Cowpea:

A potential nutrient source in coconut garden

Coconut – Kalpavriksha is one of the most important plantation crops in India. Large scale coconut cultivation is confined to the four southern states viz, Kerala, Karnataka, Tamil Nadu and Andhra Pradesh (>90% area). It is grown in moderate to high rainfall areas, in a wide range of soil types. In coconut gardens, palms are widely spaced at 7.5 m x 7.5 m to maintain canopy coverage, whereas in the ground the maximum root activity is only up to a radius of 1.8 m around the base of the palm. Thus nearly 75% area is not effectively utilized by the palm. When coconut is grown as sole crop, the unutilized areas are vulnerable to soil erosion leading to loss of fertile

> **"Growing cowpea is an excellent medium for resource conservation and weed suppression in coconut gardens."**

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Fig : 1. Cowpea grown in interspaces of coconut

top soil. Besides, there will be more weed growth in the basin and interspace (Fig.2). There are many alternative ways to effectively utilize the area and avoid soil and nutrient loss viz., adoption of cropping system, mulching etc,. Green manuring is one such alternative which acts as cover to check soil erosion, replenishes the soil nutrients as well as suppresses the weed growth.

Green manuring is growing of short duration crops in the field and incorporating them into the soil after sufficient growth. Cowpea, sesbania, sun hemp, dhaincha, pillipesara, cluster bean, horse gram etc. are some of the efficient and economically viable green manure crops. Cover crops should grow rapidly to cover soil surface and suppress the weed growth under prevailing soil and climatic condition without competing with the main/subsistence crop for the available resources. It should produce more quantity of green/dry mass and should have favorable residual effect on subsequent intercrops. Leguminous crops in general play a very important role in performing multiple functions that include improvement in soil nutrient content, organic matter addition to soil and soil conservation as well as enhancement of microbial biomass and enzymatic activity in soil.

Cowpea

Cowpea (Vigna unguiculata L.) is an annual short duration leguminous crop which can be used as green manure in coconut ecosystem because of its important features like moderate shade tolerance, quick germination, ease of establishment, profuse nodulation, low moisture requirement and robust growth. The plant performs well in a wide variety of soil types. It performs better in soils with a pH range of 5.6 to 6.0. Being a legume, when the biomass of the cowpea is incorporated into the soil, it replenishes soil fertility and improves the soil structure by adding organic matter to the soil. Further, as it covers the ground quickly it protects soil from erosion. Since, coconut productivity is closely related to the soil organic matter and availability of nutrients in soil, any improvement in these parameters directly influence the productivity. Therefore, it is essential to maintain the soil organic matter and nutrients either by recycling of biomass or application of fertilizers. Maheswarappa et al., (2003) reported that cowpea grown in coconut basin as green manure crop in the integrated nutrient management system played an important role in sustaining soil fertility and coconut yield.

Biomass yield

At ICAR- CPCRI Kasaragod research farm,

cowpea was grown as a green manure crop in coconut interspaces under red sandy loam and coastal sandy soil during the monsoon season. The field was prepared by a thorough ploughing with a disc plough in the month of June. Cowpea seeds were sown with a seed rate of 50 kg/ha through broadcasting and covered with rotovator at the onset of monsoon. The seeds germinated within 48 hours. The crop was grown under rainfed condition since this time coincides with south west monsoon in west coast region. From one hectare coconut garden (monocrop) interspaces, 11.0 and 7.7 tons of fresh biomass was obtained in red sandy loam soil and coastal sandy soil respectively. It was observed that the accumulation of fresh biomass varies depending upon the soil type. The red sandy loam soil accumulated more biomass when compared to coastal sandy soils due to the poor physico-chemical properties of coastal sandy soils. However, in situ availability of biomass is highly helpful to improve the physical properties of the soil over the period of time. Earlier studies have also shown that, the effect of green manuring varies according to the original character of the soil. When the cowpea reaches 50% flowering stage (60-70 DAS), the biomass needs to be incorporated by ploughing.

Nutrient supplying potential

Nutrient analysis of above and below ground biomass of cowpea indicated variability in nutrient composition. The above ground biomass of cowpea grown under coastal sandy soil recorded NPK content in the ratio of 3.02:0.27:2.47, while in red sandy loam soil it was about 2.93:0.27:2.46. The below ground part of cowpea biomass showed NPK content of 1.75:0.2:1.33 and 1.76:0.2:1.67 in sandy and red sandy loam soil respectively. This is mainly because cowpea roots penetrate deep into the soil and absorb nutrients from deeper layer and once incorporated in soil the same can be utilized by the intercrops which have shallow rooting system. Cowpea can produce eight feet taproot in roughly eight weeks (Clark, 2007). Thus, by incorporating cowpea in the surface soil, it will

be possible to bring back the nutrients mainly, potash and phosphorus from the subsoil to surface soil, and nitrogen through biological nitrogen fixation which can be further utilized by intercrops.

Fig. 2. Coconut garden without green manure in interspace

Resource conservation and weed suppression potential

Mechanical measures are not affordable by the farmers to reduce weed growth and control runoff and soil erosion because of the high cost involved. However, a vegetative measure like cover cropping is cost effective and easily adoptable by farmers. Due to its dense vegetative nature, cowpea is an excellent cover crop for weed suppression and reduction in soil loss. The dense canopy formed by cowpea covers the soil and it reduces the beating effect of raindrops thereby reducing the destruction of soil aggregate and erosion (Fig. 1). In addition, over a period of time, cover cropping of cowpea will increase soil organic matter, leading to improvements in soil physical properties viz., structure, stability and increased soil moisture and nutrient holding capacity of soil and soil fertility. Further, cowpea grown in interspaces of coconut gardens suppresses the weed growth by complete spread as compared to the coconut garden without cowpea. This allows them to save labor expenditure for hoeing and to reduce the use of herbicides thereby lowering production costs. Clark (2007) reported that, allelopathic compounds in the plant may also help to suppress weeds.

Economics

The cost of production for 1 kg of cowpea biomass works out to be about Rs.0.78 and Rs. 0.98 in red sandy loam soil and coastal sandy soil, respectively. Incorporation of 7.7 ton of cowpea biomass provides 34 kg N, 7 kg P_2O_5 and 33 kg K_2O in coastal sandy soil, while in red sandy loam soil incorporation of 11.0 ton of cowpea biomass provides 45 kg N, 10 kg P_2O_5 and 47 kg K_2O besides considerable quantity of other secondary and micronutrients. Cowpea also improves mobilization of native soil nutrients in soil because of production of various acids during decomposition of the plant materials. Thus cowpea would bring additional benefits, besides reducing the amount of fertilization needed for main as well as succeeding crop. Hence it is a more cost effective and environmental friendly method that will help to save the environment, improve soil fertility and improve crop productivity.

Conclusion:

The technology of cowpea green manuring in the interspaces of coconut helps in weed suppression and avoids runoff and soil erosion, due to its quick dense growth which covers the soil in the interspaces and avoids direct impact of rainfall on the ground. By incorporation of cowpea biomass, considerable quantity of NPK is added to the soil thereby resulted in soil fertility improvement. It also helps in biological N-fixation atmospheric nitrogen and bringing back potash and phosphorus from the subsoil within the reach of other intercrops in the coconut garden.

References:

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Table 1: Biomass and NPK content of cowpea grown in inter spaces of coconut.

Soil type	Fresh wt. (kg/ha)	Dry wt. (kg/ha)	Above ground parts			Below ground parts		
			N%	P%	K%	N%	P%	K%
Coastal sandy soil	7700 ± 309	1295± 76	3.02 ±0.1	0.27 ±0.26	2.47 ±0.29	1.75 ±0.06	0.2 ±0.03	1.33 ±0.19
Red sandy loam soil	11000 ± 388	1785± 78	2.93 ±0.32	0.27 ±0.05	2.46 ±0.26	1.76 ±0.16	0.2 ±0.02	1.67 ±0.19