Mulching - A Soil and Moisture Conservation Technique

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Agriculture water management is a major concern to save water in cultivated land. Also, rain-fed cultivation in dryland farming is being pressured which required more effective utilization by using water-saving technologies. Therefore, conservative and efficient water-use has been practiced for many years in arid and semi-arid regions of the world with great success. The goal of all the water conservation systems is to maximize yield by minimizing water use. The efficient use of water is crucial factor during crop growth periods which can greatly improve yield. Therefore, conservation of soil moisture by using mulching may be an efficient option to save water as well as rising production in dryland farming.

Definition: Mulch is defined as a coating material spread over the soil surface (Patil et al., 2013). Mulching is the technique of covering of the soil surface around the plants with an organic or synthetic mulch to create favorable conditions for the plant growth and proficient crop production.

Application areas of mulching

- In rainfed areas to conserve moisture
- In areas that need irrigation, Mulching reduces the frequency of irrigation
- In greenhouses to maintain the soil temperature
- In areas with soil borne diseases, Mulching is need and prevent soil erosion
- In lands where high value crops are being cultivated

Benefits of mulching:

- It helps with water conservation by preventing direct evaporation of water from the soil, thereby reducing the need of irrigation or water supply.
- Helps in weed control by cutting off the energy supply to the weeds
- It helps to retain water in the soil and keeps it moist for a longer period of time. It is also found to control the humidity level within the plant root zone.
- It forms as substrate for the plant and its parts by preventing flowers, fruits and other plant parts to get in direct contact with the soil thereby improving their flower and fruit quality.
- It keeps the insect pests away from the plants because the mulching film reflects light, thereby controlling the incidence of pests.
- Mulch reflects a lot of the sun that otherwise heats the soil. This keeps the soil cooler and helps prevent evaporation.
- Mulches spread over soil, prevents soil erosion, slow down rainwater run-off, and increase the amount of water that soaks into the soil.
- Organic mulches also improve the condition of the soil. As these mulches slowly decompose, they provide organic matter which helps keep the soil loose.
Organic matter becomes food for the beneficial earthworms and other soil micro-organisms in the soil and create a very good porous soil. This improves root growth, increases the infiltration of water, and also improves the water-holding capacity of the soil.

Decaying organic matter also becomes a source of plant nutrients. It works as a heat and cold insulator by preventing freezing of soil during winter and drying of soil in the summer.

Mulching reduces the salinity level of the soil

It prevents the leaching of fertilizers from the soil

Sometimes it helps with seed germination, early maturity and higher production.

Types of Mulches
1. Organic mulches:
   Organic mulch material includes grass, straw, dry leaves, bark, saw dust and compost. These has capacity to easy degradable due to attract of insects, slugs and cutworms that eat them and it will help to degraded rapidly and it add some amount of organic matter and nutrient in soil. The example of organic mulches and their uses are given below:

   Grass Clipping: This is one of the most abundantly and easily available mulch materials across the country. If incorporated fresh in soil, it added some amount of nitrogen to the soil. It also provides some organic matter in the soil. However, if we added green grass material it has capacity to develop its root system it will harm to crops growth and development. Therefore, use of dry grass as mulch material is suggested.

   Straw: Paddy and wheat straw and other crop residues like stubbles, groundnut shells, cotton shells etc; are the commonest mulching materials used as mulches on soil surface for moisture conservation. Though straw is poor in nutrient value but after decomposition, it makes soil more fertile. Straw mulches reduce both the amount of energy absorbed by the soil and its movement above the soil and hence reduce evaporation.

   Newspaper: Newspaper mulching helps to control weeds and also add little organic matter in soil. One to two cm thick sheet of newspaper should be used and edges should be fastened with materials like pebbles gravels etc. The application of newspaper mulch should be avoided on a windy day and avoid the color ink newspaper because it will hazardous.

   Dry leaves: Leaves, an easily and abundantly available material, are good for mulching. Though leaves are good for protecting dormant plants during winter by keeping them warm and it help to initiate germination during cold season but dry but due to light weight they may be blown away even by light wind. To reduce these problems to used stone, bark or any other material that help to reduce wind problem.

   Bark clippings: These are good mulch materials as they are long lasting and allow proper aeration to the soil underneath. Wood bark has capacity to hold more water and bark mulch material is used in both the region very dry and very wet because if rain is too much the bark will absorbed excess water and reduce waterlogged condition. When it rains too little, the wood chips will release the water they’ve been holding, providing your plants with water even in dry times. Hardwood bark clippings contain more nutrients than soft wood but bark clippings are not easily and abundantly available, and some bark products may cause phytotoxicity.

   Saw dust: Saw dust, obtained during finishing operation of wood and furniture is very poor in nutritive value as it contains only half the nutrients of straw. It decomposes slowly. Being acidic in nature, it should not be used in acidic soils.

   Compost: The compost is one of the best mulch materials. It increases microbial population, improves the soil health and adds some amount of nutrients. However, compost has one drawback. It is very fine and full of nutrients, so it doesn’t have much weed-suppressing capability.
2. Inorganic Mulch Material

**Gravel, Pebbles and Crushed stones:** These materials are used successfully for dryland fruit crops. Small rock or stone layer of 3-4 cm placed on soil surface to provide good weed control, reduced evaporation and facilitate infiltration of rain water into the soil. But they reflect solar radiation and can create a very hot soil environment during summer.

**Plastic mulch:** Plastic mulches are very effective as mulches for evaporation controls provided cost is not limiting factors. Both, black and transparent films are generally used for mulching. Advancement in plastic chemistry has resulted in development of films with optical properties that are ideal for a specific crop in a given location (Steinmetz et al., 2016).

These are three types.

**Photo-degradable plastic mulch:** This type of plastic mulch material is easily destroyed by sun light in a shorter period.

**Bio-degradable plastic mulch:** This type of plastic mulch film is easily degraded in the soil over a period of time.

**Color of film:** Films are available in variety of colors including black, transparent, white, silver etc. But the selection of the color of plastic mulch film depends on specific targets. Generally, the following types of plastic mulch films are used in horticultural crops.

- Black plastic film: It helps in conserving moisture, controlling weed and reducing outgoing radiation.
- Reflective silver film: It generally maintains the root-zone temperature cooler.
- Transparent film: It increases the soil temperature and preferably used for solarization.

Apart from the above classification there is another way of classifying Methods in Mulching

**Surface Mulching:** Mulches are spread on surface to reduce evaporation and increase soil moisture.

**Vertical Mulching:** It involves opening of trenches of 30 cm depth and 15 cm width across the slope at vertical interval of 2-4m interval and fill with the some organic material such as straw, stubbles, grass or organic matter at a layer of 10cm above the ground layer it will help to reduce runoff losses and increase infiltration rate of water.

**Polythene Mulching:** Sheets of plastic are spread on the soil surface between the crop rows or around tree trunks. It helps to reduce evaporation and weed growth and increase the germination percentage of crop.

**Live Vegetative Barriers:** Subabul and Glyricidia when used as live vegetative barriers on contour key lines not only serve as effective mulch when cut and spread on ground surface but also supply nitrogen to the extent of 25 to 30 kg per ha, besides improving soil moisture status.

**Constraints of mulching**

- The inorganic mulch is not eco-friendly
- Many organic type of mulches also encourage and provide refuge or breeding locations for snails, slugs, mice, etc. that may attack the plants.
- It can sometimes provide excessive heat and moisture

**Conclusion:**

Apart from using high yielding varieties and good agricultural practices, there is a need to utilize environmental/biological energy for higher production. Mulching is one such process that can help us in producing quality food in quantities. In the days to come, farmers will make use of this innovative technique that helps them conserve moisture, avoid weeds and improve soil health tremendously while producing more. This will also go a long way in the world achieving food security sustainably.
References: