Limitations for raising *Sesbania*

Although several advantages of green manuring have been reported by various researchers but many limitations also exist for growing it in sikkim.

- Non-availablity of quality seed material especially in organic farming
- 50-60 days are required for growing of crop for which land must be allocated by the farmers
- Lower temperature in the state which reduces the rate of decomposition of *Sesbania* which takes 6-8 weeks
- Higher rainfall and hailstorm during early vegetative growth period hampers the biomass production of the crop

Rice transplanting after green manuring

6-8 weeks after trampling the rice seedling should be transplanted at spacing of row to row 20 cm and 10 cm from plant to plant for optimum yield. Before transplanting of rice seedlings half amount of recommended dose *i.e.*, 30 kg/ha of nitrogen should be applied through the available sources of organic nutrients to get the maximum yield.

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Green Manuring of Dhaincha (*Sesbania* sp.) for Sustaining Organic Rice Cultivation

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Rice is the one of the most important crops of Sikkim, however, its average productivity is quite low (37%) than the national average. There are various reasons for lower productivity of the rice in the region and among them proper nutrition is paramount importance in the region. Farmers of the state mainly grow transplanted puddled rice with traditional varieties that require longer duration for maturity; which needs proper nutrition for higher yield especially under organic management conditions. Hence, green manuring of dhaincha (*Sesbania* spp.) before transplanting of rice may be one of the options for sustaining the productivity in the Sikkim hills. Green manuring is a practice of ploughing or turning into the soil undecomposed green plant material for improving the physical conditions of the soil or for adding nutrients.

Objective

- The main objective of green manuring in Sikkim is to curtail the nitrogen requirement by applying bulky organic nutrient *viz*., Farmyard manure.

Advantages of green manuring in rice

- The green manure is not only to incorporate the nitrogen (60-70 kg/ha) but also to improve the soil health by improving the physical and chemical properties of the soil.
- It also helps to maintain the organic matter status of soil.
- Green manuring improves aeration in rice soil by stimulating the activities of surface layer of algae and bacteria.
- Green manure crops absorb nutrients from the deeper soil layer and leave them on the soil surface layer when incorporated for use of rice crop in Sikkim.
- Depending upon the humus formed, green manuring increases the water holding capacity of light soils.

Nutrients	Content (% on dry weight basis)
N	3.50
P	0.70
K	1.30

Climate

Sesbania requires warm weather for higher growth. It grows best at temperatures above 25°C.

Seedbed preparation

After harvesting of *Rabi* crops one tilling of the field should be immediately done.

Sowing time

Second fortnight of March is the best-suited time for raising *Sesbania* in Sikkim.

Seed rate

A comparatively higher seed rate of 50-60 kg/ha is required to get higher biomass of green manure. If population is kept dense, the stem will be very thin and good for manuring and quicker decomposition.

Time of incorporation

The success of green manuring especially in hilly region depends on correct timing of incorporating green matter in to the soil and sufficient time interval should be kept before transplanting of rice in Sikkim. After incorporation, sufficient time is allowed for decomposition to take place and only after this, rice should be transplanted. In Sikkim, where the maximum temperature is 29-30°C during May and June months it takes more time for Sesbania to decompose. Hence, it should be incorporated into the soil 50-60 days after sowing the crop. The incorporation and/or trampling can be carried out by several ways several ways, *e.g*. for easier ploughing, cutting of the standing crop with the help of sickle is recommended in Sikkim. A faster and more efficient way is planking over the standing crop of *Sesbania* using an animal-drawn wooden plank, and then plough along the direction of the lodged crop. It should be ensured that all the plant should be in close contact of soil after incorporation. Usually six to eight weeks time is found to be sufficient for decomposition.

Decomposition of *Sesbania*

The *Sesbania* applied to the soil undergoes a series of chemical changes and only after these biochemical changes the nutrient contained in the plant becomes available and the humus is synthesized. The rate of decomposition mainly affected by following factors:

- The type and nature of organism present.
- Optimum temperature is about 28-30°C.
- Adequate aeration for aerobic decomposition.
- Sufficient water is necessary for proper decomposition.
- The various soil physical, chemical and biological properties will also influence the rate and type of decomposition.