COWPEA (*Vigna unguiculata*) as a Low Cost Input Green Manure Crop for Basin Management Under Coconut Root (wilt) Garden

Practising eco-friendly low cost input technology is a viable option for increasing the productivity of crop. Growing Cowpea, a green manure legume crop as cover crop in coconut basin is found to be one of the standardized low cost in put techniques in root wilt affected garden for sustainable productivity. The author Maheswarappa projects the benefit of growing cowpea in coconut garden.

Introduction

Under the present conditions of environmental degradation and loss of soil fertility and declining crop yields, practice of low cost input technologies goes a long way to meet the nutrient requirement of crops and would be an inevitable practice for sustainable agriculture without affecting soil productivity. There is evidence that chemical fertilizers can increase coconut yield, but unfortunately, due to high cost, only limited number of farmers use chemical fertilizers and even among them, a very few apply the recommended dose, leaving a vast majority of palms underfertilized and unfertilized. Increasing the area under chemical fertilizer use may not be the answer to the problem. Integrated nutrient management system (INMS) plays an important role in maintaining and improving native soil fertility and productivity. Inclusion of green manure crops in the cropping system is one of the components of an integrated nutrient management.

Cowpea as green manure crop in coconut basin

Coconut being a perennial crop with continuous leaf production and flowering habit, it is clear that unless major nutrients are replaced continuously, it wil seriously affect the productivity. Coconut root (wilt) disease is a non-lethal, debilitating malady caused by Phytoplasma, that affects the production potential of palm. There are no therapeutic control measures for the disease, however research efforts have resulted in evolving viable technologies to increase the productivity of the diseased palms. Growing green manure legume crops in the coconut basins as cover crop is one of the standardized low cost input techniques in root (wilt) garden for sustainable productivity. Cover crops are those crops, which are able to make vigorous growth and cover the ground densely in a short period of time. As distinct from a catch crop, a cover crop is chosen more with regard to the interest of the main crop than that of the cover crop itself. The following are the benefits of growing the green manure crops :

- Checks soil erosion, and unwanted weed growth in coconut basins during rainy season as it covers the soil.
- Addition of organic matter to the soil and thus maintaining the structure of the top soil.
- Improving aeration of the soil.
- Protecting the soil and roots of crops from excessive heat of the sun.
- Conservation of fertility by using available plant food, which might otherwise be leached away.
- Fixing of atmospheric nitrogen from the air in the case of leguminous plants.
- Leguminous plants in addition to the contribution of organic manure and nitrogen, effective in enhancing soil fertility parameters and microbial activity, etc.

The green manure crops to be grown in coconut garden should be tolerant of shade and water drippings during rainy season and preferably low growing. The latter requirement arises from the fact that gathering of nuts that fall in the ripe stage cannot be done satisfactorily if the green manure crops were to grow high. Following are the recommended green manure crops for coconut basins: Sunnhemp (*Crotalaria juncea*), Mimosa (*Mimosa invisa*), Calapo (*Calopogonium mucunoides*), Kudzu (*Pueraria phaseoloides*) Thomas and George, 1990).

In this article details of growing cowpea as green manure crop in root (wilt) affected coconut garden and its beneficial aspects along with farmer's perception about the technology have been described.

Materials and Methods

COWPEA (*Vigna unguiculata*)

Cowpea is a leguminous pulse crop grown for fodder or vegetable or grain purpose. This crop has the capacity to fix nitrogen biologically with the help of the bacterium, *Rhizobium* present in root nodules. The nitrogen fixed by the legume-*Rhizobium* association becomes available to the coconut palm by the decomposition of the nodules and plant materials after incorporation.

An observation was made to study the growth of cowpea as green manure crop in the coconut basins under the ongoing high density multi species cropping system (HDMSCS) plot, at Central Plantation Crops Research Institute, Regional Station, Kayamkulam which is situated at 9°8' N latitude and 76°31' E longitude at an elevation of 3.05 m above mean sea level. The experimental station receives an annual rainfall of 2580 mm, with the mean maximum temperature and ranges between 29°C to 32.9°C and mean minimum temperature of 20.6°C to 24.9°C. The soil of the experimental field is red sandy loam with low fertility and acidic in nature (pH 5.5). The Mechanical composition of the soil is with 69 per cent fine sand, 18.9 per cent coarse sand, 8.9 per cent clay and 3.2 per cent silt.

For growing green manure cowpea, sowing was carried out during May month of 1998, 1999, 2000, 2001 and 2002 by broadcasting 125-150 g seeds in 1.8 m radius of coconut basins after application of 1/3rd chemical fertilizers. When cowpea attains 50 per cent flowering, it was uprooted and incorporated in the basins during October month along with 2/3rd fertilizer and organic manure application.

Cowpea as green manure crop in the integrated nutrient management system plays an important role in sustaining soil fertility and coconut yield.

Observations on fresh green biomass of cowpea was recorded by uprooting cowpea from coconut basins (25 coconut basins) and fresh weight was recorded during 2000, 2001 and 2002. Representative samples including leaf, stem and root was taken for dry weight estimation and nutrient analysis (25 coconut basins) during each year. Samples of different parts were mixed and grinded into fine powder and same was used for analysing N by Microkjeldhal method, P by Vanado Molybdate colorimetry method and K by Flame photometry method (Jackson, 1973) and mean nutrient content was worked out.

A Participatory Rural Appraisal (PRA) was conducted in Krishnapuram village of Alappuzha district during November 2002. The PRA exercise was carried out by involving 20 key informant farmers representing 200 coconut cultivators of Alappuzha district to evaluate the ranking of root (wilt) management technologies/ practices by farmers. The key informants consisted of women farmers, old/ young, farmer with marginal/small holdings, etc. The criteria for evaluating the technologies were also delineated by the farmers after thorough discussion. They were asked to evaluate technologies out of 10 scores against each criteria after consideration of the adopted technology/practice.

Results and Discussion

Biomass yield and nutrient contribution

Observations on fresh weight of cowpea for three years revealed that, it established very well, yielding an average of 24.6 kg of green biomass in 1.8 m radius of coconut basin (*Table 1*). This indicates its well adaptability to shade and there was absolutely no weed growth in the coconut basins when cowpea was grown as green manure crop (*Fig. 1*) Thomas *et al.* (1993) reported fresh biomass yield of 24 to 28 kg by growing calapo, mimosa and pueraria in the coconut basins. Nutrient analysis of whole plant of cowpea (root,

Table 1. Fresh weight, dry weight and N,P,K content and contribution by cowpea when grown as green manure crop in coconut basin

Year	F.W. (kg/basin)	D.W. (kg/basin)	Nutrient content and contribution*					
			N content (%)	N contribution (g/basin)	P content (%)	P contribution (g/basin)	K content (%)	K contribution (g/basin)
2000	24	4.8	2.8	134	0.26	12.5	2.4	115
2001	25	4.9	2.7	132	0.25	12.2	2.3	113
2002	25	4.9	2.8	137	0.25	12.2	2.3	113
Average	24.6	4.87	2.77	134.3	0.25	12.3	2.33	113.7

F.W. : Fresh weight, D.W. : Dry weight (Mean of 25 coconut basins during each year)
**Mean of 25 samples during each year*

stem and leaves) indicated the nutrient composition of N: 2.77 per cent, P: 0.25 per cent and K: 2.33 per cent (*Table 1*). On in corporation of cowpea in the basin, it contributes 134.2 g of N, 12.3 g of P and 113.7 g of K per basin per season. Thomas and George (1990) reported addition of nitrogen from the plant tops of calapo, mimosa and pueraria ranges from 150-200 g per basin. By growing cowpea as green manure crop, the NPK can be scaled down to the tune of 27 per cent of N, 3.5 per cent of P and 12 per cent of K as per the recommendations for coconut.

Farmers' perception on Cowpea as green manure crop

A participatory rural appraisal (PAR) was conducted in Krishnapuram village of Alappuzha district during 2002. The matrix ranking exercise of integrated root (wilt) management practices indicated that "Cowpea as green manure crop in coconut basins" was ranked first among all the technologies. The attributes considered for it high ranking were : simple (8 ranking score), low cost (8 ranking score), easily available (8 ranking score), better growth as green manure output (8 ranking score), very low labour requirement (8 ranking score), ecofriendliness (8 ranking score) and need for the technology and interest of the farmer (10 ranking score). The average fresh biomass yield of cowpea obtained under farmers field ranged from 18 kg per basin to 27 kg per basin.

From these observations, it was found that, cowpea as green manure crop in the integrated nutrient management system plays an important role in sustaining soil fertility and coconut yield. The participatory rural appraisal data also showed high ranking for this technology (59 scores) among different root (wilt) management techniques. Therefore it can be recommended as low cost input green manure crop for growing in coconut basins.

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STATISTICS

All India final estimate of coconut 2001-2002

States/Union Territories	2000-2001 (Revised)			2001-2002 (Final)		
	Area ('000 Hectares	Production (Million nuts)	Productivity (Nuts/ha)	Area ('000 Hectares)	Production (Million nuts)	Productivity (Nuts/ha)
Andhra Pradesh	102.6	1092.7	10650	104.0	1129.1	10857
Assam	21.0	136.0	6476	21.1	163.6	7754
Goa	25.0	125.1	5004	25.0	125.1	5004
Karnataka	333.8	1754.2	5255	373.7	1523.4	4077
Kerala	925.8	5536.0	5980	939.5	5744.0	6114
Maharashtra	16.8	244.4	14548	16.8	193.8	11536
Orissa	17.7	109.9	6209	17.3	142.4	8231
Tamil Nadu	23.5	3192.0	9867	335.8	3293.6	9808
Tripura	3.1	7.0	2258	3.3	7.0	2121
West Bengal	24.5	330.5	13490	25.6	331.6	12953
A&N Islands	25.2	89.0	3532	25.2	89.7	3560
Laskhadweep	2.7	36.9	13667	2.7	53.1	19667
Pondicherry	2.2	24.7	11227	2.3	25.3	11000
All India	1823.9	12678.4	6951	1892.3	12821.7	6776

Source : Directorate of Economics & Statistics, Ministry of Agriculture, Govt. of India

**Fully revised estimates for all states except Orissa and Tripura for which final estimates have been used.*