**DEVELOPMENT OF AGRICULTURAL EQUIPMENT FOR ARECANUT TREE CLIMBING AND SPRAYING PESTICIDES**

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**COLLEGE**: JSS ACADEMY OF TECHNICAL EDUCATION, BENGALURU  
**BRANCH**: MECHANICAL ENGINEERING  
**GUIDE**: DR. B.V RAGHAVENDRA  
**STUDENTS**: MR. NIRANJAN KUMAR L R  
MR. NAVEEN N  
MR. BAIRED GOWDA N  
MR. THEJAS KUMAR M N

**Introduction:**

Areca nut production in India is dominant in the coastal region within 400 kilometers from the coast line, and also in some other non-coastal states of India. Areca nut production in India is the largest in the world, as per Food and Agricultural Organization. In recent years, labour scarcity has emerged as one of the foremost challenges in farming. One crop that has been most affected by this is areca nut. Areca nut trees attain a height of about 60-70 feet. 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 areca nut. 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 150 trees. As this involves real hard, physical exertion, younger generations of labourers are losing interest, with potentially harsh implications for areca nut cultivation. The spraying is done in monsoon, while harvest time is typically in summer.

**Problem definition:**

Areca nut tree climbing for spraying pesticide and harvesting is presently done by human being. Farmers have to climb the tree approximately 40 feet and above for spraying the pesticides minimum two times annually- that too in rainy season it is challenging because of slippery trunk surface. In order to minimize the human involvement in climbing tree, an alternate solution is to be developed.

**Objectives:**

The regular spraying of pesticides to areca trees, plucking of areca nut, which is done manually to a large extent, requires specialized labourers, who have to climb the tree to do that, which is a risky job. This need,

- To develop a machine suitable for climbing areca-nut tree for spaying pesticides.  
- To provide an alternative to the existing methods of human climbing the areca-nut tree and spaying the pesticides.  
- To avoid direct contact of human with pesticide while spraying the pesticides on tree.
To tackle the problem of unavailability of areca-nut tree climbers.

Methodology:
Project contains

1. **Base frame**
   The aluminum base frame is one which supports all the components to be built upon. It is fitted with three DC motor sets for the climbing. The frame also has a movable arm on one side. The frame can be opened by detaching springs so as to attach to the tree.

2. **DC motors**
   DC motors are the driving system of the equipment to climb areca nut tree. High torque dc motor with 10 rpm speed has been used to get slow and steady motion for the equipment. There are three motors used for climbing.

3. **Remote control kit**
   The whole set is controlled by remote. So the entire climbing mechanism and spraying mechanism are controlled by a remote.

4. **Movable arm**
   Movable arm which carries spraying nozzle can rotate about 270°. It is also remote-controlled by the operator.

5. **Sensor**
   An Infra Red senor is used to detect the obstacle while the equipment is climbing tree. Range of the sensor is about 5cm.

6. **Battery**
   The power for the motors is given by the 12V,5Ah battery.
Result and conclusion:

In the present day, to spray pesticides on areca nut trees people have to climb and risk their lives. It is also difficult to find labours to do this job. We are successful in putting together a prototype that can replace the man force involved into doing this job. The use of this prototype makes it economical and reduces workmen.

Future improvements:

Further research into the mechanical design of the moving arm which allows the sprayer to rotate 360º would allow for the final project to be more effective in completing our list of requirements. The design of the moving arm to provide 360º rotation of sprayer is something that could be explored in great detail by future projects. The shape and strength of the base could be redesigned to make them smaller and lighter possibly allowing for the robot to climb around the tree. Research on this could also look into incorporating engine instead of motors as power is the issue in villages and also allowing for heavier payloads to be carried.