

“FABRICATION OF SOLAR OPERATED GROUNDNUT PLUCKING AND SORTING MACHINE”

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Abstract

In India, groundnut is a small-scale crop that is grown by farmers. In past couple of decades, the production of groundnut has been increased. This underground crop is also known as the main cash crop. Workers used to pluck the groundnut manually from the ground and then sort the groundnut from the plant separately. This traditional method was very time-consuming and inefficient. The output from this process was very less due to the time, In order to reduce the time required to pluck and separate the groundnuts, This paper has been developed that uses a solar powered groundnut Plucking and sorting machine. This will allow farmers to save a lot of time and also reduce their working hours.

Keywords: Plucking, sorting machine, groundnut, crop

Introduction

Groundnut is a seed derived from the fruit of the groundnut plant. It's brought up as a nut normally terms however it's not a nut precisely in actual terms; it's a seed rather and is additionally celebrated by the name of groundnut. The groundnut plant is an annual plant herb that comes from the Fabaceae/legume family of Fabaceae. The plant has feather sort leaves; yellow flowers and grows a legume formed fruit that has a pair of to three seeds that develops within the world. Also, oil is obtained from the groundnut seeds that's a superb supply of tocopherol, numerous fatty acids and carbohydrates and is basically used as a cookery medium, lighting fuel and food constituent. Groundnut is taken into account to be the one among the foremost necessary seed crops within the world. It is fully grown in over one hundred countries of the planet and plays a vital role within the world economy. The seeds are an honest supply of edible oil.

Statement of the Problem

We are going to fabricate such machine that will eliminate most of the problems which were faced by farmers to pluck and sort the Groundnut from its plant. Productivity increased, efforts are reduced and hence the farmer earns more profit. Concept and Objective of the machine is explained below
Concept By introducing a low cost machine was to overcome various limitations with the current manual traditional method. The concept of the work is,

- Observe the manual method and to identify the drawbacks.
- Investigate all areas of automating the technology.
- Produce a specification for a low cost automatic system.

Objectives of the study

- To develop a low cost machine this can be used by farmer to pluck and sorting machine.
- (To minimize the time for both plucking and sorting process.
- To satisfy the economic needs of village peoples and reduce high requirement of labours.

Review of Literature

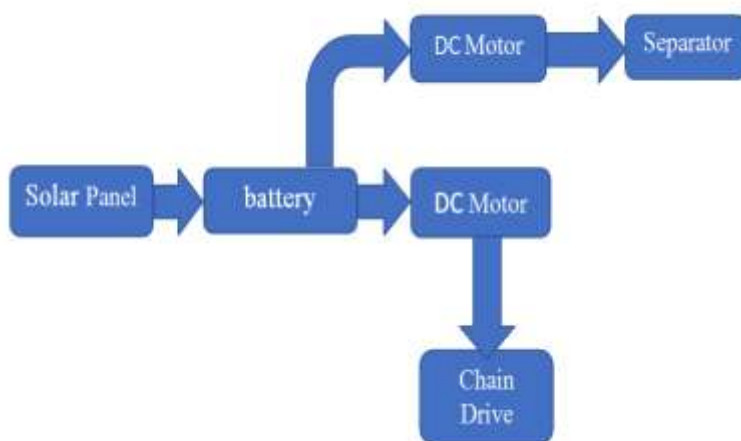
V. K. Tewari et al (2013) said that, the majority of farmers use manually to remove the groundnut or by loop wire pedal thresher which can cost them more time and also labor. There were three independent variables used, viz, drum speed, loop to height and loop spacing were taken into

consideration. They successfully used the application of RSM in conjunction with CCD. They used some various methods like response surface methodology (RSM) and central composite rotatable design (CCRD) and which was complex by calculating all the variables. It was a complex method and time consuming.

Dr. S. Alagesan et al (2014) said that, It was very difficult to separate all pods from the shell and around 20-30 women were used to separate an acre of groundnut pods. So they made a machine which is in cylindrical type where all the sides are closed leaving three open, one will be open at the top which consist of spiked cylinder and other two will be open at bottom. The groundnut will enter the top opening and in other two openings where pods which are broken and some dust with few other particles are move out. When tested the stripping efficiency was found around 99% of pods and were clean and not broken.

Pratima. G. Mungase et al (2016) said that, that used manpower instead of conventional energy resources. Like most of the people use bicycles and in agricultural fields screw conveyer are commonly used. By combining both they created a machine which is a peanut sheller. To rotate the shaft of screw conveyer they use the movement action of bicycle. The peanuts get squeezed in clearance between the shaft and casing of conveyer. Hopper is used to transport the peanuts. It doesn't need any expert. Gear pair usually used to rise the speed. This requires more amount of human effort which can be reduced by using our project as it doesn't consume much human effort and also involvement of renewable resources makes it better.

Methodology



2 D Model of Groundnut Plucking and Sorting Machine

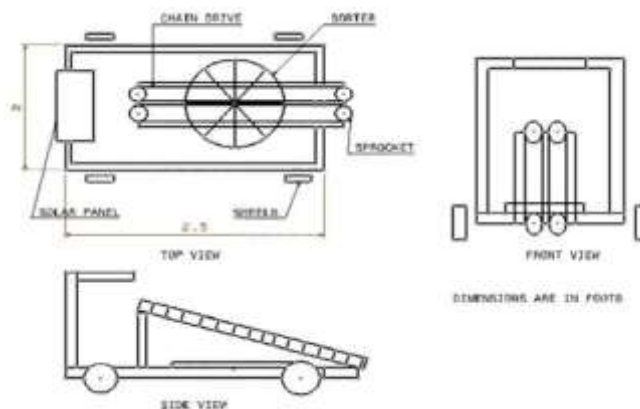


Fig : 1 2 D Model of Groundnut Plucking and Sorting Machine

The working of solar operated ground nut plucking and sorting machine is simple. It uses solar panel, battery, and DC motor etc. for its operation. Battery gives power to the DC motors which

helps to drive the two chain drives mounted in the opposite direction. When a ground nut plant comes in contact with the chain drive it plucks the plant from the ground. At the bottom of the model a sorting wheel is mounted which also starts rotating. Whenever the ground nut comes in contact with the wheel all the ground nuts starts to sort and they are collected below. Solar panel is used for the recharging the battery.

Fabrication of the Model



Fig: 2 Front View of the Model



Fig: 3 Back View of the Model



Fig: 4 Top View of the Model



Fig: 5 Side View of the Model

Calculations

Calculation of free wheel

1) The empirical formula for pitch

$$p \leq 250 \left(\frac{900}{n_1} \right)^{2/3}$$

Where p=pitch in mm, n1= speed of the sprocket, rpm

$$p \leq 25 \left(\frac{900}{60} \right)^{\frac{2}{3}}$$
$$p \leq 152.05 \text{mm}$$

2) Number of teeth of the sprocket

$$\frac{n_1}{n_2} = \frac{z_1}{z_2}$$

3) Pitch diameter $d_1 = 875.62 \text{mm}$

4) Velocity of the sprocket $V = 152.05 * 18 * 60 / (1000 * 60)$
 $V = 2.743 \text{m/sec}$

Solar Panel and Battery Calculations

Solar panel calculation:

For a given solar panel 10W and battery 172.8W.

Solar panel watts x average hours of sunlight x 75% = daily watt-hours Assuming average hours of sunlight considering all losses is 6-7 hours in a day.

$$10 \times 6 \times 0.75 = 45 \text{Wh}$$

For 6 hours a 10W solar panel charges 45Watt per hrs battery. For charging a 86.4W of one battery time taken by solar panel is $= (45 + 43.6) = 86.4 \text{W}$.

To charge the full battery the time required is $(6 + 4) = 10 \text{hours}$ For charging both the battery Time taken is $= 10 * 2 = 20 \text{hours}$ Working hours of the DC motor calculations:

Given a battery of 172.8W and a DC motor of 36W.

The average time taken by the battery to run a DC motors given by $= 172.8 / 36 = 5-6 \text{ hours}$.

Result and Discussions

Time required for manually plucking the groundnut on an average is 10 hours Time required for manually separating the groundnut on an average is 8 hours.

Total no of hours required for plucking and separating the groundnut manually on an average is $= 10 + 8 = 18 \text{hours}$.

For the same amount of groundnut to be pluck and separate by the groundnut plucking and sorting machine is 65-75kg/hr.

The above result shows the groundnut plucking and sorting machine has the efficiency of nearly 50%. Now it clearly shows that the machine has more advantage over the humans. As the result shows that the groundnut plucking and sorting machine is more convenient over the humans and the time taken for the machine is also less. This is the basic discussion about the groundnut plucking and sorting machine.

Conclusion

This work presents the fabrication of a solar powered groundnut plucking and sorting machine. This machine was fabricated using material that was sourced locally. It may be used for domestic applications. The advantage to be derived from the employment of this machine way out weights its shortcomings. The results of this model show that the model is more efficient and less time consuming than the traditional method of plucking and sorting manually.

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