

PLASTICULTURE: HOW MUCH BENEFICIAL

Abstract

The use of various forms of plastic products in the agriculture is becoming popular for the improved crop production and reduces the use of chemicals. Plastic in the agriculture heats up and acts like a warming blanket above the ground. So the use of plastic above the ground increases the net amount of carbon dioxide that the plants take. This carbon dioxide is then used in the process of photosynthesis to make food. The plastic in the field also prevents the growth of weeds in the field. Furthermore, plasticulture requires less of herbicides, pesticides as well as water. Thus, beneficial from environment safety point of view also.

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I. INTRODUCTION

- 1. Plasticulture:** The term plasticulture means the practice of using the plastic materials and plastic products for the various agricultural applications. Where Agriculture refers to the science and art of cultivating plants and crops etc.
- 2. Why Plasticulture:** Plasticulture is getting popular day by day and is being practiced not only in India rather worldwide. Plasticulture has many benefits like it eliminates garden pests. Before the plantation, the ground temperature needs to be warm enough for the plants to grow. The plastic layer heats up and deter pests. It also heats up and will act like a warming blanket above the ground thus maintains humidity. Another benefit of using plastic is the increased amount of carbon dioxide that plants take. As we know that carbon dioxide is raw material for photosynthesis so this carbon dioxide is then used in the process of photosynthesis to make food. When the soil gets warmed under the plastic, the carbon dioxide evaporates and is funneled to the leaves, where it is taken in for the process of photosynthesis. This process of funneling of carbon dioxide is called the 'chimney effect'.So Plasticulture It is important to control weeds specifically around the base of the plant to prevent disease and surplus amount of nutrients are accessible to the plant, thus we get healthy plant in less time.

II. VARIOUS TYPES OF PLASTIC BASED PRODUCTS USED IN PLASTICULTURE

There is large variety of plastic based products which are being used these days in agriculture to improve the quality and yield of crops.

It includes all kinds of plant or soil coverings i.e a wide range of mulch films, row coverings, poly-tunnels greenhouses, micro-irrigation (drips and sprinklers), walk-in tunnel covers, Plastic mulch etc.

Not only this, the plastic lining is used at the base of pond so that the mud doesn't mix with the water to make the pond water turbid and dirty, as shown in Fig: 1, the lining of farm ponds. It has many more other benefits like it reduces water seepage to large extent. Furthermore, it gives sustainable pond for fish farming for longer duration.



(Adapted)
Figure 1: Lining of farm ponds

III. PLASTIC FILMS IN AGRICULTURE:

The first use of plastic film in agriculture was to make an effort to make a cheaper version of a glasshouse. Now it has become an essential part of modern and responsible agriculture. Plastic products / films are being used in agriculture for much better results ^[2]. The climate change is another issue which is affecting the crop production and its quality as well ^{[1], [10]}. It is quite obvious that the climate change has its influence on the sustainable development and finally on the economy of that particular country ^[11].

IV. VARIOUS FORMS OF PLASTIC FILMS WHICH ARE USED BY THE FARMERS WORLDWIDE:

- 1. Modern drip irrigation:** It is considered to be the world's most valued innovation in agriculture. Drip irrigation is most preferred type, it is a type of micro-irrigation system which has the great potential to save water as well as nutrients, wherein, water drip slowly to the plant roots, which is either buried below the surface or is above the soil surface. The basic aim is to place water directly onto the root zone thus resulting in minimum evaporation. Moreover, It saves a lot of water. In the Drip irrigation systems, a network of many valves, pipes or tubing is used.
- 2. Polyethylene (PE) Plastic film:** It is the plastic film used by the majority of the crop growers or farmers as a substitute of greenhouse, because of its affordability, flexibility and easy manufacturing of this product ^[3]. The polythene can be recycled and reused few times in the field before disposing ^[6]. The plastic material in its various forms has been used in European agriculture since long ^[7]. It comes in a variety of thicknesses, such as a low density form (LDPE) as well as a linear low density form (LLDPE), which can be used as per need. Furthermore, It's composition can be modified by the addition of certain elements to the plastic that give properties which are beneficial to plant growth such as reduced water loss, UV stabilization to cool soil and prevent insects and the elimination of photo synthetically active radiation to prevent the weed growth.
- 3. Modified Greenhouses and walk-in tunnel covers:** A greenhouse is a large structure in which it is possible to stand and work with automated ventilation. It has a life span between 6–45 months, used as Small tunnel coverings. They are of about 1m wide and 1m high, and have a thinner polyethylene film than the large tunnel covers, it is usually below 80µm.
- 4. Plastic mulch:** Mulching is when a thin plastic film is placed over the ground in the farm fields, poking holes at regular intervals for seeds to be planted in Fig:2 –



(Adapted)

Figure 2: Plastic film or mulch

So in a nut shell; plastic films have revolutionized this agriculture sector with huge benefits in terms of quality and quantity of crops. In the last two decades, agricultural films gained not only a great deal of interest and attention but also a big market more and more extended in any countries within Europe, America, and Asia, with a constant positive trend.

V. BENEFITS OF PLASTICULTURE

- 1. Improves quality and quantity of the crop:** The plastic films in the field remain in place for the duration of the cultivation. The major functions of plastic mulch are to maintain a consistent temperature in the field and humidity of the soil thus act as an insulator. These films prevent the evaporation of moisture from the soil, minimization of seedtime and harvest time, prevent weed growth, and also prevent soil erosion.
- 2. Environmental aspects:** Plasticulture not only improves crop production, Increase quantity as well as quality, it requires less of pesticides, use less of fertilizers, use less of water, thus helpful in Environment Protection as well.
- 3. Recycling:** One significant importance of plastic in agriculture is its re usage. Technologies exist which allow for many agri-plastics to be recycled into viable plastic resins for reuse in various plastics manufacturing industries for further making plastic products.

VI. SOME DRAWBACKS OF PLASTIC IN AGRICULTURE AND ITS ALTERNATIVES

The plasticulture has many benefits, many advantages as it leads to sustainable agriculture. Everything has its pros and cones. The use of plastic in the agriculture has surely increased the yield, but the problems associated with the disposal of this plastic have not been solved fully. They still needs a lot of attention^{[8], [9]}. One of the problems which are associated with plasticulture are basically the recycling of plastic mulch, as the mulch is often wet or dirty. Furthermore, when lifting and removing plastic at the end of the year it is nearly impossible to extract and remove it in its entirety. The plastic can easily rip thus causing pollution and trash in the field.

An alternative of plastic in agriculture is bioplastics. Bioplastics are the plastic like materials produced from various renewable biomass sources, such as vegetable fats & oils, com starch or recycled food waste, which can be used instead of plastic. As an initiative to this, the biodegradable mulches are being used quite effectively in pumpkin farming and other crops, which seems to be better than plastics in the field^{[4], [5]}. Thus such biodegradable plastic alternatives can be practiced in other crops as well.

VII. CONCLUSION

Plasticulture is the latest and is scientifically proven methodology, being used worldwide. As it not only leads to increased crop production in general (around 20%) but also saves precious water (around 30%), control weeds growth around the plants, cutting down labor expenses and increasing the overall health of the plant itself. Furthermore, it saves the use agro-chemicals and fertilizers to great extent. Plasticulture has been very well imbibed in the mainframe of today's agriculture successfully.

Furthermore, the Bioplastic seems to be a healthy alternative, although it is quite very expensive and beyond the reach of common farmer but its low-cost version can also be explored gradually to fit in the pocket of every farmer. Since it is made from bio source, it gets degraded automatically in the soil after certain interval of time.

In the country like India, with increasing population and limited area of irrigation, this seems quite viable option for increased and healthy crop production.

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