

Role of coconut in reducing soil erosion in East & North East India

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Coconut covers about 1.07 lakhs ha (2015-16) area altogether in East and North-East India which includes Odisha, West Bengal, Assam and sparsely populated areas of Nagaland and Tripura. But unlike other fruit crops, the area under this plantation crop is difficult to calculate based on block plantation as in orchard. Rather the area is calculated based on the number of palms planted in homestead garden surrounding the house, or surrounding the main field like paddy, pulses etc. on bunds or surrounding the pond or around any other water body etc.

Since many years say around 100-200 years before people adopted this pattern of plantation for various reasons like the ability of root system of coconut to bind the soil particles and consequently prevent soil erosion due to run-off caused by heavy rain or wind.

The coconut palm has no tap root, but has a thick growth of string like root system emanating from the blunt bottom of the stem. The palm has a sound root system which anchors it solidly into the soil. Hence, it is not usually uprooted during strong winds.

Palm roots come out at all angles from the root initiation zone. Because palms tend to have heavy fronds and trunks, the numerous roots both as anchors and feeders sustain the growing plant. Even trees taller than 50-60 feet do not use a taproot system that is common in other tree species. The thin roots stretch away in search of moisture and nutrients. This character enables the soil particles in the root zone to bind closely in association with root and therefore, not easily breaks down against the force of water and wind.



In general, the number of roots produced by a fully grown palm ranges from 1500 to 8000 depending on soil texture and structure. It is different for the thin roots of the fibrous root system to push through heavy clayey soil. It prefers sandy or sandy loam soil which provide lot of air pockets and moisture for rapid root growth. The normal length of the roots is 5m in firm soil and 7 m in sandy soil. Coconut palm which grow to height of 20-25 m have roots which are only 8-10m.

As reviewed by Gomez and Prado (2007), coconut roots usually grow to a depth of close to 0.8m with 60-90% found in top 0.5m of soil. Under favourable conditions as many as 4000 to 7000 roots are found in the middle aged palm. About 74% roots do not go beyond 2m lateral distance and 80% is confined to 31 to 120 cm depth of soil. So this typical adventitious root system can hold larger amount of soil laterally

rather than many trees having tap root system. Surface area and volume of soil anchored is a huge bio-mass which helps to hold the tall coconut trees of 80-90ft height straight. Coconut root distribution in gravelly and sandy loam soil was studied, which showed that 75%-80% of roots of adult coconut palms were localised in a depth ranging from 20cm to 100cm. About 5% roots were located beyond the 100cm depth and 15-20% was confined to the top layer(0-20cm) of soil. However, root activity in the sandy loam soil was higher than gravelly soil due to the low compaction of the soil.

Coconut has no root hairs but it produces plenty of roots with a large quantity of rootlets. This factor enables coconut palm to hold larger biomass of soil. As a reference regarding anchorage and support of plant root system, it may be mentioned that Redwood trees(a gymnosperm) about 100m tall have stood erect for thousand years only because millions of individual fibrous roots dig into the ground, unlike tap root system.

How can coconut palm prevent soil erosion?

- Coconut palm reduce the effect of erosive forces using their root system and foliage. Beneficial impact of palm on areas with eroding soil can be increased by planting it in closer space than recommended. Efficacy can also be increased where planted with more than 8% slope with establishment of grasses which will enable the soil to be stabilised.

- Root system- Root extends out to the surrounding soil which hold the soil in place and improve drainage of soil. The roots prevent soil compaction and help water soak into the ground instead of flowing over its surface.

- Foliage- Foliage of the palm intercepts falling rain water and reduces the force it exerts when it hits the ground. Rainwater caught in a tree's foliage is channelled over the stem and down the trunk until it soaks into the soil. This process helps rainwater penetrate into the soil instead of washing over it and reduces the force that falling rain drops exert on the soil. ■



References:

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