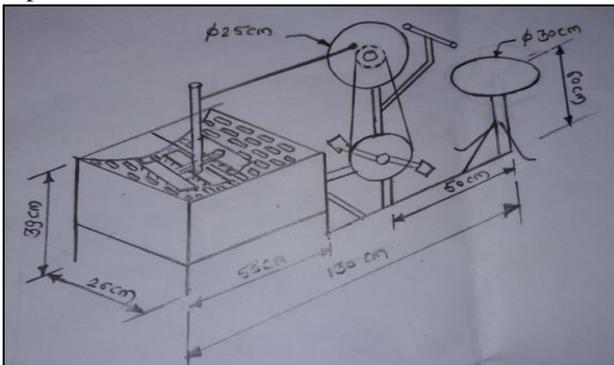


Fig. 1: Drawing of Machine

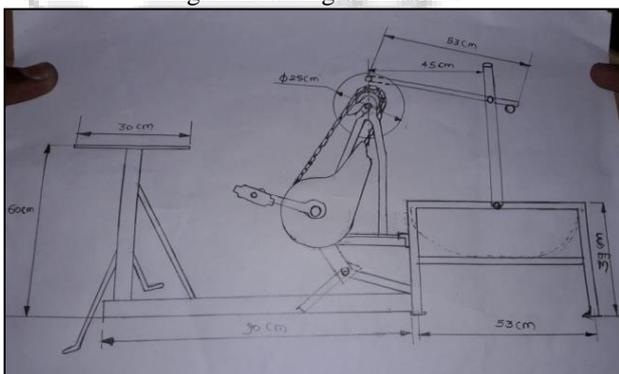


Fig. 2: Dimensions of Machine

#### IV. THE BASIC FRAMEWORK

It supports the entire machine and it carries the peddle system; is connecting by connecting rod the shelling unit; the open space for peanut carry by machine and This structure is the unit in which materials to be shelled is regulated and channeled into the shelling chamber. The brushes and sitting arrangement.

##### A. The Shelling Unit

It consist tow rollers in the shelling chamber. One of this brushes (semicircular drum) is driven by a chain and sprocket

arrangement, while the reciprocator semicircular angle has three shelling beaters fitted at to semicircular drum its surface and reciprocating through it is entire length.

During machine operation, the pod from the open space on m/c drops between three beaters. The shelling bar of the reciprocating beater's or brushes collects and compresses it against this action the pod is shelled.

Frame	
Shelling machine NET mm	10-25 length 300mm
Brushes	No. of brushes 3. Each brush having 33 teeth's. Teeth's having diameter of 11.5mm. in each line 10 teeth's are there. ( casting)
Perforated concave	Mild steel, semicircular shape 39.8 mm Long & 9.5mm Broad slot size
Size of oscillator	Mild steel
Sieve capacity	Spacing between two slots 10.3mm.
	0.52kg peanuts per minute

Table 2: Frame Work of Base

##### B. Shelling Efficiency

Shelling efficiency is percentage of the shelling seeds calculated on the basis of the total seeds entering the shelling mechanism. It increase asymptotically with concave length up to certain point. Handle speed is one of the most important variables affecting shelling losses. Shelling losses can be significantly reduced by decreasing the brushes speed. Changing the concave clearance ratio (the ratio of the gap at the front to that at the rare of the brushes) is done to facilitate crop feeding into the beater, but the effect of this variable on the shelling efficiency is not consistent. Shelling Efficiency of the machine is 250 kg peanuts per 8 hrs.

The brushes used are of material of cast iron and is of quantity of 3. The distance between brushes and net is adjusted such a way that the peanut is crushed perfectly without crushed it this distance is adjusted by using nuts and bolt.

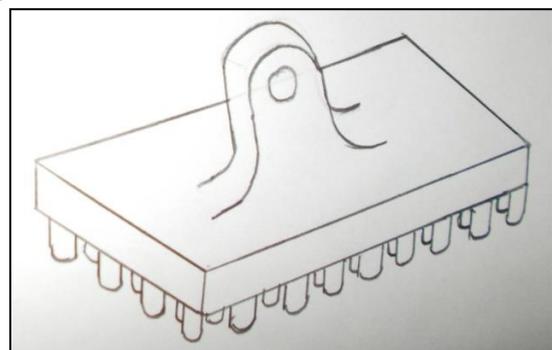


Fig. 3: Brush

#### V. CONSTRUCTION

The construction includes following parts namely;

- 1) Shelling m/c frame
- 2) Shelling unit
- 3) Peddling system on fabrication frame

#### 4) Sitting arrangement

##### 1) Shelling m/c frame:

It is support beams for supporting shelling unit to balance the machine.

It is balance because noise reduction while working condition at high speed oscillation.

##### 2) Shelling Unit

During machine operation, the pod from the open space on m/c drops between three beaters. The shelling bar of the reciprocating beater's or brushes collects and compresses it against this action the pod is shelled

##### 3) Peddling System

It has rotational disc on main sprocket wheel of chain wheel which is having two Bearings and rotates freely to transmit power to the handle of the shelling unit.

It travels at one peddling two times oscillating then crushing speed increases. And Total peanuts are crushed.

##### 4) Sitting arrangement

It is used to supporting also to peddling system and comfort to operating System.

## VI. WORKING

This is a shelling unit which is mounted on the support angle rod of one inch fabricated bracket frame. On having a net of slotted having 39.5 slot size when peanuts are added on that slotted net. The top the handle is provided having three brushes or beaters having sharp teeth to Resist the peanuts again the surface of slotted net when the power source of the man peddling is required so one peddle is while forced to act as double crushing also and double operate or oscillate the handle and peanut is 95% percent crush without destroy pods.

### A. Advantages

- Simple in construction.
- Less Costly and sometimes simple maintenance activity.
- Disturbance of whole slot is very minimum while machining of peanut that not creates obstruction to equipment stoppage.
- Economical aspects
- Efficiency is more
- It is portable while connecting rod dismantles from handle then manually operated.

### B. Application

- TNAU Groundnut Decorticator
- Groundnut Stripper (Drum Type)
- Groundnut Pod Stripper
- PAU Axial Flow Groundnut Thresher
- TNAU Groundnut Thresher
- Domestic Use Is Also More

## VII. MANUFACTURING OF MACHINE

There is various Manufacturing process involved in our project .These processes are as follows:

### A. Cutting Operation

In oxy-fuel cutting, a torch is used to heat metal to its kindling temperature. A stream of oxygen is then trained on the metal, burning it into a metal oxide that flows out of the kerfs as slag.

Torches that do not mix fuel with oxygen (combining, instead, atmospheric air) are not considered oxy-fuel torches and can typically be identified by a single tank (oxy-fuel cutting requires two isolated supplies, fuel and oxygen). Most metals cannot be melted with a single-tank torch. As such, single-tank torches are typically used only for soldering and brazing, rather than welding.



Fig. 4: Cutter

### B. Grinding Operation

Grinding is an abrasive machining process that uses a grinding wheel as the cutting tool. Surface grinders use a rotating abrasive wheel to remove material, creating a flat surface.



Fig. 5: Grinding Operation

### C. Welding Operation

Welding is an operation in which the two metals are joined to gather by inserting a filler material between them. In this type of joint we get more strength. This is a permanent joint.



Fig. 6: Welding Operation

### D. Assembly

Assembly procedure of Peanut Shell Crushing Machine

- First of all put the frame or body on the horizontal plane surface which contains crushing box sitting mechanism.
- Join the crushing box and chain and sprocket mechanism with the help of nuts and bolts.
- Insert the chain in chain and sprocket mechanism with proper clearance and suitable tension.
- Join the four bar chain mechanism for peanut shell crushing to sprocket shaft.
- Join peddles to the shaft of chain and sprocket mechanism.
- Now the project is ready for working.

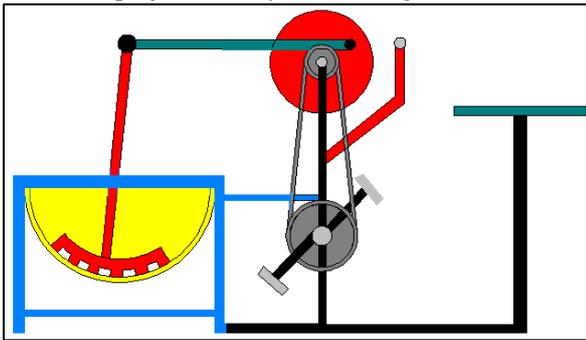


Fig. 7: Assembly Drawing

#### E. Performance

The system performance is depends upon the output of the product. In this machine the output is obtained is always greater than the handle operated machine because the force applied is more than the handle is more than handle operated so the output of this machine is 250 Kg per 8 Hours.

This machine has a good advantage is to effort required is less and hence becomes comfortable this is the most important point of the machine.

The time required is also less than the handle operated machine. It gives maximum production in minimum time and minimum efforts.

#### VIII. RESULT

The maximum shelling capacity of is calculated as following,

Manually operated	Peddle operated
The manually production is comparatively less	The peddle production is comparatively more
Less reliable	It is reliable
Peanuts are less precisely crushed	Peanuts are more precisely crushed
Production time required is more	Production time required is less
In 5 min. 1 kg peanuts are crushed	In 5 min.2.6 kg peanuts are crushed
Productivity is less	Productivity is more

Table 3: Difference Our Machine & Totally Manual

#### IX. CONCLUSION

This work presents the design of a manual powered groundnut shelling machine. The machine was fabricated using materials that were sourced locally. It can be used for both domestic and industrial purposes. The advantage to be derived from the use of this machine is that it is less costly and affordable for the local farmers.

The test result showed that the machine can shell a total 32kg of groundnut in an hour. It was also observed that the working mechanical is very easy to operate and can be very efficient to work with fewer efforts.

#### X. FUTURE SCOPE

In this project before constantly and double crushing or oscillating of handle is not achieved.

To achieve constant and uniform crushing strength is employed in machine of mechanism of peddle system which will help to double acting of oscillating handle by one time peddle is operated. Throughout the machine to transmit peddle power by connecting rod peanuts are crushed quickly. This machine can be derived by an using motor so that the working efficiency is increases so the maximum brushes of this machine type is added then shelling capacity can be increases . Also the width m/c can increased then volume of shelling is increases so product can be maximum shelling at time maximum so depend upon the construction As we design considered.

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