Chapter 2

STUDY AREA

2.1 GENERAL

The Thoppaiyar sub-basin is located in Dharmapuri and Salem districts respectively in the northern and southern part of the basin and it act as boundary for both districts. The sub-basin area is bounded between northern latitudes 11°51′47″ to 11°59′56″ and eastern longitudes 77°53′5″ to 78°18′2″ (Fig. 2.1). The highest elevation in the sub-basin is 1600m above mean sea level (amsl) in upstream at Muluvi (Fig. 2.2, Plate 2.1) and lowest elevation 240m amsl in downstream. The area is well connected by north-south NH-7 and railway line. The total aerial coverage of the sub-basin is 462 sq.km. Thoppaiyar is the main river flow in the sub-basin. A significant percentage of the sub-basin is covered by reserved forest zone (Plate 2.2).

There are five rain gauge stations in the sub-basin namely; Anaimaduvu, Bommidi, Thoppaiyar Dam, Thoppur and Mettur. The average annual rainfall of the Thoppaiyar sub-basin is 707mm. The climate in the sub-basin is generally warm. The hottest period of the year is generally from March to May and the temperature raises up to 38°C during April. The climate becomes cool in December and continues up to February, touches minimum of 15°C during January. The basin receives rainfall from the southwest as well as northeast monsoon.
Figure 2.1 Map show the Thoppaiyar sub-basin located in the southern India in the state of Tamil Nadu.
Plate 2.1 Catchment zone consist of structural hill system in part of Shevoray hills (photo taken from west)

Plate 2.2 Panaromic view of sub-basin covered by pediments and structural hill systems in the background (photo taken from west)
Figure 2.2 Physiography map of Thoppaiyar sub-basin
2.2 AGRICULTURE/LAND COVER

The major crops in the sub-basin are paddy, sugarcane, tapioca, groundnut, cotton, coconut and banana plantation. In the current trend, a major portion of cultivable land brought under floriculture (Plate 2.3). Farmers cultivate cereals/millets and pulses like ragi, samai, horse gram, bajara, mochai and red gram as dry crops. The sub-basin is blessed with a wide range of climate and soil conditions in which a range of horticultural crops such as vegetables, flowers, medicinal and aromatic plant. Floriculture established its credibility for improving productivity of land, generate employment, improving economic conditions of the farmers and entrepreneurs enhancing exports and providing life security to the people.

Plate 2.3 Major cultivation practices in sub-basin (a) Floriculture (b) Banana plantation along with floriculture (c) Tapioca and (d) Cattle fodder
2.3 SOIL

The agricultural productions and surface water infiltration are influenced by the thickness, texture and structure of the soil. The soil development controlled by geomorphology, topography and precipitation. The study area is mainly covered by red soil and black cotton soil to the minor extent (Plate 2.4). The recent formation is marked by river alluvium. The soil map of sub-basin is generated from the map published by National Bureau of Soil Survey and Land Use Planning (NBSSLUP) Soil Map. The major soil types in the sub-basin are alfisols, entisols, hillsoil, vertisols and nceptisols (Fig.2.3). The thickness of the soil in the sub-basin is ranging from 22cm to more than a meter.

Plate 2.4 Different soil types in the sub-basin
Figure 2.3 Soil map of Thoppaiyar sub-basin (source: NBSSLUP)
2.4 GEOLOGY

The entire sub-basin area is occupied by the Precambrian crystalline rocks. The recent formation is marked by river alluvium. The geological map of sub-basin is generated from the map published by GSI (1998). The basin area is covered by garnetiferous quartzofelspathic gneiss, granite, granitoid gneiss, pink migmatite, purple conglomerate, sandstone and shale, quartz vein, shale with bands of limestone and syenite (Fig.2.4). The aerial distribution of various rock types in the sub-basin is given in Table 2.1.

Table 2.1 Rock types and their aerial coverage in the sub-basin

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Geology</th>
<th>Area in sq.km</th>
<th>% of area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Garnetiferous quartzofeldspathic gneiss</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>2</td>
<td>Granite</td>
<td>324</td>
<td>70.0</td>
</tr>
<tr>
<td>3</td>
<td>Granitoid gneiss</td>
<td>40</td>
<td>9.0</td>
</tr>
<tr>
<td>4</td>
<td>Pink Migmatite</td>
<td>39</td>
<td>9.0</td>
</tr>
<tr>
<td>5</td>
<td>Purple conglomerate, sandstone and shale</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>6</td>
<td>Quartz vein</td>
<td>44</td>
<td>9.0</td>
</tr>
<tr>
<td>7</td>
<td>Shales with bands of limestone</td>
<td>3</td>
<td>0.6</td>
</tr>
<tr>
<td>8</td>
<td>Syenite</td>
<td>10</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>462</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

2.4.1 Granite and Granitoid Gneisses

Granite occupied about 324 sq.km area in the north and central part of the sub-basin. The rock is mostly composed of quartz, K-feldspar and plagioclase and orthopyroxene (Plate 2.5). Granitoid gneiss is a variety that appears to have bands of black and white minerals such as feldspar and mica. These bands developed from the heating and squeezing of the rock, granitoid gneiss may look very similar to the original granite rock. Granitoid gneiss is medium to coarse grained rock and occurs in the western part of the sub-basin (plate 2.6).
Plate 2.5 Granite outcrops in the sub-basin at (a) Erumaipatti, (b) Kongarapatti, (c) Anaimaduvu and (d) Thoppaiyar dam

Plate 2.6 Granitoid gneiss in the sub-basin at Sekkarapatti
Figure 2.4 Geology of Thoppaiyar river basin
2.4.2 Pink migmatite

Pink migmatite gneisses are dominant in central and eastern part of the sub-basin area. In outcrop section, the pink color of the rock is clearly visible. The dark bands are highly irregular and terminate abruptly. The darker bands are consists of hornblende and biotite. In places anti perthites are found (Plate 2.7). Biotites are oriented along the dark bands and shows micro scale asymmetric folding.

Plate 2.7 Pink migmatite at Erumaipatti, Thoppaiyar sub-basin

2.4.3 Quartz vein

Presence of quartz veins are most commonly noticed in the study area and it occupies about 44 sq.km area (10% of total area) (Plate 2.8).

Plate 2.8 Quartz vein and garnetiferous quartz at Thoppur ghat section
2.4.4 Minor Rocks

Garnetiferous Quartzo Felspathic Gneisses (GQFG) is a metamorphic rock, foliated, rich in feldspar, quartz and garnet, containing smaller quantities of biotite, muscovite, amphibole, pyroxene and sillimanite. The formation of gneiss is associated with the deep metamorphism of various rocks and sometimes with fusion because of easily fused granite material in these rocks. Gneisses that have been formed by changes in younger rocks under the influence of the pressure developed during the folding process. As a result of the flow of material, certain granites can acquire the features of gneiss.

**Conglomerate**

Conglomerate consisting of cement pebbles with an admixture of sand, gravel, and boulders. The cement is usually iron oxides, carbonates, and clayey materials, and more rarely silica acid. The presence of conglomerate strata and beds in the geological section indicates intensified erosion by water of the more ancient beds and proximity to land or elevations.

**Shale**

Shale with bands of limestone is present as minor portion in the study area and occupies about 3sq.km area (1%).

**Syenite**

About 2% of the area covered by syenite as veins. It is a holocrystalline plutonic rock composed of orthoclase, plagioclase, with admixtures of ferrous minerals such as hornblende, biotite, pyroxene and occasionally olivine.

2.5 SYNTHESIS

The study area Thoppaiyar sub-basin located in southern and northern part of Dharmapuri and Salem district respectively. The area receives 707mm annual average rainfall. In the recent years, floriculture is the major agricultural practices in the sub-basin. The major portion of the area is covered by granites, granitoid gneiss, pink migmatite, quartz veins and other minor rocks.