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## Mulching Paper and Drip Laying Machine

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**Abstract:** : In today's modern world the use of mulching paper in agriculture is increasing day by day due growing importance in increasing crop yield. Deficit rain poses a big problem for any agricultural activity In order to increase crop production with scarcity of water farmers are moving towards technical solutions like plastic mulching paper. Mulching as a practice to conserve soil moisture, check weed control, moderate soil temperature and provide a micro climate to the plant is age old. With the advent of plastic films for mulching application, this practice has got further importance. Research studies have shown, when mulching is practiced along with drip irrigation, it gives best results. Plastic mulching paper retains soil moisture and prohibits weed growth at the same also maintaining soil temperature. Even though this technology is quite old and versatile, its use in India is still limited due to difficulty of laying the mulching paper manually. This is because lack of availability of labour and high cost of labour. There are automatic machines but they are either not available in India or the use is limited to large scale farming.

**Keywords:** Mulching, Machine, Soil, Materials, Lying.

### I. INTRODUCTION

Mulch is a layer of material applied to the surface of an area of soil.

Mulching is the process of covering soil around the plant root area with a view to insulate the plant and its roots from the effects of extreme temperature fluctuations.

The objective of this project is to design and manufacture a small size portable Mulching paper laying machine working either manually or powered externally in such a way so as to reduce the cost of the machines as well as to facilitate small farmers by using it with mini-tractor. The main objective is to reduce or eliminate to some extent the manual labor and time required for mulching paper laying process. The another objective of this project is to provide a machine for laying mulch paper upon the ground in manner whereby paper will be neatly lay on ground without blowing away. Also efforts as well as man power required to lay mulch paper will be reduced. Also available techniques are not suitable for small scale farms.

### II. LITERATURE SURVEY

First working model of mulch laying machine was developed by Leslie.E.Bailey in October 22, 1921. The mechanism was horse pulled and had a rotary drum arrangement to lay the paper. In mid 1930s the mulching paper laying machine was used while being powered and pulled by horses. Prior to the invention of the mechanism shown the fig 2. The mulching paper was laid by simply unrolling the winded paper roll through manual labor. This technique was both time consuming as well as tedious and not efficient. The use of horses was very much effective than the manual process and hence preferred on large scale [1].

Herman John Herfort invented improvements in machines for laying mulch paper upon the ground for protecting plants and various growths. The paper is laid upon the ground in a manner whereby the paper will be prevented from blowing away. Another important

object of the invention is to provide a machine for laying mulch paper upon the ground in an even and neat appearing manner. These and numerous other important objects and advantages of the invention will become more apparent after considering the practical usefulness of the invention. In a machine of the character described comprising a wheeled frame, a spool mounted upon the same for supporting a roll of mulch paper, furrow diggers at the forward end of the frame, means for depressing the edge portions of the paper into said furrows [2].

## 2.1 SCOPE

Most of the available techniques are efficient for performing a particular task like laying mulch or for laying Drip line. There are integrated machines but they are either expensive or too big to be operated in small scale farms. The scope of the project extends to building a small size portable machine which integrates all the above mentioned tasks like laying paper as well as drilling holes and laying drip line performs them efficiently. Such a machine reduces the efforts and saves time taken from ploughing to seeding.

## III. PRAPOSED SYSTEM

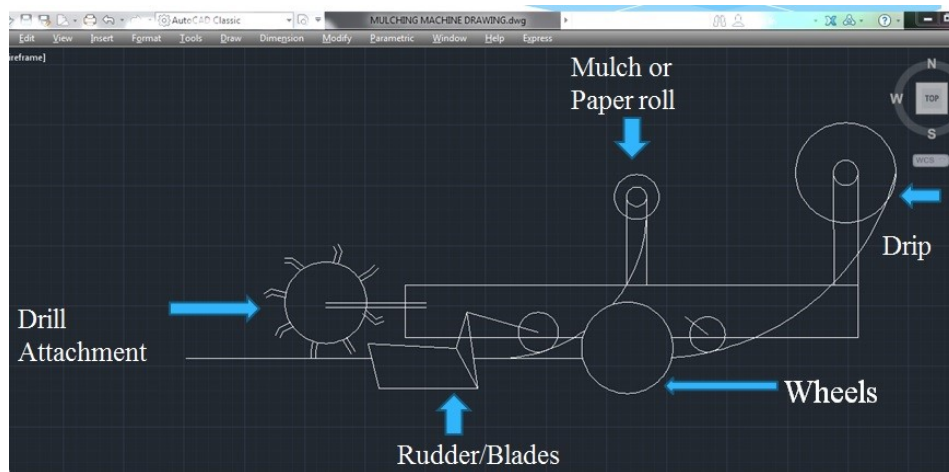


Fig.1. Mulching paper laying machine

The proposed system shows the experimental Setup of Mulching paper Laying Machine.

## 3.1 Working

The very first step in manufacturing any machine or component is design. The design requires the construction of a mechanism which can bear the load as well as perform the given task. By considering the different parameters like loads, reaction forces, linear movement a proper mechanism is to be designed to fulfill the function and work safely.

Rough sketch of Principal operation is shown below:

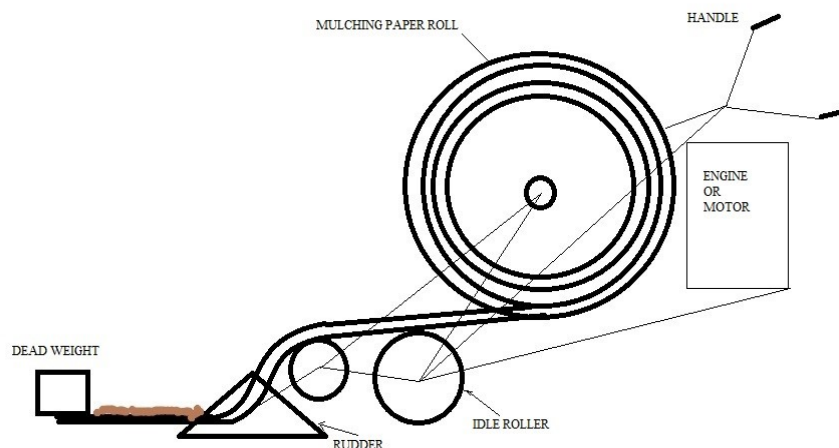


Figure 2: Simple mechanism for mulching paper laying machine

### 3.2 Types of Mulch

#### i. Organic Mulches

Mulch is usually but not exclusively organic in nature. It may be permanent (e.g. plastic sheeting) or temporary (e.g. bark chips). It may be applied to bare soil, or around existing plants. Mulches of manure or compost will be incorporated naturally into the soil by the activity of worms and other organisms. The process is used both in commercial crop production and in gardening, and when applied correctly can dramatically improve soil productivity. Hence, organic mulches also serves the purpose of fertilizer when it decomposes. Its availability is the main reason of moving toward inorganic or plastic mulches.

#### ii. Inorganic Mulches

The inorganic materials such as plastic films, when used for mulching are known as inorganic mulches. Crops grow through slits or holes in thin plastic sheeting. Plastic mulch is often used in conjunction with drip irrigation. Some research has been done using different colors of mulch to affect crop growth. This method is predominant in large-scale vegetable growing, with millions of acres cultivated under plastic mulch worldwide each year. Disposal of plastic mulch is cited as an environmental problem; however, technologies exist to provide for the recycling of used/disposed plastic mulch into viable plastic resins for re-use in the plastics manufacturing industry.

### IV. SYSTEM FLOW DIAGRAM

Methodology used for whole processing of design and development of mulching paper laying machine is given below; This methodology gives way about how work is to be carried out in systematic way. It is standard process of describing process, how it is done in simplest manner.

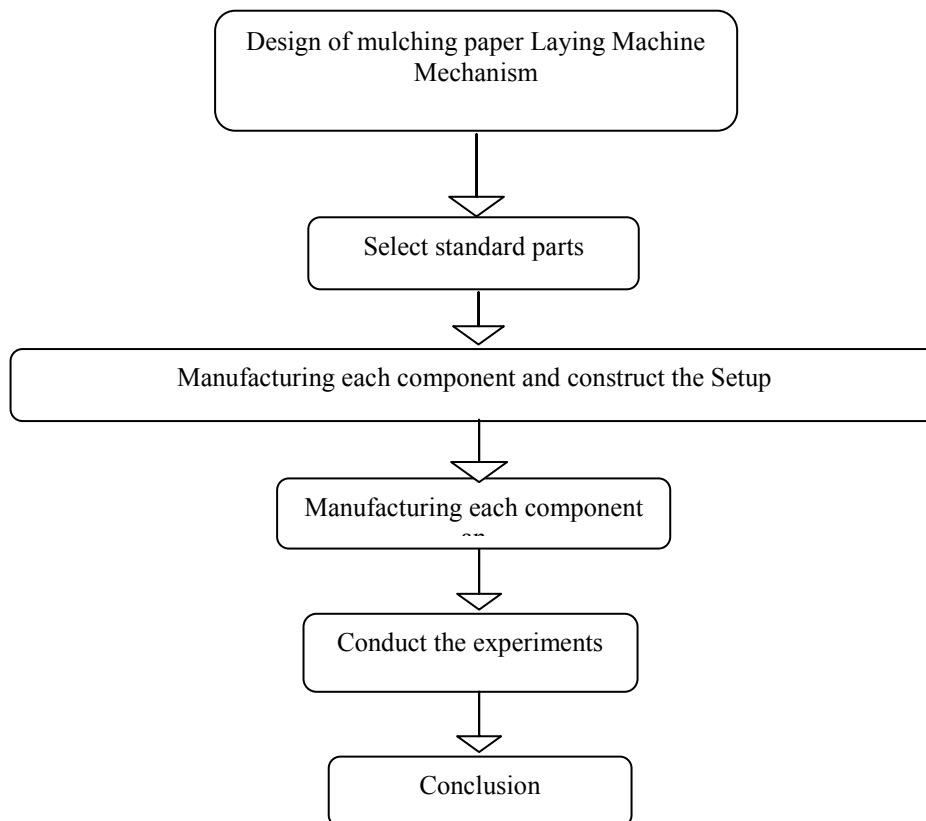


Figure 3: System Flow Diagram

### V. DESIGN OBJECTIVE

Configuration comprises of use of logical guideline, specialized data, and creative energy for advancement of new component to perform particular capacity with most extreme economy and effectiveness. Thus cautious outline approach must be embraced.

#### **A. Plastic Mulch Film Laying Machine**

The following processes are to be integrated into the machine:

- Drip pipe laying
- Mulch paper laying
- Hole making attachment

These all functions are to be integrated such that their sequential operation can be carried out safely and efficiently. The proposed machine should be compact as well as economically feasible.

By considering the different parameters like loads, reaction forces, linear movement a proper mechanism is to be designed.

#### **B. Design Considerations**

- Essential elements:
    - 1) Arrangement and mechanism for Linear Movement of Machine.
    - 2) Cylindrical Roller or drum for proper unrolling of the Mulch Paper.
    - 3) Wheels for pressing the paper on the ground.
    - 4) Mountings for Tractor attachment and pulling manual pulling.
- Curved Blades or Triangular rudder for pushing the soil on the laid paper



#### **C. Drill Making Attachment**

Holes have to be made in the laid paper for plantation of seeds or seedlings. In order to do so a mechanism similar to the one shown in the above figure will be attached to the machine

- The circular wheel with equidistant spikes will be mounted on the mainframe of the machine held at fixed position. The spiked wheel will be free to rotate and will be used to drill the holes.
- The spikes on the wheel will have a slight taper at the tip so that the paper tearing or the hole piercing starts predetermined position and not before it.
- The spikes will be arranged alternately on a wide base wheel and the holes will be drilled in zig-zag manner.
- The taper ensures perpendicular contact and also applies the maximum force for the piercing operation.

#### **D. Drip Attachment**

- A roll of Drip pipe is attached to the mechanism of machine and is placed at higher position than the mulch or paper roll.
- The position of the drip line to be laid should be such that it does not intercept with the hole piercing path.
- Drip line is laid simultaneously along with the mulch paper.
- The drip line is laid below the paper and can be adjusted to be laid centrally along the axis of linear motion of the machine.

## **VI. DESIGN**

### **6.1 Experimental Setup**

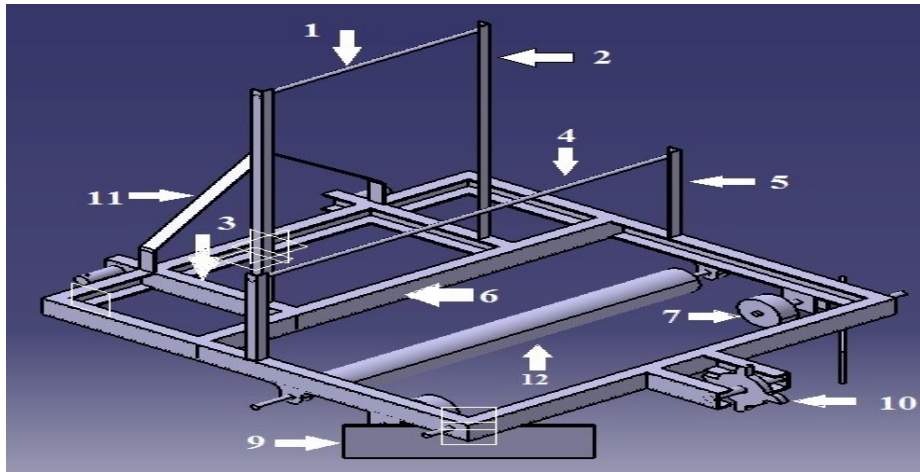


Figure 4: Mulching paper laying machine.

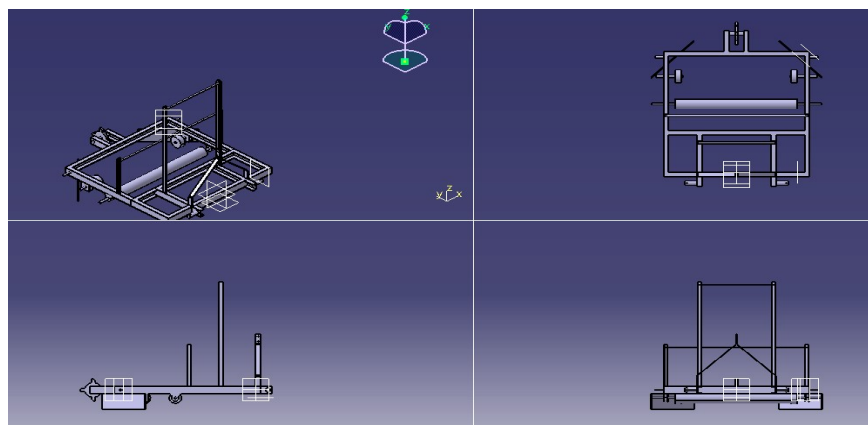


Figure 5: All Views for Mulching Paper Lying.

#### i. List of Components

- 1) Axle carrying the Drip Roll
- 2) Column supporting the Axle of Drip roll.
- 3) Channels carrying Drip Line Column.
- 4) C-channel supporting Drip Line Channel
- 5) Axle carrying Mulching Paper roll.
- 6) Column supporting the Axle of Mulch paper roll.
- 7) Drum.
- 8) Bearing.
- 9) Retaining Wheels.
- 10) C-channel supporting all horizontal elements.
- 11) Rudder.
- 12) Hole Making attachment.
- 13) Tractor attachment.

#### 6.2 Advantage

- Increase in Crop Yield.
- Reduction in Weed growth.
- A good alternative to Costly Machines.
- Multifunction like Drip and Hole Making attachment.
- Good crop yield in low water availability areas.
- Simple working and easy to use and even unskilled worker can use it.
- Prevents soil erosion
- Manipulate light, temperature and moisture.
- Protects the crops from insects.
- Warms the soil for Optimum Growth of Crops.

### 6.3 Application

- In the application of mulches to cultivated fields it has been customary to lay the mulches, which comprise long strips of paper of appropriate width done up in rolls, by hand to cover either the planting area of the plant rows, or to cover the area between the planting rows and, in order to prevent the mulches from being blown away by the wind or disturbed by other conditions.
- This system is widely use in the field of horticulture.

### CONCLUSION

The design of all the components is according to the proposed plan. The components are designed so as to obtain the required results. The machine thus designed can successfully lay mulching paper, lay drip line and punch hole simultaneously and efficiently. Plasticulture is crucial to Indian agriculture in view of the changing technological scenario for boosting crop yields and productivity. Introduction of linear low density polyethylene (LLDPE) as a mulch film has brought a revolution in agricultural water management. It is actually a boon to dry land farmers. This is one of the fastest growing plasticultural applications in the world.

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### REFERENCES

1. L.E.Bailey, "Machines for Laying Mulches " US 1436139, country- US, 15August 1922.
2. H.J. Herfort, "Mulch Paper Laying Machine". US 1787902, New Jersey 2 july 1929- January1931.
3. Practical Manual on "Plastic Mulching By national committee on plasticulture application in horticulture", New Delhi.
4. Brevet, "Machine for laying paper mulch" US 1786021A, December 23, 1930.
5. Carl Judy, "Mulch paper laying machine" US 1763789A, 14 September 1929.
6. Antiicorpella, JukkaAhokas , "Development of paper Mulches", University of Helsinki., 28 January 2014.
7. V.B. Bhandari, "Design of Machine Elements"-Tata McGraw-Hill, 3rd edition.
8. R.S. Khurmi, "Strength of Materials"-S.Chand Publication.
9. Design Data, P.S.G College of Technology, Coimbatore, 2nd Edition CH 4, 8.