



IN-SITU SUNNHEMP GREEN MANURE MULCHING IN RAINFED MAIZE BASED CROPPING SYSTEM FOR HIGHER PRODUCTIVITY



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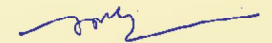
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FOREWORD



Maize is an important crop of rainfed hill agriculture which is generally grown as a pure crop in monsoon on the poorly managed terraces in hilly areas. Being an open tilled crop, maize allows the rain water to go out as runoff which also causes soil erosion and nutrients losses. Continuous loss of top soil associated with considerable quantity of nutrients and organic carbon makes the soil infertile and results in low productivity. Thus, it is of vital importance to follow the efficient cropping practices for preventing the effect of beating rain drops on soil and addition of the nutrients to maintain the fertility of the soil for sustainable crop productivity. *In-situ* sunnhemp mulching in maize during rainy season is quite promising for providing better land cover to check the soil erosion and recycling the nutrients to build up soil fertility for maize based cropping system.

Research conducted at CSWCRTI, Research Farm, Selakui (Dehradun) has been presented in this brochure to make the farmers aware about the benefits of *in-situ* sunnhemp mulching technology developed at this institute for maize - wheat cropping system. It is quite beneficial in conserving natural resources and enhancing productivity in the western Himalayan region.



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INTRODUCTION

- Agriculture in the western Himalayan region is characterized by rainfed farming, traditional crop practices and low fertiliser use.
- The major constraints in rainfed farming particularly in maize which is cultivated in wide rows with limited canopy cover causes high runoff coupled with loss of soil and nutrients and weed infestation during rainy season.
- *In-situ* sunnhemp growing in between maize rows during rainy season and its recycling as surface mulch after 30 to 35 days as green manuring is quite promising for providing better land cover and recycling of nutrients for maize based cropping systems.

WHY IN SITU GREEN MANURE MULCHING ?

- *In-situ* grown sunnhemp in between maize rows during rainy season has great potential for providing better land cover and checking soil erosion.
- Its recycling as surface mulch checks weed intensity, conserves moisture in soil profile and builds up soil fertility.
- Fixes atmospheric N and makes it available to field crops. It maintains organic matter which increases water holding capacity, infiltration rate and improves soil aggregation.
- It not only increases the yield of maize but also increases the yield of succeeding wheat crop by moisture conservation and nutritional effect.

METHODOLOGY

Crop Varieties

- Maize varieties, viz; Vivek, makka hybrid 9, VL makka 88, VL makka 42 and Kanchan are suitable for cultivation in north-western Himalayan region.

Field Preparation and Sowing

- One or two summer ploughings with mould board plough followed by planking during April-May are carried out for exposing the soil to sun light for control of weeds, insect and pests. Summer ploughing helps in conserving moisture and also in obtaining required tilth for germination of seed.
- Under climatic conditions of north western Himalayan region, sowing time of maize should coincide with arrival of first monsoon showers which generally occur during 3rd week of June.

Manure and Fertiliser Application

- A recommended dose of 80, 40 and 40 kg/ha of N, P₂O₅ and K₂O, respectively should be applied.
- Half dose of the nitrogen (50 kg/ha) and full dose of P and K are applied as basal dose at the time of sowing.
- Remaining half of nitrogen dose is applied as top dressing at *knee-high* stage of maize.

Sowing

- Sowing of maize should be done in lines at a row spacing of 90 cm with plant spacing of 20 cm @ 20 kg seed/ha.
- Sunnhemp should be sown in the inter row spaces in maize on the same day @ 60 kg seed/ha.

Weed Control and Intercultural Operations

- Weed growth in maize based intercropping systems can effectively be suppressed and controlled by applying Basalin (pre-sowing) @ 1.5 litre/ha or pre-emergence application of alachlor @ 2 litre/ha.

Mulching

- The plants of sunnhemp along the maize rows (10 cm either side of row) are removed after emergence so that they do not affect the growth of maize plants adversely. The biomass of sunnhemp along with associated weeds may be cut at 30-35 days of growth and spread as mulch in the inter-row spaces as shown in Photo 1 and 2.



Photo 1: Standing stage of sunn hemp Photo 2: Sunn hemp mulched in between maize rows

Disease and Insect Pest Control

- Recommended maize varieties are not affected by any major disease or insect pest. However, treat seed with Thiram/ Captan @ 2 g/kg to avoid seed and seedling mortality.
- For the control of leaf blight, spray Dithane M-45 @ 2.5 kg/ 1000 litres of water.

Harvesting and Threshing

- Harvesting of maize crop should be done when sheath turns yellow and grains become hard with 25-30 per cent moisture.
- Cobs may be removed and descaled, after drying under sun, grains are removed from cobs and stored.

CROP PRODUCTIVITY AND ECONOMICS

- Execution of *in-situ* green manuring with sunn hemp produces 2180 to 2310 kg/ha of maize grain and 1840 to 2310 kg/ha of wheat grain (maize-wheat rotation) resulting in higher net profit (Table 1).

Table 1: Effect of *in-situ* grown sunn hemp in between maize rows on yield of crops and net return

Agronomical practices	Maize yield (kg/ha)	Wheat yield (kg/ha)	Net profit (₹/ha)		
			Maize	Wheat	Maize+wheat
Maize with <i>in-situ</i> sunn hemp mulching	2233	2040	5800	21630	27430
Maize without <i>in-situ</i> sunn hemp mulching	2130	1860	5010	17330	22340

*Economics worked out considering the prices of 2010.

Soil Health and Other Benefits

- Sunn hemp mulching improves soil organic C along with addition of 21.6 to 41.3 kg of N/ha in the soil.
- It increases infiltration and decreases bulk density.
- Green manuring protects the soil from direct beating action of raindrops and increases the time of concentration by reducing the velocity of runoff water.

SCOPE OF APPLICATION

In-situ green manuring sunn hemp technology is recommended for adoption by the farmers of the states and region where maize crop is grown extensively as a *kharif* crop, particularly in Uttarakhand, Himachal Pradesh and Jammu & Kashmir for conserving natural resources and enhancing productivity for higher net returns in maize - wheat rotation under rainfed conditions.