

## Green Manuring - An Eco-Friendly Tool For Sustainable Crop Production

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### Introduction

India is one of the largest country of the world. But as a developing country, we are facing a lot of challenges still now to meet up the hunger and malnutrition problems. Population explosion is now a days a major factor that affects the food production in our country and thus quality food grain production in sufficient quantity without damaging the soil quality, productivity and fertility is one of the biggest challenges in the present agriculture scenario. The agriculture of the modern chemical era concentrates on maximum output but overlooks input efficiency as a result of which it has not been sustainable. Stagnation in maximum yield potential during the recent years in cereal crops like rice, wheat on which most of the people are dependent is a real concern for agricultural scientists and professional technocrats. Among the cereals, rice (*Oryza sativa* L.) is the major source of calories for 40 % of the world population. Cultivation of high yielding dwarf varieties responsive to fertilizer and excess use of inorganic fertilizers has depleted the inherent soil fertility. Under high input production systems where productivity cannot be further increased with incremental use of mineral fertilizers alone, addition of organic sources could increase yields through increased soil productivity and higher fertilizer use efficiency. In this context, practice of green manuring is the spark in dark to a great extent. Green manuring can be the one of the feasible option for sustainable crop production.

### Needs for Integrated Nutrient Management

Several long-term experiments conducted all over India indicated a decrease in rice productivity due to continuous use of chemical fertilizers. Integrated nutrient management (INM) aims to improve soil health and sustain high level of productivity and production (Prasad et al, 1995). The combined use of organic and inorganic fertilizers has been reported not only to meet the nutrients need of the crop but also has been found to sustain large scale productivity goals (Yadav and Meena 2014). Integrated Nutrient Management (INM)

promotes the use of balanced and judicious use of chemical fertilizers in conjunction with manures like compost, farm yard manure, vermicomposting, green manures and use of fertilizers fortified with micro-nutrients, use of bio-fertilizers (e.g. phosphate solubilizing bacteria, Azospirillum, Azotobacter, Rhizobium, and Potash mobilizing bio-fertilizers) that can supplement a part of NPK fertilizers (Herbert 1998).

Now a days, inorganic fertilizers are becoming more expensive; therefore, sustainability of soil productivity has become a question. Hence, green manures can be a good alternative solution to improve the soil health without causing any environmental hazards.

Every farmer knows how hard work is essential for production of a basket of compost and utilizing it for crop production as well as for maintaining soil productivity. Green manuring is a method of replacing that basket of compost with a handful of seed. In this method, the plants that grow from the handful of seed are ploughed back into the soil. After a while in the soil, the plants rot down to become compost. Particularly, green manuring is a practice of ploughing or burying the undecomposed green plant tissues into the soil for improving soil structure and fertility. The plants used in this method are called as green manures. Green manure crops are primarily used in the environmental friendly agricultural practices to reduce application of chemical fertilizers.

### **Types of Green Manuring**

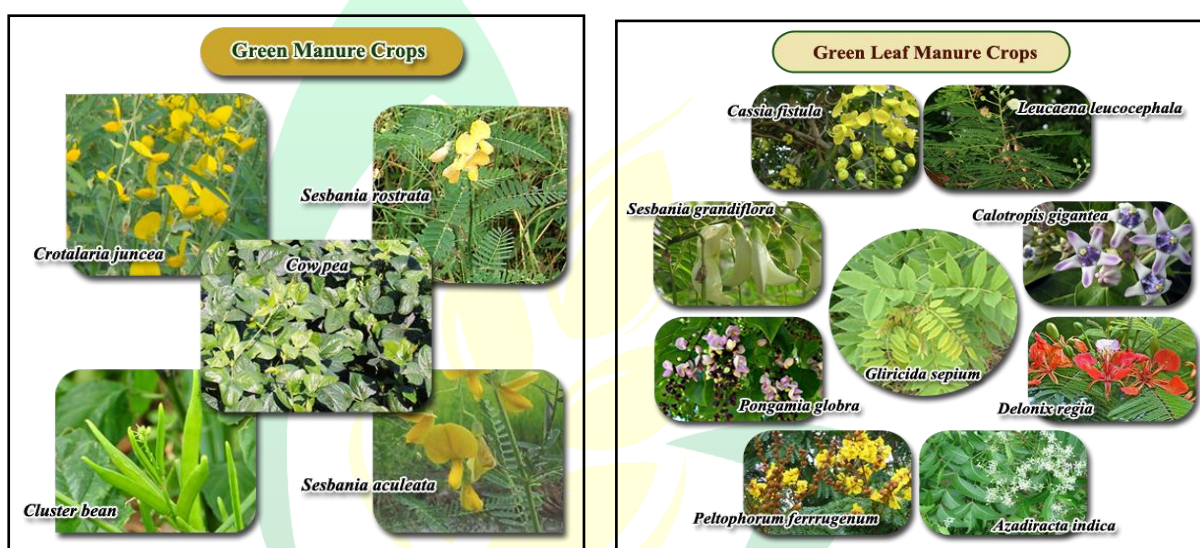
The practice of green manuring is performed in different ways according to suitable soil and climatic conditions of a particular area. Broadly the practice of green manuring in India can be divided into two types:

**1. Green manuring in-situ:** In this system, green manure crops are grown and buried in the same field, which is to be green manured, either as pure crop or an intercrop with the main crop. This system is followed in the northern India. Suitable green manure crops: Sunnhemp (*Crotalaria juncea*), Dhaincha (*Sesbania aculeata* and *S. rostrata*), Wild indigo or kolingi (*Tephrosia purpurea*). Among the green manures, *S. aculeata* and *S. speciosa* exhibited higher organic carbon content with wider C-N ratio than *S. rostrate*.

**2. Green leaf manuring:** Green leaf manuring refers to turning into the soil green leaves and tender green twigs collected from shrubs and trees grown on bunds, wastelands and nearby forest areas. This system is generally followed in the central and eastern India. For e.g. Gliricidia (*Gliricidia maculata*), Subabul (*Leucaena leucocephala*), Cassia (*Cassia auriculata*).

### Advantages of Green Manuring

1. There are various advantages of green manuring which are as follows: Green manure



crops modify soil physical chemical

and biological environments. Green manures not only supply N to rice by biological N fixation but also improve physical and chemical properties of soils (Buresh and De Datta, 1991, Becker et. al., 1995). In fact, this stimulates the activity of soil micro-organisms.

2. The green manure crops help for returning the different plant nutrients to the surface soil layer from the sub-surface soil layer.
3. It can add organic matter in soil and thus improves soil microbial activity.
4. Due to green manuring the nutrient regimes can be improved and restored otherwise be lost by leaching. In waterlogged soils, green manures increased the availability of P through the mechanism of reduction, chelation and favourable changes in soil pH (Hundal et al, 1987).

5. Better utilization of P and K to an extent of 10 to 12 per cent was observed due to green manure incorporation (Lekha and Palaniappan, 1990).
6. Green manure crops can act as a cover crop, facilitates penetration of rain water and decreases erosion and runoff.

#### **Desirable characteristics in legume green manure crops**

- Early establishment and high seedling vigour
- Tolerance to flooding and drying
- Early onset of N fixation and efficient sustenance over varied climatic and edaphic conditions.
- Fast growth with an ability to accumulate large biomass and N within four to six weeks of growth.
- Quick decomposability.

#### **Conclusion**

Green manuring is an inexpensive; eco-friendly alternative to mounting prices of fertilizer nitrogen and has become an effective technology in economizing the agricultural production system ensuring productive capacity of soil without causing environmental problems. The average N loss in flooded soils from applied green manures was considerably lower thus resulting in less pollution to the environment. Thus practice of green manuring in the rice field is an indication of sustainable production system in an ecologically sound environment. Improving rice production with such an environment friendly approach can always bring monetary improvisation as well as sustainability in agriculture.

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