Management of Coconut Plantation in Littoral Sandy Soils for Higher Productivity

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The coastal littoral sandy soils of the West and East coasts are characterised by low nutrient status, poor capacity of soil to retain the applied nutrients and very low water holding capacity, resulting in extreme drought situation during summer months. Consequently, the growth and yield of coconut plantation is very low in these soils. The growth and productivity could be improved by a judicious application of organics in conjunction with inorganics, burial of coconut husk or application of tank silt or red earth, to improve the structure and water retention of the soil. It is also suggested to drip irrigate the palms through six dripping points and mulching with either dried coconut leaves or any other leaves to conserve moisture and reduce surface soil temperature during summer months.

Introduction

In India, coconut is grown under varied soil conditions ranging from sandy soils of the sea coast to the gravelly laterite soils of the hill sides and red loamy soils in the interior of the country. Red, sandy loam, laterite and alluvial soils are considered to be the best for this crop. However, coconut is grown in considerable area in littoral sandy soil both on the west and east coasts of India. However, the plantations in coastal sand are often characterised by yellowing of leaves, irregular flowering and poor nut yield.

The coastal sandy belts are characterised by high rainfall followed by moisture stress in summer and poor nutrient status and poor capacity of these soils to retain the applied nutrients. In mechanical composition, sand fraction is very high (95.7 to 99.4 per cent) over silt (0 to 2.6 per cent) and clay (0.6 to 2.6 per cent) fractions in all the layers of the soil profile. 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 C.mol (p+) Kg^{-1} and poorplant nutrient status. Besides the fertility status, the other important factors that determine the growth and yield of coconuts are rainfall and its distribution and the availability of subsoil water.

Although the conditions prevailing in littoral sandy soils are not conducive for the satisfactory growth of the coconut, it is nevertheless possible to make coconut cultivation profitable, provided sound soil management practices are adopted. The important practices that require attention in making coconut cultivation on sandy soils a profitable proposition are briefly described in this article.

Irrigation

The most important limitation of the littoral sandy soil is its high porosity and poor organic matter content which result in very low moisture retention. On the west coast, the rainfall varies from 250-350 cm per annum, of which nearly 80 per cent is received during South-West monsoon (June-September) and the rest during the North-East monsoon (October-November) and as non-seasonal rainfall, resulting in the prevalence of rainless period for roughly six months. Observations made on the seasonal variations of soil moisture in littoral sandy soils at CPCRI, Kasaragod have shown that the soil which has field capacity of 5 to 6 per cent (ODW basis) of moisture at the end of the rainy period, dried up to a moisture content of 0.2 per cent in the surface soil during peak summer. This is usually a very critical period as the relative humidity is low (50 to 60 per cent in A.N.) and evaporative demand (6.0 to 7.4 mm/day) and surface oil temperature (35 to 42°C in A.N.) are very high and many palms start wilting, if they are not properly irrigated. If the moisture deficit could made up by providing supplementary irrigation, the palms can certainly be made to give better yields.

In the sandy belt, water is generally available at shallow depth even in summer and it would be easy to dig small wells/ filter points from which water could be pumped for irrigation. However, over exploitation should be avoided as it may result in seepage of sea water into the well. Many growers adopt pot watering of the palms by engaging manual labour. This

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practice is expensive and often results in inadequate irrigation. Though the advantage of irrigating coconut are well recognized, the practice is not being widely adopted probably because of the expenditure involved and lack of water resources.

Irrigating the entire area has been reported to be superior in coastal sandy soils compared to basin irrigation. However, this has many limitations such as wastage of water through seepage, evaporation, deep percolation, uptake by weeds etc., besides being labour intensive. Under these situations, sprinkler and drip irrigation are suitable and viable alternatives. In drip irrigation, the additional benefit noticed is fertilizer and other chemicals added in the irrigation water. This is found to be very effective, cheaper and ensuring uniformity in application. Besides, it also makes possible, application of the required minimum amount of nutrient when it is needed. This reduces the possibility of leaching nitrates into ground water. In recent years, Government of India is also encouraging drip irrigation by way of extending subsidy to the extent of 80 per cent for plantation crops. In this method of irrigation, water is applied at a low rate in mulched pits near the crop root zone at frequent intervals, thereby maintaining a high moisture status in the root zone and minimizing losses due to percolation, weed uptake, evaporation etc. Studies at CPCRI, Kasaragod in littoral sandy soil have shown that application of 50 litres/palm/day during summer months through six dripping points/palm is superior as the nut yield increased to 49 to 57 nuts/palm/year due to drip irrigation during summer months as against 38 nuts/palm/year under rainfed condition. However, the quantity of water required by coconut palms in other regions will vary in accordance with the weather conditions of the locality and the stage of crop.

Mulching

Soil dries up rapidly during rainless periods. Any measure that would help to reduce this loss naturally results in making more moisture available in the soil for the use of palm. The soil in the active root zone of coconut palms (about 2m radius around the tree) may be mulched with dry coconut leaves or any other leaves in two or three layers. Mulching not only conserves the surface soil moisture, but also reduces the surface soil temperature. Mulching should be done immediately after the cessation of rains and maintained till the receipt of summer rains. Husk with its spongy fibrous mesocarp has good moisture holding capacity and is also rich in potash, the most important nutrient needed by the coconut palms. In coconut gardens where the manures are applied in circular basins around the palms, husks are placed with concave side facing upwards at the depth of 30 cm in the basins during September after the application of second dose of fertilizers and covered with a thin layer of top soil after the monsoon is over. This husk layer provides adequate moisture for effective and maximum utilization of fertilizers.

Organic Matter Incorporation

Though irrigation is of prime importance in sandy soils, a long range programme aimed at improving the structure of the soil is equally important to improve the yield levels. The organic matter content of sandy soil is generally in the range of 0.20 to 0.33 per cent in 0-50cm soil depth and this partly accounts for its low moisture holding capacity. Efforts should, therefore, be made to raise the level of organic matter in the soil. The organic matter as it decomposes would also supply the plant nutrients in available form and stimulate the activities of the beneficial soil microbes.

The organic matter content can be increased by incorporating into the soil large quantities of compost, FYM or green leaves, but they are seldom readily available for the growers. A better and easier method is to plant the green manure crop *Glyricidia maculata* along the boundaries and borders of fields. The leaves and green twigs easily decompose without depleting soil moisture. The cuttings or seedlings of *Glyricidia* can be planted 1.5m apart during the monsoon season. Loppings of green matter could be obtained after one year. In Sri Lanka growing of two rows of *Glyricidia maculata* in the interspaces of coconut in sandy soil at the spacing of 2 m between rows and 0.9 m between plants gave 8-10 t/ha of fresh loppings and incorporation in the basins resulted in the 25 per cent yield increase. It has been estimated that in India, 7.5 million tonnes of coir pith is produced annually in coir industries. However, wider C:N ratio coupled with high tannin content and low biodegradability are some of the problems associated with the direct application of coir pith to the field. Studies conducted at various places have suggested that coir pith can be decomposed within a short period by employing *Pleurotus sajor caju,* the mushroom fungus. This compost not only supplies plant nutrients but also holds more moisture and makes it available to palms for a longer period.

Application of large quantities of silt or clay soil in the

basin area of palms would also improve the physical properties of the sandy soil. Such practice is already in vogue in certain parts of Kerala and may be usefully adopted, wherever feasible.

Fertilizer Application

The poor growth of coconut palms growing in sandy soil is partly due to the inability of the soil to supply adequate quantities of plant nutrients needed by the palms. The available plant nutrients in littoral sandy soil are in the range of 0.02 to 0.03 per cent N, 50 to 59 ppm P_2O_5 and 28 to 33 ppm K_2O in the surface soil. Coconut, being a perennial crop requires steady and continuous supply of nutrients throughout the year. A normal tree would require application of about 500 g N, 320 g P_2O_5 and 1200g K_2O/year. To supply this quantity of nutrients it is required to apply 1.1kg urea, 1.5kg mussooriephos and 2kg of muriate of potash in two splits of one-third in May-June and two-third in September-October months. The nutrients can be made available both in organic and inorganic forms. Cattle manure, fish manure, vermi-compost, coir dust manure, oil cakes etc. may be applied in conjunction with inorganics to provide the nutrient requirement of the palms. The yellowing of leaves of palms grown in sandy soils can be corrected by an application of magnesium at the rate of 500g of magnesium sulphate/tree along with second dose of fertilizer application.

Coconut productivity in sandy soils could be increased by adopting an integrated approach on the lines advocated above. Since coconut acreage under such soils is considerable, all efforts are needed to improve the productivity and even a small increase in nut yield will substantially contribute towards increased production in the country.

Coconut Milk

The terms 'coconut milk' and 'coconut cream' are sometimes used interchangeably. In general terms, coconut cream/milk is the aqueous or liquid coconut product expressed from disintegrated moist solid coconut endosperm (coconut kernel) with a proportion or all of the coconut water, or equivalent or additional potable water, to extract the disintegrated coconut and substantially removing the coconut fiber without either addition thereto or extraction therefrom.

In layman's terms, coconut milk/cream is the term used to designate the liquid extracted manually or mechanically from freshly grated, milled or ground coconut meat with or without water.

In the APCC Codes and Standards for Aqueous Coconut Products, coconut milk and coconut cream are differentiated by their composition.

Coconut cream is used for aqueous coconut products containing a minimum of 18.5 per cent (m/m) coconut fat and a maximum water content of 77.6 per cent (m/m). Coconut cream is expected to typically have a minimum of 25 per cent (m/m) total solids. Coconut milk on the other hand is used for coconut products containing a minimum of 11.5 per cent (m/m) coconut fat and a maximum water content of 86.1 per cent (m/m). Coconut milk is expected to typically have a minimum of 15.0 per cent (m/m) total coconut solids.

Both coconut milk and cream are an important ingredient in food preparations especially in coconut producing countries. They are used in many meat, fish, shellfish, poultry and vegetable dishes. They are also used in confectioneries, rice cakes, cocktail drinks, yoghurts and ice creams.

The basic process flow of coconut cream/milk extraction, sometimes referred to as the wet process is preferred because it maximises the use of coconut water, parings and coconut meat residue. The process involves the following steps: selection of good quality coconuts, deshelling and paring of the nuts, washing of pared meat, grinding and pressing, pasteurization, filling into cans or low-density P.E bags, cooling and chilling, blast freezing, casing and storage.

In canning coconut oil milk, dilution is done with tap water before pasteurization. These steps include: homogenization to produce a stable coconut milk, filling and seaming, retorting and finally, labeling the cans and casing. Labeling and casing of canned coconut milk are usually done only after a series of quality control (QC) evaluation and an incubation period of 14 days.

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