

# DESIGN AND FABRICATION OF PORTABLE CORN DESEEDER

## *A Low Cost and Efficient Solution for Small Scale Agricultural Applications*

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**Abstract:** Corn is one of the most important agricultural crops in India and plays a significant role in food production and industrial applications. Traditional methods of corn deseeding are labor-intensive, time-consuming, and often result in damage to kernels, reducing productivity and quality. In addition, existing motorized machines are expensive and not affordable for small-scale farmers.

To overcome these challenges, a portable corn deseeder has been designed and fabricated to provide an efficient, low-cost, and user-friendly solution for kernel separation. The machine is developed using locally available materials and simple mechanical components to ensure affordability and ease of maintenance. The design process includes conceptual modeling, 2D drafting, and 3D modeling using CAD software, followed by fabrication and testing.

The developed machine reduces manual effort, improves deseeding efficiency, and minimizes kernel damage. It is compact, portable, and suitable for rural and small-scale agricultural applications. The proposed system enhances post-harvest processing and supports sustainable farming practices.

**IndexTerms** - Portable corn deseeder, agricultural machine, fabrication, kernel separation, low-cost design.

### I. INTRODUCTION

Agriculture plays a vital role in the Indian economy, and maize (corn) is one of the most widely cultivated crops due to its high nutritional and industrial value. After harvesting, the separation of corn kernels from cobs is an essential process for storage, transportation, and further processing. However, traditional methods of deseeding are manual, time-consuming, and require significant human effort. These methods often result in lower efficiency and increased physical strain on farmers.

In rural areas, small and marginal farmers generally depend on manual tools or expensive commercial machines for corn processing. Manual deseeding methods lead to low productivity and inconsistent output, while motorized machines available in the market are costly and not easily affordable. Additionally, such machines may require skilled operation and regular maintenance, which further limits their usage in small-scale farming.

To address these challenges, there is a need for a compact, efficient, and low-cost corn deseeding machine that can be easily operated by farmers. The development of a portable corn deseeder aims to reduce manual labor, improve efficiency, and minimize kernel damage during the deseeding process. The machine is designed using simple mechanical components and locally available materials to ensure ease of fabrication and maintenance.

The objective of this work is to design and fabricate a portable corn deseeder that is economical, user-friendly, and suitable for rural agricultural applications. The proposed machine enhances productivity and supports sustainable farming practices by reducing dependency on manual labor and increasing operational efficiency.



**Fig. 1.** Flow chart of corn deseeder working process

## II. NEED OF THE STUDY

The increasing demand for agricultural productivity has highlighted the importance of efficient post-harvest processing methods. Corn deseeding is a crucial operation that directly affects storage, quality, and market value of the produce. However, in many rural areas, this process is still carried out manually, leading to low efficiency, higher labor requirements, and increased time consumption.

Traditional deseeding methods not only reduce productivity but also cause physical strain to farmers. Moreover, manual operations often result in uneven kernel separation and higher chances of grain damage. On the other hand, available commercial machines are expensive, bulky, and not suitable for small-scale farmers due to high initial cost and maintenance requirements.

There is a significant need for a cost-effective, portable, and easy-to-operate corn deseeder that can be used efficiently in rural conditions. Such a machine should be capable of reducing manual effort, improving processing speed, and ensuring minimal damage to kernels. It should also be fabricated using locally available materials to make it affordable and accessible to farmers.

The proposed portable corn deseeder addresses these challenges by providing an economical and efficient solution for kernel separation. It helps in reducing labor dependency, improving productivity, and supporting sustainable agricultural practices. Therefore, the development of this machine is essential for enhancing the overall efficiency of small-scale farming operations.

## III. RESEARCH METHODOLOGY

The development of the portable corn deseeder follows a systematic engineering approach involving design, material selection, fabrication, assembly, and testing. The objective is to develop a compact, efficient, and cost-effective machine suitable for small-scale agricultural applications. Each stage of the methodology is carried out carefully to ensure proper functioning, durability, and ease of operation.

### 3.1 Design and Development

The design process begins with the preparation of a conceptual layout of the corn deseeder. This includes identifying the major components such as the frame, shaft, motor, feeding unit, and kernel separation mechanism. The conceptual design is then converted into detailed 2D drawings and 3D models using CAD software (Creo).

The CAD modeling helps in visualizing the structure, ensuring proper alignment of components, and verifying dimensions before fabrication. It also allows modifications and optimization of the design without material wastage. The design focuses on achieving portability, structural stability, ease of operation, and efficient kernel separation.

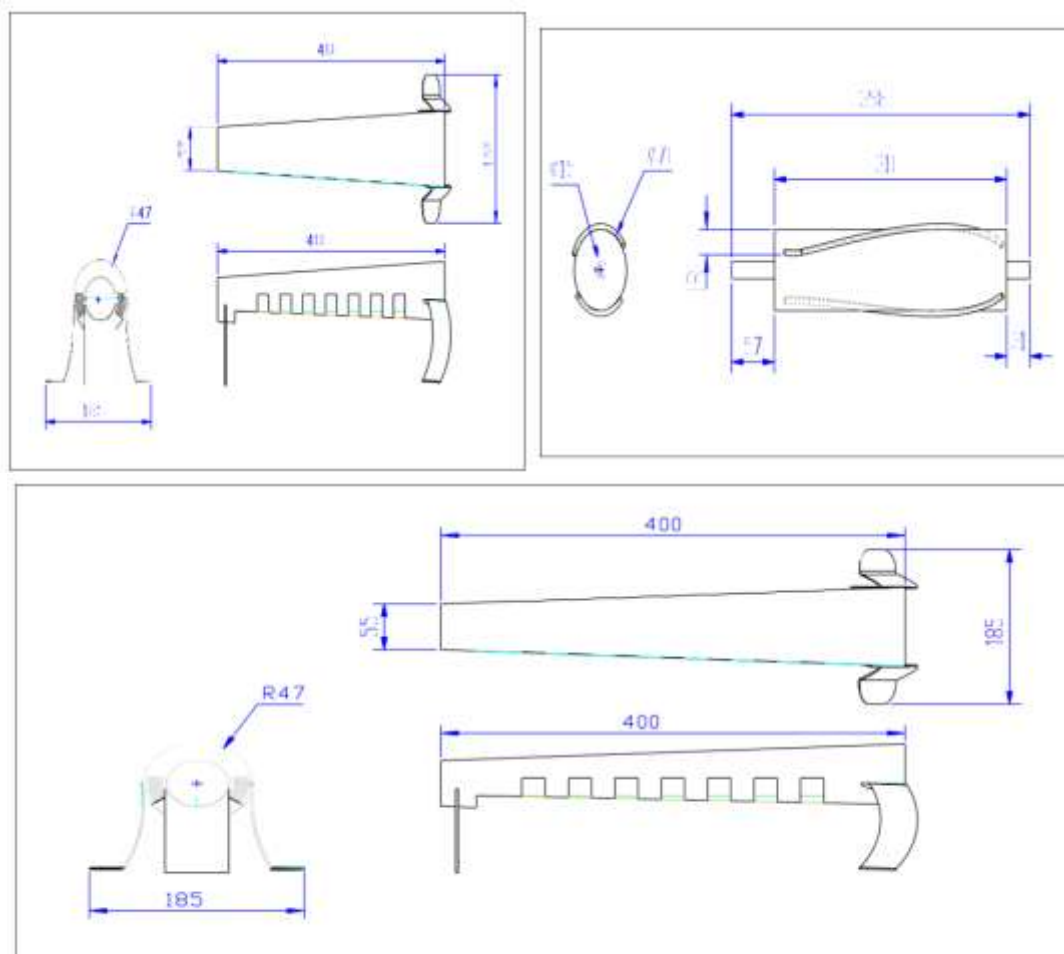
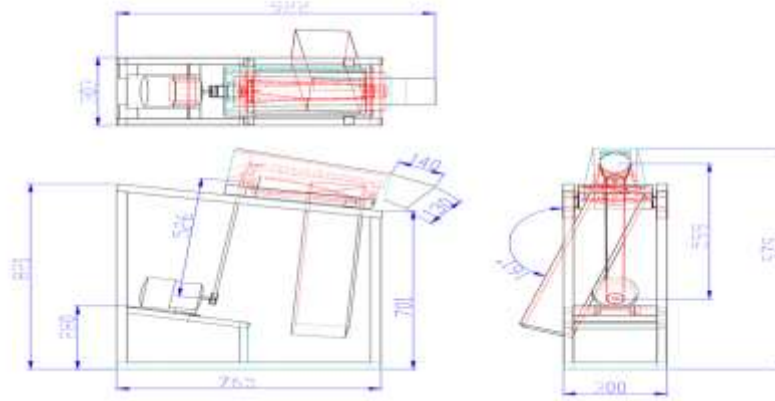


Fig. 2. 2D Sketch of portable corn deseeder



**Fig. 3.** 2D Sketch of portable corn deseeder

### 3.2 Selection of Materials

Material selection plays a crucial role in ensuring the strength, durability, and cost-effectiveness of the machine. The materials are selected based on factors such as mechanical strength, availability, weight, corrosion resistance, and ease of fabrication. Mild steel is selected for the frame due to its high strength and good weldability. Square tubes of approximately 35 mm are used to construct the frame structure. The shaft is also made of mild steel to withstand torsional and bending stresses during operation. Sheet metal is used for the guide structure to direct the corn cobs into the machine. The use of locally available materials reduces the overall cost and simplifies maintenance.

### 3.3 Fabrication Process

The fabrication of the corn deseeder is carried out using standard workshop processes. The frame is constructed by cutting mild steel tubes to the required dimensions and joining them using welding to form a rigid structure. Proper alignment is ensured during welding to maintain dimensional accuracy.

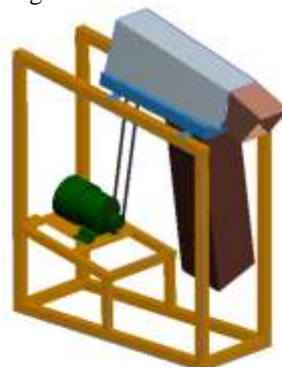
After preparing the frame, machining operations are performed on the shaft to achieve the required dimensions and surface finish. Holes are drilled for mounting the motor, bearings, and other components. The assembly process involves fitting the shaft, bearings, pulleys, belt, and motor onto the frame. The guide structure and protective covers are then attached to complete the assembly. The fabricated machine is compact and designed to be portable, allowing easy transportation and usage in field conditions.



**Fig. 4.** Fabrication of portable corn deseeder

### 3.4 Working Principle

The working of the portable corn deseeder is based on the principle of mechanical separation using rotational motion and friction. Corn cobs are fed into the machine through the guide structure. A rotating shaft fitted with rods or projections rotates at high speed. As the cob comes into contact with the rotating shaft, friction and impact forces act on the kernels, causing them to detach from the cob. The separated kernels fall downward and are collected, while the empty cobs are discharged separately. This mechanism ensures efficient separation with minimal kernel damage.



**Fig. 5.** Working mechanism of corn deseeder

### 3.5 Design Calculations

The design calculations are carried out to ensure the safe and efficient operation of the machine. The shaft is designed to withstand both bending and torsional stresses.

The shaft rotates at a speed of 1450 rpm and is subjected to a load of approximately 300 N. The bending moment is calculated as 90600 N-mm, and the torsional moment is approximately 698 N-mm. Based on these values, a shaft diameter of 25 mm is selected to ensure safety.

The power requirement of the machine is calculated using standard formulas and is found to be approximately 1.5 HP. This value accounts for motor efficiency and operational losses.

The belt length is calculated as approximately 526 mm using standard belt drive equations. A standard bearing (6205) is selected based on the shaft diameter and load conditions to ensure smooth rotation and long service life.

### 3.6 Cost Estimation

The total cost of the machine is estimated by considering both material cost and fabrication cost. The major components include the mild steel frame, motor, pulleys, belt, shaft, bearings, and other accessories.

The estimated cost of the machine is approximately Rs. 17,500. This cost is significantly lower compared to commercially available machines, making it affordable for small-scale farmers. The use of locally available materials and simple fabrication techniques further reduces the overall cost.

### 3.7 Testing and Performance Evaluation

After fabrication, the machine is tested under working conditions to evaluate its performance. The evaluation is based on parameters such as kernel separation efficiency, time required for deseeding, and level of kernel damage.

The results indicate that the machine operates efficiently and reduces manual effort significantly. It improves productivity and provides consistent output. The compact design and ease of operation make it suitable for rural applications.

## IV. RESULTS AND DISCUSSION

The performance of the fabricated portable corn deseeder is evaluated based on its efficiency, operational time, cost effectiveness, and ease of use. The results obtained from testing indicate that the machine performs effectively under working conditions and provides a practical solution for small-scale agricultural applications.

### 4.1 Performance Evaluation

The machine was tested using harvested corn cobs to observe its operational efficiency. During testing, it was found that the deseeding process is significantly faster compared to traditional manual methods. The rotating shaft mechanism enables quick separation of kernels with reduced human effort.

The efficiency of the machine is reflected in its ability to separate kernels with minimal damage. The friction-based mechanism ensures that most kernels are removed effectively without crushing. The output is consistent, and the time required for deseeding is considerably reduced.

The machine also demonstrates ease of operation, as it can be handled by a single operator without requiring specialized skills. The compact structure allows it to be used in field conditions and transported easily.

### 4.2 Discussion of Results

The results obtained from testing confirm that the developed machine meets the objectives of the project. The key observations are as follows:

- The machine reduces manual labor and physical strain on farmers.
- It increases the speed of corn deseeding compared to traditional methods.
- Kernel damage is minimized, preserving quality and market value.
- The machine operates efficiently with low power requirement.
- The overall cost of fabrication is affordable for small-scale farmers.

The cost analysis shows that the total fabrication cost is approximately Rs. 17,500, which is significantly lower than commercially available machines. This makes the machine economically viable for rural users.

The design also supports easy maintenance due to the use of standard components such as bearings, pulleys, and belts. The modular structure allows quick replacement of parts when required.

### 4.3 Comparison with Existing Methods

Traditional deseeding methods are labor-intensive and time-consuming. In contrast, the developed machine offers a faster and more efficient solution. Compared to large-scale machines, the portable corn deseeder is more affordable, lightweight, and suitable for small farms.

The machine provides a balance between performance and cost, making it an appropriate solution for rural agricultural needs. It addresses the limitations of both manual and high-cost mechanized systems.

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