

Fabrication of Mulching & Drip Laying Machine

Prof. Nilesh Singh¹ Pradip Dhakane² Pramod Lokhande³ Akshay Patil⁴ Abhishek Utgikar⁵

¹Assistant Professor ^{2,3,4,5}Student

^{1,2,3,4,5}Department of Mechanical Engineering

^{1,2,3,4,5}Bharati Vidyapeeth's College of Engineering, Lavale, Pune, India

Abstract— To mitigate the production cost and to improve the profitability of farming by using more efficient materials and machines, one of the best methods is to use the mulching and dripping method. Mulch being a natural resource has become one of the most effective techniques for optimum yield and better quality of crops by reducing the production cost. Also in dry areas maintaining moisture in soil is very important for crop life. Mulching the plastic paper film near the root area of plants is for eliminating the rise of weeds also to retaining water and avoid de-moisturizing the soil but this process requires lots of capital and time. .So 'Drip irrigation pipe and Mulching paper laying machine' will reduce the labour cost and time, It will do both the jobs i.e. laying irrigation pipe and mulching paper on the ground at a time. To meet this, it is required to use automatic mulching and drip laying machine. This review paper will flash the conventional and recently used new techniques used in farming. The machine to be formed will avoid the wages and time required. Even though this method of mulching is old and versatile its use in India is still limited due to availability issue and is limited only to large scale. The main motto of forming this machine is to avail the machine to small scale farmers in least cost.

Key words: Mulch Paper, Drip laying, Moisture Conservation, Retaining Water, Eliminating Weeds

I. INTRODUCTION

Mulch being a natural source has become one of the most effective techniques for quality enhancement of the crops. Generally mulching is a protective covering of leaves, straws and sawdust around the plants to prevent the evaporation of moisture, freezing of roots and to avoid the pollution of soil from dust and other foreign materials. The use of artificial mulch (plastic mulch) has been increased dramatically in last few years throughout the world. The increase in use of mulching paper is due to the benefits like- reduction in soil temperature, reduction in evaporation of moisture, ease of weed management, moisture conservation, high crop yield and improved germination of plants.

For certain plants mulch is very effective technique to improve the yield and germination of plants but, the conventional method of mulch lying is very costly and is not easy to handle. There are certain problems while handling the mulch paper like- tearing of mulch paper, skirting away the paper due to wind. Hence to overcome this problem the automatic mulch and drip laying machine is fabricated.

The drip irrigation is the type of micro irrigation which has the potential to save water by evaporation and to give extra nutrients to plant. The goal is to drip water directly into root zone and minimize evaporation. The objective of this project is to design and manufacture a small sized portable mulching and drip laying machine with hole making mechanism in it. This machine can be operated manually or externally powered. It will reduce the production cost as well as facilitate small scale farmers by using it with mini tractor.



Fig. 1: Conventional Manual Mulch Laying



Fig. 2: Conventional Drip Laying



Fig. 3: Conventional Hole Making

A. Why this machine?

Sr. No.	Operations	Conventional Method (Manual)	With laying machine	Cost saving
1	Bed preparation	3500	} 5500	} 6320
2	Mulch laying	6720		
3	Drip laying	800		
4	Hole making	800		
	Total	11820	5500	6320

Table 1: Cost (Rs.) Comparison per Hectare

B. Work to be done

- Development and fabrication of mulch and drip laying machine.
- Testing and performance analysis of the developed machine.
- To meet the economic considerations.
- Reduction in production and labor cost.

II. LITERATURE REVIEW

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. The cost of LLDPE film is also lesser than one third of LDPE mulch film. Moreover for mulch activity lower thickness (15 to 20 microns) is highly suitable. However due to ever increasing cost of raw materials the films are costlier now. [1]

Reducing the capital cost and time of laying the mulching paper using the most convenient method as well as placing the drip irrigation pipe in one pass of the machine. Making a compact system of laying the mulch paper and irrigation pipe which will suit Indian small size land conditions. Typically, the use of plastic mulches results in higher yields, improvement of yields quality and decreased need of irrigation and pesticides and reduced leach of fertilizers to water systems. Basically, there are two types of mulches depending upon the material used as mulching.

A. Organic Mulches

The organic materials such as crop residues & by-products, farm yard manure & by-products of timber industry, when used for mulching, are known as organic mulches. Organic mulches create no post utilization disposal problem but their availability is an issue.

B. In-Organic Mulches (Plastic Mulches)

The in-organic materials such as plastic films, when used for mulching, are known as in-organic mulches. While natural mulches may not be available at all times & places, plastic mulches can be made available in different colors & thickness to obtain the desired results. [2]

Field trials of tractor operated plastic mulch laying equipment were conducted at research farm of UAS, Raichur. They have observed that as forward speed increases, soil moisture slightly increased and then decreased. It was found that when forward speed increases from 2 to 4 Km/h the soil moisture content increases from 18.50 to 20.10 %. It was found to be higher soil moisture content when operating at a forward speed of 3 Km/h. This is because of soil thrown over the plastic mulch was optimum and at higher forward speed the soil moisture reduced as because of the soil thrown over plastic mulch was higher and formed some openings at the bottom edges of plastic mulch. When forward speed increases from 2 to 4 Km/h the average draft increases from 3138 to 3224 N. As the forward speed increases draft increases this is because of increase in acceleration forces between the soil and machine. The fuel consumption for operating plastic mulch laying equipment increases with increase in forward speed of the equipment. When forward speed increases from

2 to 4 Km/h, the average fuel consumption increases from 3.50 to 4.60 per hr. This is due to increase in draft, which leads to increase in acceleration. The acceleration forces increases it increases the normal loads on soil engaging surfaces. The soil temperature was found constant at all the forward speeds with three different width of material. This is because of forward speed does not significantly affect the soil temperature. [3]

They developed a machine which lays plastic mulch at exact position on the prepared plantation bed and secures it with soil. The laying of plastic mulch, drip pipe and hole punching will be done in one pass. The Mulch Laying machine is available at low cost compared to other existing machinery. This machine may be more useful for the small-scale farmers who will concentrate on high yield variety crops. For the professional growers the time consumption for laying of mulch, drip, and hole punching will be less by this machine. Due to this machine number of skilled labors will be reduced. Thus, the plastic mulch laying machine may give immediate solution for the advancement in the cultivating methods in agricultural sector. This may give immediate solution in cultivating methods in agricultural sector.

Drip irrigation is a type of micro-irrigation that has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. The goal is to place water directly into the root zone and minimize evaporation. [7]

It was discovered early in the project that the primary development needs of such paper mulches are the improvement of mechanical strength and the biodegradation resistance of paper mulches. Accomplishment of those development targets is a prerequisite for success in the mulch markets. In the future development targets may be different relating to added functionality of paper mulches. Second generation paper mulches may contain ingredients like environmentally friendly plant protectants, controlled release nutrients and optically active pigments. [11]

III. CONCLUSION

The developed machine will lay the plastic mulch, drip pipe and hole making in one take of machine. At the same time it will generate the bed for laying the mulch and drip and will make holes on the mulch paper simultaneously. The holes and the bed can be formed according to our requirement like-width of bed and distance between two holes. The time required for laying the mulch paper and drip laying is reduced and hence cost saving for farmers up to 45% is achieved.

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