



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 4, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com



Development of Unmanned Areca nut Bunch Plucking Machine

¹G Sujaykumar, ² Ashik S Kulal , ³ Kaushik, ⁴ Sourabha M, ⁵ Shreyas

¹Assistant Professor, Dept. of Mechanical Engineering, Yenepoya Institute of Technology, Moodbidri, Karnataka, India

^{2,3,4,5}Students, Dept. of Mechanical Engineering, Yenepoya Institute of Technology, Moodbidri, Karnataka, India

ABSTRACT: The unfortunate reality is that, when comparing earnings ratios, large-scale farmers continuously beat small-scale farmers notwithstanding the recent improvements and advancements in agriculture. The study focuses on the possibility of small-scale farmers expanding their agricultural output by raising arecanut trees at a rate comparable to that of large-scale farmers. Arecanut trees often grow narrowly, and the time it takes to harvest the crop does as well. Harvesting is the primary focus of investment, and small-scale farmers suffer significantly as a result, leading to loss. Harvesting the crop nuts required expensive equipment. Additionally, there is a risk that all of the crop nuts will be dispersed when they are taken from the top of the tree. A tree, they will all be scattered and wasted if they fall to the ground. As a result, we considered creating a product that a farmer could use. Self-explanatory and simple to use, we also concentrated on the safe release of the crop nuts from the top of the palm tree. This product was built with mechanical linkages and operates entirely on mechanical principles. Currently, it is operated manually; going forward, it will be mechanized. This product will decrease the cost of harvesting and increase the profit for the small-scale farmers to grow their ration as that of the large scale farmers. This will create a revolution in the field of crop harvesting which benefits lots of farmers to come up from their bad time to good time.

KEYWORDS: Areca nut cutter, Areca nut Collector, Battery,

I. INTRODUCTION

The majority of the climbing robots being developed by researchers worldwide can climb typical items like poles, walls, and other structures. However, only a very small percentage of people can climb trees due in large part to the irregular surface and length-dependent diameter. Traditional climbing equipment cannot be utilised for tree climbing applications because the bark of some trees may not be strong enough to hold the weight of the Areca nut cutter, Areca nut Collector, Battery, climbing apparatus. Because many trees are so tall, such as palm, coconut, and arecanut trees, climbing them can be risky. As a result, harvesting and preserving fruits and nuts becomes difficult. Therefore, the development of a unique tree climbing apparatus that can be used for harvesting and maintenance tasks is necessary.

In recent years, a lack of workers has emerged as one of farming's main issues. One crop that has been particularly affected by this is the areca nut. Areca nut trees can reach heights of 60 to 70 feet, and in order to harvest areca nuts successfully, climbers must access the trees at least five times a year: twice for fungus prevention spraying and three times for areca nut harvesting. Numerous pieces of machinery and equipment are offered on the market to help farmers in this. They are useless, however, because they ask for a person to physically climb the tree in order to chop the crop or gather the nuts, which demands physical work that requires strength. The development of machinery will lead the areca nut sector.

This machine is simple, and a person with only a basic understanding of technology can assemble it in a standard workshop. It is pretty easy to move from one location to another. This is the most effective tool for harvesting areca nuts on your own. climbing the tree. Attaching and removing the machine from the areca nut tree is easy. Cutting the areca nut bunch is also made simple on this machine thanks to a special type of blade. Climbing areca nut trees of various circumferences is the objective of this endeavour. It is essential to consider factors such maintaining the structure's stability while it is moving, reducing total weight, and achieving precise gripping. Moving uphill and downhill so that the machine can adjust to the tree's shifting cross-section. The machine maintains its locations throughout the process to needs to take hold of the tree firmly. The weight and payloads of the machine must be supported by the geared motor, which must have enough power. The force that the spring maintains necessitates the

preservation of the grip between the wheel and the tree. In this study, a climbing machine that is reliable, safe, and efficient is designed and built while accounting for all the aforementioned characteristics.

The design and fabrication of a climbing and chopping tool for areca nut trees are covered in this project. Flexible cables that connect the batteries to the motors and regulate power flow are what move the climbing machine. Reduction gear-equipped DC geared motors make sure that so that the machine can adjust to the tree's shifting cross-section. The machine's self-locking tyres help it retain its places throughout the procedure. And then grab the tree with the appropriate amount of tension to account for changes in the areca nut tree's diameter as the apparatus rises and falls. The device is reliable, safe, and efficient. Additionally, it significantly lessens the challenges of climbing and plucking areca nut trees.

II. PROBLEM STATEMENT

The current situation makes it difficult to find experienced labourers for tasks like applying pesticides and areca nut harvesting. The farming of areca nuts has been affected negatively as a result. Another significant aspect is the high pay for skilled labourers. The focus of this project is on the design and construction of a remote-controlled areca nut plucking machine, which will do away with the requirement for a skilled worker to harvest areca nuts. minimising the machine's impact on the tree's damage.

III. METHODOLOGY

Review the state-of-the-art for automated agricultural machinery today and look at related designs and functionality. To find the optimal method for creating the arecanut plucking machine, it would be imperative to conduct study on existing machinery that harvests tree crops. Establish the precise specifications for the machine, taking into account the size of the plantation, the quantity of trees to be felled each hour, the operational environment, and the spending limit. To make sure that the machine can effectively pull areca nut bunches from the trees, the requirements should be thoroughly examined. Create a mechanical device that can successfully harvest areca nut clusters without endangering the trees. The tool should have the ability to grasp and pull the nut bunches, cut the stems, and Gather the bunches and place them in a container. Create a mechanical system that is powered by an electrical system that includes sensors to locate and navigate around trees.

Create software to regulate the machine's movement, processing of sensor data, and picking operations. The software should be developed such that the device is independent and can move through the plantation without human assistance. Create a working prototype of the device and test it in various environments, such as diverse terrains, climates, and tree species. To enhance the functionality of the equipment, examine the test results and modify the design as needed. Test the device in the field to make sure it can function under real-world circumstances, paying close attention to its efficiency, efficacy, and safety. Prepare the device for commercialization, including production and distribution, after it has been tested and improved.

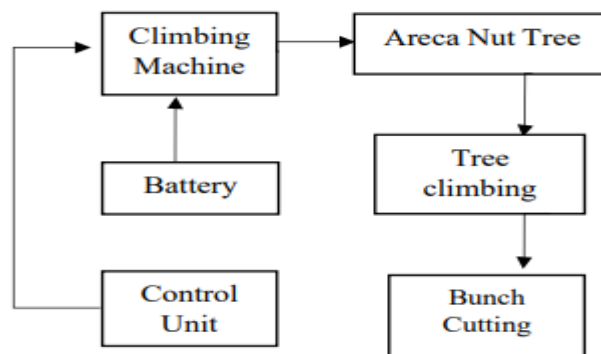


Figure 1: Block diagram of the proposed system



Components Used 1 BATTERY

An integral part that gives an automated areca nut harvesting device the necessary electrical power is the battery. Typically, the device has a rechargeable battery that can be used to store electrical energy for use when the device is in use. The unmanned areca nut harvesting device uses a battery for the following significant reasons. The gadget may be carried around from one place to another without being connected to a power source thanks to the battery. This is crucial for areca nut growers, who may need to move the machine about easily as they tend to several trees in various locations. The battery provides power to the device's electrical parts, including sensors, circuit, motor.

2 GEAR MOTOR

A gear motor is a crucial part of an autonomous arecanut bunch plucking machine because it gives the climbing mechanism the power and torque it needs to work. In order to increase torque and decrease speed, a gear motor typically consists of

an electric motor coupled with a gearbox. Because it takes a lot of force to separate the arecanut bunches from the tree, this is essential for the climbing mechanism in the arecanut bunch plucking machine. The climbing mechanism can exert the necessary force on the bunches because the gear motor gives it the torque it needs. The gear motor's gearbox enables speed reduction while boosting torque.

3. REMOTE CONTROL

In an unmanned areca nut bunch plucking machine, a wired remote-control system is an alternative to the wireless remote-control system. While the operator has the freedom to operate the machine wirelessly with a wireless remote-control system, there are benefits to using a wired remote-control system as well, especially when climbing a tree. A wired controller that is cabled to the machine is used by the operator in a wired remote-control system. The operator can control the machine's movement and plucking mechanism by using the controller to send signals to the machine through the cable. The reliability of the signal is one of the key benefits of a wired remote-control system when ascending the tree.

4. WHEEL

The wheel in an unmanned arecanut bunch plucking machine is used for traction and stability while the machine is climbing up a slope or uneven terrain. When the machine is climbing, it needs to have a good grip on the ground to prevent it from sliding or tipping over. The wheel provides this grip by exerting a downward force on the ground, which creates friction and helps to maintain traction. In addition, the wheel also helps to distribute the weight of the machine evenly, which reduces the load on the other components and ensures that the machine stays balanced. This is especially important when the machine is climbing, as the weight distribution can shift and cause the machine to become unstable.

5. PLUCKING TOOL

An unmanned areca nut bunch plucking machine is not complete without a plucking tool. The popular crop areca nut, sometimes referred to as betel nut, is grown throughout many tropical areas. The areca nut bunches can be safely and effectively removed from the tree using the plucking tool without endangering the fruit or the tree. Typically, a robotic arm that is computer-controlled carries the plucking tool. The device comprises of a sharp blade made to delicately grip and extract areca nut bunches from trees.

6. MS (mild steel) MATERIALS

Since it makes farming more productive and economical, the use of unmanned machines in agriculture has grown in popularity in recent years. The unmanned arecanut bunch plucking machine is one such machine that has been created and is intended to automate the operation of plucking arecanut bunches from trees. In this situation, the performance and durability of the equipment depend on the materials that were utilised in its construction. MS (Mild Steel), a form of carbon steel with a low carbon percentage that is simple to weld and process, has demonstrated significant potential in the creation of this machine.

7. SUSPENSION

Suspension in the development of robots that harvest arecanut bunches. In order to keep the machine steady and safe to operate, the suspension system in this device works to absorb the shock and vibration that happen throughout the plucking process. The suspension system normally consists of a pair of shock absorbers and springs that work in concert to lessen the force of the machine's motion. While shock absorbers lessen rebound that happens after impact, springs compress and expand to absorb shock. By doing so, the machine is kept steady and its parts experience less wear and tear. An autonomous arecanut bunch plucking machine's suspension system needs to be carefully built and tuned to meet the machine's unique needs.

8. COLLECTING BIN

With the use of this device, ripe areca nut bunches can be removed from areca nuts automatically. The major purpose of the equipment is to remove the bunches and place them in the collection bin for simple transportation. The collection container, which is normally at the top of the device, is made to catch the areca nut bunches when they are snipped from the tree. High-quality, lightweight materials were used to make the bin so it could withstand the force of the falling bunches. It is made to be easily detachable so that the harvested bunches may be transported from the machine with ease.

9. POWER AMPLIFIER

Unmanned areca nut bunch plucking equipment is a farming tool used to harvest the fruit of the areca nut tree. This machine needs a power source to function, and an electric motor is frequently employed in this capacity. The power amplifier is a crucial part of this machine since it boosts the electric motor's power output so that it can drive the machine's numerous mechanical parts. A power amplifier, to put it simply, is an electronic circuit that increases the strength of an electrical signal. The power amplifier in an unmanned areca nut bunch plucking machine amplifies the electrical signal from the electric motor, which is very low power, to a level adequate for controlling the machine's different mechanical parts, including the conveyor belt, the picking arm, and other moving components.

IV. RESULTS AND ANALYSIS

An inventive solution to the labour-intensive task of arecanut harvesting looks to be the proposed design for an automated arecanut bunch plucking machine. The machine may be powered by electricity without the need for manual labour, which can lower total costs and improve areca nut harvesting efficiency. Better control and traction over the machine's movement on the tree trunk can also be achieved by using a Teflon wheel and geared motor in the climbing mechanism. Additionally, the machine's adaptability to different sizes of areca nut trees can be increased by the suspension system for wheel adjustment for different radius of the tree. The machine that assists in harvesting the areca nut bunches must include the plucking tool. Although it is unclear from the description whether the plucking tool is made to cause the least amount of harm to the tree, this is an important aspect that must be taken into account for the longevity of the areca nut trees.



Figure 2: 3D model of the proposed system



V. CONCLUSION

The creation of an automated system for plucking areca nut bunches has the potential to completely change the way areca nuts are harvested. With developments Designing a machine that can efficiently and successfully pluck areca nut bunches without the need for human labor is now achievable thanks to remote control technology. This would drastically lower labour expenses and increase the profitability of areca nut farming. Additionally, it would aid in lowering the physical stress and accidents that are frequently linked to manual areca nut harvesting. The size, form, height, weight, and size of the bunches of areca nuts, as well as the topography of the agricultural region, would all need to be taken into consideration when designing such a machine.

REFERENCES

- [1]. R. Thirupathi, N. K. Adarsh, R. Akash, N. Lakshmana Prabhu, T. Karthikeyan “Design and Fabrication of Areca Nut Climber and Harvesting” International Journal of Research in Engineering, Science and Management Volume 4, Issue 3, March 2021
- [2]. Mohit Rane, Ashish Toraskar, Utkarsh Naik, 1Rajat Harmalkar, Gauresh Lingwat, Shiva Krishna J., “Gaurish Walke Design of semi-automated arecanut tree climbing plucker” Department of Mechanical Engineering Agnel Institute of Technology and Design, Assagao Goa-403507, India 2019 JETIR May 2019, Volume 6, Issue 5
- [3]. Shivdeep D R, Student Dept. of Mechanical Engineering, JSS Academy of technical Education, Karnataka, India. “Design and Fabrication of Areca Nut Tree Climber and Harvesting Machine” International Research Journal of Engineering and Technology (IRJET) Volume: 06 Issue: 02| Feb 2019
- [4]. C Sathishkumar, G Dineshkumar, K S Karthikeyan, P Prasanna 1Assistant Professor, Department of Mechanical Engineering, Bannari Amman Institute of Technology, “Development of Areca Nut Climbing And Harvesting Machine With Pesticide” 17th International Symposium on Solid Oxide Fuel Cells (SOFC-XVII) (July 18-23, 2021)
- [5]. Sri Krishna Shastri C Department of ECE Megha B 8 th Sem, Department of ECE MITE, Moodabidri MITE, Moodabidri “Automated System for Climbing and Spraying Pesticides on Areca Nut Trees” International Journal of Engineering Research & Technology (IJERT) <http://www.ijert.org> ISSN: 2278-0181 Vol. 10 Issue 11, November-2021
- [6]. Salice Peter P.V, Akhil K.T, “Design and Construction of a Tree Climbing Robot”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, April 2015
- [7] Swetha T N, Uma N, Harini T M, Kusuma R, hashikumar G H “Smart Areca Nut Plucking Robot” E-ISSN: 2321-9637 International Journal of Research in Advent Technology, Vol.7, No.6S, June 2019



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.423



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

9940 572 462 **6381 907 438** **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details