

Arecanut /Coconut Multipurpose Contrivance

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Abstract: Agriculture is back bone of India. The farmers situation is being take into consideration and we students has bought applied science with mechanical engineering into act and made a prototype that has an in-built bluetooth handy device to operate at an height of tree and which varies adjust its body to the waist of tree and move further to harvest areca/coconut from tree with help of blade which can rotate to any degree covered in body of contrivance and perfectly harvest from tree .And also added drizzle to act upon tree to make a precise pesticide sprayer .

I. INTRODUCTION

India is known to world that it's an agriculture land and it's been right now also and continue .As we all know that agriculture has proven its presence in field of applied science from a long time .we seen farmers who have adopted traditional farming, have changed to conventional farming / modernized farming. And also we seen other than large crop growing farmers, we have a huge mass of small area farmers, who grow more variety of crops. Which makes usage of different seeds, tractors, and seed sowing machine, pesticides, weed killer sprayers etc. machines and other traditional way to cut yielded crops. Applied science had played a major role in making farmers efficient and convenient way of life. Even trying more for betterment of farmer's life. Even now new age farmers use some of traditional way because of machines are costlier than small farmland can afford and use for his life betterment. As we all know that by implementing convective method in farmland can make farmer helpful in maximum harvest in good quality and large quantity .That might help farmers save from risking themselves from huge debt holder. Arecanut being formed from areca palm which is worldly known as betel nut, is majorly grown in Kerala, Karnataka and other states of India as a crop which has high demand in India itself and abroad .The main usage is for chewing purpose and lot more others also .The Coconut is enormously used for tender coconut water as a refreshment and other food purposes widely. Sustainable improvement in the livelihoods of poor farmers in developing countries depends largely on the adoption of improved resource conserving harvesting systems. While most of the necessary components already exist, information on the availability and performance of equipment is lacking and effective communication between farmers and agricultural research and development department is unsuccessful.

II. MAIN FEATURES OF INDIAN AGRICULTURE

(i) Source of livelihood:

Agriculture is the main occupation. It provides employment to nearly 61 Percentage of total population. It contributes 25% to national income.

(ii) Dependence on monsoon:

Agriculture in India mainly depends on monsoon. If monsoon is good, the production will be more and if monsoon is less than average then the crops fail. As irrigation facilities are quite inadequate, the agriculture depends on monsoon.

(iii) Labour intensive cultivation:

Due to increase in population the pressure on land holding increased. Land holdings get fragmented and subdivided and become uneconomical. Machinery and equipment cannot be used on such farms.

(iv) Under employment:

Due to inadequate irrigation facilities and uncertain rainfall, the production of agriculture is less; farmers find work a few months in the year. Their capacity of work cannot be properly utilized. In agriculture there is under employment as well as disguised unemployment.

(v) Small size of holdings:

Due to large scale sub-division and fragmentation of holdings, land holding size is quite small. Average size of land holding was 2 to 3 hectares in India while in Australia it was 1993 hectares and in USA it was 158 hectares.

(vi) Traditional methods of production:

In India methods of production of crops along with equipment are traditional. It is due to poverty and illiteracy of people. Traditional technology is the main cause of low production.

III. ADVANTAGES OF CONTRIVANCE USAGE

- [1] Easy handling
- [2] More cost effective.
- [3] Reduce human risk factor.
- [4] Improves tree/ plant life expectancy.
- [5] It tailors its self to varying width of tree.
- [6] Suitable for both Arecanut /coconut trees.
- [7] One time investment.
- [8] Comparatively low cost to market available product.

IV. DISADVANTAGES OF CONTRIVANCE

- Initial cost is bit High, and service cost for replacing and repairs of the parts are comparatively better than other available product, but its cost some money.
- Battery charging need to be done frequently in order to keep working or need of battery replacement is required.
- Net weight is a lag to system eventually after the harvest.

V. OBJECTIVES

- The main objective of our project is to combine all the individual tools and develop a modular design that provides farmers with equipment loaded machine that can be used for multiple purposes.
- The objectives of the project include the design and fabrication of a semi-automated machine which is capable of climbing tall trees with varying circular cross sections.
- Also the design should be efficient in working and controlling compared to the existing machines such that the time required for installation and harvesting is made shorter and also to make the controlling of the machine user friendly so that person with very less technical knowledge is able to use it.

Factors That Influenced Design and Fabrication

- Scientific farming methods
- Precision farming
- Portability of the equipment: our equipment is completely flexible for easy detach and attach to tree farmer friendly.
- Cost effective.

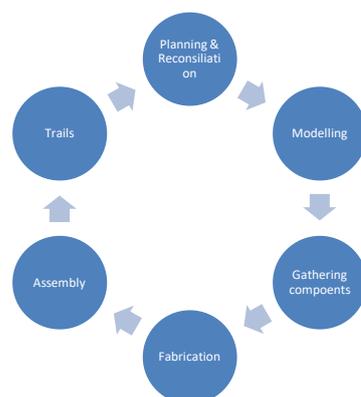
VI. METHODOLOGY

FIGURE-1

VII. COMPONENTS USED

- DC MOTOR
- BATTERY-12v, 7.3 AH.
- MILD STEEL /ALLUMINIUM.
- SPRINGS.
- WHEELS.
- RELAYS AND SWITCHES.
- CONNECTING WIRES.
- AURDINO BOARD.
- CONTROLLER.
- NUTS AND BOLT.

D.C. Motor - A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields.



Battery -12 V, 7.3 AH. A battery is a power source consisting of one or more electrochemical cells with external connections [\[1\]](#) for powering electrical devices such as flashlights, mobile phones, and electric cars



FIGURE-3 Battery

3. Springs- Springs are made from a variety of elastic materials, the most common being spring steel. Small springs can be wound from pre-hardened stock, while larger ones are made from annealed steel and hardened after fabrication.



FIGURE-4 Springs.

4. Wheels-These are the locomotive materials which helps to move the machine in a path towards the required target and reach for desired help , made of plastic and rubber material .



FIGURE- 5Wheels

5. Relay -it's an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.



FIGURE-6 Relay switches

6. Arduino board- Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

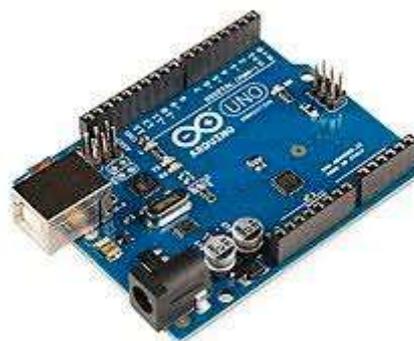


FIGURE-7.Aurdino board.

7. M.S. Frame – Mild steel consists of iron alloyed with less than 0.3% carbon, most commonly between 0.1 to 0.25%. For construction purpose mild steel used because of its ductility and malleability.



FIGURE-8 M.S. Frame

VIII. FABRICATION PROCESS

Welding: To make our project we chose Mild steel as the bone and only way to join in a cost-effective way is by welding. It's a simply a process of joining metal firmly .Its actually a weld also called homogenous bond created between to metal with the help of other metal , as we know its process of artificial heating of weld rod with the help of weld rod to melt at certain temperature.

Grinding: generally the grinding is all about abrasive tool used to cut a metal at required spot for the help of user to for certain work and also to smoothen the surface where extra weld or any unwanted inflated surface to a fine shape.

Wire connection: The wire connection is like veins that send blood to major parts as that current is being send through it to various parts of to perform its function



FIGURE-9 Welding frame



FIGURE-10 Grinding



FIGURE-11 Isometric view.



FIGURE-12 Top view.

APPLICATION OF OUR EQUIPMENT

1. Harvesting
2. Drizzle
3. Bluetooth handy
4. Dispenser
5. Obstacle remover

ADVANTAGES OF OUR EQUIPMENT

1. Setts According to variable diameter of tree at any certain height.
2. Cutter provides precise harvesting applications.
3. Low cost, it's the lowest priced multipurpose machine.
4. Bluetooth has made it easier to control in farmer friendly way.

IX. CALCULATIONS RELATED TO THE DESIGN

Design data handbook for mechanical engineers, is used for obtaining equations and do the necessary calculations.

Preliminary calculations for total forces acting on the system Total force acting due to weight of the machine (F):

$$F = \mu \times N \quad (3.1)$$

Considering total weight of the machine as 10 kg,

Hence, $W = 10 \text{ kg}$

Assuming $\mu = 0.25$

Therefore,

$$F = m \times g \quad (3.2)$$

$$F = 10 \times 9.81$$

$$F = 98.1 \text{ N}$$

$$F = \mu \times N \quad 98.1 = 0.25 \times N$$

$$N = 392.4 \text{ N}$$

$$N \approx 400 \text{ N}$$

Total resultant force acting (R)

$$R = \sqrt{F^2 + N^2}$$

$$R = \sqrt{98.1^2 + 400^2}$$

$$R = 415 \text{ N}$$

Force acting on each spring (R)

$$R_s = \text{total resultant force } R / \text{no of springs (S)}$$

$$R_s = 415 / 8$$

$$R_s = 52 \text{ N}$$

Torque on Wheels (T) $T = F \times D / 2$

$$T = 98.1 \times 100 / 2$$

$$T = 4.905 \text{ N-m}$$

Rate of climbing of climber:

Total length of tree = 30mts (maximum)

$$= 30000 \text{ mm}$$

Circumference of the wheel = $2 \times \pi \times D / 2$

$$= 2 \times \pi \times 10 / 2 = 314 \text{ mm}$$

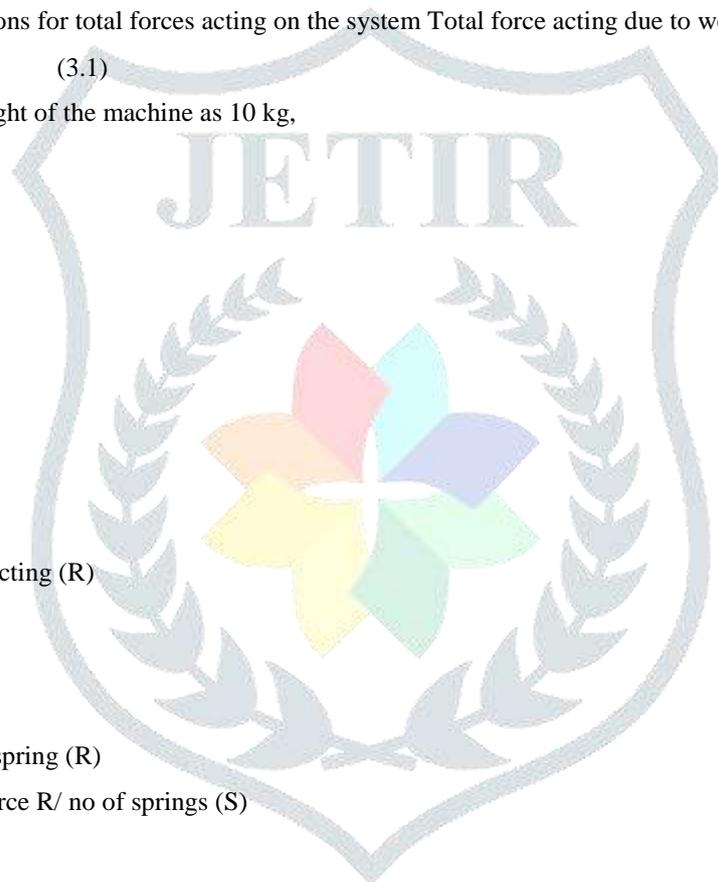
Total no. of revolutions of the wheels

$$N = \text{Total length of the tree} / \text{circumference of the wheel}$$

$$= 30000 / 314$$

$$= 95 \text{ rounds/min}$$

$$N = 100 \text{ rounds/mi}$$



Desired speed=10 rpm ~50 rpm for the Torque and grip effectiveness.

Design Torque=4.9N-m

Required voltage= 12V

Power Required = $2 \times \pi \times N \times T / 60$

= $2 \times \pi \times 10 \times 4.9 / 60$

=4.312 W/ wheel

Approximately equal to $P \times 4 = 4.312 \times 4$

=17.248~20W for all wheel used

X. RESULTS AND CONCLUSION

In Present day system, Areca nut harvesting is still carried out with involvement of manpower without appropriate safety measures which may lead to serious casualties which is also not economical and is time consuming.

This project is intended to reduce human efforts for the harvesting of Areca nut. It can be controlled by a switches which makes the control easy and is user friendly.

The use of automated contrivance is versatile and will aid in increasing the production capacity of the farmers and reduce their dependency on skilled labors.

Better visibility at high altitude will help farmer to take necessary action at right point of time. This will also reduce the spoilage of crop and increase the profit margins.

XI. SCOPE FOR FUTURE WORK

In future the device can be automated to further levels like. Instead of controlling the switches, microcontrollers can be used and can be made wireless. Use of camera will make the device easier to use. The materials can be replaced with Aluminum composites or Nano fibers which are 10 times stronger and lighter than GI pipes.

Since the machine has to work for hours, it is made less power consuming. The maintenance requirement of the device is very less making it very convenient to use. In future the device can be fully automated.

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