



Green Manuring is Good Option for Improving Soil Health

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Introduction

Planting green manure is a significant historical practice and a potential strategy for optimizing soil health and agricultural cropping structure. Once widely practiced in Punjab, the prudent practice is left with few followers owing to increased pressure for food production and easy availability of low-cost chemical fertilizers. Green manuring can bring various economic and environmental incentives, including improved soil nutrient availability, physicochemical and biological properties, carbon capture and sequestration, soil retention, water retention, provision for habitat for biodiversity, and sustainable food production, especially in the area where soil properties are marginal for crop production. Extensive agricultural growth has heavily relied upon the use of chemical fertilizers and pesticides, and therefore, has led to serious problems of low soil microbial diversity and poor soil health. However, food security is no longer the sole goal of agricultural development and increased attention is now concentrated on environmental protection and sustainable agricultural development. At the same time, the farmer's willingness to plant green manuring crops has faded over the last few decades and needs to be revived through education, awareness, and incentives. Concentrated efforts are needed for harmonious restoration and promotion of green manuring practice among rural masses.

Selection of green manure crops

Green manuring is ploughing under or soil incorporation of any green manure crop while it is green or soon after it flowers with the idea to increase soil quality and fertility. While selecting a crop for green manure it must be kept in mind that the crops should be leguminous in nature, bear maximum nodules on their roots to fix a large amount of atmospheric nitrogen in the soil, fast-growing and high yielding. Roots should be able to go deeper to extract nutrients from deeper layers and should also consume less water. Green manure crops such as Sunhemp, Dhaincha, Cowpea, Mungbean, and soybean are most commonly grown in Rajasthan. The nitrogen and dry matter content in different green manure crops commonly grown is presented in table 1. The dry matter of these crops also contains 0.15 to 0.20

percent potassium along with 25-35, 12-18, 280-320, and 600-700 ppm of zinc, copper, iron, and manganese, respectively.

Table 1: - Biomass production and accumulation of green manure crops

Crop	Age (Days)	Dry matter (t/ha)	Nitrogen accumulated
<i>Sesbania aculeata</i>	60	23.2	133
Sunhemp	60	30.6	134
Cowpea	60	23.2	74
Cluster bean	50	3.2	91
<i>Sesbania rostrata</i>	50	5.0	96

Cultivation of green manure crops

For green manuring, the crops like Sunhemp, Dhaincha, Cluster bean, and Cowpea are recommended. The field should be irrigated after harvesting wheat or any other crop for the sowing of green manure crops. After that, sow 20 kg Dhaincha or Sunhemp, or 12 kg of Cowpea seeds pre-soaked in water for 8 hours. In order to get the best use of green manuring in fields with low phosphorus content, use the phosphorus fertilizer at the time of sowing of green manure crop (75kg single superphosphate per acre) instead of paddy fields. It enhances the growth of green manure crops and also improves the nitrogen fixation capacity of the soil. Afterward, do not use the phosphorus fertilizers in the paddy crop. The green manure crop needs about 3-4 irrigations and is ready in about 6-8 weeks after sowing; when the crop starts flowering. The crop sown on April 15-20 is ready to incorporate by June 10-15. Plough the green manure crop with a rotavator one day before the transplanting of paddy and 10 days before sowing of maize. The green manure crops that are ploughed in this way are decomposing slowly and providing essential nutrients to the crops throughout the crop growth period.

Advantages of green manuring

1. Green manuring is an effective and cheap way of improving soil health.
2. Green manuring improves soil structure, and water holding capacity and reduces soil erosion.
3. Green manuring improves nutrient availability in soil, promotes a deeper root system for nutrient uptake, and increased the concentration of plant nutrients in the surface soil.



4. The incorporation of 6-7 weeks old Dhaincha/Sunhemp/Cowpea, 1-2 days before transplanting of paddy in the second week of June helps in saving about 25 kg nitrogen (55 kg of urea fertilizer) per acre for rice and also helps in reducing the occurrence of iron deficiency in the rice.
5. Allows skipping of urea application to basmati crop, if the field has been green manured with 45-55 days old Sunnhemp/Dhaincha.
6. Sowing of summer moong immediately after the harvesting of wheat in April end, after picking of pods, burying of its stover a day before transplanting of rice also helps to increase the paddy yield and in reducing the nitrogen dose of rice by one-third.
7. Green manuring helps in reducing the weed problem for the subsequent crop.
8. Increases soil biodiversity of beneficial microbes.
9. Green manuring helps in the reclamation of alkaline soils.
10. Root-knotknot nematodes can be controlled by green manuring