AgriCos e-Newsletter
ISSN: 2582-7049
Volume : 01 Issue : 05 September 2020 Article No: 32

Green Manuring: For Sustainable Crop Production

Kumbhar N. M.[1], Rawool S. A.[2], Palsande V. N.[3] and Wani A. G.[1]
[1]Watershed Organisation Trust, Pune, (M.S.)
[2]M. Sc. (Agriculture) Anand Agriculture University, Anand (G.J.)
[3]Assiatant Professor, College of Horticulture, Mulde (M.S.)

SUMMARY

Green manure is a crop used primarily as a soil amendment and a nutrient source for subsequent crops. It's a very good way of increasing the fertility of the soil and can give huge benefits to the farmers. GM can help buffer soil pH with its organic matter in the soil just like compost for the next planting season. Green manure improves soil organic matter, water holding capacity, N release and availability for future crops and also reduces soil erosion.

INTRODUCTION

In modern agriculture use of chemical fertilizers is increased which results in increasing crop production and productivity during the initial year. But the long term effect of excessive use of mineral fertilizers resulted in declining soil health, crop productivity and increased soil degradation problems. To overcome these problems green manuring is a better method to improve soil health and crop productivity. Green manure provides an alternate approach for disease control, they may increase nutrient availability, reduce groundwater contamination, and stimulate beneficial micro-flora in soil (Davis *et al*., 1996).

Green Manuring

Green manuring is the practice of incorporating large quantities of un-decomposed green material such as leaves and twigs of plants or crops in soil by ploughing.

Methods of Green Manuring

There are two methods of green manuring i.e. A) Green manuring in situ B) Green leaf manuring.

Green Manuring In-Situ.

In this system, green manure crops are grown and buried in the same field, either as a pure crop or as an intercrop with the main crop. The most common green manure crops grown under this system are Sannhemp, dhaincha and guar.

Green Manure Crops

Leguminous (Pulse) crops used for Green Manuring

- Sannhemp (*Crotalaria juncea*). Adapted to well-drained soil, suitable for upland condition, quick growing, relatively resistant to pest and disease, has deep root system.
- Dhaincha (*Sesbania aculeata*). Resistant to drought, salt and water-logging, ideal for rice, generally grown in low land, suitable for saline and alkaline soil, have a deep root system.
- Dhaincha (*Sesbania rostrata*). A newly introduced green manure crop which can also grow in water-logged condition. In this crop nodules formation is on the roots and also in large numbers on the stem. So that it fixes more nitrogen than *Sesbania aculeata*.
- Mung (*Phaseolus mungo*). It is quick growing, drought resistant.
- Indigo (*Indigofera tinctoria*). Suited to heavy soil (clay), slow growing.
- Khesari (*Lathyrus sativus*). Winter season crop.

Non-leguminous Green Manure Crop

1.Bhang (*Cannabis sativa*)
2.Kodogira (*Vernonia cenerea*)

Table 1: Green manure crops, their yield and nitrogen added in the field

Sr. No.	Green Manure Crop	Botanical Name	Growing Season	Average Yield Of Green Matter (Kg Ha^{-1})	Nitrogen Added (Kg Ha^{-1})
1	Sannhemp	*Crotalaria juncea*	Summer & Kharif	194.7	84.2
2	Dhaincha	*Sesbania aculeate*	Summer & Kharif	183.6	76.9
3	Urd	*Phaseolus mungo*	Summer & Kharif	100.1	42.2
4	Mung	*Phaseolus aureus*	Summer & Kharif	37.4	38.6
5	Khesari	*Lathyrus sativus*	Summer & Kharif	123.0	54.9
6	Berseem	*Trifolium alexandrinum*	Summer & Kharif	155.0	54.2

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, waste lands and nearby forest areas. The common shrubs and trees used are Glyricidia, Sesbania (wild dhaincha), Karanj, etc

Green Leaf Manuring Crop

- Glyricidia (*Glyricidia maculata*)
- Karanj (*Pongamia glabra*)
- Ipomoea (*Ipomoea carnea*)

Principles of Green Manuring

- Green manure crops should be grown in the irrigated area or where annual rainfall is more than 30 inches. Lack of moisture is harmful to the growth of the crop as well as for decomposition. An un-decomposed crop may harm the subsequent crop by upsetting the balance of carbon and nitrogen.
- In irrigated area, the best stage at which the crop should be incorporated in the soil as a green manure is when it reaches the flowering stage. In rainfed or dry region, green manure crops should be incorporated before the flowering stage (tender or leafy stage).
- It should be preferably from the legume family.
- It should have a deep root system.

Techniques in Green Manuring

- Green manure crops can be grown in any type of soil, provided there is sufficient rainfall or alternate irrigation facility is available.
- To ensure success with a leguminous green manure crop is to inoculate the seed with the proper strain of bacteria.
- The green manure crop should be sown with a higher seed rate than usual so that there will be a good canopy produced very quickly. The usual seed rate for Sannhemp is about 40 to 50 kg per hectare.
- The production of green manures is limited by the plant food elements (plant nutrients) deficient in the soil. Leguminous green manure plants are able to fix atmospheric nitrogen so well, as when grown in poor soils. The application of phosphatic fertilizers improves the growth of leguminous crop markedly and promotes the fixation of nitrogen by profuse nodulation.
- The best stage at which the crop should be incorporated in the soil as a green manure is when it reaches the flowering stage. Sannhemp crop is ready for turning-in at the age of 7 to 8 weeks whereas dhaincha crop is ready for incorporation when 5 to 6 weeks old.
- Burying of green manure crop is done in different ways. In some cases, the plants are cut close to the ground and the green material is put in the furrows opened by a mould board plough, and is later buried. One of the methods is to plank the material down with a heavy plank or log, and then plough the field. The other method

is to mix the uprooted or cut plant material (green leaf manure) by means of disc harrow. In drier areas, this method has been proved to be better than ploughing in.

- Immediately after ploughing the material, careful packing of the soil should be done by suitable implements to ensure proper decomposition. Packing (compacting) is especially necessary if the soil moisture supply is deficient.
- Under certain favorable circumstances, green manure crops such as dhaincha can be sown in between the rows of cotton or jowar. When the dhaincha is sufficiently tall it can be uprooted and mixed with the soil by inter-cultivations.
- Under limited moisture supply conditions, it may be advisable to grow the green manure crops in one field and add the green material to another field. By doing this the moisture required for growing the green manure crop is saved.
- For proper decomposition, in light soils, the crop should be buried deeper than that in the heavy ones.

Characteristics of a Good Manure Crop

- Green manure crops should be produce a large quantity of green biomass within a short period of time.
- It should be quick growing, especially in the beginning, so as to suppress weeds.
- It should be succulent and have more leafy growth than woody growth so that its decomposition will be rapid.
- Preferably is a legume, so that atm. 'N' will be fixed.
- Have deep and fibrous root system so that it will absorb nutrients from the lower layer of soil and add them to the surface soil.
- Green manure crops are able to grow on poor and problematic soil.
- Stage of green manuring: A green manure crop may be turned in just before the flowering. The majority of the green manure crops require 6 to 8 weeks after sowing at which there is maximum green matter production and most succulent.

Advantages of Green Manuring

- It adds organic matter to the soil and stimulates the activity of soil micro-organisms.
- Green manuring improves soil structure, increases water holding capacity and decreases soil loss by erosion.
- It takes nutrients from lower layers of the soil and adds to the upper layer in which it is incorporated.
- It is a leguminous crop, it fixes 'N' from the atmosphere and adds to the soil for being used by succeeding crop. Generally, about 2/3 of the N is derived from the atmosphere and the rest from the soil.
- It increases the availability of certain plant nutrients like P_2O_5, Ca, Mg and Fe.
- Growing of green manure crops in the off season reduces weed proliferation and weed growth.
- Green manuring helps in the reclamation of alkaline soils. Root knot nematodes can be controlled by green manuring.
- Green manures can act as habitats for general predators and encourage good populations of lacewings and parasitic wasps.

Disadvantages of Green Manuring

When the proper technique of green manuring is not followed or when weather conditions become un-favorable, the following disadvantages are likely to become evident.

- Under rainfed conditions, it is feared that proper decomposition of the green manure crop and satisfactory germination of the succeeding crop may not take place, if sufficient rainfall is not received after burying the green manure crop. This particularly applies to the wheat regions of India.
- Since green manuring for wheat means loss of kharif crop, the practice of green manuring may not be always economical. This applies to regions where irrigation facilities are available for raising kharif crop along with easy availability of fertilizers.
- In case the main advantage of green manuring is to be derived from the addition of nitrogen, the cost of growing green manure crops may be more than the cost of commercial nitrogenous fertilizers.

- An increase of diseases, insects and nematodes is possible.
- A risk is involved in obtaining a satisfactory stand and growth of the green manure crops, if sufficient rainfall is not available.

CONCLUSION

Green manures are fertility building crops and may be broadly defined as crops grown for the benefit of the soil. The green manuring crops improve the humus, organic carbon, nitrogen and soil microbial growth. Green manuring crops increase the microbial activities in the soil. These crops improve soil structure and reduce soil erosion. They help to increase the supply of nutrients available to plants.

REFERENCES

Cherr, C.M., Scholberg, J.M.S. and McSorley R. (2006). Green Manure Approaches to Crop Production: A Synthesis. Agronomy Journal, 98: 302-312.

Davis, J.R., Huisman, O.C., Westerman, D.T., Hafez, S.L., Evberson, D.O. Sorensen, L.H. and Schneider, A.T. (1996). Plantpathology 86:(5) 444-453.

Dubey L., Dubey M. and Jain P. (2015). Role of green manuring in organic farming. Plant Archives, 15(1): 23-26.

http://ecoursesonline.iasri

https://geographymaterials.blogspot.com

https://www.soilmanagementindia.com