

Some Aspects of Green Manuring for Arecanut

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Green leaf manuring is a common and an age old practice in arecanut cultivation. Arecanut growers in the southern states usually add green leaves and twigs collected mostly from the neighbouring forest areas to the basins dug around the palms once in a year in the month of August - September. In view of the shortage of forest areas it is probably high time to popularise the cultivation of green manure crops amongst the cultivators as a substitute for forest leaves. This will benefit farmers not only of the South but also of Assam and West Bengal where practically no manuring is done for arecanut.

The fertility status of the arecanut growing soils of India is mostly below average. This is particularly so in the case of organic matter due to its fast oxidation because of the hot climate. Unless the lost organic matter is returned to the soil periodically through the addition of bulky organic manure, it would be very difficult for the ryots to get an economic return from the cultivation of arecanut. Out of all the organic sources available in the country today, probably green manuring is the only method which is within the reach of the common cultivator to feed his crop with essential nutrients and particularly of nitrogen.

Concept of Green Manuring

Green manuring literally means the practice of raising a legume and subsequently turning it down in soil after it reaches the maximum vegetative growth to increase the soil fertility. Although green manuring is done both by legumes and non-legumes, generally the former is preferred, since they fix atmospheric nitrogen in the soil in addition to the supply of organic matter. The green plant material incorporated into the soil is decomposed with the help of the microbial agents and get converted into humus which releases plant nutrients. The rate of decomposition depends upon the stage of the crop buried, available nutrient status of the soil, temperature, moisture and the carbon-nitrogen ratio of the green matter. When the plant tissues are rich in nitrogen, the decomposition becomes very fast leaving behind only traces of humus. On the contrary, in the case of woody and fibrous plant materials with a wide C/N ratio, the microbial population feeding on the supplied organic matter starve for nitrogen and compete with the plant roots creating a temporary depression in the available nitrogen content of the soil. It is, therefore, desirable to add plant parts to the soil having a balanced C/N ratio around 15 for

proper nitrification and release of nitrogen.

Benefits from Green Manuring

A number of benefits are accrued directly or indirectly as a result of green manuring. The legumes assimilate the atmospheric nitrogen and enrich the soil with this vital nutrient. It has been estimated that 56-102 kgs. of nitrogen per hectare per year is fixed by a well inoculated legume. The efficiency of the legume to fix nitrogen goes up when the soil is optimum in lime, phosphorus, potassium and deficient in nitrogen. As most of the arecanut growing soils are acid lateritic in nature, all the above nutrients except nitrogen should be added to the soil prior to the sowing of green manure seeds. This will facilitate a bumper harvest of nitrogen present in the air.

In reality, the organic matter content of our tropical soils cannot be substantially increased but can be maintained by green manuring. It has been revealed that a one per cent increase of organic matter takes place when 2240 kgs. of dry matter obtained from green manure crops is added per hectare continuously for a period of ten years. If this is the extent of increase of organic matter content under temperate climate, it would be still low in tropics. However, replenishing the annual loss of organic matter is equally an important task in the management of soils. The organic matter added through the plant parts improves the structure of the soil. It binds the particles of sandy soil turning it to loamy and changes a heavy soil porous. The presence of organic matter in the soil gives it the natural resistance which is technically called the buffering capacity of the soil.

The biggest advantage from green manuring is the prevention of leaching

losses, conservation of nutrients and moisture. In lateritic soils because of their loose texture, there is considerable loss of nitrogen which can be prevented by raising a green manure crop. The plant by its extensive root system absorbs nutrients from the subsoil layers and when the same is buried shallow the nutrients are brought to the surface in a readily available form than before. This circulation of nutrients from the lower layer of soil to the upper layer prevents fixation as happens in the case of phosphorus.

The root system of some green manure crops has better capacity to assimilate certain nutrients than those of the main crop. The nutrients absorbed by the crop are returned to the soil in a more readily available state which can be used by the standing crop. Besides, root penetration to the deeper layers of soil and their subsequent decay improves aeration, drainage and adds organic matter to the subsoil.

Arecanut is also grown on hill slopes. In such areas soil erosion and nutrient losses can be checked by growing cover crops. The thick vegetation prevents the direct impact of rain drops that dislocate the soil particles affecting the structure of the soil. During summer months, although some of the cover crops die out, the dry plant material acts as a good mulch and conserves moisture and controls the weed growth.

Principal Green Manuring Crops

Green manuring crops which are high yielding and quick growing to compete with the weeds during the initial stage of their growth are to be selected. A list of such crops which can be raised *in situ* or in vacant spaces adjoining the arecanut gardens are given in Table I along with some agronomic information and their nutrients content.

TABLE I

**Information Regarding the Agronomy and Chemical Composition of
Principal Green Manuring Crops**

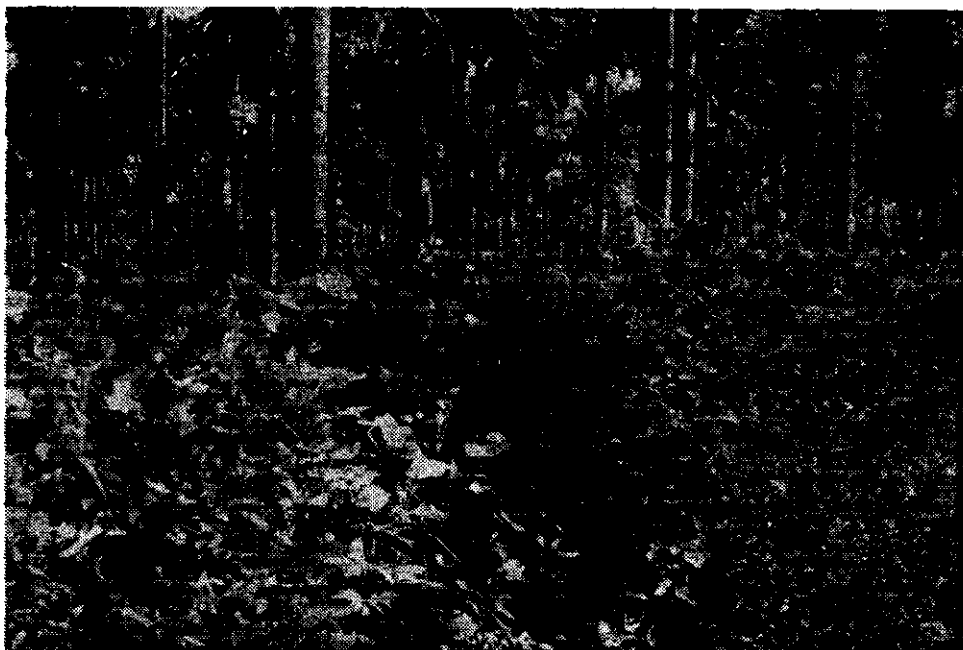
Sl. No.	Botanical name	Soil type	Seed rate kg./ha.	Green matter production kg./ha.	N (percentage on oven dry basis)	P	K
1.	<i>Calopogonium mucunoides</i>	Upland	11.0	12,800	1.81	0.14	1.38
2.	<i>Crotalaria anagyroides</i>	Upland	30.0	11,000	2.88	0.08	0.53
3.	<i>Gliricidia maculata</i>	Upland	Cutting	12 kg./tree	2.90	0.22	2.32
4.	<i>Pueraria javanica</i>	Heavy soil	11.0	16,800	1.17	0.19	1.29
5.	<i>Sesbania aculeata</i>	Any soil	28.0	25,500	3.50	0.26	0.99
6.	<i>Stylosanthes gracilis</i>	Upland	8.0	13,500	1.74	0.11	1.01
7.	<i>Tephrosia purpurea</i>	Upland	28.0	7,700	3.20	0.13	1.08
8.	<i>Mimosa invisa</i>	Upland	15.0	17,000	1.89	0.09	0.22
9.	<i>Centrocema pubescens</i>	Upland	20.0	5,400	2.32	0.18	1.50

Out of all these green manure crops, *Sesbania* has the capacity to withstand extreme soil conditions like water-logging and drought besides being a good yielder. It can be grown in the narrow valleys of Assam, Mysore and Kerala receiving high rainfall. *Calopogonium* and *Pueraria* may be better suited to the hill slopes of these states as cover crops to prevent erosion and conserve moisture. *Tephrosia* is considered to be a very useful green manure crop in some parts of Tamil Nadu because of its hardiness and high nitrogen content. It is a bush and comes up well in loamy soil but cannot stand water-logging. *Crotalaria anagyroides* is

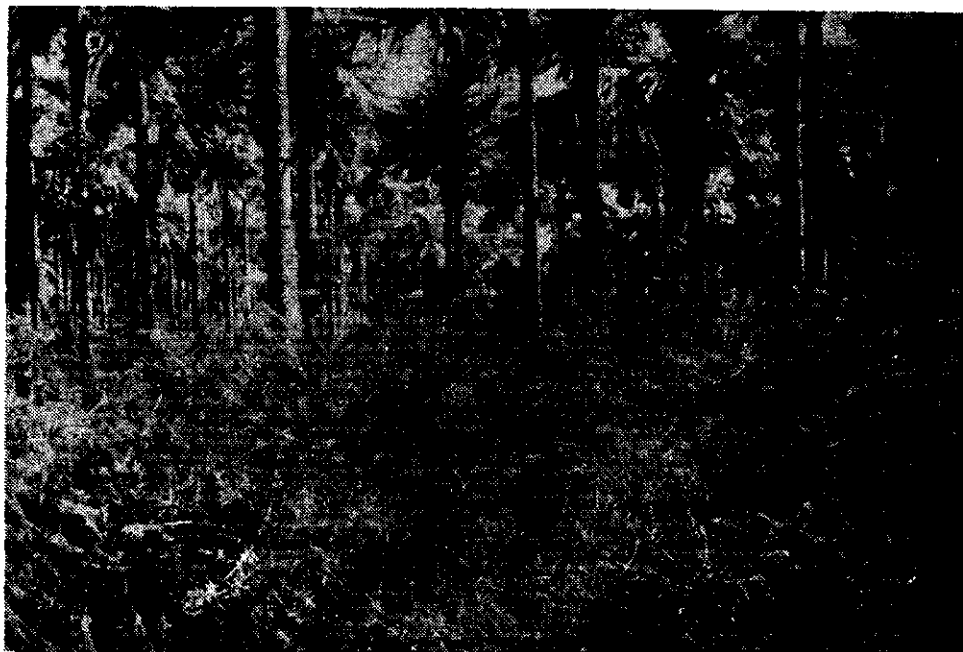
also a promising green manure crop for upland soils and is grown throughout the tropics. In plain land, *Mimosa* will be a better choice. Field experiments carried out at Vittal and Hirehalli have revealed that *Mimosa* is the highest yielder of green matter. *Stylosanthes* did not thrive at Hirehalli but grew well at Vittal.

Method of Green Manuring

In order to get the full benefit from green manuring certain points should be kept in mind. Sowing of seeds should be done in the first week of May so that the crop comes up vigorously during the rains. When



A cover crop of Pueraria grown in situ



Mimosa — an excellent cover crop

sown just before the monsoon, experiences have shown that the crop fails partly because of poor germination and partly because it gets smothered by the weeds. It is very much necessary to inoculate the seeds with the proper strains of bacteria. The seeds can be broadcasted in the garden and a higher seed rate than generally recommended should be used because of poor germination. The legumes respond nicely to the applica-

tion of Super phosphate and, therefore, the fertilizer should be added at the rate of 40 kgs. of P_2O_5 per 500 palms before sowing. The crops should be harvested at the flowering stage. The green matter obtained should be chopped and added to the basins. Proper covering with soil is a must to ensure the supply of moisture for the rotting of plant materials and this is especially important in moisture deficient conditions.

