BENEFICIAL ASPECTS OF GROWING LEGUMES AS INTER OR MIXED CROP IN ARECANUT PLANTATION

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Arecanut cultivation in India is mainly restricted to high rainfall belts. The total area under arecanut plantation is about 1.8 lakh hectares. In addition to the application of chemical fertilizers and farm yard manure, the application of green leaf is a common practice during August-September every year. The green leaves and twigs are mostly collected from the forest areas. Since the area under forest is getting reduced day by day it is probably high time to popularise the cultivation of green manure and cover legume crops as substitutes for forest leaves. The nodulated legumes contribute a good deal to the amount of nitrogen fixed into the rhizosphere. The beneficial aspects of growing green manure, cover legume, forage legume and grain legume crops are discussed in this article.

Green Manure Crops.

The green manuring consists of turning into the soil green plant material grown in situ or brought from outside. The crop grown in situ is to be incorporated at the time of flowering. The materials should be incorporated when there is sufficient moisture in the soil. The following are the benefits expected by growing green manure crops:

1. Maintenance of humus content of the soil, humus resulting from the decay of green manures improves the physical properties of the soil such as absorption capacity, aeration, drainage and granulation.
2. Stimulates the biological activity in the soil.
3. Exerts a conserving influence on soil nutrients and brings them upwards from sub-soil and deposits them within the root zone.
4. Increases the availability of inorganic constituents of the soil.
5. Prevention of soil erosion and suppression of weed growth.
6. Fixing atmospheric nitrogen.

Cowpea (*vigna catgang*), unhemp (*Grotaleria juncea*), dhaincha (*Sesbenia aculeata*) and pillipersara (*Phaseolus trilobus*) could be grown for green manuring purpose.

Crotalaria striata is found to be the most suitable green manure crop for growing in situ and incorporating in arecanut gardens. It comes up well in all types of soils and tolerates shade of the palms. Of all these green manure crops, *Sesbenia* has the capacity to withstand extreme soil conditions like water logging and drought, besides being a good yielder.

The foliage of the following crops are used in India for green manuring, *Gliricidia maculata, Pongamia glabra, Calotrapia gigantea, Cassia tora, Sesbenia speciosa Tephrosia candida and Crotolaria magyroides.* In gardens where growing of green manure crops in situ is not possible, growers can plant the above quick growing green manure crops on the borders of the gardens.

Cover Legumes.

Growing of cover crops in arecanut plantation is now becoming more and more popular. Cover crops grow vigorously and cover the ground densely within a short period.

The cover legumes can be used as green manure crops. The beneficial aspects of cover cropping are as follows:

1. Prevention of soil erosion.
2. Smothering of weeds, thus reducing the weeding costs.
3. Improving the aeration of the soil.
4. Protecting the soil and roots of the crops from excessive heat of the sun.
5. Conservation of fertility by using available plant food which might otherwise be leached away.
6. Increases the soil fertility by fixing atmospheric nitrogen.

Some of the cover legumes that can be grown in Arecanut plantation are *Pueraria javanica, Stylosanthus sp. Sesbenia cennolina, Centrocema pubsens, Phaseolus atropurpurea, Mimosa invisa, Sesbenia acuieata* and *Calopogonium mucunoides.*

Forage Legumes

In arecanut plantations where there is acute problem of grazing, the forage legumes provides fodder for livestock. The main selection criteria are high yielding potential in dry season, late flowering, high nutritive value and either tolerance to temperature extremes or rapid recuperation. The forage legumes can also be grown as cover crops in plantation. Therefore, the cover legumes listed could be grown for forage purpose. The other beneficial aspects remain the same as for that of growing cover legumes.

The nitrogen fixation by some of the tropical cover and forage legumes are given in Table I. *Pueraria javanica* and *Mimosa invisa* were found to be the best forage and cover legume crops from the point of view of nutrient addition and yield of green matter.

TABLE I

Green matter production and nitrogen fixed by some tropical and sub-tropical forage and green manure crops

Sl. No.	Common name	Botanical name	Green matter (kg/ha)	Nitrogen fixed (kgN/ha/yr)*
1.	Calopo	*Calopogonium mucunoides*	12,800	120
2.	Kuduz	*Pueraria javanica*	16,800	99
3.	Centro	*Centrocema pubencens*	5,400	259
4.	Stylo	*Stylosanthus gracilis*	13,500	124
5.	Mimosa	*Mimosa invisa*	17,000	..
6.	Dhaincha	*Sesbenia aculeata*	25,500	..
7.	Sunhamp	*Crotaleria juncea*	11,000	..

*Nitrogen fixed figures refers to pure stand of legume crop.

Green Legumes

The interspaces in arecanut plantation can be utilised for growing the grain legumes as a source of additional income to the grower. The grain legumes represent the economic source of protein for human nutrition. The crops commonly cultivated in plantation could be ground nut (*Arachis hypogea*), horse gram (*Dolichos biflorus*), chick pea (*Cicer arietinum*), pigeon pea (*Cajanus cajan*), cowpea (*vigna catiang*), green gram (*vigna radiata*) and soybean (*Glycine max*). The legumes can be grown in rotation with non-legume crops for enriching the soil fertility and reducing the incidence of pests and diseases. After harvesting the grains, the plant could be incorporated into the soil. The amount of nitrogen fixation by some grain legumes are given in Table II:

TABLE II

Nitrogen fixed in some grain legumes (Pulses).

S.No.	Common Name	Botanical name	Nitrogen fixed (kg N/ha)*
1.	Green Gram	*Vigna radiata*	62—202
2.	Pigeon pea	*Cajanus Cajan*	224
3.	Cow pea	*Vigna sinesis*	198
4.	Chick pea	*Cicer arietinum*	103
5.	Ground nut	*Arachis hypogea*	124

*Nitrogen fixed figures refers to pure stand of legume crop.

Forage Legume — Grass Association

The forage legumes and grass could be grown together in the plantation in order to meet the fodder requirement of the livestock. The introduction of a two crop rotation (Legume-grass) into large areas has already been successful. The dairy animal and other livestock in plantation area require fodder. Since there is a growing demand of fodder, this practice of growing forage legumes and grasses could be very well adopted. The grasses grown in association with legumes are Pusa giant, NB-21 (Both hybrid napier) and Guinea grass (*Penicum maximum*). The mixed cropped experiment in arecanut with Cowpea, NB-21 and Guinea grass was found to increase nitrogen fixing *Beijerinckia, Azotobacter* and phosphate solubilizing microflora.

The practice of growing green manure and cover crops for enriching the soil fertility, grain legumes as a source of additional income, forage legumes and forage legume-grass as fodder for livestock can be successful in areca plantation. Depending on the requirement, the grower has to select the suitable legume crop to cultivate in the garden. The selection of legume species and their corresponding rhizobia is required for substantial increase of protein production either for livestock or for human consumption or for raising the soil fertility. The total of 48,600 tonnes of urea costing Rupees 7 crores is required to meet the nitrogen demand of this crop. This calls for the attention of the growers to go for legumes as inter or mixed crops in arecanut gardens to enrich the nitrogen status of the soil. Even if the nitrogen fixation by these legumes in arecanut plantation is only fifty percent of what it is being fixed by the legume monocrop, it will be advantageous to a great extent in reducing the cost of this input.

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