

The practice of green manuring dates back to 200 BC. Green manuring is described as ploughing live plant material into soil for improving the physical structure as well as fertility of the soil.

Green manuring can be done in two ways depending on the situation.

1. In situ green manuring: Growing and burying of a green manure crop in the same field for the purpose of manuring is called in situ green manuring.
2. Green leaf manuring: Green leafy material brought from elsewhere when buried in the field for manuring is green leaf manuring.

Practice of green manuring adds organic matter to soil, improves the physical properties of soil in terms of aeration, porosity, water holding capacity and facilitates penetration of rain water. Green manure crops hold plant nutrients that would otherwise be lost by leaching. Leguminous green manure crops add nitrogen to the soil. This practice increases the availability of nutrients like phosphorus, calcium, potassium, magnesium and iron. Nitrogen fixing legume crops usually reduces soil pH and improves nutrient availability.

Green manuring is gaining popularity as a method that successfully improves soil productivity. While green manuring it is important to note that there is sufficient water available in the soil for decomposition of the green manure crop. Leguminous green manure crops can fix large amount of atmospheric nitrogen which generally can accumulate 100 kg N/ha in 50-55 days. Green manuring can be used on lands where it is not possible to add animal manures.

Green manure crops can be used to fill a niche in crop rotations and to improve the fertility condition of the soils. Legumes such as cowpeas, soybeans, sesbania, crotalaria, may be grown as summer green manure crops to add nitrogen along with organic matter.

The green manure crops should

- Have profuse leaves and rapid growth early in its life cycle.
- Have abundance and succulent tops.
- Be capable of making a good stand on poor and exhausted soils.
- Have a deep root system.
- Be legume with good nodular growth habit.

Use of leguminous green manure crop is more useful in comparison to non-legumes, as more nitrogen is added by legumes.

Crops suitable for green manuring are of two types:

1. Non-leguminous crops: The non legumes used as green manuring crops provide only organic matter to the soil. Eg. Mustard, wheat, radish, jowar, maize, sunflower etc.
2. Leguminous crops: The legumes used as green manuring crops provide nitrogen as well as organic matter to the soils. Eg. Sunhemp, daincha, cowpea, lentil. They are biological sources of nitrogen that reduce the amount of fertilizer required for the following crop.

There are numerous advantages of green manuring. These include supply of organic matter, addition of nitrogen, nutrient and soil conservation, increases the biochemical activity and increase in crop yield. Green manure crops can be used to provide

nitrogen, increase the organic matter content and /or scavenge nutrient in the soil.

Several factors influence the release of nutrients from green manure crops including soil temperature, soil moisture and placement green material in the soil. Nutrient release is slower when soil is dry or waterlogged due to lower biological activity of soil micro-organisms. Green manure crop when incorporated into top 6-8 inches of soil breaks down more rapidly due to presence of soil organisms in that area. When green manure crop is soil incorporated deeper than 8 inches, it will decompose more slowly because of lower oxygen levels as deeper soil depths limit the number of organisms that breakdown plant tissues.

In Northern light soils of West Godavari district of A.P. where flue-cured tobacco is cultivated as mono-crop and the soil remains fallow for more than 6 months. These soils are poor in organic matter content and exposed to heavy rain fall in summer months resulting in soil erosion and nutrient loss. Green manuring these soils helps in building up of organic matter content, improving the soil physical structure and conservation of nutrients and soil. The green manuring practices followed at CTRI Research Station, Jeelugumilli shows that summer green manuring with sunhemp is highly beneficial in improving the soil organic matter content, soil structure and subsequent crop productivity. In the month of June, after first rains sunhemp seed can be sown @ 20-25 kg/acre. The crop is ready for incorporation in 50-55 days. We have recorded a green matter production of 3.5 to 4.0 kg per m<sup>2</sup> or 35 to 45 tonnes per ha. The nitrogen content of green material is in the range of 2.4 to 2.6%. As the sunhemp crop



fixes atmospheric nitrogen the major portion of nitrogen in the green material is from atmospheric nitrogen and this nitrogen is an addition to the soil, which will be available to the tobacco crop.

#### **Benefit of Green manures**

**Organic matter and soil structure** - They add organic matter to the soil. Compounds formed during breakdown of organic matter by microbes are resistant to decompositions, such as gums, waxes and resins. These compounds and the mycelia, mucus and slime produced by the microorganisms help bind together soil particles as granules or aggregates. A well aggregated soil tills easily, is well aerated and has a high infiltration rate.

The contribution of organic matter to the soil from a green manure crop is comparable to the addition of 9 to 13 tons per acre of FYM or 1.9 to 2.2 tons dry matter per acre.

**Nitrogen production** - Nitrogen accumulation by leguminous crops range from 40 to 200 lbs. of nitrogen per acre. The amount of nitrogen available from legumes depends on the species of legume grown, the total biomass produced and the percentage of nitrogen in the plant tissue. Delayed planting date, poor stand establishment and drought reduce the amount of nitrogen produced. A good stand, optimum soil nutrient levels and soil pH, good nodulation and adequate soil moisture encourage good nitrogen production.

The portion of nitrogen available to the following crop is usually about 40-60 % of the total amount contained in the legume.

**Soil microbial activity** - A rapid increase in soil microorganisms occurs after a young green manure crop is incorporated into the soil. During microbial breakdown, nutrient held

within plant tissues are released and made available to the following crop. Soil temperature, soil moisture, and carbon to nitrogen (C:N) ratio of the plant material influence the ability of microorganisms to breakdown the organic matter. The optimum C:N ratio for rapid decomposition of organic matter is between 15:1 and 25:1. C:N ratios about 25:1 can result in nitrogen being 'tied up' by soil microbes in the breakdown of carbon-rich crop residues, thus pulling nitrogen away from crop plants. Adding some nitrogen fertilizer to aid the decomposition process may be advisable with these high carbon residues. The lower the C:N ratio, the more N will be released into the soil for immediate crop use.

**Nutrient Enhancement** - Alfalfa and other deep rooting green manures scavenge nutrients from the subsoil and translocate them upwards to the surface rooting zone, where they become available to the following crop. During decomposition of organic matter, carbonic and other organic acids are formed as a byproduct of microbial activity. These organic acids react with insoluble mineral rocks and phosphate precipitates, releasing phosphates and exchangeable nutrients.

**Rooting action** - An extensive root system is effective in loosening and aerating the soil. Acts as a biological plow in penetrating compact soils.

**Weed suppression** - The soil-loosening effect of deep rooted green manures reduces weed populations that thrive in compacted soils.

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## **GREEN MANURE YOUR FIELDS TO IMPROVE PRODUCTIVITY**



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