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The Improvement in Vegetable Production and Profitability by Using Mulching Techniques in Arunachal Pradesh

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INTRODUCTION

In India the total area under vegetable production is 10.26 million ha with total production of 184.40 million tones. The top three highest producing states of India are- Uttar Pradesh (15.40 %, 283.16 million tons), West Bengal (15 %, 276.95 million tonnes) and Madhya Pradesh (9.5%, 175.48 million tonnes) respectively. The total area of the Arunachal Pradesh is 2.6 million tones and production is only 16.6 million tones. The vegetables production is a major engagement source of rural population in Arunachal Pradesh. The winter seasonal vegetables are the prominent segment of vegetable production due to high rainfall during summer and rainy season in the state. The vegetable productivity is too low as compared other districts of the state as well national level due to excess rain during high rainfall, leaching of soil nutrients, acidic soil, insect-pest attack, poor cultural practices etc. Though different efforts have been made by different agencies for its improvement but that are not enough for this.

Mulching is the one of the technique which can be help to reduce all the problems among all and increase the yield. A favorable plant soil relation is created by plastic mulch over the soil surface. The microclimate surrounding the plant and soil is significantly affected by mulch i.e. the thermodynamic environment, the moisture, the erosion, the physical soil structure, the incidence of pests and diseases, crop growth and yield. In order to maximize water use efficiency by the plant and to improve the quality of produce, the use of mulch has become an important cultural practice for commercial production of vegetable crops. This is one of the least cost methods to increase vegetables production in Aruanchal Pradesh which is helpful to the small holder also.

Mulches reduce weed growth by making conditions unfavorable for germination of weed seeds and by providing physical barrier for emerging weeds. A good mulch layer can save many hours of laborious weeding. Fumigants like methyl bromide can be used effectively under plastic mulch to provide successful season long control not only over weeds but also on fungal and bacterial diseases and plant parasitic nematodes.

Black plastic mulch can accelerate crop production by as much as one to two weeks. Clear plastic mulch has shown to increase earliness by as much as three weeks in cool climates. Weed growth, however, can be a major problem under clear plastic unless appropriate herbicides or fumigants are used.

Soil temperature is modified by mulches to various degrees. Plastic mulches warm the soil more quickly, increasing early plant development in the cooler months. However, under high temperature conditions during the summer, plastic may warm the soil to temperatures that might be deleterious to plant growth. Organic mulches act as insulation, helping keep soil cooler and, therefore, should be applied in the hot seasons.

Several reports showed that mulch application can modify the soil temperature. Organic mulch as well as reflective plastic mulch helps reduce the soil temperature while the clear and black plastic mulch increases the soil temperature. Organic mulches reduce the soil temperature by protecting the soil from direct heat of the Sun.

Water is essential for growth and development. It is also a major cost in agricultural systems. The success of many agricultural forms relies on conservative and efficient use of water. Moisture retention is undoubtedly the most common reason for which mulch is applied to soil. Mulch is used to protect the soil from direct exposure to the sun which would evaporate moisture from the soil surface and cause drying of the soil profile. The protective interface established by the mulch stops raindrop splash by absorbing the impact energy of the rain, hence reducing soil surface crust formation. The mulch also slows soil surface runoff allowing a longer infiltration time. These features result in improved water infiltration rates and higher soil moisture.

Soil compactness is generally less under mulch than in bare soil. Water from rain or irrigation falling directly on the soil tends to compact the surface of the soil thus reducing soil aeration. Specific mulches spread the impact of the water droplets over a large surface area and reduce soil compaction.

Mulches also help in reducing the fertilizer losses. Flood and furrow irrigation techniques tend to leach nitrogen and other water soluble nutrients below the root zone. Since plastic mulch techniques generally include drip irrigation, nutrient loss is kept to a minimum.

Black plastic mulch is both effective at warming the soil and reducing weed competition. Clear plastic mulch provides greater soil warming, but it does not reduce the weed competition. Dark colored mulches lie across the soil and around the crop reduce the amount of light reaching the soil and thus inhibit weed germination and smother emerging weeds. Mulching for weed control can take a number of forms: inorganic or organic mulches can be applied and left *in situ* to control the weeds.

Organic or inorganic soil mulches influence the crop in a number of ways. Plastic mulches can offer a barrier against weeds, moisture loss, nutrient loss, erosion, insect and disease injury while encouraging plant establishment and an earlier crop of potentially higher quality.

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Newly planted seedlings of Cole crops; with plastic mulching at farm of KVK Tirap

Cole crops; with plastic mulching at farm of KVK Tirap

The combined effects of soil temperature, soil moisture and weed suppression not only work to improve crop growth but they also facilitate hand picking and lead to higher yield and increased fruit size.

The mulching also influence to the root growth and distribution of vegetable crops. In different studies it has find out that the root growth and distribution was significantly influenced by soil structure and management, including cultivation, irrigation and the use of polyethylene mulch in pepper. Color mulches found influenced the total number of adventitious and lateral roots but not the root system architecture of pepper plant. Plants grown under mulch had fewer but thicker adventitious roots. In tomato it has observed that the roots were significantly longer 1 week after transplanting on plants grown under clear polyethylene than on these grown without mulch.

In a study it has reported that increased tomato yield over the red plastic mulch was caused by reflection of FR to the

growing plants and its subsequent phytochrome-mediated regulation of photosynthetic allocation to developing fruit. Number, size, and total fruit produced over the red plastic mulches were compared with those over standard black plastic. Because soil temperature affects production of horticultural crops, that component was minimized in a tomato productivity.

Mulches have been found to be useful for the control of insects. Use of reflective silver and white plastic mulches to delay onset of aphid vectored viruses in summer squash has been well documented in the different literature. As yellow color is known to attract insects, yellow color plastic can be used to control insect with insecticide spray over the mulch.

A favorable soil-water-plant relation is created by placing mulch over the soil surface. The microclimate surrounding the plant and soil is significantly affected by mulch i.e. the thermodynamic environment, the moisture, the erosion, the physical soil structure, the incidence of pests and diseases, crop growth and yield. In order to maximize water and nutrient use efficiency by the plant and to improve the quality of produce, the use of mulch has become an important cultural practice in many regions of the world for the commercial production of vegetable crops.