Morphometric Analysis of Sarabanga Basin for Sustainable Water Resource Management using Geoinformatics & Arc Objects with VB Customization, Tamil Nadu

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Abstract: In the present study, morphmetric analysis using GIS techniques has been carried out in parts of Sarabanga basin. Remote sensing techniques with an emphasis on lineament identification can play a great role in groundwater prospecting in Sarabanga Basin watershed in Salem districts, Tamilnadu. The area is bounded within latitudes 11°30'00"N and 12º00'00"N and Longitudes 77º50'00" E and 78º10'00" E. The area covered by Survey of India Toposheet Nos. 58I/1, 58I/2, 58E/10, 58E/11, 58E/13, 58E/14 of scale 1:50,000. The total aerial extent of the study area is 1215 Sq.km. Aim and Objectives To delineate drainage morphometric characteristic (Linear and Aerial) carried out from the SOI sheets.To study morphometric characteristic of concern sub-watershed.To calculate the parameters in Visual Basic programming language and to Produce the customized output using Arc objects.To integrate the thematic maps through the GIS software (ArcGIS).Recommendations for further planning and development of locally available water potential zones Methodology a) Field data collection include geological mapping; b) Meteorological data collection from Public Work Division (PWD); c) Remote sensing study through Landsat ETM satellite image. Except Muthunaickenpatty and part of Kadayampatty subbasin all other basin and having vegetative cover and settlements. More checkdams may be constructed to store the precipitated water, for the use of agriculture, settlement and for high yield of groundwater potentials even in dry area.

***Index Terms* -. Kadayampatty Sub Watershed, Muthunaickenpatty, Mecheri, Jalakandapuram and Idappadi Sub Watershed**

I. INTRODUCTION

Remote sensing and GIS techniques have proved to be extremely useful tool in morphmetric analysis and groundwater studies. In the present study, morphmetric analysis using GIS techniques has been carried out in parts of Sarabanga basin. Remote sensing techniques with an emphasis on lineament identification can play a great role in groundwater prospecting in Sarabanga Basin watershed in Salem districts, Tamilnadu.

II.STUDY AREA

The study area "Sarabanga upper basin" falls within River Sarabanga originates from the Shevaroys and flows in the northwestern and western parts of Salem district and joins with the Cauvery near Komarapalayam town. The area is bounded within latitudes 11°30'00"N and 12º00'00"N and Longitudes 77º50'00" E and 78º10'00" E. The area covered by Survey of India Toposheet Nos. 58I/1, 58I/2, 58E/10, 58E/11, 58E/13, 58E/14 of scale 1:50,000. The total aerial extent of the study area is 1215 Sq.km.

Figure:1 Study Area Amp

III.AIM AND OBJECTIVES

- To delineate drainage morphometric characteristic (Linear and Aerial) carried out from the SOI sheets.
- To study morphometric characteristic of concern sub-watershed.
- To calculate the parameters in Visual Basic programming language and to
- Produce the customized output using Arc objects.
- To integrate the thematic maps through the GIS software (Arc GIS).
- Recommendations for further planning and development of locally available water potential zones

IV.METHODOLOGY

- a) Field data collection include geological mapping;
- b) Meteorological data collection from Public Work Division (PWD);
- c) Remote sensing study through Landsat ETM satellite image.

V.MORPHOMETRIC ANALYSIS:

- In the presently study, the morphometric analysis for the parameters namely basin perimeter, stream order, stream length, bifurcation ratio, stream length ratio, basin length, drainage density, stream frequency, elongation ratio, circularity ratio, form factor, etc.,

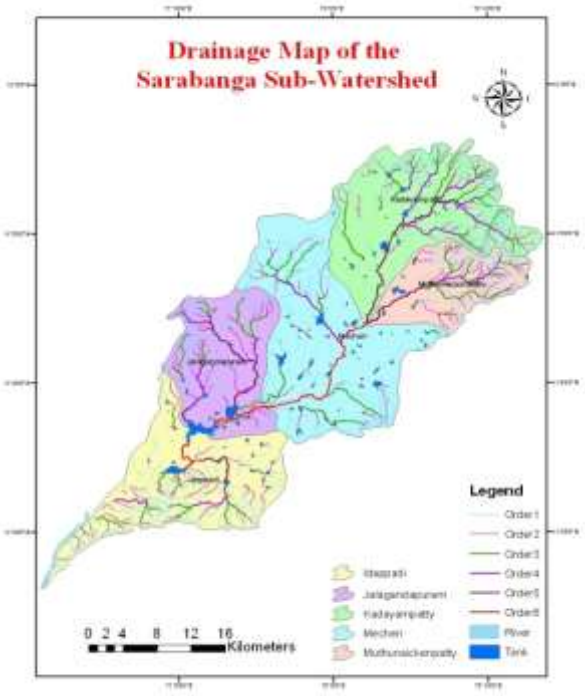


Figure: 2 Sarabanga Sub -Watershed

Description of the Sub Watershed

1. Kadayampatty Sub Watershed,2. Muthunaickenpatty Sub Watershed,3. Mecheri Sub Watershed, 4. Jalakandapuram Sub Watershed, 5. Idappadi Sub Watershed

1. Kadayampatty Sub Watershed

The Kadayampatty subbasin has an areal extent of 288.58 sq.km having six stream orders. The total number of streams is 537and basin perimeter is 93.05 km. The maximum length is 25.41 km.

2. **Muthunaickenpatty Sub Watershed**

The Muthunaickenpatti Subbasin has an areal extent of 129.81sq.km. having five stream orders. Total numbers of streams are 256. The basin perimeter is 54.71 km. The maximum length of the basin is 19.66 km.

3. **Mecheri Sub Watershed**

Mecheri subbasin has an areal extent of 351.05sq.km. having six orders. The total number of stream are 190. The basin perimeter is 104.75 km. The maximum length of basin is 30.85 km.

4. **Jalakandapuram Sub Watershed**

Jalakandapuram subbasin has an areal extent of 190.62sq.km. having six stream orders. The total number of streams is 252. The basin perimeter is 63.81 km. The maximum length of basin is 19.01 km.

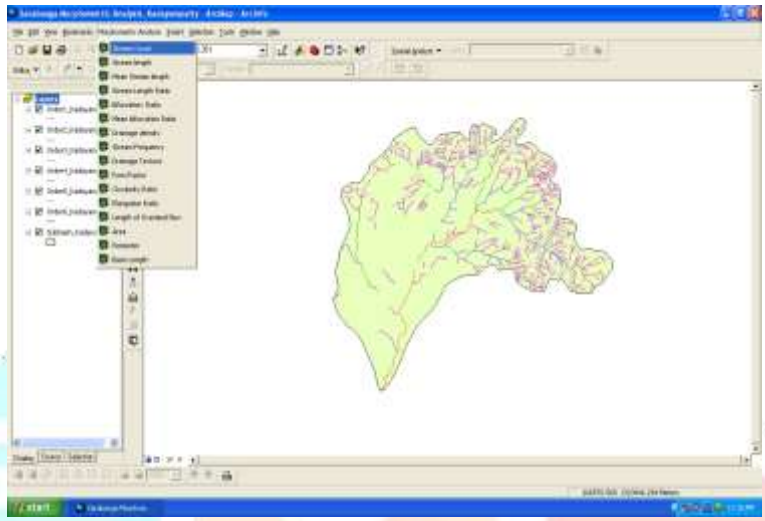
5. **Idappadi Sub Watershed**

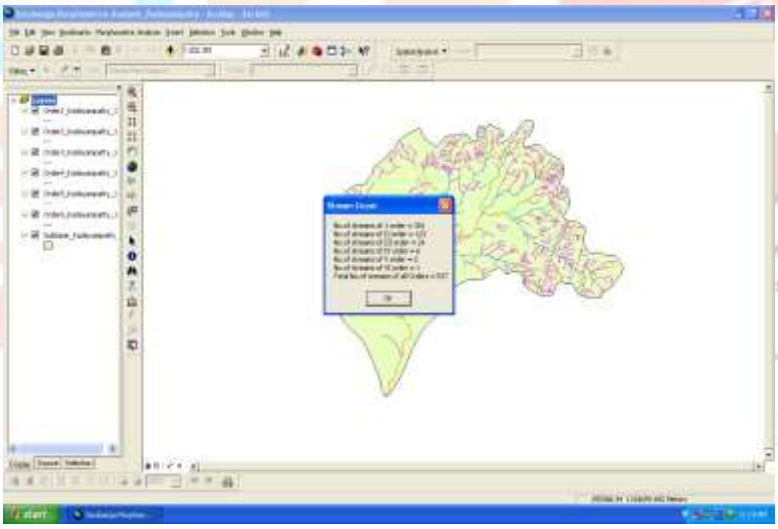
Idappadi subbasin has an areal extent of 255.15sq.km. having six stream orders. The total number of streams is 350. The basin perimeter is 97.05 km. Maximum length of the basin is 28.91 km. The lower orders are from the Sankari hill.

VI. CUSTOMIZATION (MORPHOMETRIC ANALYSIS)

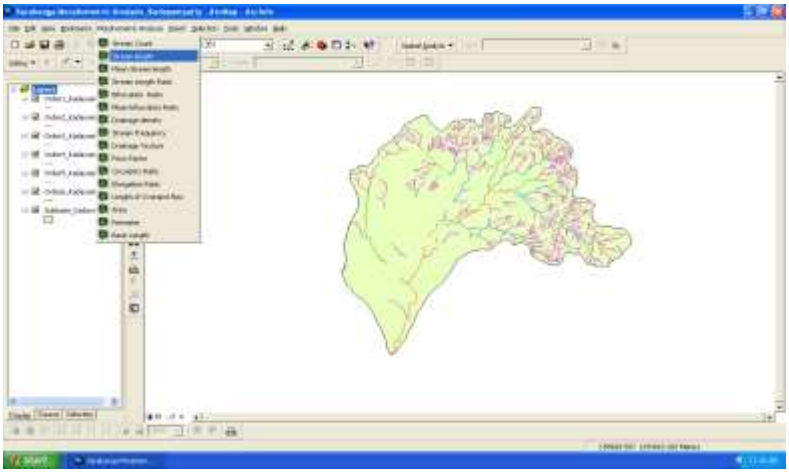
1. Stream Count, 2. Stream Length , 3.Mean Stream Length , 4.Stream Length Ratio, 5.Bifurcation Ratio, 6.Mean bifurcation Ratio 7.Drainage density , 8.Stream Frequency , 9.Drainage Texture , 10.Form Factor 11.Circularity Ratio ,12.Elongation Ratio,13.Length of Overland flow 14.Area, 15. Perimeter, 16.Basin Length

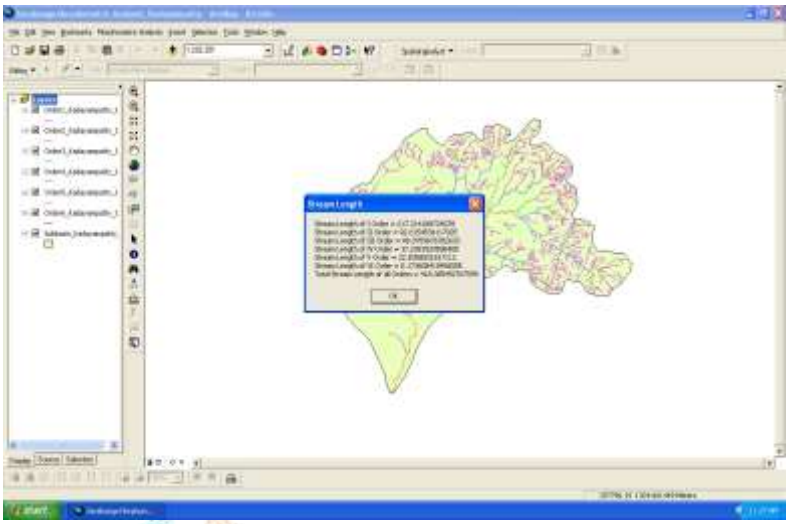
1. Stream Count



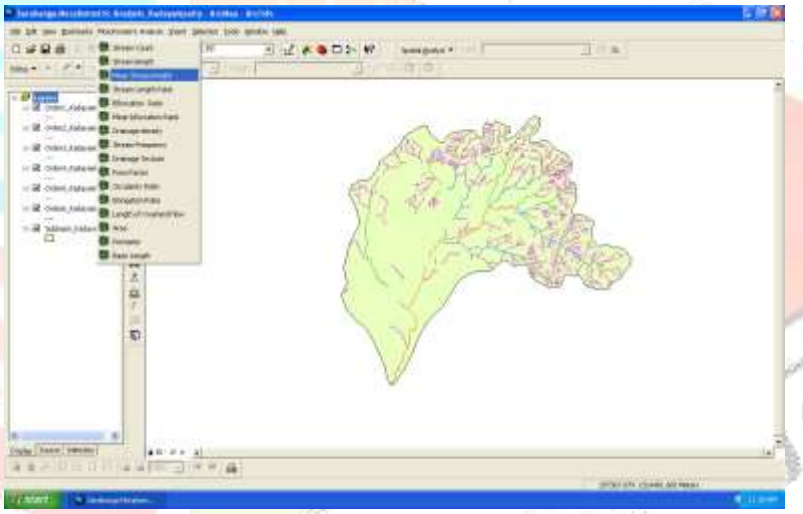


2.Stream Length

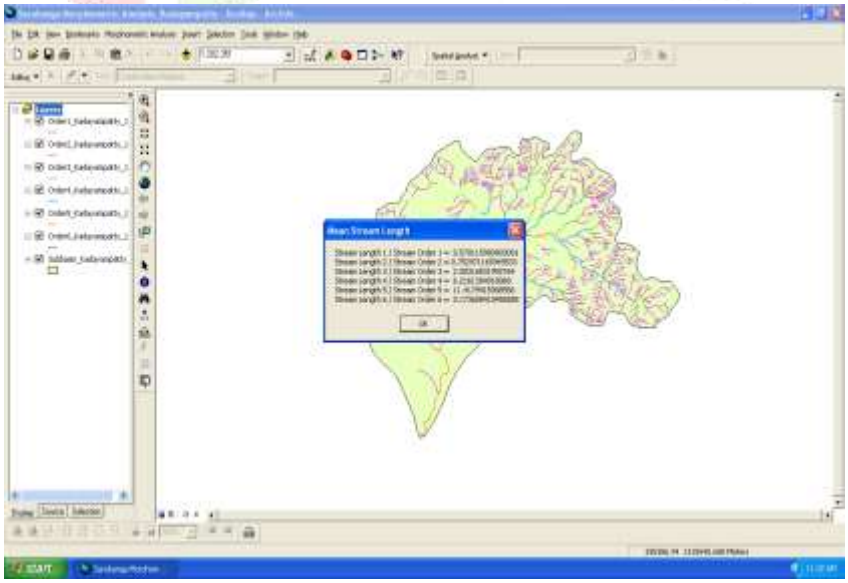


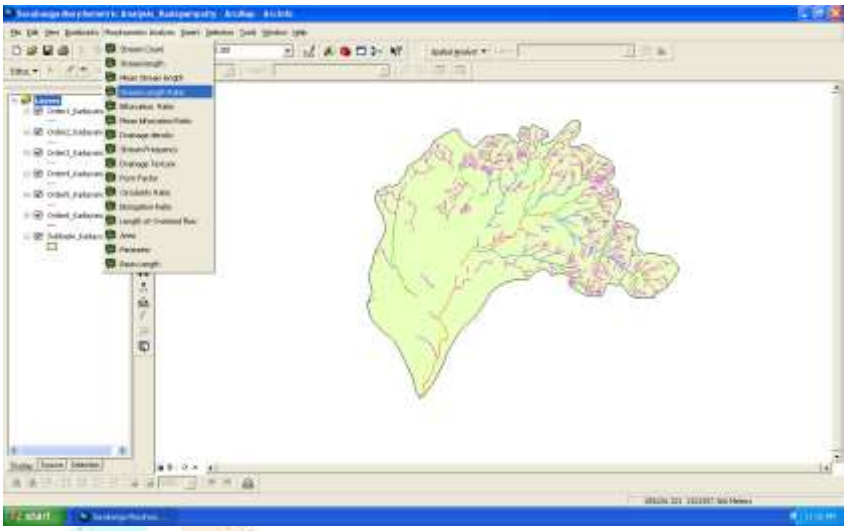


3.Mean Stream Length

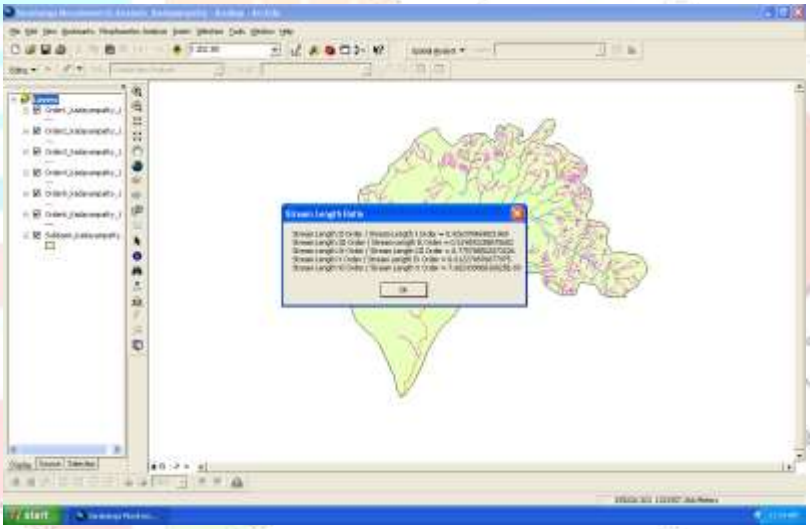


4. Stream Length Ratio

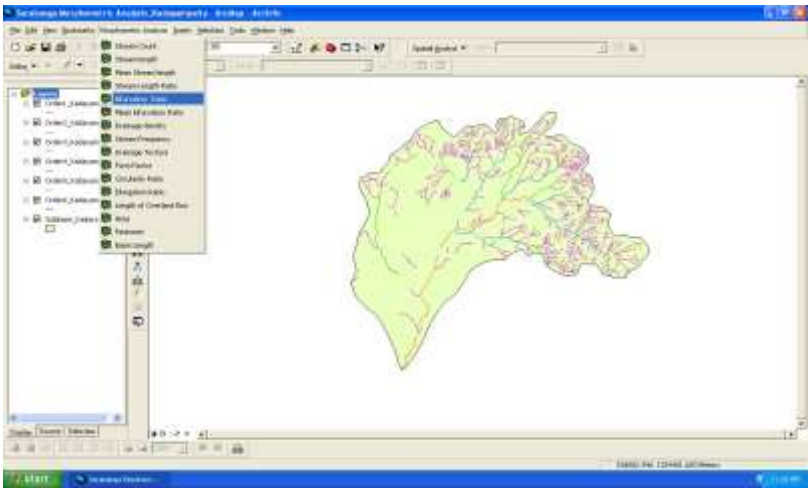


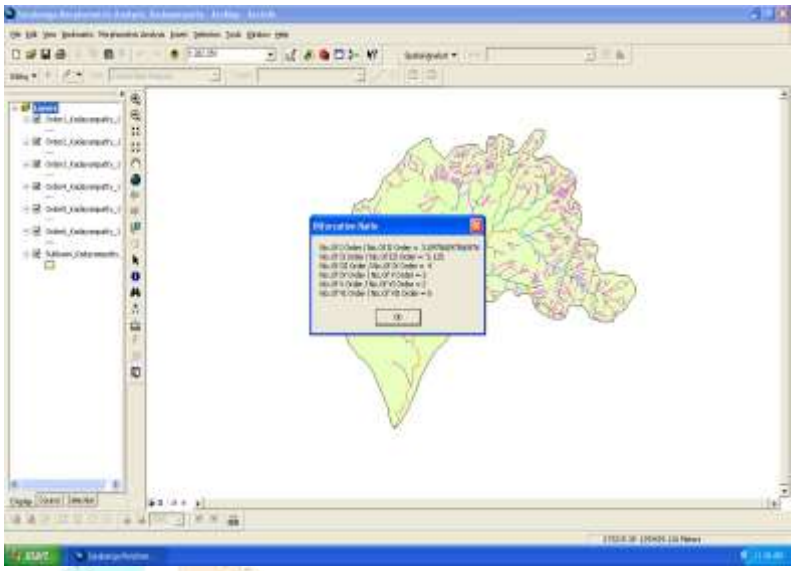


5.Bifurcation Ratio

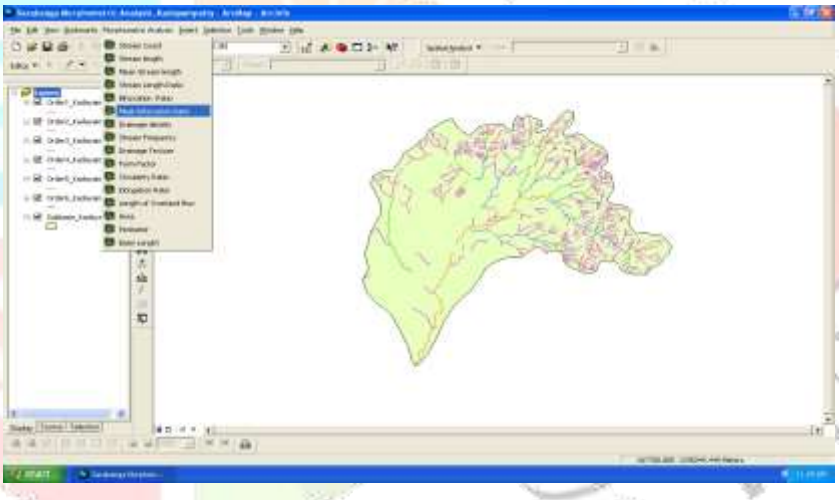


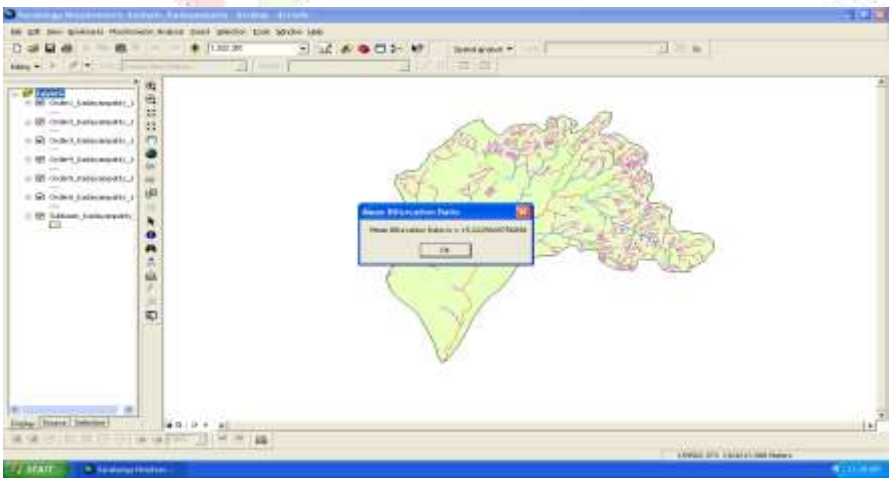
6.Mean bifurcation Ratio



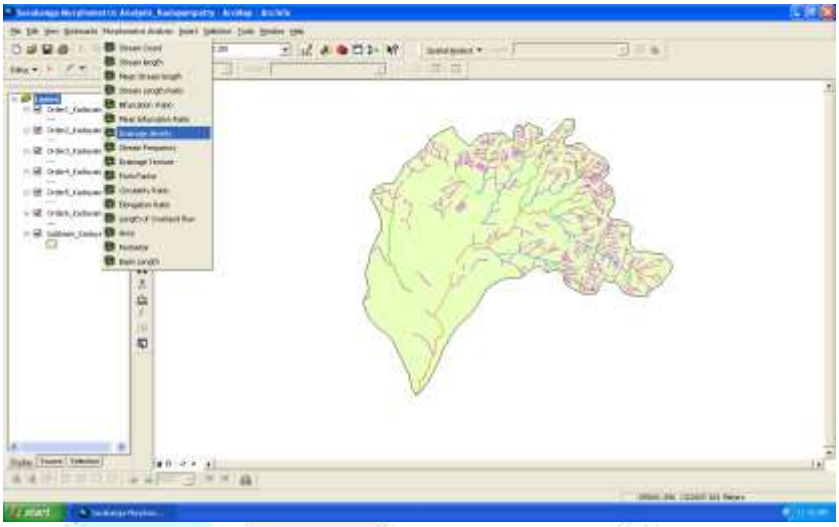


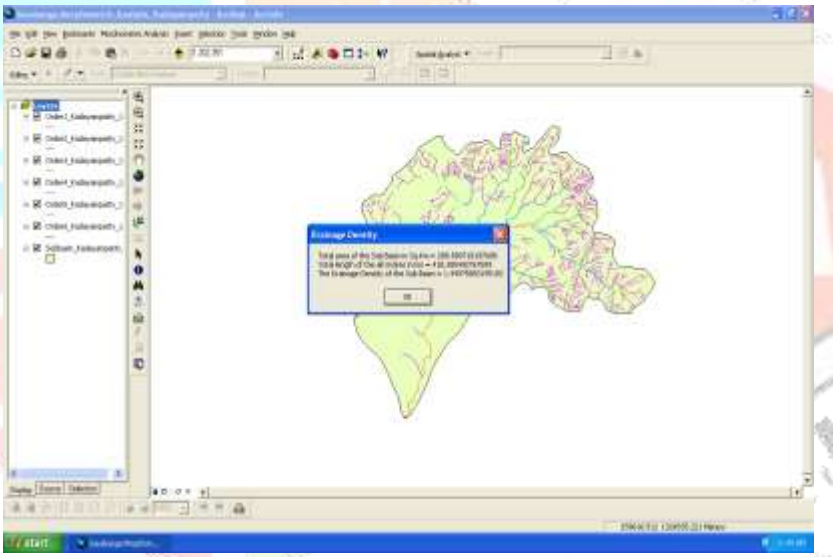
7.Drainage density



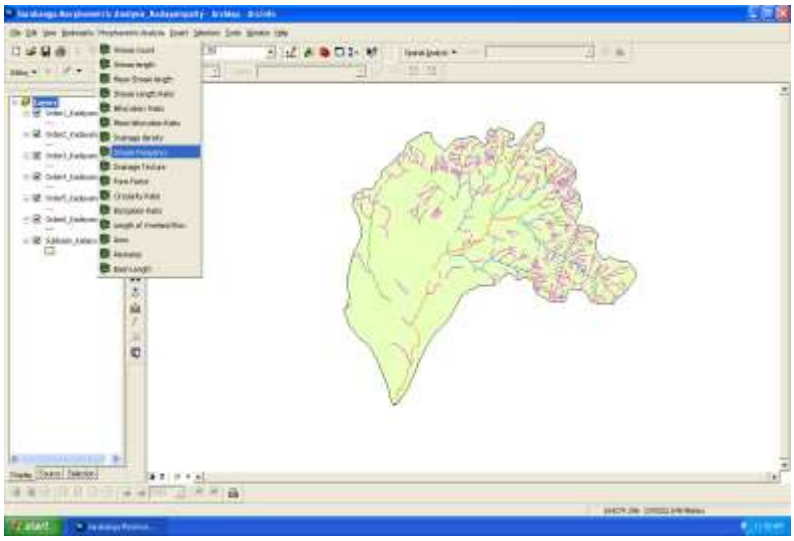


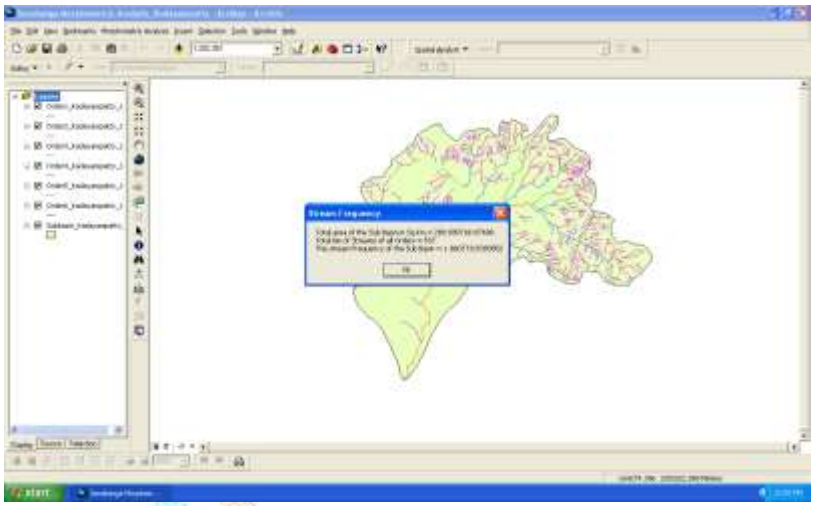
8.Stream Frequency



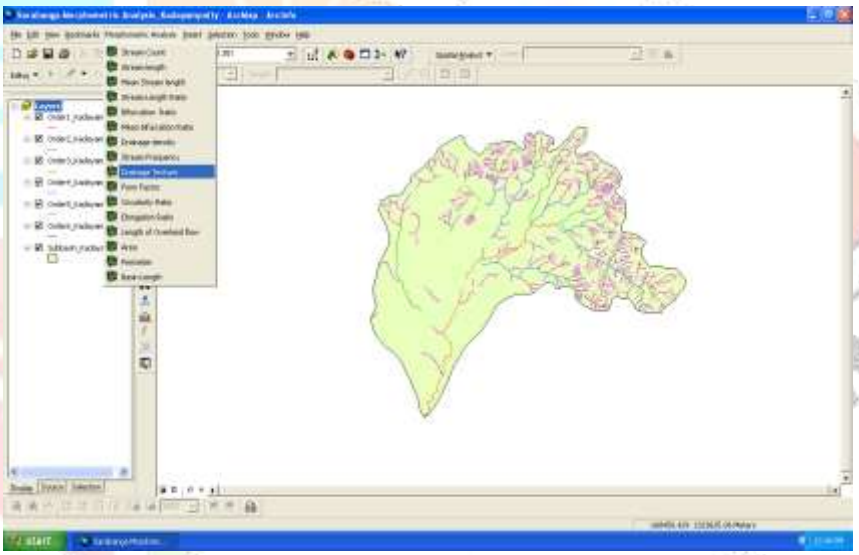


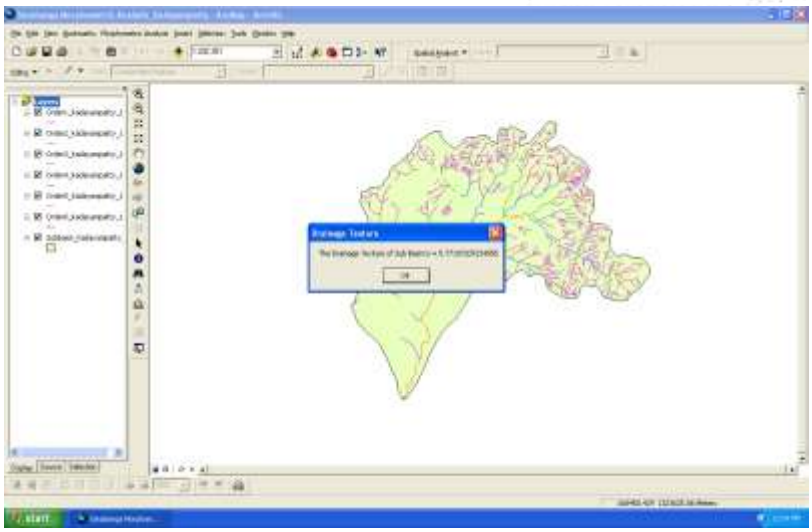
9.Drainage Texture



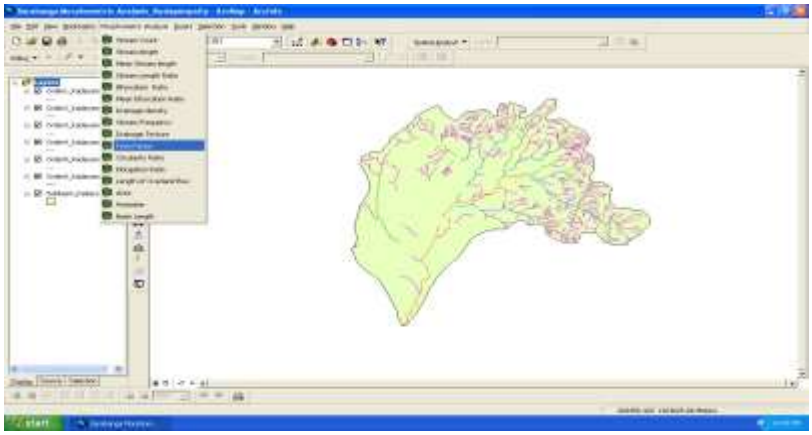


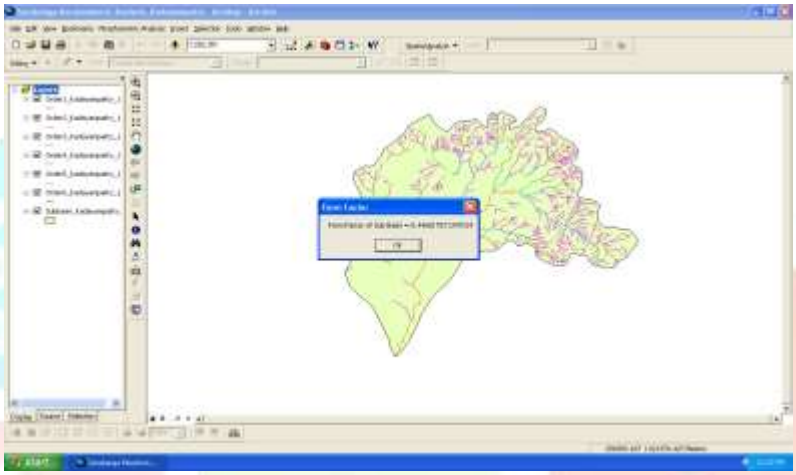
10.Form Factor



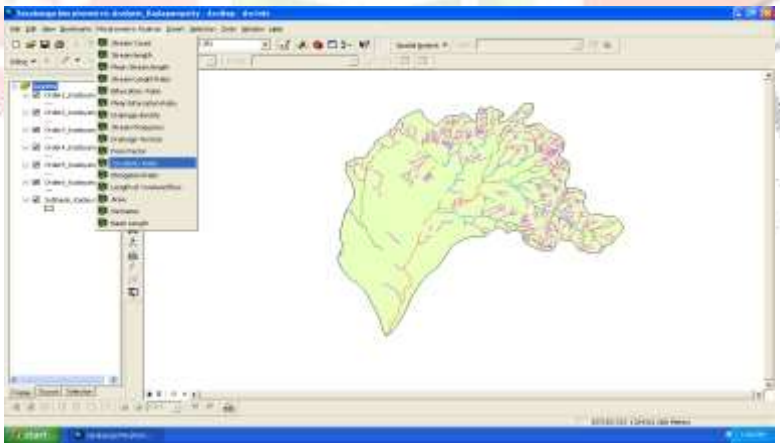


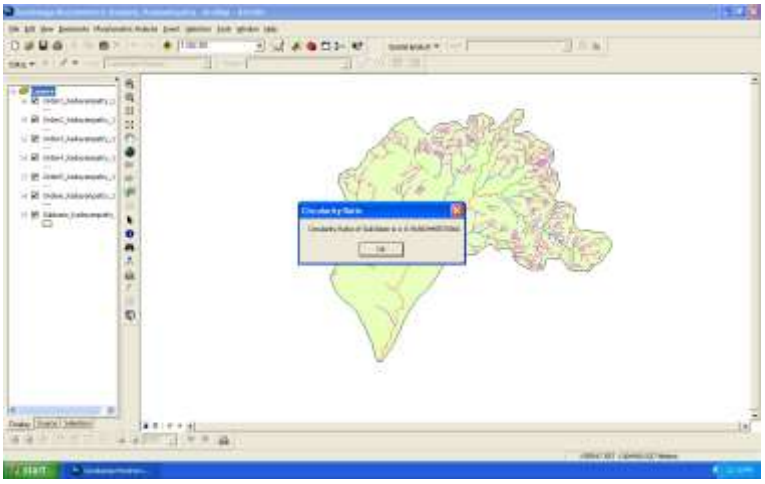
11.Circularity Ratio



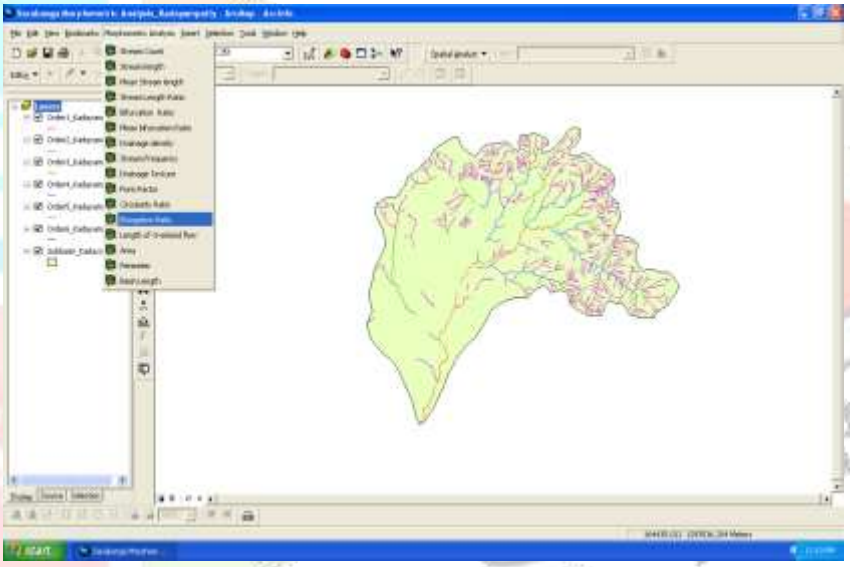


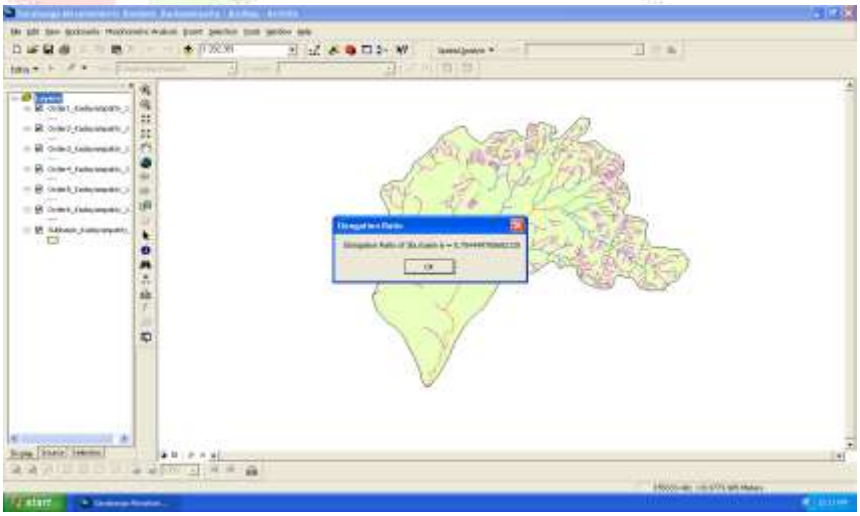
12.Elongation Ratio



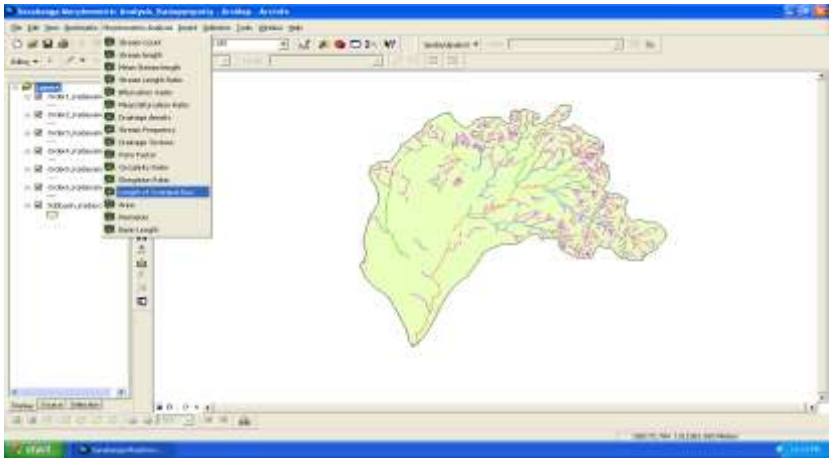


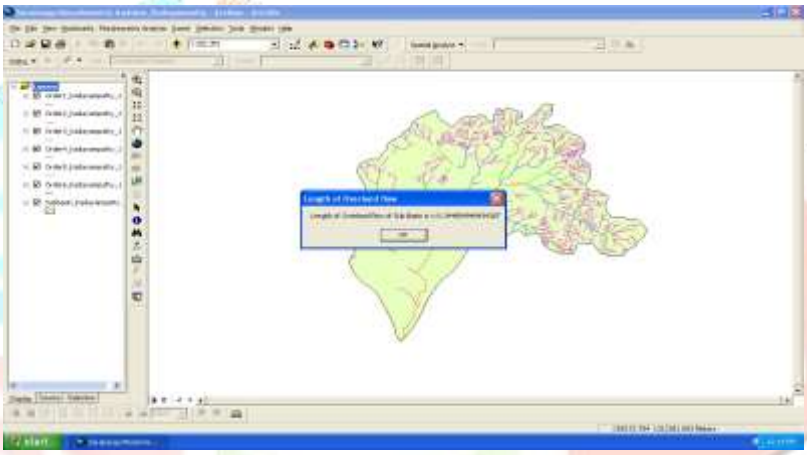
13.Length of Overland flow



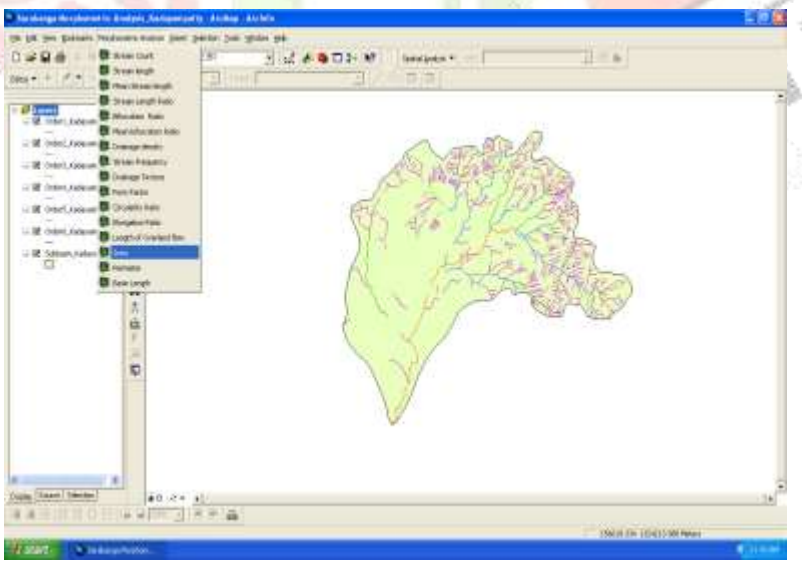


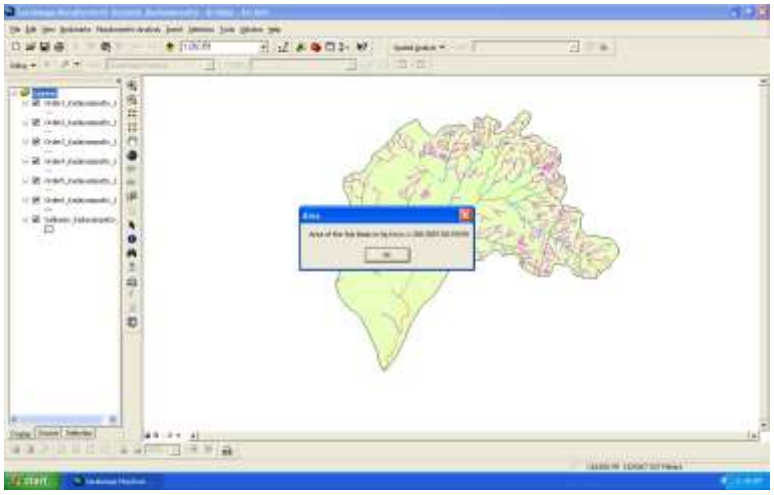
14.Area



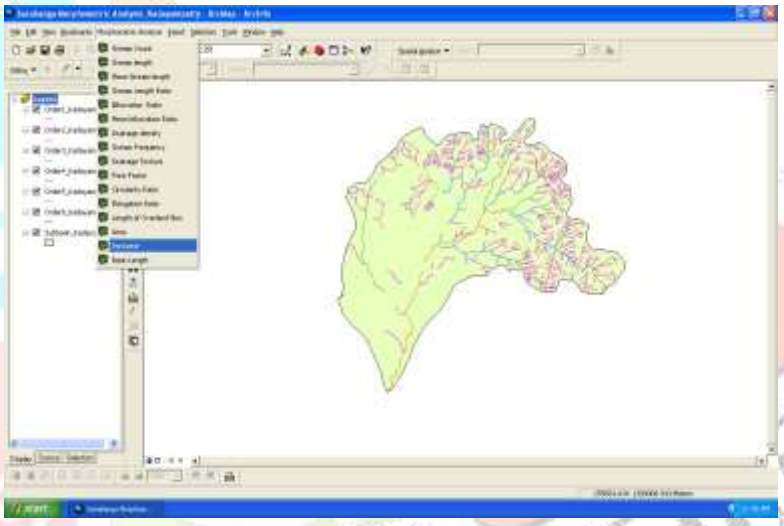


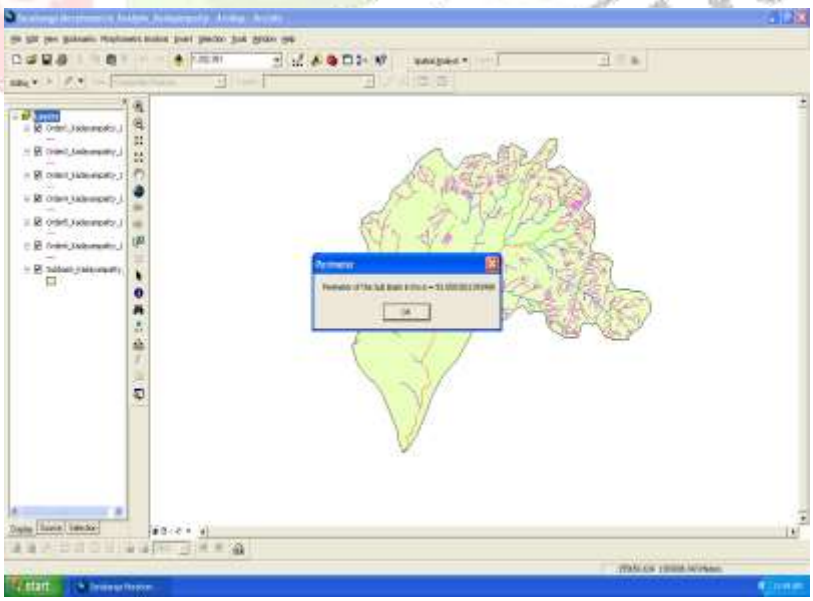
15.Perimeter





16.Basin Length





VII. RESULT AND CONCLUSION

The various Thematic maps are prepared through remote sensing and GIS in the scale of 1:50000 like Geomorphology, soil, drainage, geology, Lineament.The pediment forming 50% in the Kadayampatty, Mecheri, Tharamangalam, Virapandi , Thoppur and Residual Hill covered by SE, SW, and NW of the study area. Their contributes 75% of the total area and the remaining portion is occupied by valley Fill, Bajada Zone, Hill Top Pediment, Shallow Buried Pediment so on.The totally 93 lineaments present in the area of investigation. The prominent direction of the lineaments in NNE to SSW and NNW to SSE. The major trend line towards on the NNE to SSW. The major land uses are dry crop, wet crop, plantation, degraded forest land, water body and remaining are barren land, settlement and transport.The drainage density varies between 0.83 and 1.86 indicating low drainage density. In the study area, the low drainage density indicates the region has highly permeable subsoil and thick vegetative cover.

The form factor for Muthunaickenpatti, Idappadi and Kadayampatti subbasin shows elongated and flatten peak flow for longer duration; Jalakandapuram and Mecheri shows high form factors which is of in circular form having high peak flows for shorter duration.Circulatory Ratio ranges from 0.34 to 0.58 which categories as circular basins. The Re of sub-basins of the study area varies from 0.62 to 0.81. Morphometric parameters are calculated in visual Basic programming language and the concerned results are tabulated respectively to their aspects have been discussed. Further customization was carried out based on the needs of the project, so finally the calculation and the respective spatial features are displayed in the same VB from to produce the output.Based on the morphometric anlaysis the subbasin can be easily managed in flood period, because the subbasins are in elongated forms. These are due to highly weathered and minimum structured disturbances. Except Muthunaickenpatty and part of Kadayampatty subbasin all other basin and having vegetative cover and settlements. More checkdams may be constructed to store the precipitated water, for the use of agriculture, settlement and for high yield of groundwater potentials even in dry area.

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