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SABUIEEM



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Introduction

70% of all water use worldwide is used for agriculture, making it the largest user of water worldwide. Among them, rain-fed (non-irrigated) crops make about 80% of global cropland and produce 60–70% of the world's food. Rain-fed agriculture is crucial to the world's food supply in light of the increasing water scarcity. However, the lack of water resources that restrict agricultural output in dry and semi-arid regions is caused by global warming and erratic rainfall patterns. In order to preserve water on farmed land, agriculture water



management is crucial. Therefore, with great success, conservative and effective water use has been practiced for many years in semi-arid and arid regions of the world. All water conservation techniques aim to minimize water use while increasing yield. As a result, mulching the soil to conserve moisture may be a productive way for dryland farmers to conserve water while also increasing output.

Mulching

Mulch is a material that is applied to the soil surface as a coating. Mulching is the process of applying an organic or synthetic mulch to the soil surrounding plants in order to improve plant growth and efficient crop production (Kader et al., 2017). It insulates soil to shield plant roots and other living things from varying weather conditions. Mulching maximizes the usage of water and also enhancing crop development and yield. Mulches come in varieties: inorganic, primarily two composed of plastic-based materials, and organic, or biodegradable, comprised of organic elements. Furthermore, one of mulch's key purposes is to prevent erosion, and this is achieved by applying vegetative material like grass, leaves, and pruning. (Adeboye et al., 2017).

Benefits of mulching

Mulching enhances soil ventilation around plants, increases soil productivity, aggregate soil particles, and facilitates water drainage. Mulching has several advantages for crop fields, including decreased soil erosion, weed development,



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kinetic energy of water droplets, and competition for nutrients and water amongst nearby fields (Kader *et al.*, 2017). Additionally, it lowered the pH of the soil, increasing the availability of nutrients. Mulching improves soil ventilation around the plant, soil productivity, soil particle agglomeration, and water drainage. Mulch reduces the germination of seed by preventing sun light to reach the top layer of soil.

Biological mulching/ Organic mulching

Materials such as animal manure, grass clippings, straw from different crops, dried leaves, bits of tree bark, and sawdust are used to make organic mulches.. Several benefits include preserving soil moisture by slowing down the rate of evaporation, regulating soil temperature, minimizing soil erosion, impeding the growth of weeds, promoting the development of beneficial soil microorganisms, and minimizing the of soil-borne diseases. spread After decomposing over time, organic mulches enhance soil structure and boost nutrient content (Telkar et al., 2017).

Once organic mulch breaks down, it releases more nutrients into the soil and prolongs their availability. Following the organic mulch's breakdown in the soil, the soil's organic matter quickly improves, increasing the soil's ability to store water. Prevent weed germination and growth, limit soil erosion, decrease runoff, improve soil moisture retention, enhance water infiltration and percolation, improve soil condition, raise soil porosity, and promote better root growth. It can also keep the temperature of the soil constant.

Moisture Retaliation in the Root Zone

Mulches slow down the evaporation of water, which makes more moisture available near plant roots and gives plants more time to absorb water. Consequently, a mulched area requires less watering.

Enhancement of Soil Structure

Both biodegradable plastic mulches and organic mulches eventually collapse and increase the amount of nutrients that reach the soil surface, improve the soil ability to retain moisture, and increase the humus layer.

Diminished Reflectivity

Below the leaves of plants, sand and clay soils reflect light and heat. Because of their deeper, multifaceted faces, organic mulches exhibit less light reflection. Thus, organic mulches slow down the rate of evaporation. However, inorganic mulches, especially rocks increase reflectivity, which is good for certain plants but bad for more delicate ones.

Control of Erosion

In order to prevent runoff and give the soil more time to absorb the rainwater, mulch lowers the kinetic energy of rain and slows down the transport of rainwater. Mulch also shields soil from erosion caused by wind.

y wind.

Types of materials used for bio-mulching Straw

Straw or crop remnants are easily accessible after harvest. Straw mulch is an easily applied and lightweight substance. All straw mulches worked similarly well to slow down the rate at which water was lost from the soil surface; at a depth of 5 cm, these mulches reduced evaporation by 40%. An extra 10% increase in soil moisture was observed at a mulch depth of 10 cm; however, a further boost to 15 cm yielded no further benefits (McMillen, 2013). Adding 2-16 t/ha of wheat straw could increase soil moisture. Mulches made of wheat straw and black plastic may lessen evaporation, aiding in the recovery of cucumber plants from drought stress.



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Bark mulches

These mulches work well because they retain moisture for longer periods of time and increase the crop water availability. It is frequently applied to plants and landscape. However, this mulch is perfect for covering the paths that run between the beds.

Wood chips

Wood chip mulches may limit the amount of soil nitrogen available for plant absorption during their decomposition because of their high C:N ratio.

Sawdust

In areas where sawdust is easily accessible, it is a widely used mulch. The high C:N ratio causes the breakdown to occur very slowly. Because of its breakdown, the soil will become N_2 deficient, requiring frequent fertilizer application.

Compost

Compost strengthens the soil characteristics and increases its carbon content, which enhances the ability of soil

to hold onto water and promotes soil health. Newspaper

Newspaper

mulching is a cost-effective way to reduce weeds by reducing the chances of germination of weed seeds fallen from the previous season. The newspaper layers biodegrade quickly into the soil. Newspaper is preferable to plastic since it

decomposes over time (Haapala *et al.*, 2014).

Drawbacks of Using Organic Mulch Because mulching retains more moisture, it limits the flow of oxygen to the root zone of poorly drained soil. If you mulch near the stem of the plant, the surrounding wetness may serve as a home for a variety of pests, illnesses, and microorganisms. Weeds can be encouraged to germinate by mulches containing seed, such as grass clippings, straw, hay.

Conclusion

Bio mulching has proven to be an effective method for water conservation. offering a sustainable solution to agricultural water management challenges. By applying organic mulch materials such as straw, leaves, and compost, soil moisture significantly retention is enhanced, reducing the need for frequent irrigation. This practice not only conserves water but also improves soil health, suppresses weed growth, and contributes to a reduction in soil erosion. The dual benefits of water conservation and soil enrichment make biomulching a valuable technique for promoting sustainable agricultural practices and ensuring long-term environmental and economic resilience in farming communities.



Reference

Deboye OB, Schultz B, Adekalu KO, Prasad K (2017) Soil water storage, yield, water productivity and transpiration efficiency of soybeans



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(Glyxine max L. Merr) as affected by soil surface management in Ile-Ife, Nigeria. Int Soil Water Conserv Res [Internet]. 5:141-150. Available from: http://scihub.tw/10.1016/j.

- Haapala, T.; Palonen, P.; Korpela, A.;
- ub.tw/10_ swcr.2017.04.000 i, T.; Palonen, P.; Korpen. Ahokas, J. Feasibility of paper mulches in crop production, a review. Agric. Food Sci. 2014, 23, 60–79 ^mge M, Mojid MA, Ito K advances in foods for Kader MA, Senge M, Mojid MA, Ito K
- McMillen, M. The Effect of Mulch Type and Thickness on the Soil Surface Evaporation Rate; California Polytechnic State University: San Luis Obispo, CA, USA, 2013.
- Telkar S.G, Singh A. K, Kant K, Solanki S. P. S, Kumar D. Types of Mulching and their uses for dryland condition. Biomolecule Reports.2017;17(6):1-

Davamani et al. (2024)

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