Design and Fabrication of Multi-Operational Agriculture Model

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Abstract- *The average Indian farmer works 80 hours per week, and earns about $3000.00 in year. His wife and children work with him in the field, whereas an American farmer earns $60000.00 in a year working 80 hours a week. He has a very comfortable life Farming methods are very modern which make farming easier and more convenient. He has very modern machinery for farming. About 60-65% farmers of India have low economic status. So instead of purchasing this costly machinery they use traditional way of farming. So for increasing his profit and reduction of his human effort, advance mechanization suitable for small scale farmer make available at market. So this paper is deal with detail of an agricultural machine consist of four different operation chaff cutting, groundnut decorticator, wheat grain separator and tool grinder. The induction motor drives this all operation with the help of pulleys and V-belt drives. By using this entire operation one may perform various operations in optimum time and money.*

Keywords- 'Sore thumbsyndromes', 'Roll Feed', 'Decorticator', 'Productivity', 'Efficiency', 'Traditional'.

I. INTRODUCTION

India is an agricultural country. In India 70-72% of population is farmers. In India mostly farming is done with the help of traditional equipment and methods the earning of farmer is reduced. In India most of the rural population is engaged in agricultural land. Hence this project can of great use. So this project is decided to carry out on cycle like layout. Groundnut is major oilseed crop grown in the state; it occupies about 11% of total cultivated area. Groundnut is valuable source of edible oil and proteins for human beings, and fodder for live stocks. Shelling is the fundamental step in groundnut processing. Shelling can be done by hands or machine. Hand shelling keeps the rate of kernel breakage low, need of energy is high causes "*sore thumb syndrome*". In groundnut decorticator machine the removal of kernel is high which reduces the machining cost and increases the rate of production. This operation requires a roller feed which comes in contact with the pod and by shearing action the kernels separate out.

A Chaff cutter is mechanical device used to cut the straw or hay into small pieces so as to mix it together and fed to cattle. This improves animal digestion and prevent animal from rejecting any part of their food. As per today's scenario the population of cattle especially population of buffalos is drastically increased. So as to increase productivity and reduce the physical effort required for running the machine motorized machinery comes into existence it is best for dairy farmers. Presently fodder cutting machines are electric driven as well as hand operated or engine driven.

In a wheat grain separator,the rotary motion is converted in to the reciprocate motion of wheat cleaner block. Thus the cleaning process is carried out through this machine. Here the mesh is fixed in slider block which isolate the paddy and wheat.

II. OBJECTIVES

1. To develop a machine which can easily replace the tiresome manual process for decortication, chaff cutting and wheat grain separation.
2. To provide not only good fodder to the animals but also clean wheat and ground nut to the farmer.
3. To make the machine which performs all mentioned process very effectively and simultaneously.

III. REVIEW OF LITERATURE

We have studied various literature review related to this project. We have come up with the following important and helpful literature reviews:

A. In this paper, Roshan P Ghodkhande, et.al. [1], has reported that shelling action is required for the decortication process. And also reported that ground nut require very less power to be broken. Another view we have taken that the clearance between the shearing surfaces is small so that the pressure required for breaking of pods can easily achieve. In this paper they also provide the brief information of ground nut decortication.

B. In this paper, Sanjay Patil, et.al. [2], has reported that existing fodder cutter machines observe properly and reduces problems. The research work in new cutting technology domain studied and new method to achieve desire goal. They also use the different blade technique, due to which can allow farmers to supply different fodder to cattle.

C. In this paper, Chris Miller[3], has reported that various technique for grain cleaning in food production.

D. In this paper, P. Meghashyam[4], has reported that shearing operation is used for dehusking. The machine has not only capacity of dehusking 1kg paddy just in 3 minutes but also efficiency of 85-90%

IV. PROPOSED MULTIPURPOSE AGRICULTURE MACHINE

Mechanical Aspect:

There are four different machining operation done by this multipurpose agriculture machine such as cutter, decorticator, paddy separator and sickle grinder. The required power is given by using AC electric motor of 1Hp. Every operation consists of v-belt mechanism. There are cast iron pulleys for each operation mounted over the AC motor. As motor switch ON, the rotory motion is provided to all the assemblies.

- **Chaff Cutter Mechanism:**

This machine gets power from the AC motor. This electric motor drives main shaft and with the help of V-belt drive this power is provided to the main shaft of cutter wheel. The chaff is feed to the cutter wheel and cut it by the means of cutter blade at high rotation speed. A V-belt is connected to fly wheel and motor pulley through which the fly wheel rotates. At the same time chaff will cuts into small cutter, it will helpful for cattle. This improves animal digestion and preventing animal for rejecting the food.

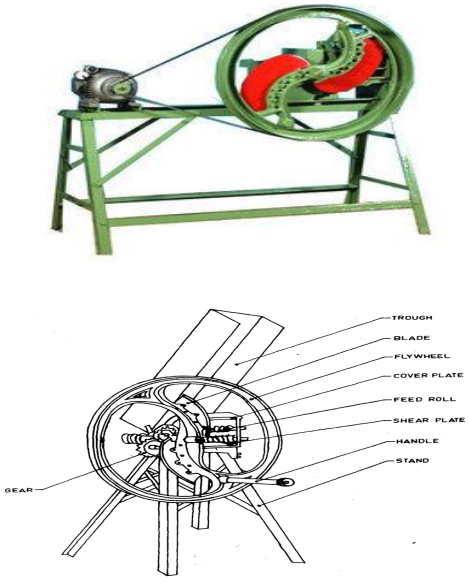


Fig. Chaff Cutter

- **Groundnut Decorticator Mechanism:**

Decortications or shelling operation is done on the phenomenon of shearing operation. It consists of the one roller shaft and a net. When groundnuts are introduce in between the roller and net then due to shearing operation the groundnut shell gets broken and kernel gets separated from it. The clearance between the roller and net is of only the size of the groundnut which is to be decorticated.

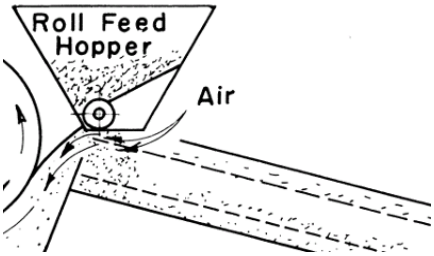


Fig. Section of Groundnut Decorticator

Fig. Manual Operated Decorticator

- **Wheat Grain Separator :**

Wheat is separated from grains with the help of slider crank mechanism. With the help of cam arrangement the rotary motion of shaft is converted into reciprocating motion of slider a wheat cleaner block. Thus the cleaning operation is done by this machine. Here the mesh is fixed in slider block which isolate paddy and wheat.

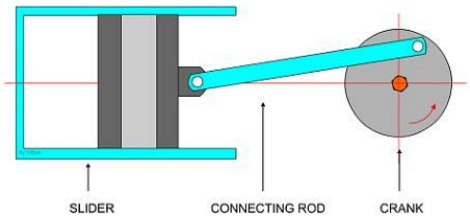


Fig. Slider Crank Mechanism

- **Sickle Cutter Grinder :**

It is the process of sharpening of tool. Sharpening is done by grinding away material on the implement with an abrasive substance harder than the material of the implement, followed sometimes by processes to polish the sharp surface to increase smoothness and to correct small mechanical deformations without regrinding.

Fig. Sickle Cutter Grinder

V. CONSTRUCTION AND WORKING

A. Power Source – Electric Motor:

Electric motor is an electrical devicewhich convert electrical power to mechanical power in the form of rotation of shaft. We have used the ac motor of power capacity of 1Hp. The main purpose of motor is to provide required powed for the mechanical use.

Fig : Electric Motor

B. V belt drive:

V belt is a loop of flexible material used to link two or more shafts mechanically. V belt is a mechanical drive which drives the pulley with the help of motor pulley. Belt drives are simple, inexpensive, and do not require axially aligned shafts. It has higher efficiency 90-98%, usually 95%.

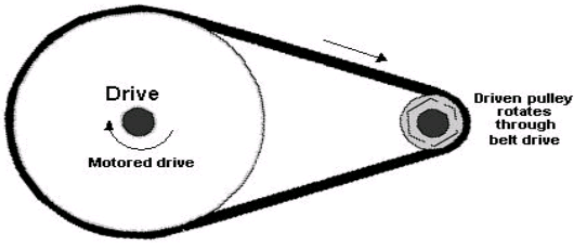


Fig. V belt drive

C. Shafts:

A Shaft is a rotating element, usually in circular cross section, line shaft is used to transmit power between two shafts. It houses various mechanical elements viz. pulleys, belts, gears etc.

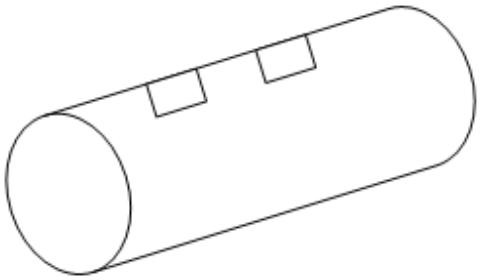


Fig. Shaft

D. Pulley:

Pulley and Belt are used to transmit the power from motor shaft to machine shaft. Here we used pulley of cast iron. A belt and pulley system is characterized by multiple pulleys in common belt. This allows for transmission of mechanical power, torque and speed across the axles.

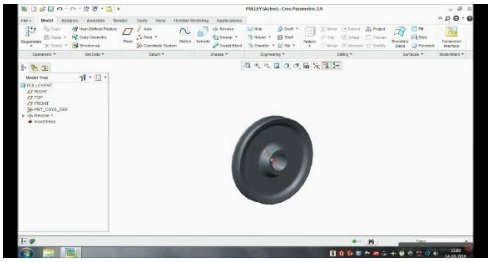


Fig. Pulley

E. Chaff Cutter:

Cutter blade is a main part of chaff cutter machine. They have sharp edge, they used to cut the grass and various other things into number of small steps. They can easily rotated with chaff cutter and cutting operation can be done.

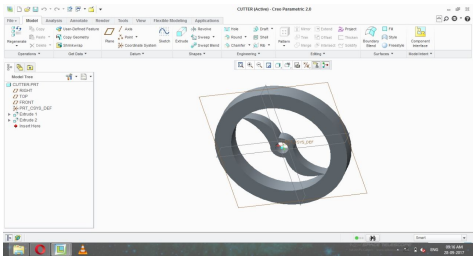


Fig. Cutter Blade

WORKING: Chaff cutter machine for feed is powered by electric motors, drive main shaft from main shaft to the cutter wheel. The material enter the compression roller and then cut into cutting institutions at a certain speed enter the cutting part, approved by high speed rotating cutter cut up after the through the material outside. A flat or v-belt (leather) is connected to fly wheel and motor pulley through which the fly wheel will rotate, it will helpful for cattle.

F. Ground Nut Decorticator:

Groundnut decorticator is operated on the shearing action. The inputs i.e. the groundnut are fed to the machine. Then groundnuts come in contact with the two members, one is semi-circular net and another is roll shaft having soft wooden core. Semi-circular net is a stationary member while the roll shaft of wood is rotating member.When the groundnut comes in contact with these two members then the shearing action takes place there. Due to shearing action (crushing) the groundnuts gets shelled and divided into two parts. i.e.in the kernels and outer shell of the groundnuts. There clearance is provided between the net and roll shaft. The clearance provided is depends upon the size of the groundnuts which is to be decorticate.

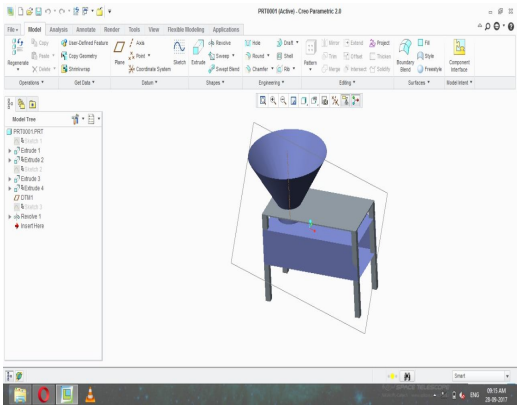


Fig. Groundnut Decorticator

G. Wheat Grain Separator:

When we switch ON the machine. The motor start to rotate the cam arrangement. Here the rotary motion is converted in to the reciprocate motion of wheat cleaner block. Thus the cleaning process is carried out through this machine. Here the mesh is fixed in slider block which isolate the paddy and wheat.

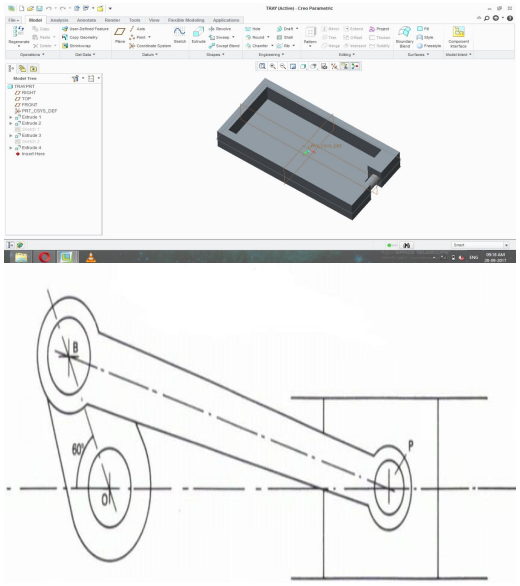
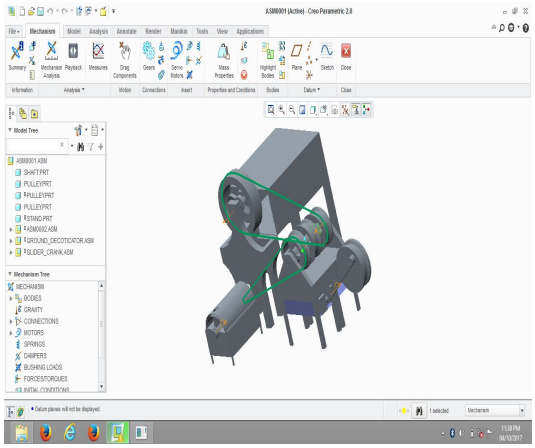


Fig. Slider Mesh and Wheat Grain Separator Mechanism

VI. CAD MODEL ASSEMBLY



VII. ACTUAL ASSEMBLY

VIII. MACHINE DESCRIPTION

- **Table:** Length=1200mm, Width=900mm, Height=775mm
- **Pulley:** No. of Pulleys=3, Diameter=250mm, Weight=6kg for each pulley
- **Chaff Cutter:** Diameter=250mm, Weight=7kg
- **Shaft:** Diameter=28.6mm, Weight=5kg
- **Motor:** Power=1HP
- **Bearing:** 1 inch ball bearing, No. of bearing=3
- **Motor Pulley:** Diameter=100mm
- **Ground nut Wheel:** Diameter=250mm, Weight=20kg
- **Belt:** V- belt, Type=C, No. of belt=3
- **Grinder Wheel:** Diameter=40mm

IX. ADVANTAGES AND APPLICATIONS

A. Advantages

This machine reduces human effort and precious time.Speed of machine can be adjusted as per the material with the help of regulators.The machine can be easily handle and it is easily portable.All four operation i.e. cutting, decortications, wheat grain separation and cutting grinder can be used simultaneously. The machine is of very low cost as machine for each operation has high initial capital. This machine is very safe and design is compact. This machine saves work time and reduces labor. With the help of chaff cutter, one can provide good fodder for animal. The machine has compact structure, simple operation and easy installation. Due to simple operation and easy installation, there is no requirement of skilled persons. Unskilled or semiskilled person can easily operate the machine. Machine has long service life.

B. Application :

1. Farm Fields:

Farmer uses chaff cutter for cutting the chaff and other things which are to be feed to the domestic animal.
Farmers which are produce groundnut are used for decorticating the shells of groundnut.

2. Animal food processing industries:

Now a day, there are industries which are producing food for animal from chaff, groundnut and paddy, there also this machine can be used.

X. CONCLUSION

Implementation of technology in the field of agriculture is the major step towards the advance processes and good revolution in the agriculture of India. The human or manual procedures are replaced by advance technical procedures. This machine is used by the farmers who have agricultural land less than 2 acres. This machine is generally used by this farmer which reduces the service time and does efficient work. It can done all operation in least time and helps avoiding injuries because through manual processes.

XI. ACKNOWLEDGMENT

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