

Dispelling the myth of tropical dry evergreen forests of India

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There have been speculations about the original vegetation type that covered the coasts of Peninsular India. Gamble¹ described the vegetation of the Deccan region that includes most of Karnataka and Andhra Pradesh (AP) and parts of Tamil Nadu (TN) as deciduous forests where, in some valleys, evergreen trees of small size such as *Memecylon edule* occurred. Such evergreen forest patches were known in Nellore district, AP and Chingleput, North Arcot, South Arcot, Salem and Coimbatore districts of TN. Gamble¹ has also described the coastal forests in AP and TN as 'shrubby with small tree growth of evergreen species such as *Memecylon umbellatum*, *Eugenia bracteata*, *Capparis brevispina*, *Carallia integerrima*, *Linociera malabarica*, *Manilkara (Mimusops) hexandra*, etc.¹.

The most explicit analysis of the vegetation types of India is the one provided by Champion and Seth². These authors, who were basically foresters, had broadly treated all Indian forests under six categories, viz. Moist tropical forests, Dry tropical forests, Montane sub-tropical forests, Montane temperate forests, Sub-alpine forests and Alpine scrub. Among these, the present discussion concerns dry tropical forests as they include three distinct sub-types: tropical dry deciduous forests, tropical thorn forests and tropical dry evergreen forests.

Tropical dry evergreen forests are under type 7 of Champion and Seth's² scheme of classification. These forests have been described as 9–12 m high, having a complete canopy and distributed along the coasts of Karnataka, TN, and Nellore district, AP. They grow in lateritic and sand dune soils. Even at the time when Champion and Seth² described the forests, they were probably in a state of degradation that the authors described it is as follows: 'most of the forests have been much influenced by felling, logging and browsing and have become irregular with open patches and thorny unpalatable species have largely displaced the climax vegetation'.

'Typical' tropical dry evergreen forests (sub-type 7/C1) are dominated by trees like *M. hexandra*, *Memecylon* spp., *Diospyros* sp., *Eugenia* spp., *Chloroxylon*

sweitenia and *Albizzia amara*². At least one locality in which this forest sub-type was known is the Sriharikota Island (Table 1).

Further, Champion and Seth² have also described a sub-type (7/DS1) of the tropical dry evergreen forests as 'tropical dry evergreen scrub'. This forest sub-type, according to the authors, is found in Vandalur, Chennai, Navalur and Maduranthakam. Dominant plants in the scrub are *Memecylon edule*, *Zizyphus glabrata*, *Dichrostachys cinerea*, *Randia dumetrorum*, *Carissa spinarum*, *Albizzia amara*, *Buchanania lanzan*, *Maba buxifolia* and *Dodonea viscosa*.

The other sub-type of dry tropical forests that is known in southern India is the southern thorn forest (6A/C1 of Champion and Seth)². This sub-type is found in Coimbatore, Tuticorin, Ramnad, Pamban and Tirunelveli. Among these five localities, Coimbatore is rather removed from the coast while Ramnad and Tirunelveli are partly coastal in orientation. Pamban and Tuticorin are entirely on the east coast of TN.

The forests types of India described by Champion and Seth² also include a distinct sub-type of moist tropical forests by name 'littoral and swamp forests'. This sub-type was apparently found in and around Pulicat Lake, Vedaranyam (Point Calimere) and Gulf of Mannar. While swamp forests include mangroves and freshwater swamps as found in the Western Ghats, littoral forests are essentially coastal naturally inhabiting the beaches and shores. The littoral forest plant community is known to include species such as *M. hexandra*, *Morinda* sp., *Erythrina* sp., *Calophyllum inophyllum*, *Cordia* sp., *Barringtonia acutangula*, *Thespesia populnea*, *Hibiscus tiliaceus*, *Pandanus* sp., *Ipomoea pes-caprae*, *Mucuna gigantea*, *Pongamia pinnata*, *Vitex negundo*, *Saccharum spontaneum*, *Borassus flabellifer* and *Phoenix* sp.

Almost 20 years after the explicit vegetation classification of Champion and Seth², Gadgil and Meher-Homji³ adopted a different scheme while identifying localities of great significance to the conservation of India's biological diversity. According to this scheme the vegetation of India (including the islands) is split

into 43 sub-types within eight broad categories. Category 5 of this scheme includes dry evergreen types (Table 2).

Analyses¹⁻³ of the forests along the southern coasts of India do indicate that the authors are dealing with a heterogeneous vegetation type that spreads across a wide rainfall regime under the broad category of dry evergreen. Whereas rainfall over much of Deccan would be around 1000 mm or less, that along the east coast exceeds 1500 mm and in the west (Karnataka) averages well above 3000 mm annually. Further, suggestions that the vegetation type is found across northeastern Sri Lanka, northeastern Thailand, southwest China, Jamaica and the Bahamas⁴ indicates that the tropical dry evergreen forest is representative of a larger biome (like tropical rainforests) than a specific vegetation type. From the various descriptions provided²⁻⁵, it is apparent that within this biome (as in tropical rainforests) there are many types of vegetation that vary from

Table 1. Plants characteristic of tropical dry evergreen forest sub-type 7/C1 known from the Sriharikota Island²

Scientific name*
<i>Manilkara hexandra</i>
<i>Syzigium cumini</i>
<i>Albizzia amara</i>
<i>Albizzia lebbek</i>
<i>Strychnos nux-vomica</i>
<i>Drypetes sepiaria</i>
<i>Ficus tsilea</i>
<i>Sapindus emarginatus</i>
<i>Tamarindus indica</i>
<i>Azadirachta indica</i>
<i>Pterospermum suberifolium</i>
<i>Borassus flabellifer</i>
<i>Memecylon umbellatum</i>
<i>Maba buxifolia</i>
<i>Garcinia spicata</i>
<i>Crataeva religiosa</i>
<i>Atlantia monophylla</i>
<i>Cordia dichotoma</i>
<i>Gmelina arborea</i>
<i>Phoenix sylvestris</i>
<i>Flacourtia indica</i>
<i>Glycosmis pentaphylla</i>
<i>Randia</i> sp.
<i>Calamus viminalis</i>

*As provided by Champion and Seth².

Table 2. Vegetation sub-types broadly grouped as dry evergreen by Gadgil and Meher-Homji³

Sub-type	Vegetation series	Champion's equivalent ⁸	Vegetation structure
28	<i>Acacia-Albizia amara</i>	Tropical dry evergreen forest	Scrub-woodland
		Southern thorn forest (climax)	Closed thicket and continuous thicket
		Carnatic umbrella thorn forest (climax)	Flat-topped canopy of <i>Acacia planifrons</i>
		Southern <i>Euphorbia</i> semi-desert scrub (climax)	Scattered shrubs
29	<i>Manilkara-Chloroxylon</i>	Topical dry evergreen forest	–
		Southern thorn forest	Discontinuous thicket
30	<i>Albizia amara-Chloroxylon-Anogeissus latifolia</i>	South Indian dry mixed deciduous forest	Savanna woodland
		Dry savanna forest	Shrub-savanna
		Dry deciduous scrub	Scattered scrub
		Southern <i>Euphorbia</i> semi-desert scrub	Scattered scrub

being dominated by cactus-like *Euphorbia* spp. to the coriaceous (leathery-leaf) evergreen *M. hexandra* or the deciduous *A. amara*.

Meher-Homji⁶ had earlier proposed that the sub-types of Champion and Seth², viz. tropical dry evergreen (7/C1) and southern thorn (6A/C1) forests can be treated as *A. amara* community based on the ubiquity of this common species of South Indian tree. After comparing the forests of the coastal areas with those of the interior areas, Meher-Homji⁶ has remarked that there are only six species of trees that are confined to the dry evergreen forests. These are *M. hexandra*, *Memecylon umbellatum*, *Drypetes sepiaria*, *Pterospermum suberifolium*, *Carmona microphylla* and *Garcinia spicata*. Of these, *M. hexandra* occurs in other parts of India (as in Bhitarkanika, RJR Daniels, pers. obs.), where it grows to be a tree (as against the shrubby depauperate form⁶ in the southeast coasts). *M. umbellatum* is considered by some botanists as a variety of *Memecylon edule*, a species that occurs in the Western Ghats (and west coast). Further, the best development of *M. umbellatum* is in the *A. amara* community and dry deciduous forest ecotone⁶.

Besides ruling out these two tree species as unique to the tropical dry evergreen forests, Meher-Homji⁶ has drawn attention to three other species, viz. *D. sepiaria*, *P. suberifolium* and *G. spicata*. *D. sepiaria* occurs under riparian conditions in the Javadi Hills (R. J. R. Daniels and V. S. Ramachandran, unpublished). *G. spicata* is also riparian, as it can be seen far from the coasts along waterways (as within the campus of IIT-Madras and between Mahabalipuram and Chingleput (e.g. Thandrai; R. J. R. Daniels, pers. obs.).

Whether these plants are remnants of the once widespread tropical dry evergreen forests or merely an opportunistic assemblage of shade and moisture-loving species that have adapted to local microclimatic conditions, cannot be conclusively stated. However, what is known is that many have fleshy fruits that are dispersed by birds and mammals, and apparently 69% of the trees in the coastal forests are dispersed by jackals, civets, bats and rodents⁴. Meher-Homji⁶ describes certain species of trees as 'fillers'. These are opportunists that grow under favourable edaphic conditions in localities that were originally covered with deciduous forests.

It is quite likely that today's coastal evergreen forests are comprised of such opportunists in the absence of the original littoral forests². Littoral forests of the climax kind are still found in the Andaman and Nicobar Islands. These forests are characterized by tall emergent trees that are often deciduous. Littoral forests with emergent trees occurred along the east coast of southern India. These presumably have been lost long ago in history due to their timber value (especially for boat-building). In the absence of these tall littoral forests, we presently find a second growth of evergreen understorey trees and shrubs distributed patchily along the coasts.

Early Tamil societies had identified five cultural landscapes that were characterized by specific plants and animals. These were described in the well-known *Sangam* literature that was compiled between 300 BC and AD 300. It is widely believed that the most degraded and desert-like stage of the plains got its name 'paalai' after 'an evergreen tree unaffected by drought' that prevailed (M. Jaishree unpublished). This evergreen tree can be *M. hexandra*

(Sapotaceae) or *Wrightia tinctoria* (Apocynaceae) that dominated the landscape. Both species produce thick and milky white latex. It is also said that Palakkad (Palghat), Kerala got its name (pala = milky latex-bearing tree and kaadu = forest) due to the predominance of *W. tinctoria* trees in the drier forests.

The most recent description of the plant community structure of tropical dry evergreen forests is provided in Mani and Parthasarathy⁴ and Venkateswaran and Parthasarathy⁵. These authors have described it as a 'climax' forest. However, description of its structure and geographical distribution suggests that these forests are only secondary. Key characteristics that point to this inference are as follows: (i) They occur in patches⁵ and as sacred groves⁴; (ii) They are short-statured, mean tree height⁵ is 7 m; (iii) They occur in climatically dry areas⁵; rainfall⁴ less than 1200 mm; (iv) They extend from the coast to at least 50 km inland⁴ and (v) Stem (not less than 10 cm gbh) density varies between 596 and 1663/ha in inland sites and 1077 and 2813/ha in coastal sites⁴.

The patchy distribution, low tree height and high stem density, especially along the coasts, are clear indications that the forests are secondary. In fact, Meher-Homji⁷, who has discussed the origin of the dry evergreen scrub-woodlands of Coromandel (coasts of northern TN and AP), has shown that the early fossils of trees in the region were representative of tropical wet evergreen and deciduous forests. This, according to him was the condition of the vegetation during the Eocene-Miocene (approximately 40 million years ago). Subsequent patterns of climate change that led to the drying of the eastern parts of the peninsula encouraged deciduous

forests to take over. The dry evergreen scrub-woodland and thickets of the Coromandel have been the most recent stage of succession, which according to him was more due to the subsequent climate changes than the eastern peninsula experienced.

While we tend to agree with Meher-Homji^{6,7}, we contend that the much celebrated tropical dry evergreen forests do not belong to a climax vegetation type. These are instead secondary stages of highly degraded coastal forests that were appropriately designated as 'paalai' by the early Tamil societies. To conclude we quote Meher-Homji⁷ who had described the tropical dry evergreen forests of Marakanam (north of Pondichery) as follows: 'this scrub may be classified under the category "tropical dry evergreen forest" of Champion⁸. However, it is not a forest in the true sense of the word but a tall thicket or scrub-woodland. Neither is it evergreen, as majority of its species are

deciduous, but different from those of the deciduous forest proper. The climate is not particularly dry, nor is the regime typically tropical. Therefore the term "tropical dry evergreen forest" is a misnomer and Meher-Homji⁶ designated this type as *A. amara* community. However, to distinguish this special vegetation of the Coromandel region from the deciduous forest, the physiognomic term "dry evergreen" is retained'.

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COMMENTARY

University education in India: Can the collapse be reversed?

Shri Singh

The higher education system in India is in a state of considerable disarray characterized by a total lack of motivation, vision, monitoring and commitment to implement the policies with purpose and firmness. The system is threatened, both from within and without. Some of the factors that have brought us to the present state, when the very existence of the system is in danger, have been identified and measures to be taken urgently on a priority basis are suggested.

The education system today requires a complete change in its perception, structure, emphasis and implementation. All the concerned people have to realize the urgency of the situation and participate in reorienting it in the right direction. But the question is can this be done? With an optimistic belief, I have tried to give a positive answer to this question. It is a reality that over the years many institutions in India have developed to be of world class with excellence. This shows that the

creativity, capability and motivation to achieve excellence are still alive in this country. What is required is a paradigm shift in our purpose and emphasis. However, no incremental change to bring improvement will be of any use. A quantum jump is required to reformulate the policies and implement them firmly. Unfortunately this is neither easy nor pleasant. However, if the country has to move forward and the collapse of higher education system has to be reversed, this difficult and unpleasant task must be taken up immediately with great urgency.

Education is the most effective instrument which can imbue people with the knowledge, skill, capability to observe and analyse the sense of purpose and confidence for building a dynamic, vibrant, just and cohesive nation able to take care of all its people. There are three stages of education – elementary, secondary and higher education (college and university level). Higher education occupies a place of special

importance because it can provide ideas and personnel to give shape to the future and also sustain all the other levels of education. For almost 25 years after independence there was strong political will and support at work to ensure that the Indian education system achieves a respectable position internationally and develops to cater to the needs of every class of people. Some things have been accomplished, but much of the effort is frustrating, our education system is one of the largest in the world, but the most chaotic¹. Here, I discuss the status and problems of higher education in India.

While formulating the policy of higher education in India a two-tier system was adopted: the Central universities under the responsibility of the Central Government and State Universities under the control of the State Governments. The gulf between the Central and State Universities is quite substantial and increasing day by day.