FABRICATION OF COCOA-BEAN SEPARATION MACHINE

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ABSTRACT

India is an agribusiness based nation and horticulture utilizes over half of our nation's populace, subsequently farming is one of the primary wellsprings of salary for our nation. The principle goal of this undertaking is to help the little scope ranchers solely working in the field of cocoa development. As the ranchers do not have the propelled machines to process their developed cocoa natural product. Our task "plan and manufacture of convenient Cocoa bean isolating machine" can incredibly improve the preparing abilities of cocoa products of the soil the wellbeing of ranchers instead of obsolete strategies utilized for handling. This machine is straightforward in development and minimal, it tends to be made from the parts which are easily accessible. This machine is practical as the work cost is nearly diminished. This machine is exceptionally profitable and explicitly intended to lessen the time taken for division of cocoa beans when contrasted with conventional technique. This machine can be possessed by a gathering of cocoa ranchers who can tolerate the low support cost of this machine.

Keywords: agriculture, cocoa pods, cocoa cultivation, machine design.

INTRODUCTION

Cocoa tree thrives in hot and rainy tropical climates (20 degree north and south of the equator) and predominantly grows in Africa, Asia, Central and South America. Cocoa tree is a small (4 to 8 m height) evergreen tree. In India, it is mainly cultivated in Karnataka, Kerala, Andhra Pradesh and Tamil Nadu mainly as intercrop with Areca nut and Coconut. Slowly the area under cultivation is being promoted by many chocolate producing companies as contract farming. In the survey conducted during the time period 2015-2016, India produced approximately about 17,200 metric tones.

The shell (husk) is a good source of potassium and can be used in the production of potash fertilizer, local soap, biogas ,The beans are ground into powder for making beverages, chocolates, ice-cream, soft drinks, cakes, biscuits, flavoring agents and other products. Cocoa butter, made from the fat extracted from the beans, is a stable fat used in the production of cosmetics and pharmaceutical products.

This study outlines the design of a very efficient, highly productive, cost-effective, ergonomic and environmentally friendly cocoa splitting machine that will be used by cocoa Farmers world-wide to increase and boost productivity and enhance the quality of cocoa products to the highest possible level devoid of any hazards, dangers or perils. This machine can be manufactured from locally available scraps and assembled and maintained at a relatively low cost. Therefore it can be owned patronized by a group of cocoa farmers who can easily bear the low cost of maintenance of the already relative cheap machine.

LITERATURE REVIEW:

Now a days there is no machine to do the process of cocoa pod cutting and cocoa bean separation rural farmers of cocoa farm hence this process is done manually. So major disadvantages of existing method is that, Chance of injuries. The cutting operation is done using knives, and there are many chances of getting injured. Also while separating the beans, penetration of the small cocoa pods particles between the nails and the skin leads to higher pain for the laborers .This method takes more time. It will take about 6 hours for a skilled laborers to cut and separate 100 kg of cocoa beans. So it is time consuming High Labour cost. For separating 100 kg of cocoa beans, it requires two labour. One for cutting the cocoa pods and other for bean separation. So the labour Cost is high. Physical energy requirement is high.
**DESIGN:**

![Diagram of hopper system]

**MATERIAL AND METHODOLOGY:**

**Raw Material:**

![Cocoa Pod]

The cocoa fruit comprises of the pod or shell, beans or seeds, husk, placenta and mucilaginous pulp which contains a sweet juice referred to as 'sweating'. Generally, cocoa pods are oval-shaped and vary in size. The length is normally between 20 and 32 cm. Its colour ranges from yellow or green to red or violet. The surface texture is warty and deep furrowed to nearly smooth in most cases. The husks appear appreciably in thickness. Each bean is surrounded by mucilaginous pulp. The number of beans per pod is usually between 30 and 40. Each bean consists of two convoluted cotyledons and is enclosed in the testa. The cotyledon has its colour varying from white to purple. Figure 1.1 shows the cocoa fruit, beans with the pulp, as well as the pod or the husk.

**FABRICATION OF HOPPER:**

Fabrication of hopper is done by the M.S Steel with required dimensions as per specification and hopper is main component in the entire system. The number of steel plates turns to a tunnel shape which further welded to a finished product.
Fig: HOPPER VIEWS

FABRICATION OF ROTATING DRUM:

Rotating Drum is made of MS steel which is further rolled and welded into strips. For easy escape of beans into the basket we made a grooves type cuts in the drum constructions. The centre portion of drum is welded with a long shaft which is directly connected to pulley shaft to motor shaft.

Fig: Rotating Drum

THIS MACHINE CONSISTS OF FOUR UNITS:

- Input Unit (loading unit) - Input unit consists of hopper and rubber roller, initially the cocoa pods are feed into the hopper the main purpose of the hopper is to make sure that the cocoa pods are feed into the machine vertically, because it is easier for the cutter blades to cut along the fibres of the pod, rather than perpendicular to the fibres hopper is also used for safety purpose so that human hands does not make contact with roller while loading the pods, rollers are run by electric motor, both the roller are mounted on shaft and one of the shaft is welded to a sprocket this roller is linked to motor by a chain which drives the roller. Rollers grip the pod with its rubber surface.

- Cutting Unit - this unit consists of two cutter made of steel material rotating opposite to each other, with the help of spur gears which are driven by the electric motor, the cutter consists of seven sharp blades, when the pod is forced down by the roller the sharp blades cuts through the shell of the pod along the pods fibres, due to high speed rotation of blades the shell is ripped apart and the seeds inside the pod are exposed.

Rotating Unit (separating unit) - the separating unit is made of metal cylinder mesh, which is driven by the electric motor with the help of cardan joint, the slit pods by the cutter are made to pass through this unit by the curved path provided by sheet metal, as the seeds inside are sticky the seed are separated by the rolling action of the mesh the pods inside mesh tumbles and the seeds are forced out of the pods, the separated seed falls through the mesh holes and since the pods are in bigger size they are collected at the end of the cylinder.
Collecting unit- the split seeds from the cocoa pods are collected in a clean tray placed under cylinder mesh and the waste empty pods are collected in another tray placed at the end of cylinder mesh.

**Fig: Structural Unit**

![Structural Unit](image)

**DESIGNED MACHINE:**

Final structural design from the CAT IA V5 software is drawn with obtained values. In this every part will be shown in particular direction that can be identified easily. For proper result in the designed structure there is a way of animation of the obtained machine.

In this model major portion of the design is that to proper motion of the machine with accurate design period. For beyond the design the materials used and the process followed in this design make the proper design machine. Application in this design that shown for the regular design to attain the most probable machine.

**RESULTS AND DISCUSSION:**

In this fabrication of cocoa-bean separation machine First we ran our machine dry without stacking it with cocoa units, to guarantee that the working of the machine was appropriate. Further we directed five trials, in which a solitary cocoa case was included for each trial.
The primary reason for this trial was to record the procedure time taken by the machine to gather a solitary cocoa unit from start as far as possible, for example from parting of cocoa cases to isolating and gathering of cocoa beans.

Table 7.1: Trail run result.

<table>
<thead>
<tr>
<th>Trial number</th>
<th>Number of pods</th>
<th>Time taken in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>30.4</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td><strong>Average time taken</strong></td>
<td><strong>34.88 = 35</strong></td>
<td></td>
</tr>
</tbody>
</table>

GRAFICAL REPRESENTATION

**NUMBER OF PODS VS TIME**

CONCLUSION:

Our task "Convenient Cocoa Bean Separation Machine" is planned and by utilizing locally accessible and effectively available material and parts, for example, shaper and structure was straightforward enough to be effortlessly created. This machine working is sufficiently basic to be comprehended by a composer with absolute minimum information, the upkeep of this machine is normal grease, and if there should arise an occurrence of fixes the parts can be effectively supplante
REFERENCES:

- **Design, Fabrication and Testing of Cocoa Depodding Machine** Murtala O. Iyanda1, Elijah A. Alhassan2* and Timothy A. Adekanye Department of Agricultural and Biosystems Engineering University of Ilorin, Ilorin, Nigeria

- **Design of a Cocoa Pod Splitting Machine** S.K. Adzimah and 2E.K. Asiam Department of Mechanical Engineering, Faculty of Engineering, Department of Mineral Engineering, Faculty of Mineral Resources Technology, University of Mines and Technology, Ghana


- **DESIGN AND FABRICATION OF COCOA POD SPLITTING AND BEAN EXTRACTION MACHINE** Arivu. Y1, Manikandan S2, Sivakarthi T3, Gowtham M M4