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Novel approach for areca nut harvester

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***Abstract*— – There have been many improvements and advancements in the field of agriculture in recent years, but sadly, when the ratios are compared, large farmers always earn more than small farmers. Focus on growth. This corresponds to the growth of large farmers in the agricultural sector in the cultivation of palm trees. Palm trees typically grow in a small area and take about 3 to 4 years to produce fruit. The total investment is based on the crop, the cost and machinery to harvest the nuts is huge, and the smallholder farmers have a lot of trouble, which leads to losses.Also, palm tree tops Harvesting from the vine may result in a loss of yield as all the berries will scatter and fall to the ground. We wanted to develop a product that farmers could operate, use, and handle, and we also focused on ensuring that harvested nuts could be safely landed from the tops of palm trees. The product works entirely on a mechanical concept and was developed with mechanical connections. It is now manually operated. It will be automated in the future. This product reduces harvesting costs and increases profits for small farmers to grow rations like large farmers. This will revolutionize the field of crop harvesting and help many farmers get out of bad times and into good times.**

***Keywords*—** - Arecanut harvester, Tree climbing machine, etc

I. INTRODUCTION

The areca nut is the fruit of the areca palm, which grows in much of the South Asia, Southeast Asia, and parts of east Africa. It is commonly referred to as betel nut. Areca nut has been an integral part of traditional medicine for many centuries and is used extensively in Ayurveda and traditional Chinese medicines. The Arecanut has many uses like anti –inflammatory, antioxidant, antiulcer. But there are difficulties in harvesting arecanut because the tree is not strong as other trees so it may risk the humans who climb the tree to harvest the arecanut in danger even though now some innovation but they still need human on it.

My project is to avoid the human involvement in climbing and risking his life by make it operate on a remote-control system and to avoid damage of Arecanut that's falling down from the height of 20 meter. As in olden days they use ropes in leg to climb the tree based on that weight balance concept I am going to implement it in my project. The machine is going to have two wheels one is drive and another one is a drive wheel both are connected in a single pipe on both sides the drive wheel have the motor and the battery on its side for the weight by now the drive wheel is kept on one side of the tree and the drive when on other side below the height of drive wheel due the weight it will hold the tree and as it is high torque motor with high stall torque it can stay still on the tree even with the load

II. OBJECTIVE

Before starting the project first, the required objective is decided the main objective of our project.

- Avoid risking of human life
- Reducing the wastage of fruits while harvesting
- To make it cost efficient so small-scale farmers can make use of it
- Should not require special training and should be easy handling
- Should be abled to operate by a single person
- Avoid risking of human life

III. DESIGN REQUIREMENT:

Before starting the design, we have some of the design requirements they are

- Portable
- Easy to dismantle and carry everywhere
- Avoiding risk of human life
- Battery powered machine
- Reduce wastage of fruits
- Does not require power plugs everywhere

IV. METHODOLOGY

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To calculate the torque the weight of the machine with a harvest fruit is assumed as 20 kg so the torque required if a 2inch pully is used is

=20x9.8x2.54

=494 N cm

=500 N cm (approx.)

So, the motor needs to have a minimum of 50 N cm to lift the machine. So, till now two motors were shortlisted after analyzing the cost the motor will be purchased

V. PRINCIPLES AND DESIGN OVERVIEW

The concept works only depending upon the gravity as the most of the weight is placed at one side the gravitational force provides the required force to grip the tree and hold the fruits while harvesting.

VI. DESIGN REQUIREMENTS

The design requirements were reviewed based on the concept design

S. No.	Design Requirement	Design	mechanism meeting the requirement
1	Portable .	✓	It can be Transport from one place to another
2	Easy to dismantle and carry everywhere	✓	It can be easily carried but the table is big making it occupy a lot of space
3	Avoiding risk of human life	✓	The cameras are used and the shooter detects the court and shoot random shoots
4	Battery powered	✓	Only 3 balls in a time. But will be improved
5	Reduce wastage of fruits	✓	Power from a rechargeable battery can be used.
6	Does not require power plugs everywhere	✓	The speed can be varied from 8 m/s to 30 m/s
7	Easy handling	✓	This height can be attained at different speeds at different angle for different shoots

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VII. DESIGNING PROCESS

• First process was to finalize the types used. First, I searched for a solid rubber tyre with large grip profile but due to unavailability then we have to move for other option at this point we had got only an 8-inch wheel with 2.5-inch thickness which will not be sufficient for one side so we planned to use two tyres at both the ends.

Finalized tyres

• Initially I started my concept model by fixing the distance between the two wheels so that even if the trees are 3 inch of diameter the inclined angle of the frame will not be more than 45 degrees

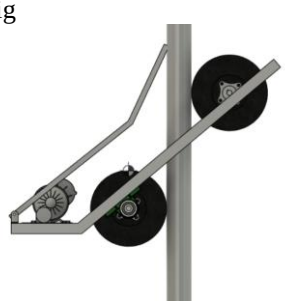
• Initially we provided a single side support but as there is higher load it would not be more sufficient. over a long period, the shaft may deform so we provided the support at both sides

• We used a flanged bearing at the driven side to reduce the unnecessary load to the motor and for smooth operation.

Bearing

• Then considering 40 degrees as the higher angle we designed the motor mount parallel to the ground surface at 40 degrees.

• Then the pipe used to cut the bush is designed in the way that will not make contact with motor or battery. And at last, the holder is also done. The image of the final design is shown below in Fig



Concept design front view

Concept design Isometric view

VIII. MANUFACTURING

• *Initially we started the manufacturing with the frame. The main frame is made of 30x30 square pipe of 2mm thickness.*

• Simultaneously the some of the components were done in lathe the two rods in the bearings are machined using grinding for high precision.

Drive and driven shaft

• To connect the wheel to the drive shaft main hub of the driven wheels have been changed in the way so that the hub can be connected to the hub using EN key.

• We purchased the drive and driven sprocket. In the

small sprocket we drilled the 12mm hole and in larger sprocket we have an id of 15mm in both the sprockets keyway has been done

Chain & Chain sprocket

- And a plate of 3mm thickness is used for motor mounting and the battery placement.
- Finally, everything is assembled.

Initial assembly

IX. Initial Testing

- *During the initial testing we placed the machine in the position but the weight of battery and motor was not sufficient to grip the tree*

X. Alterations

- *To improve the grip, we decided to use any other product to improve the grip to the tree after many ideas we finalized to use a gas spring strut and to make 2-point contact as a 3 point*
- contact by this the grip would improve.

Support member

- So again, we created altered the design using gas strut. The image of the alter design is shown in Fig
- And then fabricated the mounts and positioned it and then fixed them

XI. Second Testing

- *After the alterations again we tested the machine but the problem faced at this situation is it cannot be mounted on a tree of 6inch and higher and at this place we used a M10 bot of 280 mm to hold the nylon bush but as it was support at one side it started bending*
- The probability of areca nut trees having diameter of more than 6 inch is rare. But without it. It will not fulfill its purpose. So again, we altered out design to fix it on both small and larger trees we increased the length of the pipe
- And to avoid bending of the bold we converted one side support to two side support so it can avoid the bending of the bolt. The image of testing after alteration is shown in Fig

Second Assembly

- During initial testing's the testing were done using ta 2.5-inch pipe as this was done in home.

XII. Final Testing

XIII. After the alterations again we tested the machine but the problem faced at this situation is it cannot be mounted on a tree of 6inch and higher and at this place we used a M10 bot of 280 mm to hold the nylon bush but as it was support at one side it started bending.

XIV. The probability of areca nut trees having diameter of more than 6 inch is rare. But without it. It will not fulfill its purpose. So again, we altered out design to fix it on both small and larger trees we increased the length of the pipe

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XV. Conclusions

The design and analysis of an Areca nut crawler with a pesticide sprayer will be implemented at a relatively low cost. This will reduce accidents in the future. This is a more efficient technology for climbing Areca nut trees. The purpose of our device is fulfilled. The design of the product is made according to the calculation and the exact efficiency is achieved by the finished product. Load parts as well as fruit nuts were firmly held by the product. The product fulfills the purpose of the small farmers by providing them with high profit in the harvesting process and thus ultimately provides the right time to harvest the nuts. The yield capacity is perfect so that the harvesting process only takes once per tree as the product can harvest the nut crops from the palm to be harvested. The advantage of climbing areca nut trees is a very smooth climb without damaging the tree. An unskilled worker can operate the machine safely and efficiently. An average of 15 to 20 trees can be harvested/sprayed while climbing one tree. This project concluded that the areca tree climber is safe, reliable, efficient and greatly reduces the risk of climbing areca nuts.

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