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Suitable soils for Mango cultivation and Sustainable productivity in Tamil Nadu

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Introduction

Mango (*Mangifera indica*) is the leading fruit crop in India and is considered the king of fruits. Mango crops are an essential tropical fruit for food security and industry because of their substantial economic contribution through international trade, processing and livelihoods; their nutritional value, versatility and environmental benefits.

India is the world's top producer of mangoes, with major growing states like Uttar Pradesh, Andhra Pradesh, Telangana, Karnataka and Maharashtra. In Tamil Nadu, Mango is cultivated on about 1,25,104 ha, with production of about 5,37,780 tonnes, yielding an average productivity of 4.30 ton/ha. Major mango growing districts are Dharmapuri, Krishnagiri, Vellore, Dindigul, Thiruvallur and Theni.

Mango fruit is used at every stage of its development, both immature and mature. Chutneys, pickles, and juices are made from raw fruits. Ripe fruits, in addition to being used for dessert, are also used to make squashes, syrups, nectars, jams, and jellies. The mango kernel also contains 8-10% of high-quality fat, which can be utilized for soap and as a substitute for cola in candy.

Fresh mangoes and mango pulp are key agricultural exports from India. Although India is the world's largest mango producer, accounting for over 60% of total production, fresh

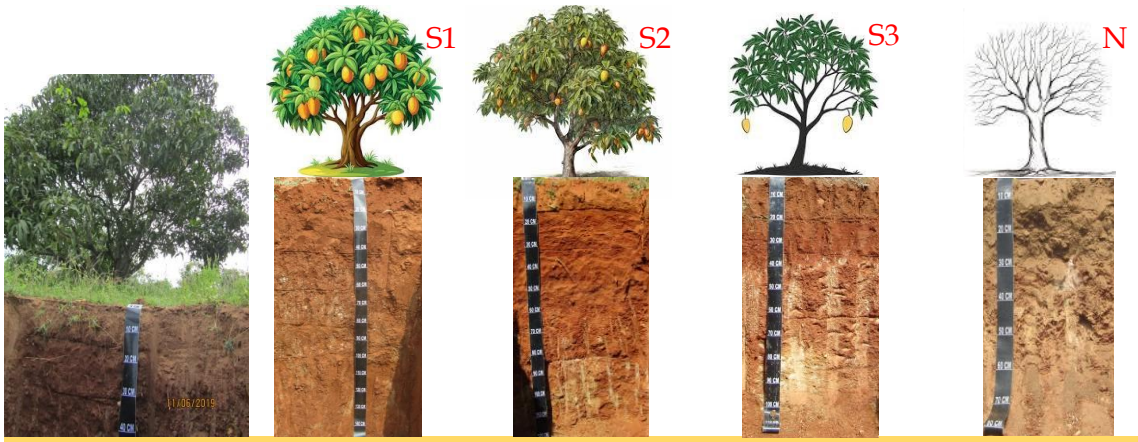
fruit exports are limited to Alphonso and Dashehari. India's proportion of the global mango market is approximately 15%. Mango accounts for 40% of the country's fruit exports. There is ample room to expand mango cultivation and production across the country.

Mangoes thrive in tropical and subtropical regions. It grows well in practically every part of the nation, from sea level to 600 meters above sea level. Mangoes prefer high humidity and temperatures between 24°C and 30°C throughout the growing season. Mangoes are thought to grow best in an annual rainfall range of 890–1015 mm. Mangoes, however, can be grown in areas with high rainfall (2540 mm) or low rainfall (254 mm). Prolific flowering is facilitated by dry weather before blossoming. Rain during flowering hinders pollination, which reduces yield. During the flowering season, which spans from November to February, fog and overcast weather conditions lead to poor fruit setting and increase the likelihood of pest and disease infestations.

One of the most significant non-renewable fundamental resources on the surface of the globe is soil. Tamil Nadu is covered by approximately 39.34% of Red soils, followed by brown soils (37.89%), black soils (16.38%), grey soils (3.51%), mixed soils (2.03%) and alluvial soils (0.86%). Mangoes thrive in a wide range of soil types, including sandy loam, lateritic, alluvial, and sandy. Mangoes grow best in loamy, alluvial, well-drained, aerated, deep (2-2.5 m), organic matter-rich soils with a pH range of 5.5-7.5. Mangoes should not grow on soils with a high-water table, which should be about 3 meters.

Evaluating land appropriateness is crucial for maximizing agricultural outcomes, defining its potential and limitations, and promoting sustainable crop production. It is critical for decision makers. Evaluate lands for production capacity and crop appropriateness to optimize agricultural cultivation and maximize productivity. FAO (1976) suggests several strategies for evaluating and categorizing land capability. Land suitability evaluation is one of the most effective methods for agricultural land-use planning, as it assesses land suitability for a specific crop. The crop requirements for mango cultivation, including climate, site, soil, and fertility, were established using standard criteria.

The suitability classes, soil suitability parameters were compared with soil-site characteristics of different soil types (Fig. 1). Soil characteristics, such as depth, texture, gravelliness, pH and calcareousness, land features like slope, erosion, and drainage and climatic factors such as the amount of rainfall and its distribution were used to evaluate the suitable soil for mango. The number and severity of limits were used to assign suitability classes as highly suitable (S1), moderately suitable (S2), marginally suitable (S3), and not suitable (N) for Mango cultivation (Srinivasan *et al.,* 2020).



Characteristics	S1-Highly Suitable	S2-Moderately Suitable	S3-Marginally Suitable	N-Not Suitable
Climate	Temp: 15-32°C	22-35°C	22-40°C	20-24°C
Soil Depth (cm)	>200	125-200	75-125	<75
Slope (%)	<3	3-5	5-10	>10
Gravels (%)	<35	35-60	60-80	>80
Hard pan (cm)	>250	150-250	100-150	<100
Drainage	Well	Moderate to imperfect	Poor/somewhat excess	Very poor/excessive
Texture	Sl-Scl-Sc	Sic, sc-c	Ls, c	Heavy clay & sand
pH (1:2.5)	6.5-7.5	5.0-8.5	4.0-9.0	<4.0, >9.0
OC (%)	>0.75	0.50-0.75	<0.50	-
Calcium content	Nil	<5	5-10	>10
Salinity (ECe)	Nil	<2	2-3	>3
Sodicity (ESP)	<5	5-10	10-15	>15

Fig. 1 Soil suitability criteria for mango cultivation

Conclusions

Soil suitability for mango cultivation, identifying problems and opportunities, helps improve mango production and productivity across various areas of Tamil Nadu. Based on climate and soil criteria, major parameters and crop requirements soils were classified into highly suitable, moderately suitable, marginally suitable, and not suitable for mango cultivation. Suitability evaluation revealed that soil parameters were the most critical factors in mango plantation, fertiliser management, and soil conservation to increase mango yield.

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