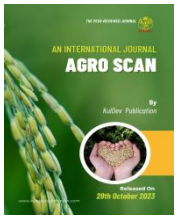
AgroScan: ISSN 0000-0000 (Online) 2023

Contents lists available at KulDevWeb

AgroScan

journal homepage: www.agroscan.kuldevpublication.com



Research Article

Enhancing Soil Fertility and Crop Yield in India via Green Manuring

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ARTICLE INFO

Article history:
Received 11 September 2023
Accepted 15 October 2023
Available online xxxx xxxx

Keywords:
Manuring
Soil fertility
Crop production

ABSTRACT

Green manuring has long been recognized as being crucial to crop productivity. Its significance has been steadily growing recently because to the high expense of chemical fertilizers, the elevated danger of environmental contamination, and the need for sustainable agricultural practices. When a green manure crop is plowed, the nutrients from the bottom layer are absorbed and left on the surface. Green manuring, on the other hand, may raise crop yields by enhancing soil fertility. Green manuring is an inexpensive technique that protects production and lowers the cost of fertilizers.

Selection and peer-review under responsibility of scientific committee of editorial board members of AgroScan and author(s) and suggested reviewer.

Introduction

India has now reached a degree of food sufficiency via greater fertilizer usage at discounted costs. The affordability of inorganic fertilizers is rising, raising concerns about the long-term viability of soil productivity. As a result, other sources are considered to augment inorganic fertilizers. crops cultivated using green manures to improve the soil. For thousands of years, green manure crops have been used in traditional agriculture; however, conventional agricultural techniques have mostly rejected them. The the high expense of chemical fertilizers, the rising danger of environmental contamination and need for sustainable agricultural methods has been all contributed to the growing of plants was importance of this soil improving technique in recent years. Plants grow better on healthy soils. For farmers, maintaining such soils and raising agricultural yields is a major undertaking. Green manures are a gift from nature; they are an excellent substitute to raise the soil's organic matter content and have helped farmers accomplish their goal of raising crop yields and soil productivity. Green manuring is a useful technique for protecting production and lowering fertilizer costs. When a green manure crop is plowed, the nutrients from the bottom layer are absorbed and left on the surface [1]. The process of putting fragile leaves either while they are still green and shortly after they flower into the soil by plowing them under or converting them into green manure crops. Forage or leguminous crops are used as green manures because they produce the leafy components that help retain soil nutrients and enrich the soil with organic matter.

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https://doi.org/10

Because they incorporate organic matter into the soil will gives green manuring was valuable. For true soil fertility was one of the soil's most important components is acknowledged to be organic matter. Two kinds of green manure crops are often used in green manuring [1].

Using green manuring techniques

"Green Manuring" refers to the use of green manure in cropping systems. Two methods exist for Green Manuring. Green manuring in situ: The in-situ approach involves growing green manure crops on a field before crop cultivation, which are subsequently chopped and buried after about half of the plants have flowered. Legumes are recommended for green manuring due to their capacity to fix nitrogen from the air. The majority of farmers utilize sun hemp, *Crotalaria juncea*, extensively and with great popularity. These plants are cultivated and sacrificed to enhance the living conditions of the primary crop because of their rapid growth and effective capability to fix nitrogen. Legume green manuring is the practice of using legumes (such as cluster beans, lentils, clovers, green gram, sesbania, and cowpea). It may lower the quantity of nitrogen fertilizer needed and is a good substitute for traditional lean time fallowing. Before the plants produce seeds, this crop has to be turned beneath the earth. Utilizing legume crops as feed or green manures has become a crucial technique for preserving the fertility and productivity of the soil.

Manuring with green leaves

In this practice, the leaves and twigs of trees growing along the farm's boundaries and along the main bunds of the fields were gathered, and the foliage of shrub and herb type weeds that grow along riverside and roadside were incorporated into the already-existing crop field. There will be a greater diversity of species in this.

The commonly used weeds species as a green leaf manures are as follows:

a) *Cassia auriculata*
b) *Cassia seamia*
c) *Thespesia populina*
d) *Glyricidia* spp.
e) *Pungamia pinnata*
f) *Azadiracta indica*
g) *Eichornea*
h) *Ipomoea* spp.
i) *Calatropis gigantea*
j) *Cassia auriculata*
k) *Pungamia pinnata*

Characteristics of legume green manure crops [2]

1. It is possible to spread Pillipesara seeds throughout the standing rice crop.
2. Legume is cultivated first to harvest green cow feed cuttings and subsequently to provide green manure.
3. Their generation of biomass ought to be high. The goals of environmentally friendly manuring
4. Resistance to diseases and pests
5. Simplicity of integration; 6. High viability of seeds
7. A lot of seeds are produced
8. Insensitivity to photoperiod
9. Generate plenty of succulent tops.
10. Tolerance for cold, shade, floods, and droughts
11. Broad ecological flexibility
12. Extremely economical with water use
13. Elevated rates of N accumulation
14. Short life, quick growth, and excellent capacity to store nutrients

Advantage of green manuring-

1. Increase the yield of crop 10-15%.
2. Providing supplementary animal forage
3. Lower fertilizer N requirements for succeeding crops
4. Suppressing weeds

5. Promotes habitat for natural enemies
6. Reducing pest and disease problems
7. Improves soil aeration
8. Improves the soil structure
9. Prevention of erosion
10. Provision of nutrients and organic carbon of soil
11. Improves the soil fertility

A number of disadvantages can also be identified

1. Increased solubility of trace elements, lime phosphate, and other substances due to the activity of soil microorganisms and the production of organic acids during the breakdown process
2. Fix ambient nitrogen and harbor N-fixing microorganisms (Rhizobium in root nodules).
3. Stop nutrients from seeping into lower layers.
4. When green manure crops are plowed, the nutrients from the bottom layer are absorbed and left on the surface.
5. How green manuring increases soil fertility
6. Missed chances to grow lucrative crops
7. Extra labor at peak seasons of the year

Direct seed and additional cultivation expenses [3]

Management of green manures:

The kind of green manure, the length of the crop species and the sort of agricultural technique utilized to produce the green manure crop will all affect how the green manure is managed. Table 1-3 provides a summary of the essential management techniques for a few typical species of green manure.

Table 1: Management of green manures.

S. No.	Crop	Seed Rate (kg/ ha)	Sowing Time	Green Biomass (tonne/ha.)	N Content (%)	Available N kg/ ha.)
Green manure crops						
1	Sun hemp	April-July	40-45	20-30	0.43	84.0-129
2	*Sesbania* Spp.	April-July	35-40	23.2	0.42	77.1-105
3	Cluster bean (Guar)	June-July	40-45	18-30	0.43	61.0-85
4	Lobia	April-July	45-50	15-18	0.49	74-88
5	Green gram (Moong bean)	March-April	20-25	10-Aug	0.53	38.6
6	Black gram	June-July	20-25	12-Oct	0.41	42.5
7	Berseem	Oct.-Dec.	18-20	16-18	0.43	60
8	Senji	Oct.-Dec.	20&25	26-29	0.51	134.4

Table 2: Available nutrient content (%) in green manure and green leaf manure crop.

S. No.	Crop	Botanical Name	Nutrient Content (%) on Dry Weight Basis		
Green Manure Crop			N	P_2O_5	K_2O
1	Sun hemp	*Crotalaria juncea*	2.3	0.5	1.8
2	Dhaincha	*Sesbania aculeata*	3.5	0.6	1.2
3	Sesbania	*Sesbania speciosa*	2.71	0.53	2.21
4	Jangli neel	*Tephrosia purpurea*	2.4	0.3	0.8
Green Leaf Manure Crop					
1	Neem	*Azadiracta indica*	2.83	0.28	0.35
2	Karanj	*Pungamia pinnata*	3.31	0.44	2.39
3	Glyricidia	*Glyricidia sps*	2.76	0.28	2.8

Table 3: Green manure crops suitable for different type of soil.

S. No.	Type of Soil	Green manure crops
1	Light sandy loam soil of dry region	Lobia, Guar, Green gram and Black gram
2	Saline and Alkaline soil	Sun hemp and Dhaincha
3	Loamy sand soil	Dhaincha, Guar, Sun hemp and Green gram

Getting the seed bed ready

Using normal methods, loosen the soil with a fork to break up any clods to a suitable depth before planting a green manure crop. Early establishment of strong root systems is essential to the green manure crop's overall effectiveness. It was especially crucial for the green manures that last less time. The size of the seed determines how compacted the soil becomes, therefore it's crucial to plant tiny seeds like clover into a fine, well-firmed seedbed. It should go without saying that the seedbed ought to be sufficiently wet before seeding.

Techniques for sowing

Drilling and broadcasting are used to plant green manure crops. In actuality, the decision is often made based on the equipment that is available. Together with a good, solid seedbed, the two most important conditions for a successful establishment are consistent sowing depth and even seed dispersion.

Cutting grass

The majority of crops planted for short durations of time are grown to produce bulk, which is then incorporated into the soil either after the crop has flowered and before the seed has set. If longer-term green manures are to be cultivated and provide the necessary advantages, they must be managed properly.

Including a crop of green manure

Growing the crop is vital, but so is effectively incorporating the green manure crop. Aeration of the soil and correct mixing of the green manure crop are key factors in ensuring that the green material of the included crop breaks down swiftly. Additionally, it's critical that the green manure hasn't become too woody or mature at the time of introduction. The top growth should preferably droop before inclusion. When there is a lot of bulk, the growth should be chopped with a chopper and allowed to wilt for a maximum of seven days before being included. Using a shallow rotavator or disc harrows is an alternate method of chopping the green material into the soil surface.

References

1. Francis Rayns, Anton Rosenfeld (2006) Green manure: A review conducted by HDRA as part of HDC Project FV 299. p. 37.
2. Fageria NK (2007) Green Manuring in Crop Production. Journal of Plant Nutrition 30(5): 691-719.
3. Ansari MA, Prakash N, Punitha P, Ansari MH, Amarpreet Singh (2014) Green Manuring: An Ideal Approach to Improve Soil Fertility in Jhum Area of NEH Regions of India. Popular Kheti 2(2): 222-229.