SOILS THAT SUPPORT COCONUT IN THE WEST COAST

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Coconut is essentially a tree crop of the humid tropics. In India coconut is grown under varied soil and climatic conditions. It is versatile in its adaptability to a very wide range of soil conditions—varying from littoral sand to clayey soils, ill-drained low-lying marshes to well-drained hill slopes, strongly acidic peaty soils to alkaline calcareous soils. The west coast belt accounts for 87 per cent of the area under coconut in the country and contributes 79 per cent of the national production of nuts. The nature of soils that support coconut in the different states on the west coast, their problems limiting productivity and prospects for improvement are presented below.

Kerala

Coconut cultivation is the life style of the state and its by-products generate a variety of employment opportunities. The state with an area of about 0.74 m ha distributed over all the 11 districts, has three physiographic regions, highland in the east, midland and lowland in the west coast. Coconut cultivation is mainly confined to the lowland bordering the coast with a level topography and to the midland with an undulating terrain and elevation up to 100 m and the major area of the crop is under rainfed condition. Considerable variation is observed in the soil and cropping patterns of these regions primarily influenced by the topography.

Laterite Soil. This soil type occupies a major portion of the coconut area of the state and is met with in all the eleven districts. This is characterised by its red to reddish brown colour, abundant ferrugenous gravel and concretions, shallow to moderately good depth, good drainage, vulnerability to run-off and soil erosion on slopes, a friable to hard substratum of laterite and a very low water table in summer. It varies from loam to sandy clay loam in texture in the hill slopes to clayloam to clay at valley bottoms which are devoid of gravel and poorly drained. Adoption of appropriate conservation measures like cover cropping, contour bunding, bench terracing, diversion of excess run-off through waterways are necessary to check erosion on slopes and upland. In fertility status it is medium to high in nitrogen, low in available phosphorus and potash, poor in base status, high in free oxides of iron and aluminium and acidic in reaction.

Coastal Sandy Soil. Kerala has a long but narrow coastal strip of 580 km covered by littoral sandy soil which occurs in all the coastal districts of the state. The soil is of marine origin, very coarse with less than three per cent clay fraction, sandy in texture throughout the depth, highly permeable, excessively leached and drained, very poor in organic matter and plant nutrients, very low in water holding capacity and is slightly acidic to neutral in reaction. Inadequate nutrient status, drought in summer due to moisture stress resulting in severe button shedding, yellowing and drying of foliage, threat from sea erosion, matting of surface roots are some of the factors limiting productivity. Summer irrigation through filter point tube wells is feasible in this tract and with the provision of this, the full potential could be exploited. Under heavy rainfall conditions of Kerala, irrigation with saline or sea water in summer months in this soil type has been found to increase the yield in coconut without any deleterious effect either on the palm or the soil. Judicious application of organic manures and fertilisers is necessary to build up the physical properties like water holding capacity, structure and nutrient retention and supplying power. Seedlings planted on this soil at the Central Plantation Crops Research Institute, Kasaragod, Kerala, have established well with vigorous vegetative growth to the application of cattle manure or green leaf in conjunction with N, P and K fertilisers. Red earth, river or 'kayal' silt can also be applied to improve the physical condition of the soil.

Red Sandy Loam. The midland plains are covered by red soil which occurs largely in the northern two districts of Cannanore and Kozhikode and in parts of Trivandrum district in the south. The soil is dark red in colour, sandy loam in texture, deep, well-drained and devoid of gravel or impermeable layer with water table below 6 m in summer. In general the available

nutrients and organic matter content is medium and the soil is acidic in reaction. With adequate supplementing of manures and fertilisers and summer irrigation, this soil having the desirable physical properties, is found to support coconut best. Studies with N,P and K, fertilisers on bearing West Coast Tall palms in this soil had shown maximum response to N and K.

Alluvial Soil. The river banks and sides of lagoons and backwaters are studded with coconut groves. The soil in these areas is formed from the alluvial parent material transported and deposited by rivers and streams and therefore varies in its characteristics from place to place. This soil is met with largely in the districts of Cannanore, Kozhikode, Trichur, Ernakulam and Alleppey. The texture ranges from sandy to silty clay loam to clay, deep and well-drained in the uplands but poorly drained in the low-lying areas with high water table and clayey subsoil. The coconut gardens on the banks are subject to seasonal inundation and are liable to erosion hazard. Clearance of 'sand bars' at the mouth of the rivers, construction of dams at the upper reaches will help control floods to some extent. Uprooting of coconut palms and soil erosion on banks can be checked by constructing stone walls and having soil binding grass vegetation at the weak points. Deep drains have to be provided in gardens in low-lying situations. Incorporation of river or sea sand to the heavy soil will improve the drainage and aeration. The nitrogen and organic matter status of the soil is high except in the coarse sandy soil and available phosphate and potash are low to medium. The soil is acidic in reaction. Density of plant population is very high and surface planting is a common feature of this soil region.

Reclaimed Marshy Soils. These soils, locally termed as 'Kari', 'Kaipad', 'Pokkali' are formed through the reclamation of the low-lying swampy and marshy lands adjoining backwaters. As such these lands are subject to seasonal flooding and ebb and flow of tidal actions. These are found in Cannanore, Trichur, Ernakulam, Alleppey and Kottayam districts. The reclamation process consists of forming mounds by heaping up layers of sand, silt and organic wastes like coirdust, weeds, etc. to a height of one metre above ground level or water table on which coconut seedlings are planted. In course of time, the gaps between mounds are filled using the above materials and providing drainage channels in between rows of palms. The soil thus reclaimed is invariably black in colour, coarse to medium in texture at the surface tending to be finer at the strata approaching the original soil beneath. The sub-soil is mottled gley and anaerobic due to the tidal action and standing water in the drains.

Nitrogen and organic matter contents are high, but phosphate and potash status is low. It is extremely acidic with fair amounts of soluble salts and hence also called as acid sulphate soils. Drainage has to be improved for better aeration and root spread. Correction of acidity and elimination of toxic levels of aluminium, iron and manganese can be effected by liming. Application of river sand to the basin regularly will improve the physical conditions of the soil and cover the exposed aerial roots caused by shallow surface planting.

Lowland Valley Soil. This is met with in the valley portions adjoining the coastal sandy strip, formerly raised to paddy but subsequently converted to coconut gardens. The seedlings are initially planted on small mounds raised in the field and subsequently the interspaces and gaps are filled and levelled up with earth.

Three-year old West Coast Tall seeding on littorals and supplied with cattle manure and fertilizers

Being lowlands, the water table rises to the surface, partly submerging the gardens during rainy season. The soils are characterised by an ash grey colour at the surface, changing to yellowish brown or yellow with depth, sandy to loamy sand in texture, saturated during the monsoon and dry with severe moisture stress at the peak of summer. In certain locations a hard layer of oxides of iron and manganese, locally called 'Naipara' occurs below 1.5 to 2 m which restricts root penetration and water percolation. When the coconut roots strike this layer, the entire foliage turns yellow, accompanied by stunted growth and poor yield. Summer irrigation

and application of lime/dolomite to the soil are found beneficial to reduce the intense foliar yellowing. The soils are acidic and in general have a very poor reserve of organic matter and major plant food elements.

Karnataka

The extent of coconut area is 1.38 lakh ha with annual production of about 669 million nuts. Based on soil, climate and agronomic conditions, it may be divided into three zones: 1) the heavy rainfall zone with precipitation ranging from 178-432 cm which includes the coastal strip, the ghats and the 'Malnad' with littoral sand, red sandy loam and laterite soils respectively; 2) the transition zone with 63 to 100 cm rainfall with red loam and black soils and 3) the dry zone receiving less than 63 cm rainfall, comprising the south and north 'Maidan' areas with black and red soils.

Coastal Alluvium. This covers the narrow coastal strip of south and north Kanara districts with littoral sand on the seashore and red sandy loam in the interior. These two soil types are similar in features and in their problems to the littoral sand and red sandy loam of Kerala.

Laterite. Parts of south and north Kanara, Hassan and Chickmagalur districts in the western ghat region are planted to coconut at lower elevations on slopes of hillocks and on plateau covered by laterite. Here also, the characteristics and problems are similar to those encountered in the laterite regions of Kerala.

Red Soil. Red soils are extensive in the state with two types, red loams of transported origin and red soil of light texture formed in situ from granites and granitic gneisses. Coconut is extensively cultivated in the light textured red soil in the districts of Tumkur, Mandya, Mysore, Chickmagalur and Bangalore. The soil is sandy or gravelly to loam in texture, moderately deep, well-drained and low in organic matter and major nutrients. Being situated in the central region of the dry zone, the soil is subject to severe moisture stress and drought condition in summer. This soil will respond well to summer irrigation and manuring. Red loam soil occurs in parts of Chickmagalur, Hassan, Mandya, Mysore and Chitradurga districts. It is loam to silt loam in texture, deep, well-drained and fairly well supplied with organic matter and plant nutrients.

Maharashtra

The state has a coconut area of 8500 ha with annual production of about 43 million nuts. The coconut areas come under the very high rainfall zone with laterite soil occurring in Ratnagiri, South Kolaba and western part of Kolhapur district and coastal alluvial soil in parts of Kolaba and Thana districts.

The laterite soil is deep, well drained, high in organic matter, low in phosphate, low to medium in potash and acidic in reaction. As in the case of the high rainfall area of the west coast there is problem of erosion hazard in the laterite areas of the state. The coastal alluvium is sandy to sandy loam in texture, deep and well drained and poor in fertility status.

Goa

The coconut area of this territory is 18700 ha with annual production of 97 million nuts. Coconut is raised in laterite, coastal and river alluvium. Major portion of the coconut area is covered by laterite which is gravelly, sandy loam to silt loam in texture, deep and well drained with high organic matter and low phosphate and potash. The alluvial soils are formed from transported material, fine textured, fairly well supplied with plant nutrients and subject to salt problem in some parts due to tidal action. The coastal alluvium is sandy in texture, deep and well-drained and poor in fertility status.

Lakshadweep Islands

This group of islands consists of 20 coral islands and open reef with a total extent of 28.5 sq km. Coconut covers almost the entire cultivable area of 2,233 ha of the territory with an annual production of 20.5 million nuts. The soils are coral sandy underlined by limestone gravels of different shapes and sizes. The calcium carbonate content is not less than 85% with pH value above 8. The surface soil is medium to high in nitrogen, medium in phosphate and very poor in potash. Since the soils are highly calcareous, deficiency of certain micronutrients like boron, manganese, iron, copper and zinc may develop in due course. Surface and close planting are common features in these islands. Sea erosion also poses a problem in some of the islands for which protective measures should be taken up. One such measure may be to drive in the sea coast a wall of coconut stem. Inside this saplings of banyan, Kanni, Tenera may be planted to a width of about 5-10 m. These will provide a tree belt having strong root system all along the boundary arresting sea erosion.