



Moisture conservation techniques and intercropping of hybrid Bajra Napier Co 3 grass in coconut under coastal sandy soil

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The coastal sandy soil, which is widespread along the coastal regions of India, is the important soil type where coconut is grown predominantly. In Kerala alone, coastal sandy soil which occurs all along the 600 km coastal length of Kerala, is the second largest soil type where coconut is grown predominantly as a monocrop



Fig.1: Husk applied trenches (T1)

The coconut, primarily a small holder's crop is now cultivated throughout the humid tropics. In India, most of the acreage under coconut palm lies in the four southern states i.e. Kerala, Karnataka, Tamil Nadu and Andhra Pradesh. Coconut contributes to 6 per cent of the national vegetable oil pool and about 10 million families depend on it for their livelihood. Most of the production comes from small and marginal holdings. More than 90 per cent of the coconut holdings are below one hectare with an average holding size of 0.22 hectare. Despite the potential for impressive high yields, the national average is around 44 nuts palm⁻¹ year⁻¹, which is only half of what is realized in experimental fields under rainfed conditions. The various reasons that can be contributed for the low yield are pest and disease problems, poor management practices, growing of coconut in non-suitable areas, etc. Among them, poor management plays a major role in low productivity. In India, coconut is being grown in different soil types.

However, laterite, sandy red alluvial and sandy loam form the major soil types occupied by coconut. The coastal sandy soil, which is widespread along the coastal regions of India, is the important soil type where coconut is grown predominantly. In Kerala alone, coastal sandy soil, which occurs all along the 600 km coastal length of Kerala, is the second largest soil type where coconut is grown predominantly as a monocrop.

Coconut is highly amenable for cultivating inter/mixed crops in the interspaces because of its wider spacing (25 x 25 feet). Coconut based integrated farming is a proven system which is ecologically sustainable and will enable the farmer to realize more income. It is a well-established fact that grass can be successfully grown as intercrop in most of the coconut growing soils. However, growing of grass economically in between the coconut palms in coastal sandy soil is not feasible under normal management practices. This is mainly because of the poor inherent physico chemical properties of the coastal



sandy soil. Sandy soils suffer from poor retentive capacity for water and nutrients, which can be overcome by adopting certain agro techniques. In addition to the poor water retaining capacity, sandy soils also show excessive infiltration due to the porosity of sands, easy leachability and low inherent fertility status. The fine fraction of soils is the natural source of nutrients to the plants. Soils containing high percentage of this fraction are generally rich in nutrient elements and retain them when they are applied. But, in the case of sandy soils, the main constituent is the sand fraction and this does not supply any nutrients to the growing plants. The coastal littoral sandy soils have a field capacity of 4 to 6 per cent and permanent wilting point of 0.2 to 0.6 per cent and bulk density of 1.6–2.0 g.cm⁻³ with a mechanical composition of 95.8 per cent coarse sand, 3.3 per cent fine sand, 0.12 per cent silt and 0.7 per cent clay. Because of low clay and organic matter contents, these soils have small specific surface area, cation exchange capacity as low as 1.5–2.4 centi mol. Besides the soil available nutrient status viz, nitrogen, phosphorous and potassium, is also low.

Under these situations growing any annual/biennial/perennial in the interspaces of coconut palm is possible only by improving physio-chemical properties of soil. Waste/usufruct materials from coconut palm viz., husk and coir pith come handy for rectifying these situations. From a well-managed coconut garden about 14–16 tonnes/ha/year of dry material is available in the form of leaves, spathe, bunch waste and husk. These wastes/usufructs

can be used as moisture conservation materials and a source of nutrient for these crops. The added advantage is the *in situ* availability of these materials. Based on the experiments conducted at CPCRI, the results revealed that grass could be successfully grown as intercrop in coconut gardens under coastal sandy soils by adopting appropriate soil moisture conservation measures. In this context, growing grass as intercrop using coconut husk/coir pith in sandy soil is discussed.



Fig.2: Coir pith applied trenches (T2)

Using husk/coir pith for growing fodder crop as intercrop in coconut under coastal sandy soil

A trench measuring 30 cm width and 30cm depth is opened in the interspace of the coconut garden leaving a 2 m radius around coconut basin. In the bottom of the trench one layer of husk is spread out in a concave manner. (Husks from 10 coconuts are used to cover 1-meter long trench). Trenches are made with a spacing of 50 cm between trenches. In the case of coir pith incorporation, similar trench is opened and raw coir pith is applied to a height of 5 cm. Application of farmyard manure @

5t and vermicompost @ 5t /ha is to be adopted for both the husk and coir pith applied trenches. The trenches are then filled with soil and the planting can be taken up with hybrid bajra Napier Co 3 fodder grass. Two budded stem cuttings are used for planting at a spacing of 50 x 50 cm. For one ha of coconut garden approximately 30,000 stem cuttings/root slips are required. Best time of planting is June for the areas benefited by Southwest monsoon and for September- October for the areas benefited by Northeast monsoon. As a basal dose, 50 kg N, 40 kg K and 40 kg P are applied at the time of planting. Thereafter only nitrogen @ 75 kg is applied after each cutting is made. However, the basal application of NPK should be repeated once in a year for sustained higher yield of fodder. Sprinkler system of irrigation is practised once in 4 days (20 mm of water at IW/CPE ratio of 1.00). First cutting of grass can be done at 80 days after planting. And subsequent cuttings are done at 45–50 days interval. Cutting should be done 10–15 cm above the ground level.

Performance of hybrid Bajra Napier Co 3 fodder grass

The husk and coir pith added to the soil had sustained influence on growth and yield during the period under study. The direct beneficial effect of husk and coir pith viz., higher soil moisture availability, nutrient availability and enhanced biological activities in the rhizosphere resulted in higher green fodder yield. Further, husk contains considerable amount of potassium which is added to the soil as it



decomposes. The husk is spongy in nature and, when buried in the soil, absorbs and retains moisture, which will become available to the crops. A fully soaked husk is able to retain about six to eight times its weight of water. Similarly, coir pith also has very high water holding capacity of 5 to 6 times its weight. It has been found that by incorporation of 2 per cent of coir pith by weight in sandy soil, the water holding capacity of the soil is increased by 40 per cent.

An average plant height of 237 cm was recorded in the treatment where husk was applied in the planting zone (T_1) and it was comparable with coir pith application (T_2) and both the treatments significantly differed from the control (168 cm). Similar type of response was obtained in number of tillers/clump also. The highest number of tillers/clump was obtained in the treatment where husk was applied in the planting zone (27) and it was on a par with the treatment T_2 where coir pith was applied in the planting zone (25) and it was significantly different from the control treatment (21). The direct and indirect effect of amendment application resulted in higher tiller production.



Fig. 3: Performance of hybrid Bajra Napier Co3 grass as intercrop in coconut garden using husk / coir burial technology

The experiment findings proved that the grass could be successfully grown as intercrop in coconut garden under coastal sandy soil. From one ha of coconut garden around 100 tonnes of green fodder can be harvested (Table 1) which will be sufficient to supply green fodder for 8-10 milching animals. Other advantage of using amendments (husk and coir pith application) and growing grass under coconut shade also resulted in higher crude protein yield.

Economics

A farmer integrating coconut + grass (1 ha) + dairy (6-8 milch

animals) in the coconut based mixed farming system under coastal sandy soil situations can realize an annual net profit of more than Rs. 1 lakh. Maximum profit realized is from dairy followed by coconut. Besides this, farmer can get 20 to 25 tonnes of cow dung, cowshed washings and urine that could be effectively recycled for biogas production and later pumped to the garden and increase the productivity of the system.

Advantages

In the coastal belt i.e. the area adjacent to the sea, only coconut is grown without any management practices thereby giving a poor yield and returns to the farmer. By introducing the coastal sandy soil management technology (husk and coir pith technology), intensive cultivation in the coastal sand is possible thereby increasing the income of the farmers. Growing of grass under coconut as intercrop influences the crude protein content of the grass compared to grass growing in open area.

Table 1. Performance of conservation measures on crude protein content (%), green fodder yield and crude protein (t/ha/year)

Treatment	Green fodder (tonne/ha)	Crude protein (content %)	Crude protein (tonne/ha)
T_1 : Coconut husk burial in the planting zone of the grass	96.83	11.83	2.28
T_2 : 5 cm thickness of coir pith application in the planting zone of the grass	90.20	12.13	2.22
T_3 : Control	62.85	11.47	1.48