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# "Design Development and Analysis of Pigeon Pea Threshing Machine"

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**ABSTRACT:**In India, most of peoples do agriculture. As we know what it is farming and what it needs, in the same way it is also necessary that it necessity of advance machines, as well as many agriculture machines are available in market at high price because of that the machines are most importance for farming. So we are developed the cheapest pigeon pea threshing machine. Many of the things we are added by comparing the many machines which are available in markets, a very high threshing and cleaning/separation efficiencies of 99.97% and 97.01% respectively with an average minimal loss/damage of 0.2% under cylinder speed of 480rpm and feed rate of 2 to 3kg/min were obtained. The analysis of variance of the results obtained revealed that both the cylinder speed and feed rate were highly significant at 5% and 1% probability levels for the threshing and cleaning efficiencies.

**Key words:** Pigeon Peas, Local Farmers, Performance, Thresher, Threshing and Cleaning Efficiencies.

## I. INTRODUCTION:

Pigeon pea (Cajanus Cajan) is one of such crops which have considerable potential for adoption at large scale by farmers provided some of the major operations such as threshing are mechanized. At present farmers thresh pigeon pea manually which is tedious and laborious. Various attempts have been made by different researchers to evaluate the existing paddy-wheat threshers for pulse crops with necessary modifications and develop crop specific threshers. Singhal and Thierstein (1987) reported that thresher with rasp bar and spike tooth type cylinders, primarily designed for threshing paddy, were quite safe for pulses, but several modifications were required to be carried out for effective threshing of common pulses.

The total un-threshed peas increased with increase in pod moisture content and decrease in cylinder speed whereas peas damage increased with increase in cylinder speed and decrease in peas moisture content.

Threshing as a post-harvest operation is as old as man. The evolution of mechanical threshers to secure the ever growing consumption of cereal has been hindered by several factors which have leads to low performance of several developed threshers. It has been discovered and observed by various researchers that performance of cereal threshers is highly dependent on the value of its working parameters.

The project has the following objectives

- Provide a low cost machine.
- Equip new part handling easily.

## II. LITERATURE REVIEW

Peas are one of the important in many dishes in India. Peas are grown in three times in a year that's why Peas shelling a post harvest operation, is the removal of peas seeds from the cob. This operation can be carried out in the field or at the storage environment. An average moisture content of 15% to 18% for peas that was to be threshed or shelled was reported by moisture content seriously affects the thresh ability of peas. The different methods of peas shelling can be categorized based on various mechanization technology used. Pea's damage can be regarded as a function of peripheral velocity and contact pattern of impacting. Pea's loss can be regarded as a function of contact pattern of rasp bars. Pea's loss coming from cleaning and separation in the subsequent process of combing threshing was significantly decreased. It showed that in the combined application, tangential rolls are used to accelerate peas flow and axial rolls are used to increase threshing quality especially lower loss and

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damage. Pea's loss and damage in harvesting are significantly related to threshing theory and technology. There are four kinds of threshing principles including impact, rubbing, combing and grinding. Four types of contact models between peas and threshing components have been constructed correspondently. These factors are the design of the power transmission shaft, selection of the prime mover, type of pulley, appropriate belt design, key and selection of appropriate bearings support

**COMPONENT USED**

| SN | Description | Material | Quantity |
|---|---|---|---|
| 1 | Screen | Mild steel | 1 |
| 2 | Wheels | Purchased | 4 |
| 3 | Main Frame | Mild steel | 1 |
| 4 | V-Belt | Rubber | 1 |
| 5 | Two way pulley | Mild steel | 1 |
| 6 | DC Motor | Purchased | 1 |
| 7 | Cross-tangential threshed technology | Iron | 1 |
| 8 | Peas Outlet | Mild steel | 1 |
| 9 | Air blower | Mild steel | 1 |
| 10 | Crops sieves | Mild steel | N\A |
| 11 | Bolt and nut | Mild steel | N\A |
| 12 | Shaft | Mild steel | 1 |
| 13 | Hopper | Mild steel | 1 |
| 14 | Handle/Cover | Mild steel | 1 |
| 15 | Threshing cylinder/ Beaters | | 1 |
| 16 | Chaff outlet | Mild steel | 1 |

- Screen: The screen is made up of mild steel sheet with drilling of 11.5 mm bores (600 bores). It is concave in shape and perforated to allow for the threshed seed and chaff to pass through. It covers the lower portion of the threshing cylinder.

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- Wheels: wheels are use to move the machine anywhere in form.

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- Frame: This is frame made up of mild steel material. The whole parts are mounted on this frame structure with the suitable arrangement. As well as it is mounted the Motor. Boring of bearing sizes and open bores done in one setting so as to align the bearings properly while assembling. Provisions are made to cover the bearings with grease.
- V-belt: V-belt are use to transmit a power to the pulley.
- Two way pulley: A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a cable or belt along its circumference. Pulleys are used in a variety of ways to lift loads, apply forces, and to transmit power. Pulleys are also assembled as part of belt and chain drives in order to transmit power from one rotating shaft to another
- DC Motor: A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The field because of the current in the conductor bolsters the primary field over the conductor, however contradicts the fundamental field underneath the conductor. The outcome is to build the flux thickness into the area specifically over the conductor and to decrease the flux thickness in the locale straightforwardly beneath the conductor. 2.7-3.0KW Single-Phase Two-Pole

- Cross-tangential threshing technology: In the cross-tangential threshing technology, the threshing cylinder rotates with high speed (Figure 5). When a pile of peas pass through the drum quickly, spike teeth and bow teeth beat pea's ears alternately. Detached peas kernels fly through concave, and run around a cross cylinder with only a tangential velocity. The rotate speed of this threshing cylinder ranges from 800 r/min to 1200 r/min [85-89]. In addition, the path of peas stalks is the internal surface of concave, which could reduce stalk blockages between drum and concave. However, when the moisture content

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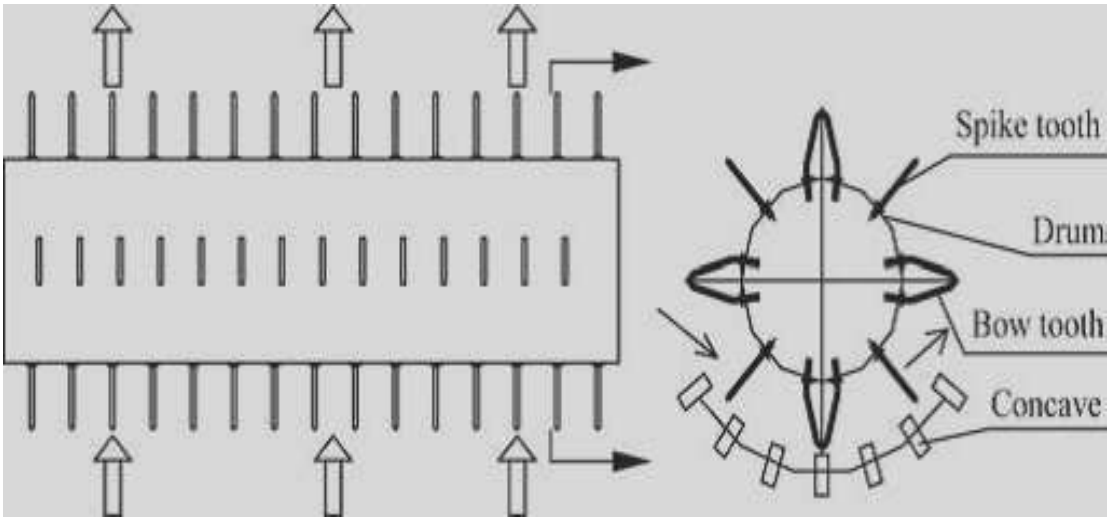
of peas is higher, the connection force between kernels and axis of pea's ear is bigger. Consequently, the detachment action of pea's kernels will spend more time, and threshing efficiency will be reduced. In this case, higher rotate speed of threshing cylinder is needed. But the momentum and inertia force transferred to peas ears will be increased, which extremely raise the possibility of pea's damage. Therefore, the cross-tangential threshing technology is usually applied as an assistant threshing device. For example, a cross-tangential threshing cylinder may be installed in the front of threshing system to enhance initial material feeding.




- The Peas Outlet: This is placed directly below the cleaning chamber to appropriately discharge separated beans. It is 120mm X 80mm and inclined of 450 to the horizontal at lower end.
- Air blower: Air blower is use to remove the chaff and cleaning the peas.

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- Crops Sieves: It is use to separates the peas. Crops sieves are also use to cleaning chaff and separate pigeon peas.

- Bolts And Nuts: It use to join the parts of machine
- Threshing Cylinder: The threshing cylinder consists of the shaft of diameter 30mm and beaters or spikes. The shaft is inserted into the bearing at both ends. The bearings are then bolted to the thresher frame through the holes drilled on the frame at the sides. The threshing is done by the rotating shaft through the impact of the beaters (spikes) on the pigeon pea pods against stationary spikes.
- Hopper: Hopper made 800mm on the topmost part and 500mm on the lower part was joined with upper half of the thresher cave bolted to the required shaft dimension machined at both ends. The hopper is a medium through which un-threshed pigeon peas are loaded to the machine for threshing.
- Peas Outlet: The grain outlet is welded to the lower part of the concave screen. It is located at about 400mm from the base. The grains of the threshed pigeon pea are collected from the Peas outlet.
- Chaff Outlet: After threshing, the stalk and hull materials (chaff) are collected at the chaff outlet which is situated and welded such that the air blower can blow the chaff materials away through the outlet.

**CONSTRUCTION**

Fabricating procedures are the means which crude materials are changed into a last item. These materials are then altered through assembling procedures to wind up noticeably the required part. Fabricating procedures can

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incorporate treating, (for example, warm treating or covering), machining, or reshaping the material.

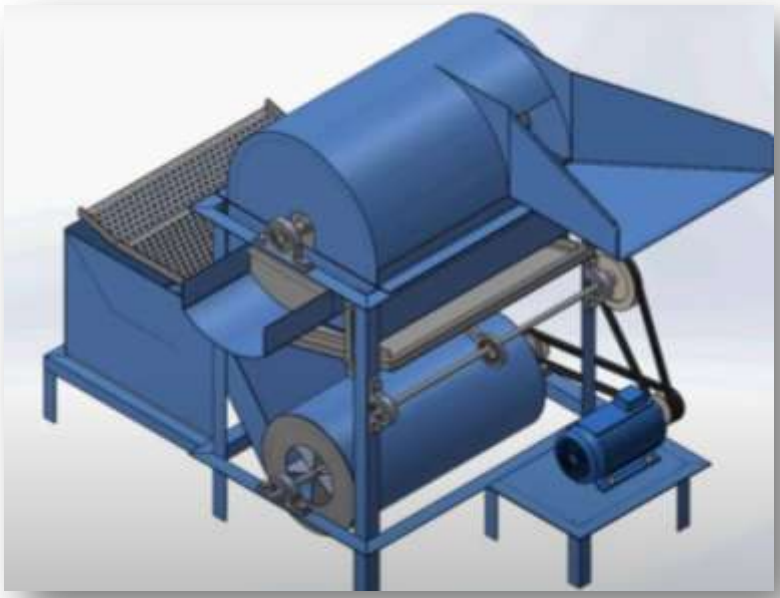
**RAW MATERIAL USED**
Material: Mild steel, iron
Frame
Screen
Cross-tangential threshing technology
Air blower
Pea's outlet
Metal rods

**READY MATERIAL USED**
DC motor
Wheels
Pulley
Chain
V-belt
Nut and bolts
Crops sieves
Shaft
Hopper
Threshing cylinder
Handles/covers

## III. METHODOLOGY

Threshing efficiency (%): The threshing efficiency is the ratio of total weight of peas threshed to the total weight of peas fed into the thresher expressed as a percentage. It is also the difference between 100% and the percentage of un-threshed peas.

**CAD DIAGRAME**



## IV. FUTURE SCOPE

- Future work in this endeavour may include expanding utilization and application of these technologies in agriculture for the human centric design of various tools and equipment.
- In future many machinery are developed that's why this thresher used to decrease the human effort
- These machines itself avoid the hand threshing.
- All these modification can be done in future which will result in decreases the investment of the formers.

**ADVANTAGES**

- Reduce the man import
- Minimize the labor cost
- Minimized the chaff expelled into the atmosphere
- Produce quality feed for animals
- Identify the critical factors in threshing and pod separation
- To develop low cost system.

**APPLICATION**

- It used in form at more production capacity.

- When failure happens, the thresher should be shut down for maintenance and adjustment in the process of operation.
- Make sure connection of driving belt is firm enough; It is strictly prohibited to remove the belt or place any object on the running transmission part.

## V. CONCLUSION

Pigeon pea threshing machine are most important for ruler area peoples because they do very hard work in there form they are not aware about this machinery. The actual throughput capacity has far better than the human actual throughput capacity which was determined to be 19.45kg/hr. The machine has an estimated useful life of ten years. Mainly the purpose of this project to decrees the human efforts. As well as maximum threshed peas and many paddy crops to a farmer. The Agro-processing centre's established helped many farmers to process their agricultural products in market acceptable from which gave rise to added value to the market prices at which the farmers sold them. More research should be done to identify the many needs of the rural farmers, so that experts can design system and proffer solution that meets their needs. Pea's loss and damage in harvesting are significantly related to threshing theory and technology. There are four kinds of threshing principles including impact, rubbing, combing and grinding. Four types of contact models between peas and threshing components have been constructed correspondently.

**Total seed loss**

The total loss as spilled over and blown-up seeds ranged from a minimum of 1.78% to maximum of 7.85% for speed of 320 r/min to 515 rpm and ranges from a maximum of 6.89% to minimum 2.5% for moisture contents of 10% to 22% at a constant feed rate and concave clearance. At a lower speed and higher moisture content the total seed loss is at minimum range due to the low air velocity and high seed weight.

Total losses: The total losses calculated by using the following formula:

Total losses = Unthreshed seeds + seed losses from straw outlet
+ damaged seeds.

## VI. ACKNOWLEDGEMENT

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