MULTIPURPOSE MACHINE FOR ARECANUT FARMING

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Introduction :

The people in rural areas of south India like Karnataka and Kerala mainly depend on agriculture for their livelihood. The main crops grown are Arecanut and coconut. For spraying and applying pesticides on the crown and also for harvesting, skilled labourers have to climb manually up the tree. Such a process looks easy, in reality it is time consuming and dangerous task. Arecanut trees attain a height of about 13-16 meters. It is mandatory to climb the trees a minimum of five times a year for a successful harvest- twice for the preventive spray against fungal disease, and thrice to harvest the arecanut. Only skilled labourers can carry out these farming operations. They have to climb the trees using muscle power. In an acre that has 550 trees, a labourer has to climb a minimum of 100 to 160 trees. As this involves real hard, physical exertion, younger generations of labourers are losing interest, with potentially harsh implications for arecanut cultivation. The spraying is done in monsoon, while harvest time is typically in summer. It requires skill to climb arecanut tree. Skilled arecanut tree climbers have become scarce and farmers are finding it difficult to spray the pesticides.

In summary although many device were invented to climb the arecanut tree it was not economical and user friendly. In this project aimed to overcome these deficiencies by developing a multifunctional machine for arecanut farming. This research is useful for climbing, cutting and spraying pesticides on single tree to multi trees in 360°. Cutting is mainly done using telescopic arm with the help of high speed motor.

Objectives :

The purpose of this project is to combine agricultural operations like arecanut tree climbing, pesticide spraying and cutting the bunch of arecanut in a single machine using necessary equipment.

Methodology :

The project consists of three main systems

- The climbing system
- The spraying system
- The arecanut bunch cutting system
Working of climbing system:

The machine will consist of a single frame which is connected around the arecanut tree with the help of supporting rollers that can be adjusted as the diameter of the tree. The frame is fitted with the 2 roller along with the shaft. The one end of the shaft is connected to the pulley and the sprocket. The rollers are attached to the frame with a help of bearing. 2 rollers are connected with the help of two V-belts both rollers rotates in the same direction. Upper shaft consists of a sprocket which is connected to another sprocket with the help of chain. One more chain and sprocket is connected between the speed reduction gear and cordless drill machine. The motion of the drill machine can be controlled with the help of DPDT switch or with a wired RC controller, here we can control the speed and forward and reverse motion of the drill machine. The sprayer system or cutting system can be attached to the climbing system with the help of nut and bolt.

Working of spraying system:

The sprayer base is first fitted into the frame of a climbing system with the help of bolt and nut. This sprayer base holds circular ring, this circular ring is fitted around a arecanut tree in order to form a circle. The circular ring is connected with rollers and motors to provide 3600 rotation to the circular frame. Nozzle which is used to spray pesticides is fitted to the circular ring and an additional motor is fitted to the nozzle to provide upward and downward motion. Spraying of pesticides is carried out in 3600 rotation, any type of sprayer pump can be attached for this system.

Working of cutting system:

Cutter base is first fitted in to the frame of a climbing system with the help of bolt and nut. Cutter base holds the extendable arm and one cutting blade with motor. Spring is used to connect cutter base and an extendable arm. Another cutter is rigidly fixed to the cutter base, this cutter will be straight i.e.900 and this cutter is used to cut the bunch of arecanut on which machine is used to climb. One more cutting blade and motor is attached to the extendable arm, to cut the arecanut from a neighbouring tree this extendable arm is pulled manually downward i.e. 1800 with the help of rope and the arm can be extended for different length .This arm is arranged in telescopic format. Cutting action of a cutter is carried out by using motor. Here cutting of arecanut from nearest tree is carried out in a 2700 rotation.

Results and Discussions:

Climbing system:
The climber system for arecanut tree is designed and tested for various arecanut trees. The unit is capable of climbing tree for about 20 feet. The climbing capabilities can be further increased by using power full motors or 2 stroke engine. The unit is also climb in wet condition and is able to climb the arecanut tree without slips. In future good quality springs can be used for better operation as the diameter of the tree decreases it will contract and as the diameter increase it will expands with high grip around the tree.

![Climbing system at Field](image)

**Cutting system:**

There are two cutters used in the cutting system one cutter it is fixed it cuts the arecanut from the same tree, in future fixed cutter can be made into adjustable so it can cut the arecanut with high precision. Another cutter is extendable it is used for cutting the arecanut from the nearer trees it does not worked as expected because it is manually operated so it is difficult to operate. In future this can be made automated so it can be operated easily.

![Cutting system at Tree](image)

**Spraying system:**

The spraying system is capable of controlling the direction of the sprayer nozzle and the angle of nozzle. Spraying of pesticide can be done at 360° angle with high accuracy. Any type of sprayer pump can be used for this system.

![Spraying system](image)
Conclusions:

- Multipurpose machine for arecanut farming is a unique model which serves as a great help and boon to arecanut farmers.
- The multipurpose machine has been tested on an arecanut tree with satisfactory results.
- A farmer with little or no technical knowledge can easily operate the machine from the ground with a remote control.
- The project concludes that the arecanut tree climber and pesticide sprayer is a safe, reliable, efficient robot and reduces the risk involved in manual climbing and spraying to a great extent.
- By installing properly designed sprayers or cutting device many number of trees can be harvested in a single climb thus increasing the efficiency.
  So, we conclude that the multitalented robot machine is a safe, reliable, efficient and automatic tree climber which reduces the problems in climbing the arecanut tree and also it solve most of arecanut harvesting problem.

Future scope:

- Wireless technology can be adopted.
- Lowering the weight.
- Wheels with better frictional co-efficient can be designed.
- The process of cutting can also be made fully automatic using robotic arms.
- Computer vision can be added.
- Improving of $270^\circ$ cutting system.