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# Review on the Development of Groundnut Sheller

**Roopshree Naugrahiya, S. K. Jain**

PG Scholar, Department of Processing and Food Engineering, College of Technology and Engineering), Maharana Pratap University of Agriculture & Technology, Udaipur, India

Head & Professor, Department of Processing and Food Engineering, College of Technology and Engineering), Maharana Pratap University of Agriculture & Technology, Udaipur, India

**ABSTRACT:** Small-scale farmers in developing countries like India face a significant challenge in groundnut production due to the lack of affordable groundnut processing machines, specifically groundnut shellers. The available groundnut sheller machines in the market are both large in size and expensive, making them unsuitable for domestic use. To address this issue, a groundnut sheller machine needs to be designed and fabricated using locally sourced materials. The key components of the machine include a hopper, crushing chamber, separating chamber, and blower. The project involves various processes such as designing, fabricating, and assembling the different components of the machine.

## I. INTRODUCTION

Groundnut is the sixth most important oilseed crop in the world. It contains 46-50% oil and 25-28% protein, and is a rich source of dietary fibre, 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. The main purpose of this paper is to understand the knowledge of design and fabrication mechanism of portable groundnut Sheller machine. The design is very simple and eco-friendly which uses simple mechanism properties such as shelling system, automatic separating system and crushing chamber *etc.* (Ravindra et al., 2017)

The study of manufacturing played a vital role in this project's success. During the design phase, careful consideration was given to create different components for the groundnut shelling and separating machine, considering various forces and ergonomic factors to ensure user-friendly operation. The main objective was to develop an innovative groundnut shell (crush) concept that would enhance portability and enable efficient groundnut crushing.

Once the design phase was finalized, the concept was transformed into a tangible product, with the design serving as a blueprint. The resulting machine is a simple, manually operated groundnut sheller with a semi-cylindrical shape enclosed on both ends. A central shaft with a lever is fixed at one end of the machine, facilitating easy and effective shelling of groundnuts.

One of the main limitations of this machine is its reliance on manual labour, which results in significant time consumption. The output of the machine is approximately 20-30 kg/hour. However, the unique design of this project addresses these concerns and enhances efficiency. The machine comprises several key components, including the hopper, crushing chamber, separation chamber, blower unit, and a supportive frame. To overcome the labour-intensive nature, the crushing chamber and blower unit are powered by electricity, which significantly reduces the processing time. Additionally, the machine is lightweight, user-friendly, and easy to operate and maintain. Furthermore, the availability of locally sourced spare parts ensures convenient maintenance and repairs.

## II. LITERATURE REVIEW

Shelling groundnuts involves the removal of the seeds from their pods using methods such as stripping, impact action, rubbing, or a combination of these techniques [4]. The traditional method commonly used for groundnut shelling is crushing or pressing the pods between the thumb and first finger to break them and release the seeds. However, this method is inefficient, time-consuming, and requires a significant amount of energy [4]. Groundnut

shelling machines are designed to remove the shells and obtain the groundnut seeds [3]. Various machines have been fabricated and used for shelling a wide variety of groundnut pods [4]. However, these machines tend to be expensive and complex to operate and maintain [4]. The lowest price for a hand-operated groundnut sheller machine is Rs-11,500/-. Some of these machines have high shelling capacities, ranging from 5kg seeds/h to 60kg seeds/h [1] [2]. While certain hand-operated sheller machines are suitable for domestic use, they only perform the shelling operation. The separation of shells and seeds still needs to be done manually using traditional methods like natural wind or sieving. A simple hand-operated groundnut sheller typically consists of a semi-cylindrical screen closed on both ends. A shaft with a lever at one end is fixed across the center of the semi-cylinder, as shown in Figure 1 (a). The lever is equipped with a pair of plates with blunted shoes or beater bars on their undersides. To operate the machine successfully, the operator stands by the side and holds the operating lever (handle). They swing it back and forth to provide the shelling action on the shoe's assembly [4]. The semi-rotary motion of the shoes shells the pods against the screen. However, this type of machine cannot separate the shells from the seeds efficiently.

### 2.1 Types of Groundnut Sheller Machines

**Manual Groundnut Sheller Machines:** These machines are operated manually, requiring human effort to shell the groundnuts. They are typically hand-operated and suitable for small-scale or domestic use. As shown in Fig.1



Fig.1 Manual Groundnut Sheller Machines

**Electric Groundnut Sheller Machines:** These machines are powered by electricity, providing automated shelling capabilities. They are more efficient and suitable for larger-scale groundnut processing.



Fig.2 Electric Groundnut Sheller Machines

Pneumatic Groundnut Sheller Machines: These machines utilize pneumatic pressure or airflow to remove the shells from the groundnuts. They often employ suction or blowing mechanisms to separate the shells and seeds.



Fig.3 Pneumatic Groundnut Sheller Machines

Multi-Purpose Groundnut Sheller Machines: These machines offer additional functionalities apart from shelling. They may include features for sorting, cleaning, or grading the groundnut seeds, enhancing the overall efficiency of groundnut processing operations.



Fig.4 Multi-Purpose Groundnut Sheller Machines

### 3.0 Objective

- Cost-effectiveness: The machine should be designed to be affordable and accessible to farmers, considering their limited financial resources. The aim is to provide a low-cost solution for groundnut shelling and separation.



- **Efficient Shelling:** The machine should have a high shelling capacity, allowing it to shell a maximum number of groundnuts in the shortest possible time. This enhances productivity and efficiency in groundnut processing.
- **Preservation of Groundnut Quality:** The machine should handle the groundnuts delicately, minimizing damage to the seeds. Preserving the quality of the groundnuts ensures that farmers can obtain higher profits from the sale of undamaged seeds.
- **Space Optimization:** The machine should be compact and require minimal space for installation. This enables farmers to keep the machine within their limited land area, optimizing the utilization of available space.
- **Portability:** The machine should be lightweight and easily movable. This ensures that farmers can transport the machine to different locations as needed, allowing flexibility in its usage and making it more convenient for farmers.

#### IV. COMPONENT AND SPECIFICATION

- Frame
- Electric motor
- Roller
- V belt
- Pulley
- Hopper
- Fan

##### 4.1 Frame

The frame is used to support all the components. Material of frame is cast iron and height up to 1m.

##### 4.2 Electric motor

This motor is used to rotate the roller by using belt and pulley.

Output = 230 volt

Current = 3.5 amps

Power = 0.37kw/0.5 HP

##### 4.3 Roller

Roller is made up of hollow cylinder of 1ft dia. and 1ft length with the rods welded on its periphery. The material of roller is cast iron.

##### 4.4 V belt

V-Belt is used to transmit rotary motion of shaft of motor to the shaft of roller. Material of the belt is rubber or polymer for strength and reinforcement.

##### 4.5 Pulley

Pulley is used to transmit the torque of motor to the roller. One pulley is directly mounted over the motor shaft and another pulley mounted on the shaft of roller. And both the pulleys are connected with the help of V-belt. Pulley Dia. = 75mm.

##### 4.6 Hopper

Hopper contains groundnuts before and during shelling process. It is use to continuous supply of the groundnut to the crushing unit.



#### 4.7 Blower

Blower is mounted on the shaft of the motor just in front of pulley at some distance. This fan separates the shell and the peanuts.

#### V. FUTURE SCOPE

- Agriculture is a primary occupation for a significant portion of the global population. By making certain modifications to this machine, it can be adapted for widespread use on a larger scale, catering to the needs of farmers worldwide.
- This machine offers substantial assistance to farmers, enabling them to generate a more stable income from their crops. The potential for growth and development in the agricultural sector is immense.
- This sector presents a vast opportunity to reduce labour requirements, enhance operational efficiency, decrease operating costs, and minimize manual efforts. Working in this field holds great potential for improvement and innovation.

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