

STUDY ON SOIL AND LAND USE PLANNING OF RAMESWARAM ISLAND

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A study on soil and land use carried out in Rameswaram island and three soils viz., Typic Ustipsamments, Calcic Ustipsamments and Calcic Ustochrepts were recognised. The properties of soil and quality of water were determined in the soil and water samples collected from the island. By making use of this information, a land use plan for developing the island in the fields of agriculture, forestry and tourism was prepared.

Soil, being the most non-renewable resource, should be properly understood before putting it to any use. Therefore investigation was undertaken to study the properties of soil and qualities of water of Rameswaram island in order to locate areas suitable for agriculture and forestry. Further the soil potentialities, were also assessed for recreational and allied activities, as the island has to be developed into an important tourist complex. Keeping the present study as the basis, a potential land use map was prepared for the use of planners.

Rameswaram island, situated between 9°09' and 9°20' N latitude and 79°12' and 79°27' E longitude, covers an area of 8936.29 ha with a mean annual rainfall of 784.4mm. The soil being moist for not more than 90 cumulative days in a year is grouped under Ustic moisture regime. The mean annual temperature of the island is 28.7°C, with a difference of less than 5°C between the mean summer (31°C) and the mean winter (25.8°C) temperatures. Therefore the soil temperature is grouped under isohyperthermic regime.

MATERIALS AND METHODS

The macro-morphological charac-

teristics of soils were studied by opening profiles and describing them based on the guidelines prescribed by FAO (1966). The taxonomical classification of soils upto the level of families was carried out (USDA, 1975). Profile soil samples representing each soil family were collected and analysed for their physico-chemical properties. With the help of a pH meter and Solubridge the soil reaction (pH) and the salt content (EC) of the soil samples were determined in the soil; water suspension ratio of 1:5 (Jackson, 1958). International Pipette method (Piper, 1966) was followed to determine the mechanical components of the soils. Organic carbon was estimated by Walkley and Black's (1934) chromic acid wet digestion method and the neutral ammonium acetate method of Schoolenberger and Dreibelbis (1930) was followed to determine the cation exchange capacity of soils. The water samples were analysed following the procedures outlined in diagnosis and improvement of saline and alkali soils (USDA, 1954).

RESULTS AND DISCUSSION

The results obtained from the study are discussed under the following heads (a) Soils (b) Water quality (c) Land use planning.

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a. Soils :

Three soil families were identified in Rameswaram island and their important morphological, physical and chemical properties are furnished in Table 1. The soils are :

Typic Ustipsamments :

These soils are distributed in the southern part of the island covering an area of 5595.79 ha (62.70 per cent). They are brownish, very deep and sandy textured. They are readily susceptible to wind erosion, because of the predominance fine sand fraction. The soluble salt content of these soils is below the harmful limit and the soil reaction is mildly alkaline. Organic carbon content and cation exchange capacity are low, thereby indicating the poor fertility status of the soil.

(ii) *Calcic Ustipsamments* : These soils occupy the the central part of the island, covering an area of 1580.40 ha (17.30 per cent). They are brownish, very deep, sandy textured soils with unweathered sea shells distributed throughout the profile. The soils have a neutral to mild alkaline reaction with low GEC. The organic carbon content is high at the surface and decreases with depth

(iii) *Fine Loamy, Calcic Ustochrepts* : These soils occupy an area of 1799.70 ha (20 per cent) in the northern part of the island. They are light brownish, very deep, fine loamy, calcareous soils with a calcic horizon and occur in low lying swamps. The soils have a neutral to mildly alkaline reaction. The soluble salt content is low at the surface and increases with

depth. The presence of harmful amount of soluble salts in the subsoil is attributed to the submergence of soils in sea water during rainy season with soluble salts being impregnated. The high content of organic carbon in the surface layer may be due to the bushy growth of swampy vegetation during monsoon period and subsequent drying up during summer resulting in the decomposition of plant materials. The cation exchange capacity of the soils is low.

b. Water quality:

The results of the water samples collected at six different locations of the island are presented in Table 2.

The pH of the water samples ranged from 8.0 to 8.6, indicating mild alkalinity and therefore amelioratives are to be applied when they are used for irrigation purposes. According to Eaton (1950), water samples containing carbonates and bicarbonates in excess of calcium and magnesium are said to be harmful and a classification for water was proposed by him based on the RSC values. The RSC values for the water samples 2 to 6 is less than 1.25 and hence they are suitable for irrigation. With regard to sample 1, the RSC value is more than 2.5 and therefore unsuitable for irrigation.

The water samples 1, 3 and 6 are said to be medium saline low sodium (C_2-S_1) water as per the USDA classification of water samples rated based on EC and SAR values. These waters can safely be used for moderately salt tolerant crops grown on highly permeable soils as there is no danger of salt accumulation in such soils.

Water samples 2, 4 and 5 are grouped under high saline-low sodium (C₁-S₁) category and they can be used for crops with high salt tolerance capacity.

c. Land Use Planning:

Suggestive measures for the better land use of Rameswaram island are given below, based on the characteristics of soil and qualities of water.

i) *Agricultural Use*: The inlands of the island are occupied by the soils of Calcic Ustipsamments which occur in the Villages of Thangachimadam, Tenmuthu pamban, Taravaithopu, Maluparanai, Akkamadam, Kallupuli and Meyanpuli and the soils of Typic Ustipsamments which occur in the villages of Athikadu, Kilakadu, Ariyakundu, Sudukattampatti and south to Erakkadu can be utilized for agricultural purposes. The quality of water available in the shallow, open wells is moderately suited for irrigation and in isolated patches, they are exceptionally good. Flowers, Vegetable crops, fruit trees like mango, pappaya and plantation trees like coconut and casuarina can be grown on these soils.

ii) *Forest development*: The entire coastal belt of the island are susceptible to the influence of high winds and sand dunes and the soils of the area are Typic ustipsamments which can be put under forest vegetation. The vegetation such as casuarina, cashew etc., should be raised in order to break the winds effectively. In addition Aliyathi (*Acacia officinatis*) which is believed to control the rise of sea waves may be planted throughout the coastal belt. Further the soils of Calcic Ustochrepts occurring in the north of Ghandamana parvatham

can be utilised for raising swampy type of vegetation.

iii) *Tourist development*: Soils can be rated as follows based on their utilitarian value: (a) small camp sites accompanied with the activities of outdoor living and (b) picnic spots. There is the necessity for site preparation other than shaping or levelling for putting tents and parking vehicles. The limitations of camp sites and picnic areas are similar and the degree of soil limitation to camp sites and picnic spots given below :-

Soil Name	Degree of limitation to Camp sites and picnic spots
a) Typic Ustipsamments	Moderate
b) Calcic Ustipsamments	Slight
c) Fine loamy, Calcic Ustochrepts	Severe

For chalking out any programme for recreational purposes, the swifiting sand dunes in the southern part of the island must be taken into consideration. Further it is not advisable to have settlement with fishermen in the Dhanuskodi area, as has been proposed in the development project of the island as the area is very often subjected to the effects of cyclone and sea swell

The establishment of a bird sanctuary in the swampy lands (Calcic Ustochrepts) of the island where the sea water collects during monsoons may be studied in detail.

Ghandamana parvatham being the highest place in the island may be utilised for setting a telescope tower from where it is possible to get a Panaromic view of

Table 1. Soil Properties

Sl. No.	Soil name	Location	Depth (cm)	Soil colour (moist)	Clay %	Silt %	Coarse sand %	Fine sand %	Texture	pH	EC m.mhos/cm	Org. carbon %	CEC me/100g soil
1.	Typic Ustipsamments	Nochivadi	0-11	10YR 6/6 (Brownish yellow)	20.50	4.15	40.40	55.30	s	8.3	0.05	0.33	1.5
			11-45	"	—	—	69.70	27.10	s	8.3	0.05	0.03	1.5
			45-75	"	—	—	69.90	27.05	s	8.4	0.05	0.18	2.8
			75-110+	"	—	—	46.70	50.20	s	8.3	0.05	0.18	1.3
Calcic Ustipsamments	Thangachimadam	0-4	10YR 5/3 (Brown)	—	5.10	80.20	13.40	s	7.8	0.10	1.75	2.1	
			4-20	10YR 4/2 (Dark grayish brown)	—	4.25	77.00	18.00	s	7.8	0.10	5.67	1.7
			20-44	10YR 5/4 (Yellowish brown)	—	—	70.80	17.70	s	7.8	0.10	0.09	2.0
			44-54	10YR 7/3 (Very pale brown)	—	—	71.60	23.80	s	7.9	0.10	0.06	1.8
3.	Fine foamy, Calcic Ustochrepts	Parvatnam	0-11	10YR 5/4 (Light brownish yellow)	20.50	4.15	31.25	49.70	sl	7.8	0.4	1.00	7.7
			11-28	"	21.15	3.20	43.90	23.30	sl	7.9	1.1	1.14	7.2
			28-48	10YR 6/3 (Pale brown)	22.20	3.10	46.40	27.85	scl	8.3	1.3	0.22	7.5
			48-70	"	23.15	2.80	44.80	27.55	scl	8.4	1.6	0.22	7.5
			20-44+	"	24.20	3.15	45.00	28.55	scl	8.4	1.3	0.31	10.1

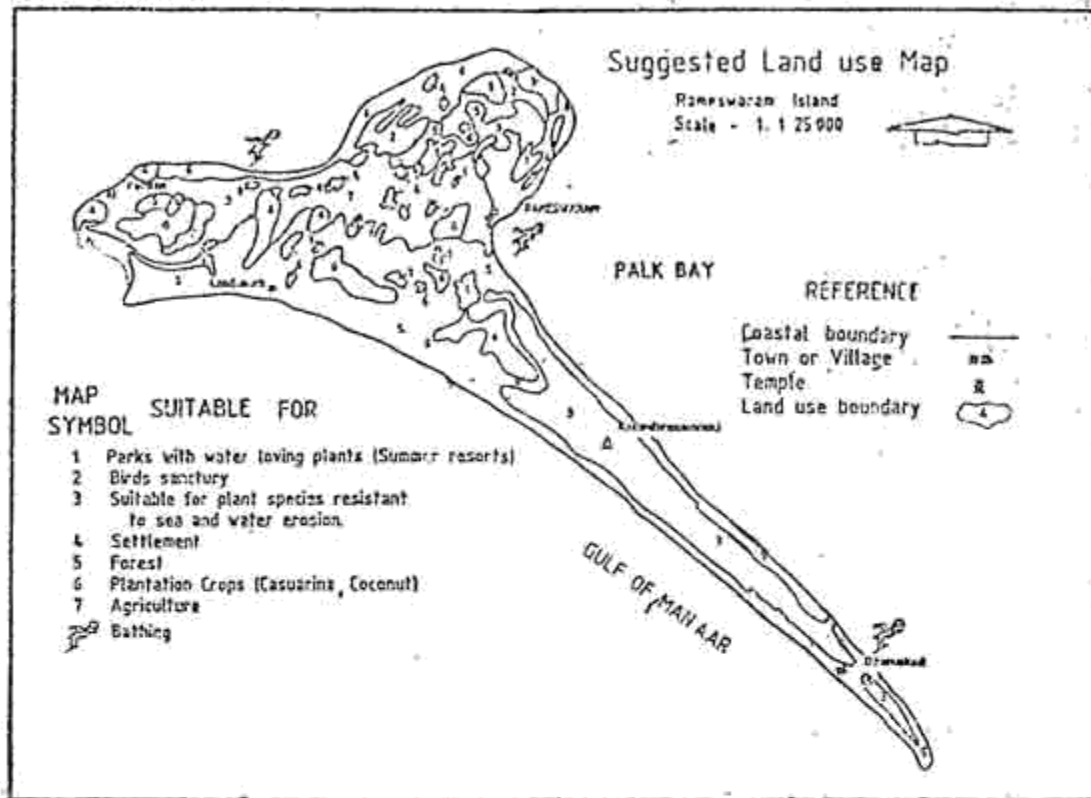


Table 2 : Water quality

Sl. No.	Location	pH	EC m. mhos/ cm.	CO ₃ ⁻	HCO ₃ ⁻	Cl ⁻	Ca ⁺⁺	Na ⁺	K ⁺	SAR	RSC
1	Taravaihopu	8.2	0.7	0.4	4.0	3.0	1.2	2.2	0.3	2.8	3.2
2	Thangachimadam	8.3	1.3	0.8	3.6	7.0	3.2	6.5	0.5	5.2	1.2
3	Verkkadu	8.1	0.3	0.6	1.8	2.0	2.0	1.1	0.1	1.1	0.4
4	Nochivadi	8.0	0.9	0.4	4.8	6.0	4.4	3.9	0.3	2.6	0.8
5	Meyampu	8.0	1.4	0.8	5.2	9.0	4.8	9.2	0.3	5.9	1.2
6	Parvatham	8.6	0.6	1.0	2.4	2.0	4.4	1.7	0.2	1.1	0.1

the sea. The places like Pamban, Rameswaram, Parvatham, Kodandavamaswami Temple and Dhanuskhodi may be developed as the visiting points for the tourists in the island. Temporary tourist resorts can also be put up during summer in the sea coast leading from Rameswaram to Dhanuskhodi.

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