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# Mulch mats as soil's suit of armour and silent guardian foragriculture

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**Abstract**

Several studies have shown that mulching with organic materials increases soil nutrients, maintains optimal soil temperature, reduces evaporation from the soil surface, suppresses weed growth, and prevents soil erosion. It also helps to improve the soil health. Organic mulches are inexpensive and economical. In the face of intensifying climate volatility, agricultural mulching serves as a dual-purpose strategy: a "Suit of Armour" providing a physical shield against extreme weather and a "Silent Guardian" fostering soil biological health.

**Keywords**: Organic agriculture, sustainability, mulching, soil fertility, biodiversity, straw, crop residues, mulching materials

**Introduction**: Mulching in agriculture is the practice of covering the soil surface or topsoil with organic (straw / leaves / grass) or inorganic (plastic films) materials to enhance crop growth and soil health. It acts as a protective barrier, reducing soil erosion, water evaporation, suppressing weeds, and regulating soil temperature. The use of organic mulching is one of the suitable methods that could help horticultural growers increase production and produce high-quality produce. Due to water scarcity and challenges posed by climate change, the large-scale adoption of organic mulching by farmers would help to overcome several problems as it has many advantages. Several studies have shown that mulching with organic materials increases soil nutrients, maintains optimal soil temperature, reduces evaporation from the soil surface, suppresses weed growth, and prevents soil erosion. It also helps to improve the soil health. Organic mulches are inexpensive and economical (Ranjan *et al*., 2017). It represents a shift toward regenerative and climate-smart agriculture where protective layers are viewed as essential infrastructure rather than optional inputs.

As a suit of armour, mulching provides a resilient barrier against soil erosion, kinetic raindrop impact, and extreme temperature fluctuations. In arid regions, it acts as a moisture-trapping shield, reducing evaporation by up to 70% and increasing water-use efficiency by 65–73%. This physical armour allows crops to withstand prolonged dry spells and heat stress that would otherwise lead to failure.

**Types of mulching materials:**

1. **Organic mulch:** Derived from natural, biodegradable materials such as straw, hay, dry leaves, wood chips, compost, or crop residues. They add nutrients but require replacement.

   Ex.: include straw, crop residues, dry leaves, compost, and manure. These decompose over time, adding nutrients to the soil.

2. **Inorganic / synthetic mulch:** Typically, plastic sheets (polyethylene) used in commercial farming to manage, for example, weed control in strawberry production. They are highly efficient but do not decompose. **:** Examples include black or reflective plastic sheets, which are highly effective at suppressing weeds and retaining heat, particularly for vegetables like strawberries and melons.

3. **Living mulch:** Cover crops like legumes that protect the soil.

**Key benefits of agricultural mulching**:

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- **Moisture Conservation:** Reduces water evaporation from the soil surface, minimizing the need for frequent irrigation, vital for dryland farming.
- **Weed suppression & control**: Blocks sunlight, inhibiting weed germination and reducing the need for herbicides.
- **Temperature regulation**: Keeps soil warmer in winter and cooler in summer, promoting consistent root health. Acts as an insulator.
- **Soil health & structure**: Organic mulches (like compost or leaves) decompose, adding nutrients and humus to the soil.
- **Erosion control:** Protects soil from heavy rain and wind, reducing runoff.
- **Prevents compaction:** Keeps soil loose and porous, facilitating better root growth.
- **Soil protection:** Prevents soil erosion from wind and water and reduces soil compaction. The mulches help create a soil structure with a range of smaller and larger pores through which rainwater can infiltrate easily, reducing surface runoff. As mulch decomposes, it increases the soil's organic matter content. Soil organic matter helps create good soil with a stable crumb structure. Thus, the soil particles will not be easily carried away by water. Therefore, mulching plays a crucial role in preventing soil erosion (Zacharias, S. *et al* ,2016).
- **Improved nutrient content**: Organic mulch decomposes and improves soil structure, fertility, and microbial activity.

**Application Best Practices**

- **Thickness**: Apply a layer of organic mulch, generally 1 to 3 inches thick, for optimal protection.
- **Placement**: Keep mulch a few inches away from the plant stem or trunk to prevent rotting.
- **Timing**: Apply during dry seasons to retain moisture, or early in the season to manage temperatures. Generally applied around crops after they are planted and watered.
- **Drip Irrigation**: When using plastic mulch, drip lines are often laid underneath the film to deliver water directly to the root zone.
- **Maintenance**: Organic mulch should be applied in a 2-3-inch-thick layer.

Mulching is a key technique for sustainable agriculture, helping to improve crop yields and reduce water consumption. There are some species that tolerate excessive mulch better than others. Some of the worst-affected plants are grassy plants (iris, daylilies, liriope, *etc*.), Indian Hawthorn, Azaleas and Loropetalum.

**As a silent guardian**: Beneath the surface, mulch quietly improves soil structure by fostering a favourable microclimate for beneficial microorganisms and earthworms. It acts as a primary agent for carbon sequestration, with organic and modern biodegradable mulches significantly increasing soil organic carbon (SOC) compared to traditional plastic. This underground guardianship ensures long-term fertility and stabilises yields, making farm communities more resilient to economic and environmental shocks.

Key 2026 Trends Supporting this Idea

**Biodegradable innovation**: New microplastic-free biodegradable films are replacing traditional polyethene, allowing the "armour" to break down naturally into H2O and CO2, eliminating the "white pollution" of legacy plastics.

**Climate-adaptive economics**: Mulching has moved from a "luxury" for large farms to an affordable necessity for

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smallholders, with visible benefits in reduced labour (less weeding) and greater income predictability.

**Carbon farming integration**: Specialised techniques now focus on maximising the "guardian" role of mulch for carbon credits, using biochar-mulch combinations to reduce greenhouse gas emissions further while boosting productivity.

**Conclusion**: Mulching is practised successfully in a wide variety of cereals, plantations, but more so in horticultural crops, fruit orchards, flowers, vegetables, nurseries and forests. where lesser frequent cultivation is required for 8 growing the crops. Development of cost-effective, biodegradable mulching materials. Optimising mulch types for specific local climatic zones and soil types is the need of the hour.

**References**:

IFOAM. 2003. Training Manual for Organic Agriculture in the Tropics. Edited by Frank Eyhorn, Marlene Heeb, Gilles Weidmann, p 214, 219-224.

FiBL 2011. African Organic Agriculture Training Manual – Conversion. Version 1.0 June 2011. Edited by Gilles Weidmann and Lukas Kilcher. Research Institute of Organic Agriculture FiBL, Frick.

Ranjan P, Patle G. T, Prem M, Solanke K. R. Organic Mulching- A Water Saving Technique to Increase the Production of Fruits and Vegetables. Curr Agri Res 2017;5(3). doi : http://dx.doi.org/10.12944/CARJ.5.3.17

The International Federation of Organic Agriculture Movements (IFOAM - Organics International) Training Manual (2020),Philippines, The Food and Agriculture Organization of the United Nations FAO TECA. https://teca.apps.fao.org/en/technologies/8365/

Zacharias, S. *et al* (2016), Plastic mulching in agriculture. Trading short-term agronomic benefits for long-term soil degradation?, Science of The Total Environment, Volume 550, Pages 690-705, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2016.01.153. (https://www.sciencedirect.com/science/article/pii/S0048969716301528)