



Role of Mulching in Crop Production

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Rain fed agriculture accounts for 80% of the world's agricultural land and produces 60-70% of the world's food. Water availability, accessibility, and precipitation are the key variables limiting agricultural

output in dry and semi-arid regions. Climate change and altered rainfall patterns reduce agricultural output in dry and semi-arid regions, which in turn contributes to water scarcity. As a result of worsening

drought circumstances, rain fed agriculture is gaining popularity around the globe for its role in assisting in food production. In dry land areas, inefficient water use combined with drought or heat stress during cropping seasons pose a threat to the sustainability of agriculture. Thus, more effective use of water-saving technologies is also required, so, to overcome these issues, farmers are seeking for innovative methods to improve soil moisture.

Types of Mulching Materials:

Mulching materials include organic, inorganic and special materials:

A. Organic Mulches:

Agricultural wastes, wood industrial wastes, processed leftovers, and animal manures are used as organic mulching materials. The optimal time to utilise organic mulch is when the crop first sprouts or when vegetable seedlings are transplanted. Organic mulches help to minimise nitrate leaching and balance the nitrogen cycle, improve soil physical properties, stimulate biological activity, add organic matter, regulate temperature and water retention, and lessen soil erosion. Applying natural substances to growing crops is challenging and requires a lot of labour. Due to financial and logistical constraints, there is currently a minimal amount of large-scale commercial use of organic mulch in horticultural crop production.

- **Straw mulch:** It is a lightweight and easy to utilise substance, so, now frequently used as field mulch. Straw used as mulch may result in a number of problems. Because they are highly combustible, contain

Mulching is one traditional practice that can aid in the solution to this issue. Mulching is spreading of materials such as plastic sheet, agricultural leftovers, livestock manure *etc.* over the soil surface in the field before, during or soon after sowing. Mulching is primarily used to reduce evaporation or water erosion, maintain soil temperature, increase the capacity of the soil to hold water and control weeds.

grain seeds that could germinate and reduce the amount of nitrogen in the soil, and straw mulches need to be renewed every year.

- **Bark mulch:** These are efficient mulches because they retain moisture for longer period of time and increase water availability for crop. It is commonly utilized for landscaping and planting, however, being acidic; it should not be applied to vegetable crops. Additionally, this mulch is perfect for lining the paths in between the beds.
- **Wood chips:** Reprocessed wood and a variety of tree species are used to make wood chips. Wood chip mulches have high C:N ratio, they may restrict the availability of nitrogen for plant absorption while they decompose.
- **Sawdust:** It is produced when finishing the wood, so, where easily accessible, sawdust is a common mulch. Similar to wood chips, due to the high C:N ratio, its breakdown proceeds very slowly and cause lack of nitrogen in the soil, requiring the

frequent application of fertiliser. However, it can hold onto moisture for a very long time, but should not be used in low pH soil being acidic in nature.

- **Compost:** Compost can be easily manufactured at home from a number of waste materials, including leaves, straw, grass clippings and plant debris *etc.* Compost is a great soil conditioner, widely available and frequently used in agriculture. It improves the soil's characteristics and carbon content, which enhances the soil's ability to hold water and maintain soil health. Compost is not advised for use in vegetable fields due to its high N content that have potential of weed growth.

B. Inorganic Mulches:

Polyethylene plastic films and synthetic polymers are examples of inorganic mulching materials. The majority of the mulch used in commercial crop cultivation is inorganic and best example is plastic mulch. The plastic materials utilised as mulch are polyethylene or polyvinyl chloride films. Because of its greater permeability to long-wave radiation, it may increase the temperature in the surrounding of plants at night during winter season. For cultivation of horticultural crops, polyethylene film mulch is advised as a mulching

Advantages of mulching

- Buffer soil temperature
- Organic mulch adds nutrients in soil
- Protect soil from erosion
- Inhibit weed germination
- Preserve high and sustainable yields
- Prevent water loss by evaporation
- Minimize soil compaction
- Improve water holding capacity

material. Black plastic mulch film application is growing popularity and has excellent results, especially in arid and semi-arid regions. Black polyethylene mulch decreased soil evaporation, modified microbial community, increased soil moisture levels, achieved greater crop yield and quality, and thus, increased economic value for farmers.

C. Photodegradable or biodegradable mulches:

Several innovative biodegradable and photodegradable plastic films, as well as surface coating and biodegradable polymer films for ease of implementation and flexibility, were also introduced as ecologically friendly materials. There are several types of mulch that are rarely used, such as sand, gravel, and concrete, which results in nutrient deficiency and very expensive to integrate. Photodegradable and biodegradable mulch is an easy-to-use, adaptable type of mulch. Polythene mulch can be replaced with biodegradable plastic mulch for a cleaner, greener product and help to stop the build-up of LDPE and environmental degradation brought on by plastic trash. Today's biodegradable plastic mulches are made of a variety of polymers or additives that are easily found on the market worldwide or are comparable to LDPE mulches in terms of crop yield productivity.

- Improves soil physical properties and productivity
- Improve microbial activity and earthworm movement

- Lowers soil pH and increase nutrients availability

Disadvantages of mulching

- Higher transportation costs and increased labour needs
- Difficult removal and disposal
- Some organic mulch such as straw and grass may lead to weed growth and acid leakage
- Plastic mulch producing fragments may contaminate the soil

- Inorganic mulch may be destroyed by the sun and deteriorate over time
- If spread out over a vast region, can raise the soil temperature
- Organic mulch like rubber being toxic can damage plants and hazardous to the environment

Conclusions:

Mulching materials have substantial impact on water conservation in agriculture by altering the microclimate and lowering soil evaporation. Mulching has several essential applications, including reducing soil erosion, enriching soil fauna, improving soil properties and nutrient cycling in the soil. The availability, durability, or pricing are all key factors to consider while

choosing the mulching materials. However, minimizing the detrimental effects of mulching should be the main priority, so, it is very important for farmers to choose organic mulching rather than synthetic applications. This will also contribute significantly to the world's long-term food security.