Spatial Analysis for Suitable Soil Parameters for the Expantion of Saltpan in Ramanathapuram District Using Remote Sensing and GIS

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Abstract

This paper is study on a spatial analysis for suitable soil parameter for the expansion of saltpan in Ramanathapuram district using remote sensing and GIS. The present study area is located on Ramanathapuram district, Eastern coastal part of Tamilnadu. It is bounded between the 9° 16′ 49.58″ N, 77° 26′ 1.03″ E. The thematic map (soil map) was prepared from IRS P6, LISS IV 2011 satellite image (scale 1:50000) thematic map and the soil details is obtained from geological survey of India. On the basis of tone, texture, size, shape and associations, various soil features like Entisols, Inceptisols, Alfisols, settlement, vertisols, Pondicherry, Reserve forest miscellaneous, etc..By using weightage parameters the best soil saltpan is identified.

1. Introduction

India is the second most populous country in the world. Agriculture, Fisheries and saltpan dominates the Indian economy. It plays a vital role in government plans to achieve poverty reduction and production of natural resources. Gujarat is the first largest salt producing state in India, accounting for around 80 to 85 lakh metric tonnes. Tuticorin is the second largest salt producing state in India. The main salt production is behinds in the month of November and upto June month. The landless people belonging to socially and economically backward caste and communities were compelled to work on saltpans as seasonal labours in the absence of better income generation opportunities, and then to improve the income of the coastal area people. Use of Remote sensing and GIS is time and cost effective, which will help in achieving a more comprehensive and integrated pattern of saltpan development. The Remote sensing and GIS are inevitable tools will provide information about, location, quantity and spatial spread of each type of resources. Remote sensing and GIS data analysis gives to accurate spatial and quantifiable information on the saltpan area estimation.

2. Objective

To identify the spatial analysis for suitable soil parameters for expansion of salt pan in Ramanathapuram district using RS and GIS.

3. Study Area

The study area is Ramanathapuram district; it is an administrative district of Tamil Nadu state in southern India. This district has an area of 4123 sq.km. It is bounded on north by Sivaganga district, on North East by Pudukottai district on the East by Palk Strait, on the south by Gulf of Mannar, on the West by Tuticorin district and on the North West by Virudhunagar district. The famous Pamban Bridge and Ramanathaswamy temple pall strait separates the Srilankaas an island in this district.

The Tertiary sandstone (Cuddalore Formation) comprise pinkish, yellowish, reddish (variegated colors) medium to coarse grained sandstone and clay stone. It is overlain by thin alluvium and exposed towards north of Vaigai River. Detached exposures of laterite and lateritic soil are seen in the northwestern part of the district.

A major part of the district is covered with the fluvial, fuvio-marine, Aeolian and marine sediments of Quaternary age. The fluvial deposits which are made up of sand, silt and clay in varying degree of admixture occur along the active channels of Vaigai, Gundar, Manimuthar and Pambar rivers. They have been categorized into levee, flood basin, channel bar/ point bar and paleo-channel deposits. The paleo channel deposits comprise brown coloured, fine to medium sands with well-preserved cross-beddings.

The fluvio-marine deposits are exposed in the Vaigai delta as deltaic plain, paleo-tidal and dune flat deposits. The deltaic plain and dune flats comprise medium, Grey brown sands. The paleo tidal flat deposits include black silty clay, black

clay and mud. In Rameswaram Island, the fluvio-marine deposits include indurated sand and dune sands.

The Aeolian deposits comprise red sands which are in nature of ancient dunes and occur over a 3.2 km wide and 8 km long stretch and lie parallel to the sea coast. These are separated by marshy deposits of black clays. The sands are underlain by calcareous hardpan. In Rameswaram Island also brown sand deposits occur around Sambaimadam on either side of NH 49 west of the town.

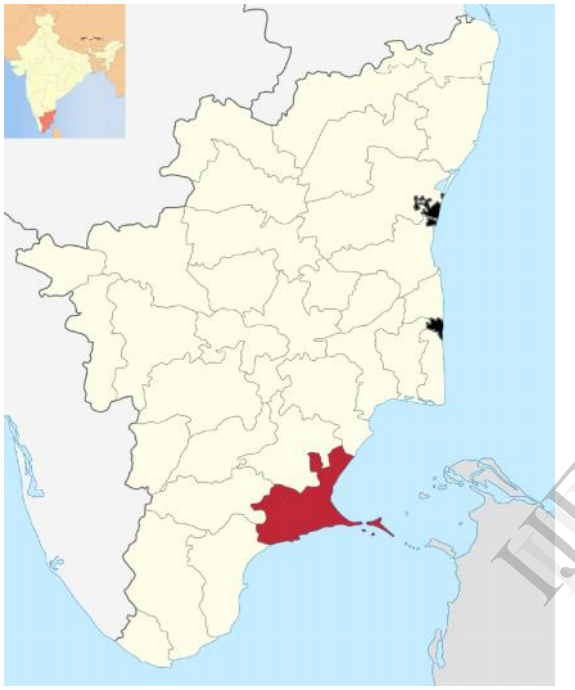

Figure 1: STUDY AREA

4. Materials And Methodology

The spatial data were generated from the satellite image IRSP6 LISS IV and survey of India Toposheet. A field study involving identification and mapping of the various Geomorphic features present in the area was conducted with the help of survey of India Toposheets.

The soil details were analysed from the soils of Tamil Nadu booklet No.359, soil science SSS-4. The soil map was generated from the satellite image, scale 1:50000.The soil features were identified to use on visual interpretation keys. On the basis of tone, texture, size &shape various soil major features entisols, Inceptisols, alfisols, ultisols & vertisols. The soil map is analysed by using Arc GIS & weightage is given to identify the best suitable soil for saltpan.

5. Result and Discussion

5.1. Temperature

Temperature is a physical property of matter that quantitatively expresses the common notions of hot and cold. The temperature of the water in which saltpan facility will operate is an important aspect of site suitability. In some cases the expected temperature ranges at a site impact directly the decision to proceed with a facility. The favourable temperature for the saltpan ranging from 30◦ - 38◦c.it is measured by thermometer and there will be a daily fluctuation less than 5 ◦c.

Ramanathapuram District temperature range is 25.7◦ - 37.8◦c. Hence the normal temperature for Ramanathapuram District is best suitable for saltpan expansion.

5.2. Soil Map

The coastal districts of the study area are covered with various soil types. The soils of Tamilnadu have been classified into 5 soil orders such as Entisols, Inceptisols, alfisols, ultisols & vertisols. Previously the soils were studied under the category of black, red, laterite & alluvial soils. The black soils are now classified under vertisols & Inceptisols, redsoils under alfisols and ultisols, laterite soils into alfisols and ultisols & alluvial soils into inceptisols & entisols. The soil parameters are the important vital role in saltpan increment. To classify the suitable soil, since the water will be stored and hence the soil parameters are studied.

The soil is analysed using the thematic maps and equal weightage is given and the best suitable soil is identified. The soil classification are listed below as per physical properties,

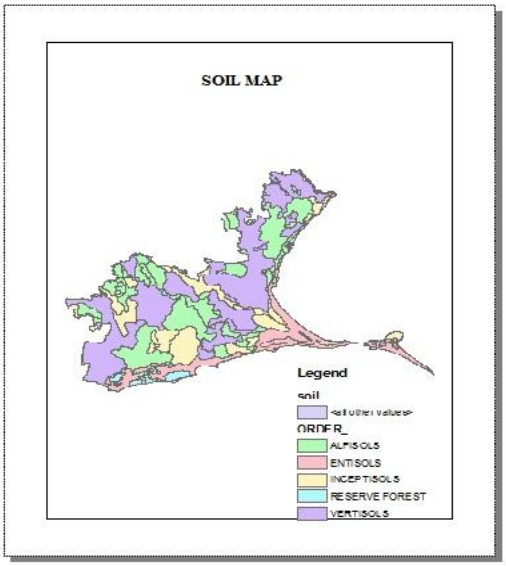

Figure 2: STUDY AREA

S.No	Soil Type	Rank for Saltpan
1	Entisols	3
2	Inceptisols	5
3	Alfisols	2
4	Reserved Forest	4
5	Vertisols	1

Table 1: WEIGHTAGE OF SOILS

1. Vertisols

Vertisols is consisting of expansive clay. Water will be penetrating the cracks only. Clay particles are compacted. In the crack, groundwater table is high. So surface water will be penetrating slowly. Hence we give the first preference.

2. Alfisols

Alfisols is a reddish brown soil Alfisols is composed of aluminum & iron minerals. It consists of pedogenic accumulation of clay. Clay particle is loose material. So Permeability will be more to compare the vertisols .Hence we give the second preference.

3. Entisols

Entisols is deposition of water, wind, and colluvium. It consists of alluvium particle. It composed on sulfidic clay or kaolinite clay. Groundwater table is high for rainy time & low for summer period. Water level is depending upon the weather condition. So we give the third preference.

4. Settlement

Settlement is consolidation of soil. It consists of different types of soil. Characteristics of soil will be differing. But water will be penetrated. Hence we give the fourth option.

5. Inceptisols

Inceptisols is an immature soil, before the soil stage. It is hard & compacted stony soil. It does not infiltrate the water. Water will be always stored in the surface .so the salt content cannot deposit to the top of the surface. Hence we give the last preference

5.3 Water Quality

Water quality is a one of the most important parameter for the saltpan. The salinity of water is changed to water quality. The twenty water samples are collected from this district. All samples are analysed physic-chemical parameters are pH, conductivity, turbidity, total solids, total dissolved & suspended solids, total hardness ca, mg hardness, chlorides, alkalinity, nitrates, sulphates, phosphates, DO, BOD, COD, BO, Na & k. All these parameters are analysed in sodium Absorption Ratio. But in this study, we cannot conduct that all these parameters. pH, water temperature & salinity are analysed. These are the parameters to change the water quality based upon the saltpan. pH values are conducted by the pH meter method. Water temperature is estimated from the thermometer. Salinity of water is calculated by electrical contectivity. Range of pH value in the saltpan is 7.86-9.91 (B.Lalitha kumari et al).Suitable temperature of saltpan is minimum 15^0c, optimum 33^0c & maximum 41^0c.Salinity range of saltpan is 0.5% to 20%.surface.

Since the Ramanathapuram District lies in the eastern coast of Tamilnadu. Therefore the coastal parts of Ramanathapuram has the pH range 8 to 8.5.So the water quality parameter is also suitable for the saltpan. Hence the saltpan will be more suitable around the coastal belt of this district.

6. Conclusion

Ramanathapuram district lies in the eastern coast of TamilNadu. Fisheries and saltpan is responsible for the economic growth. Hence saltpan increment is monitored. Using IRS P6, LISS IV satellite image, the soil thematic map is prepared and soil details are collected from soils of TamilNadu Booklet No.359. With these two data are analysed, finally conclude that vertisols is more suitable for saltpan increment. Alfisols and Entisols are moderately suitable, & Inceptisols are poorly suitable soils.

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