Chapter III

Land Resources of Tamilnadu State.
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LAND RESOURCES OF TAMILNADU STATE

The land resources of Tamilnadu State are evaluated based on studies from Survey of India topographic sheets on scale 1:250,000, LANDSAT Images and FCC’s on scale 1:250,000. Based on physical characteristics of the state the land capability of the state has been evaluated.

PHYSIOGRAPHY:

Physiographically the state is divided into eastern coastal plains and lateritic sandstone uplands, middle pediplains and northwestern, western and southwestern hilly terrain. In between pediplains and hilly terrain lies the Coimbatore plateau region.

Altitudinally the coastal plains lie below 10 metres above MSL and the sandstone lateritic uplands lie in between 10 to 20 metres above MSL (Fig.3.1). The middle pediplains range in altitude from 50 to 150 metres above MSL. The Coimbatore plateau lies in between 150 to 450 metres above MSL. The northwestern hilly terrain range in altitude from 300 to 600 metres. The Nilagiri hills cover an area of about 2,500 km2 with range in altitude from 1800 to 2400 metres above MSL. The Dodabetta peak (2,673 metres above MSI) is the highest peak and is located east of Udagamangalam town. On the
eastern side of Niligiri hills there is a fall in altitude by 1800 metres within 4 km, The western hilly terrain consists of the Annamalais, the Palanis, and the Cardamumhills, There is a gap between Nilagiris and Palanis. It is called as Palghat gap. The Palani hills lie in between 1500 to 2000 metres above MSL. The Anaimudi (2652 metres above MSL) is the highest peak overlooking the Palghat gap. The Cardamum hills lies south of Palani hills and are divided into two ranges namely Varushanad and Andipattihills through the formation of Cumbum valley.

The Javadu, the Shervaroy, the kalrayan and the Panchaimalai are isolated hills distributed between Palar and Cauvery rivers. The Shervaroy hills raised to an altitude of about 1600 metres above MSL. To the west of these hills lie the Dharmapuri district in Baramahal plateau and range in altitude from 300 to 700 metres above MSL.

DRAINAGE:

The Tamilnadu State is predominated by Cauvery system which drains more than $1/3^{rd}$ of the state. There are about 17 basins in the state. They are Chennai, Palaru, Tondiaru, Penniyaru, Vellaru, Cauvery, Agniaru, Pambaru, Kottakkaraiyaru, Vaigal, Gundaru, Vaipparu, Tuticorin, Tambrapaarni, Nambiar, Kumari, and Pollachi. The total area is 1,30,069 km$^2$. Among the basins Cauvery has the highest basin area in Tamilnadu with 48,718 km$^2$. The total area of
the Cauvery basin is 87,900 km². The kumari basin has the lowest area of 1,515 km² in Tamilnadu. The basins with above 10,000 km² in Tamilnadu are Polaru (10,656 km²) and Ponnaiyaru (12,123 km²). The basin with 5000 to 10,000 km² in Tamilnadu are Chennai (5,524 km²) Vellaru (8,540 km²), Vaigai (7,723 km²) Vaipparu (6,237 km²), and Tambraparni (5,464 km²). The other basins in hierarchy are Gundaru (4,820 km²), Agniaru (4,445 km²), Tondiaru (3,619 km²), Pambaru (3,470 km²), Pollachi (2,156 km²), Kottakkaraiyaru (1,795 km²), Tuticorin (1,721 km²), and Nambair (1,543 km²).

**LITHOLOGY:**

Lithologically the state covers with 95,500 km² (73.5%), of Archean rocks consisting of unclassified crystalline rocks. The rock types are charnockites, Khondalites and gneisses. The Quaternary formations are in 8,500 km² (6.5%), the Cretaceous formations are in 1,500 km² (1.2%) and Gondawanas are in 2,500 km² (1.9%).

The crystalline rocks are exposed in the peninsular shield. They are traversed by ultramafic, basic granite and syenite intrusive, Upper Gondawana rocks, mostly comprising of pink and white shales and felspathic sandstones. They are found in Tiruchinapalli district and are subdivided into Uttatur, Tiruchinapalli, Ariyalur and Niniyur. The Upper Gondwanas are over lain by Cretaceous rocks, they are
succeeded by sandstones and clays of Mio-Pliocene age. Formations of Pleistocene and Recent age include alluvium in deltic regions and river valleys and coralline limestone in parts of Gulf of Manner. Charnockitic rocks are well distributed in Javadu, Kalarayan, Chitteri, Shervaroy, kolli, Palani, and Nilgiris, Gneisses are found more in plain areas and hills. They are Arcot gneisses and Peninsular gneisses. Upper Gondwana beds are traced near Sri perumbudur and Satyavedu in Chengalpattu district, Uttatur in Tiruchinapalli and Sivaganga in Ramalingam district. Lateritic cappings and vbauxite concentrations are exposed in Palani, Nilgiris, Shervaroy and Kolli hills.

SLOPE:

Slope is an important parameter for understanding the land use, land use planning and geo-engineering purpose. The Wentworth (1930) method has been adopted to delineate slope categories of Tamilnadu State. The slope categories are divided into 2 degrees slope (very gentle), 2degrees-5degrees slope (moderately sloping), 5degrees- 10 degrees slope (strongly sloping), 10degrees-20degrees slope (very strongly sloping) and more than 20 degrees slope (steeply sloping). The fluvial and deltaic plains, valley fills, wash plains and creep built plains fall under very gentle sloping category(Fig. 3.2). The terraced plains, piedmont palins, pediplains, colluvial plains,
lower parts of debris solpes are grouped under moderately sloping zones. Debris slopes and residual hills are categorized into strongly sloping zones. Ridge and valley topography with 10 degrees to 20 degrees slopes are classified into very strongly sloping and a few hills of the hilly terrain with cliffs, and a few hills of the hilly terrain with cliffs, and escarpments are grouped into steeply sloping zones. The eastern plains of Tamilnadu show slope less than 2 degrees, followed by 2degrees-5degrees in central uplands, 5degrees-10degrees in the undulating terrain and 10degrees-20degrees in hilly terrain. The slope with less than 10degrees could be used for agricultural purposed and it covers more than 50% of the total geographical area.

**LAND SYSTEMS:**

The major land system of Tamilnadu state are hilly terrain with ridge and valley topography 2. undulating terrain, 3. rolling plains, 4. fluvial plains, 5. lateritic plains, 6. black soil plains, 7.coastal alluvium and 8. coastal plains (Fig. 3.2). The land system have been divided based on study of LANDSAT images and FCC’s on scale 1:250,000 following CSIRO, Australia method. The hilly terrain with ridge and valley topography is found in western, south-western and north-western parts of the district. Boardering the hilly terrain is the undulating terrain consisting of piedmont plains, and terraced plains.
The rolling plains are found in pediplains and creep built plains. The fluvial plains are associated with river valleys and deltaic plains. The lateritic plains are Plio-Miocene sand-stone uplands boarding the deltaic plains and coastal alluvium. The black soil plains are distributed fairly in plain regions of the state particularly in south-eastern parts of the state. The state and coastal plains lie parallel to the present shoreline.

**LANDFORMS:**

The major landforms of state are classified into denudational hilly terrain with ridge and valley topography, the bordering lateritic uplands, fluvial plains, deltaic plains, coastal alluvium and coastal plains. The denuding ridge and valley topography is found in western, northwestern and southwestern parts of the state. They are associated with escarpments, cliffs, rapids, water-falls, synclinal and anticlinal valleys and terraced plains (Fig. 3.2). The details of their formations and distribution is not dealt. The piedmont plains are derived from denuding hilly terrain and are deposited along the foot slopes. The depth of sediment varies from 3 to 10 metres. The pediplains are coalescence of pediments with rocky outcrops and possess shallow soil formation varying from 2 to 3 metres or less than 2 metres. They are well distributed in Coimbatore plateau, above the southern and south-western hilly terrain, and
northwestern hilly terrain. The black soil plains are well distributed in southeastern parts of the state and are derived from in biotite gneisses. The lateritic uplands are found along the Quaternary sediments in northeast-southwest alignment. The fluvial plains are associated with major river valleys of the state and are deposited by river action. The Cauvery, Vaigai and Tambraparni deltas consist of deltaic plains deposited by river action. The coastal alluvium is found in northeastern parts of the state and are derived from both fluvial and coastal action. The coastal sands are associated with present shoreline with beach ridges, swales, paleolagoons, spits and coral reef formation in and around Rameswaram island. The state is predominated by pediments in central and western parts.

SOILS:

The major soil types of Tamilnadu state are 1. insitu hilly soils, 2. deep red sandy soils, 3. shallow red sandy soils, 4. black soil plains, 5. mixed soils, 6. lateritic soils, 7. deltaic soils, 8. alluvial soils, 9. coastal sandy soils and 10. coastal alluvial soils (Fig. 3.3).

The western, northwestern and southwestern hilly terrain consists of insitu soils or hilly soils rich in organic matter. The deep red sandy soils are found in piedmont plains bordering the hilly terrain. The depth of sediments vary from 3 to 8 metre, in valley fills
in between Bodinaickanur and Cumbum. The shallow red sandy soils are found in pediplains of the state with rocky outcrops. The depth of sediments vary from 1 to 3 metres. The creep built palins also possess shallow red sandy soils with high calcium carbonate content. The balck soils are derived from insitu rocks of boitite gneisses and are well distributed in southeastern parts of the state around Thirumangalam and Vilathikulam. The mixed soils are found in wash plains and are composed of red clay soil and lie in between creep built plains and fluvial plains. They are good recharge of issue zones. The lateritic soils are found in sandstone lateritic uplands and in the areas where lateritic outcaps exposed in the hilly terrain. The deltaic soils consists of rich alluvial soils derived from action and change in the courses of former rivers. They are found in Cauvery, Vaigai and Tambraparni deltas of Tamilnadu state. The alluvial soils are also deposited by river action and are found in river valleys of major rivers of Tamilnadu. They are rich alluvial soils and posses high ground water potential. The coastal sandy soils are derived from aeolian and marine forces and lie parallel to the present shoreline. The coastal alluvium is deposited of slightly alkaline clayey soils. They are found abundant in northeastern parts of the state and in paleo lagoons.
SOILS

SOILS

LAND USE

LAND USE

IN SITU SOILS

IN SITU SOILS

DEEP RED SANDY SOILS

DEEP RED SANDY SOILS

SHALLOW RED SANDY SOILS

SHALLOW RED SANDY SOILS

BLACK SOIL PLAINS

BLACK SOIL PLAINS

MIXED SOILS

MIXED SOILS

LATERITIC SOILS

LATERITIC SOILS

DELAFIC SOILS

DELAFIC SOILS

ALLUVIAL SANDY CLAY

ALLUVIAL SANDY CLAY

COASTAL ALLUVIAL CLAY

COASTAL ALLUVIAL CLAY

WASTE LANDS

WASTE LANDS

DEGRADED FORESTS

DEGRADED FORESTS

AGRICULTURAL (WET)

AGRICULTURAL (WET)

AGRICULTURAL (DRY)

AGRICULTURAL (DRY)

CURRENT FALLOW

CURRENT FALLOW
LAND USE:

The land use as on date of LANDSAT images and FCC's in February 2012 show forests in western, northwestern and southwestern hilly terrain of the state. These hills are also composed of degraded forests. The forests of Tamilnadu state consists of evergreen forests in southwestern hilly terrain, deciduous forests in Palani and Nilagiri hills, grass lands in western Nilagiri and Palani hills, dry deciduous forests in western hills of Dharmapuri district, scrubs and woodland forests in the central hills, eastern slope of Palani hills, Varushaned hills and Mahendragiri hills. Thorny bushes are also found on eastern slopes of the central hills in northwestern part of the state in Palani hills and Dindigul hills. The degraded forests are found more in Nilagiris, Palani hills. They are disturbed for cultivation of tea, cardamom, spices and rubber plantations. The agricultural wet land is found in river valleys, deltaic plains and in ayacut areas. The agricultural dry lands are found in pediplain zones. The current fallows are found in the western uplands and pediplains. The waste lands are associated with isolated hills in pediplains, water logging zones in ayacut and deltaic plains, salt affected lands in coastal alluvium and black soil plains (Fig. 3.3 and plate 3.1).
HYDROGEO MORPHOLOGY:
The hydrogeomorphology map of the Tamilnadu has been prepared based on ground water level variations, fluctuations, recharge, transmissibility, specific yield and ground water yield in each unit. The hydrogeomorphic units of Tamilnadu state are 1. excellent, 2. very good, 3. good, 4. very fair, 5. poor, 6. very poor and 7. Run-off zone or unproductive zone (Fig. 3.4).

The deltaic plains of all rivers posses excellent ground water potential with ground level variations of 2 to 3 metres and the fluctuation of 0.5 to 1 metre and recharge of more than 15%. The specific yield is high and exceeds 15% and ground water yield ranges from 50,000 to 70,000 litres/hour. The ground water in fluvial palins is very good. The ground water level variations range from 2 to 4 metres and the fluctuation from 0.75 to 1.25 metres. The recharge also exceeds 10%. The specific yield is high and exceed 10%. The ground water yield ranges from 40,000 to 60,000 litres/hour. In the piedmont plains and ayacut areas under major and medium irrigation project the ground water is good. The depth of ground water level varies 3 to 5 metres in piedmont plains and 2 to 4 metres in ayacut areas. The recharge is high in ayacut areas due to return flow and exceeds 10%. The specific yield exceed 10% and ground water yields varies from 20,000 to 40,000 litres/hour. The ground water potential in moderately buried pediments is very fair. The
ground water level variations range from 4 to 6 metres and fluctuation from 1.25 to 2.25 metres. The recharge is very fair and varies from 8% to 10%. The ground water yield varies from 10,000 to 30,000 litres/hour. The fair ground water potential is found in black soil plains. The dept of ground water level varies from 5 to 7 metres. The fluctuation range from 1.25 to 2.25 metres and the recharge from 5% to 8%. The specific yield also varies from 5% to 8%. The ground water yield ranges from 10,000 to 20,000 litres/hours. The poor ground water potential is noticed in pediplains of Coimbatore and Periyar districts. The ground water level varies from 5 to 8 metres and the fluctuations range from 1.50 to 2.50 metres. Ground water is found in weathered, fractured and faulted zones of the pediplains. The specific yield is 3% and the recharge is less than 10,000 litres/hour. The unproductive and run-off zone is the hilly terrain located in western, northwestern and southwestern parts of the state.

EROSION AND FLOOD AFFECTED AREAS:

The normal erosion under environmental and climatic conditions is noticed in the hilly terrain, piedmont plians, pediplains, creep built plains, black soil palins and wash plains. However due to man's interference with the natural ecosystems the land units are subjected to accelerated erosion. They are found in disturbed hill
slopes, poorly maintained tea, cardamom and rubber plantations, in pediplains, piedmont plains and black soil plains (Fig. 3.4). Normal erosion is also high in poor vegetated pockets of piedmont plains, pediplains, and wash plains. The pediplains north of Palani hills are subjected to gulley erosion due to poor vegetal cover. Accelerated erosion is also found in pediplains east of central hills in north western part of the state. The flood affected areas are river valleys, ancient river courses, coastal alluvium, paleolagoons, partially filled in meanders, lakes and in the tial end areas obstructed by beach ridges. Floods are found during northeast monsoon due to cyclonic activity.

**LAND CAPABILITY:**

The land capability of the Tamilnadu state has been evaluated based on physical characteristics namely relief, slope, drainage, lithology, land systems, landforms, land use, hydrogeomorphology and flood and erosion susceptible zones. Eight classes of land are identified. They are class I (fluvial plains), class II (Deltaic plains and ayacut areas), class III (piedmont plains), class IV (black soil plains), class V (pediplains), class VI (coastal alluvium), class VII (lateritic uplands) and class VIII (hilly terrain) (Fig. 2.5).
Class I:

The class I land consists of fluvial palins in river valleys. They are composed rich alluvial soils. The slope is less than 2 degrees. The ground water potential is very good. The recharge and specific yield exceeds 15%. The ground water yield is very high. Commercial crops like banana, sugarcane, turmeric and wet crops like paddy are cultivated. The erosion is very low. The soil productivity is very high. The soil and land irrigability are grouped under class I and class A respectively.

Class II:

The class II lands posses deltaic plains and ayacut under major and medium irrigation projects. The slope is less than 2 degrees. The ground water potential is excellent. The soils are formed of rich alluvium. The soil erosion is low. The ground water yields is very high. The recharge and specific yield exceeds 15%. Mostly paddy and pulses are cultivated. The erosion is low. The soil productivity is high. The soil and land irrigability are grouped under class A and class 2 respectively.

Class III:

The class III land consists of piedmont plains, terraced and wash plains. The slope is gentle and varies from 1 degrees to 3 degrees. The soil productivity is good. The soils are moderately drained. The ground water potential is good and yields is high. The dry food crops and wet crops like paddy are cultivated where ever irrigation
facilities are available. The soil and land irrigability are grouped under class B and class respectively.

**Class IV:**

The class IV land consists of black soil plains. The soils are sticky and fertile. The slope is gentle and less than 2 degrees. The soil productivity is good. The soils are moderately drained. The ground water potential is very fair. The dry food crops and cotton are cultivated. The soil and irrigability are grouped under class B and class 3 respectively.

**Class V:**

The class V land consists of pediplains with shallow red sandy soils. The ground water potential is fair. The ground water yield is low. The recharge and specific yield are less than 10%. The soil productivity is moderate. The slope varies from 2 degrees to 5 degrees. Dry food crops and ground nut are cultivated in pediplains of Tamilnadu state. The soil and irrigability are grouped under class C and class 3 respectively.

**Class VI:**

The class VI land consists of coastal alluvium and coastal sands. They are alkaline in nature. The slope is less than 2 degrees. The ground water is fair. But in coastal alluvium of Chengalpattu and Chennai districts due to over extraction of ground water resources. Sea water intruded into the coastal aquifers and the water contains high salinity and alkalinity. Paddy and dry food crops are cultivated.
soil and land irrigability are grouped under class C and class 3 respectively.

**Class VII:**

The class VII land consists of sandstone lateritic uplands. In these uplands mostly cashewnut, casuriana, and eucalyptus plantations are brought up. They are mostly waste lands. Paddy is cultivated under tank or well irrigation. The soils are poor. The soil erosion is high. The ground water potential is low. The soils and land irrigability are grouped under class C and class 3 respectively.

**Class VIII:**

The class VIII land consists of hilly terrain with ridge and valley topography. The slope varies from 10 degrees to 20 degrees and more than 20 degrees in steep escarpments and cliffs. The soils are insitu and rich in organic matter. Both normal and accelerated erosion are noticed. The hills are disturbed in Nilagiris, Palani, Cardamum and Mahendragirifor cultivation of tea, cardamom, spices and rubber plantations. The soils and land irrigability are grouped under class D and class 5 respectively.