# SOIL QUALITY INDEX FOR RICE USING GIS

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- Rice is staple food for nearly half of the world's population and major daily source of calories
- Rice ranks second in agricultural production in most Asian countries
- In India, Rice area- 43 m.ha ; Production – 105 m.t (DES, 2012)
- Almost many regions are suitable to rice cultivation in India, still they are not producing the achievable yield.
- Efficient management of natural resources is essential for ensuring sustainability in rice production
- Continuous cultivation of rice in the same fields without assessing the soil quality is one of the factors influencing productivity

- In agricultural context, the soil quality is aimed at maximizing production without adversely affecting the environment.
- Potential physical, chemical and biological indicators with minimum data sets are suggested to evaluate soil quality
- There is no single correct indicator or index value because of inherent differences among soils, crops and climates (Sojka *et al*., 2003)
- Soils are spatially variable and Geographical Information System(GIS) is useful for management and analysis of this variability.
- In this study, physical parameters of soils were used to assess soil quality.

Sojka, R.E., D.R. Upchurch and N.E. Borlaug, 2003. Quality soil management or soil quality management: Performance varsus semantics. Adv. Agron., 79: 1-68.

- Soil quality assessment framework is based on 5 physical parameters

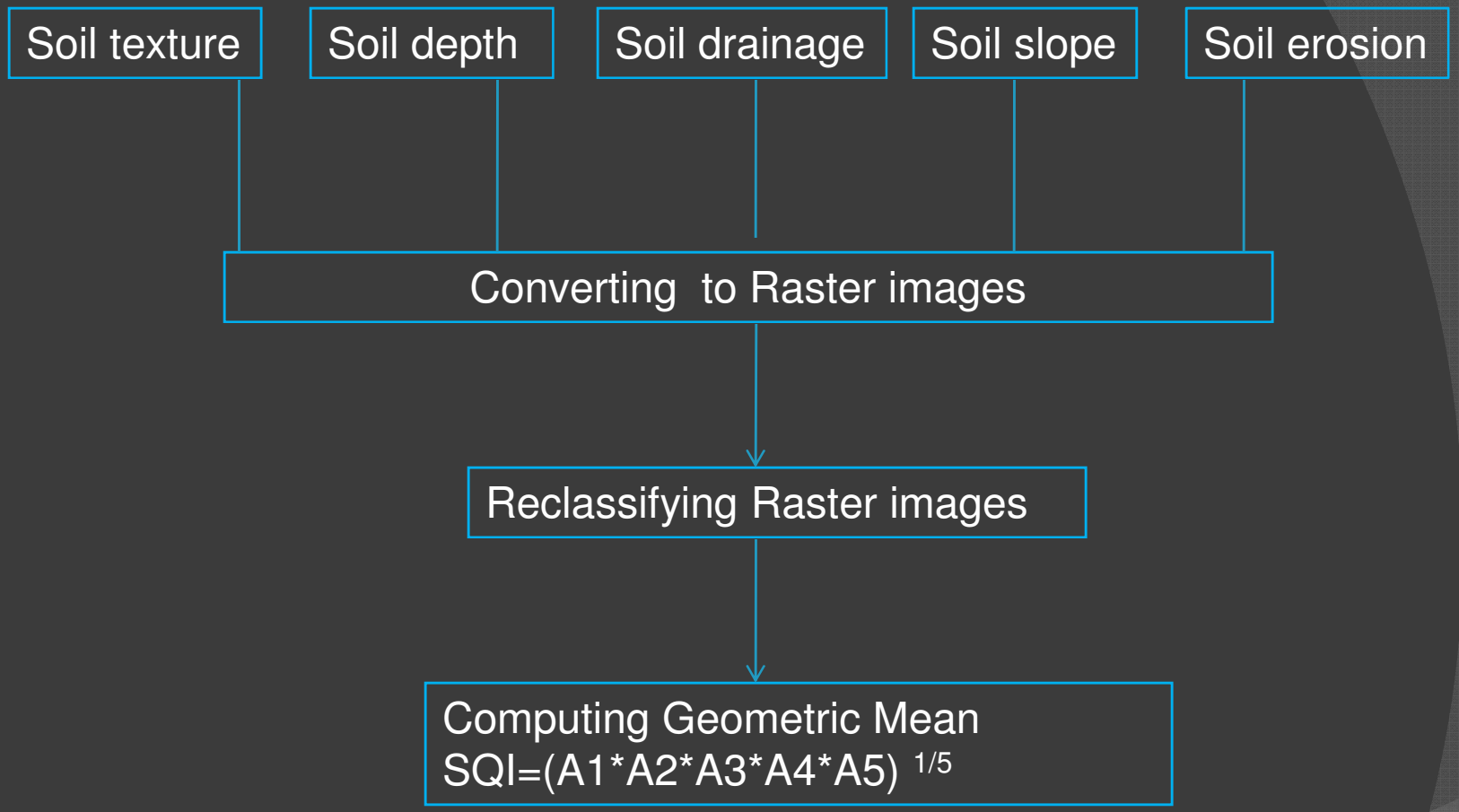
  a)Soil type, b)Soil depth, c)Soil drainage, d)Soil slope, e)Soil Erosion

- Assigned quality indicators based on a quality rating (Ochela and Kerkides, 2014) to each of the attributes(Table 1)
- Soil quality index has been calculated using Geometric mean of the attributes(Fig. 1)

W.O.Ochola, P.Kerkides, (2004), An Integrated indicators-based spatial decision supports system for land qualit y assessment in Kenya, Computers and Electronics in Agriculture 45(2004) 3 -26

Table 1 **:** Soil quality indicators (Indicator – 0, for Water body).

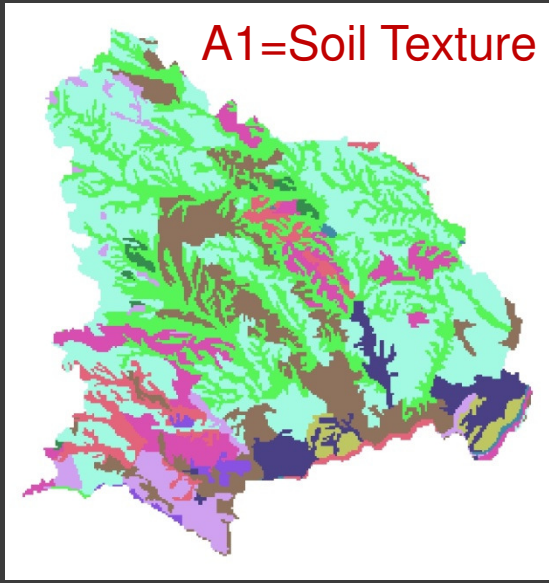
| **Soil attribute** | **Indicators** | | | | |
|---|---|---|---|---|---|
| | Very Low(1) | Low(2) | Moderate(3) | High(4) | Very High(5) |
| Texture | Clay, Cracking Clay Calcareous, Clay Calcareous ,Cracking Clay. | Gravally Clay | Loam Calcarious, Gravally Loam Calcarious. | Loam, Gravelly loam. | |
| Depth | 10-25cm | 25-50 cm | 50-75 cm | 75-100 cm 100-150 cm | >150 cm |
| Slope | | 15-30% Moderate Steep slopping | 8-15% Moderate Slopping | 1-8% Very gentle | 0-1% Level |
| Drainage | Poorly drained | Excessively Drained | Well drained | Moderately poor drained | Somewhat excessive, Moderately Well drained |
| Erosion | Severe Erosion | M oderate Erosion | Nil/Slight Erosion | | |

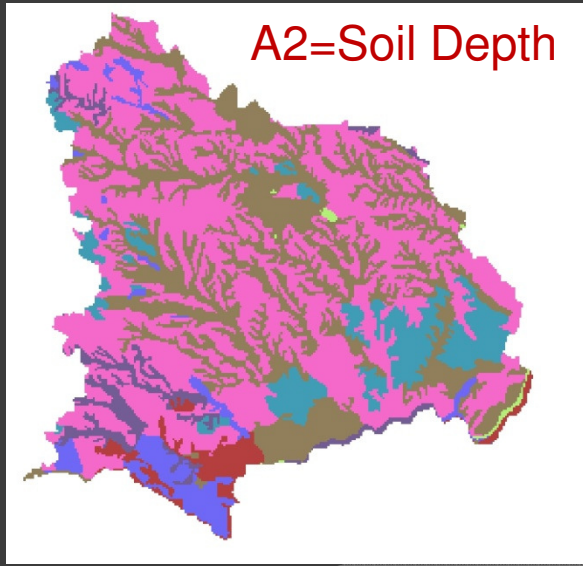


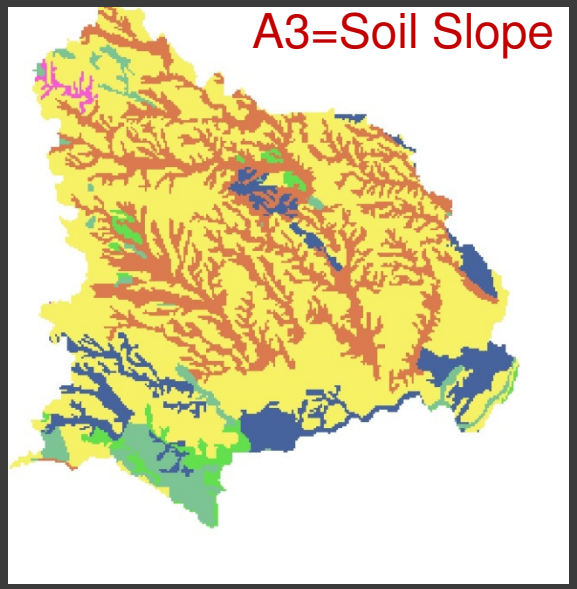

A1=Soil Texture; A2=Soil Depth;A3= Soil Drainage;A4=Soil Slope;A5=Erosion Status

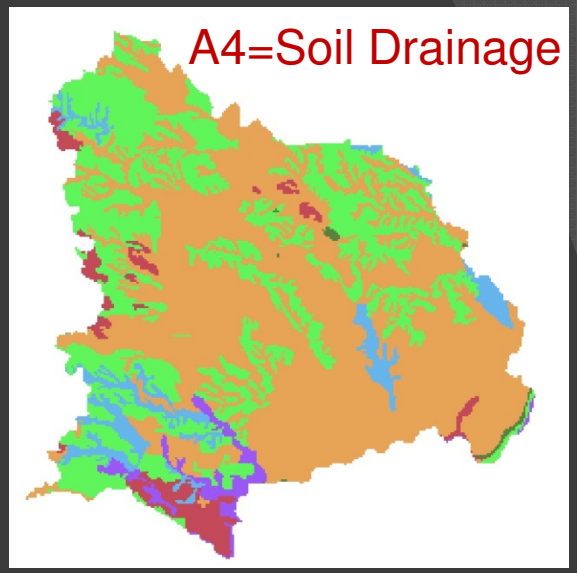
Figure 1 **:** Schematic representation of computation of soil quality index

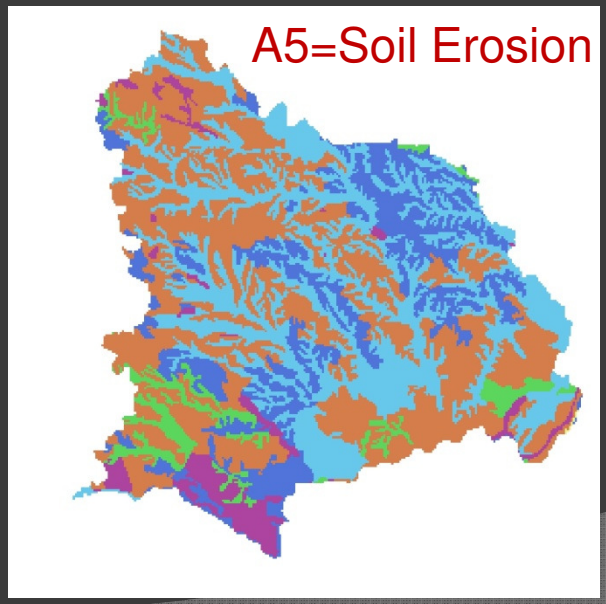
- Study area -Nalgonda district, Telangana, India
- Input datasets used for Soil type, Soil depth, Soil drainage, slope, and Soil erosion status -the soil map of Nalgonda District from National Bureau of Soil Survey & Land Use Planning (NBSSLUP) .
- ArcGIS software was used for this analysis.



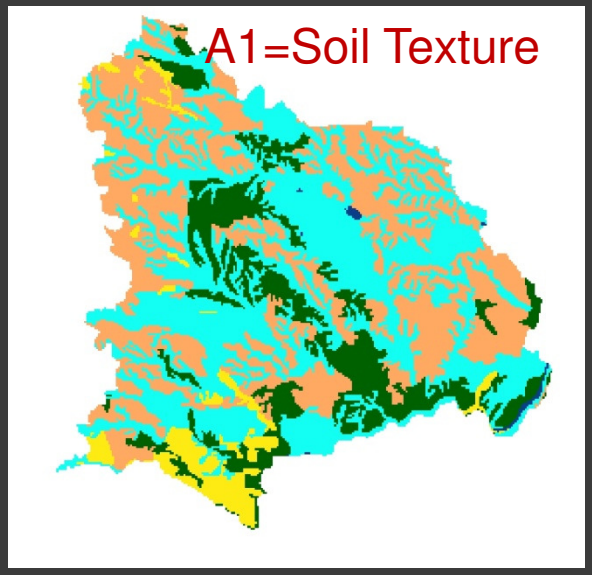



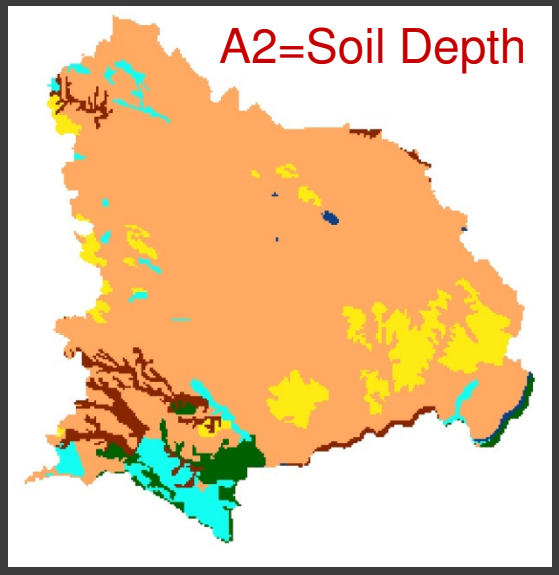

A3=Soil Slope

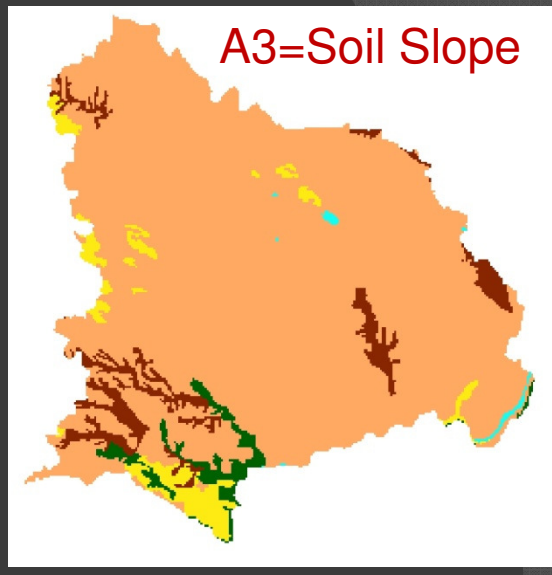

A4=Soil Drainage

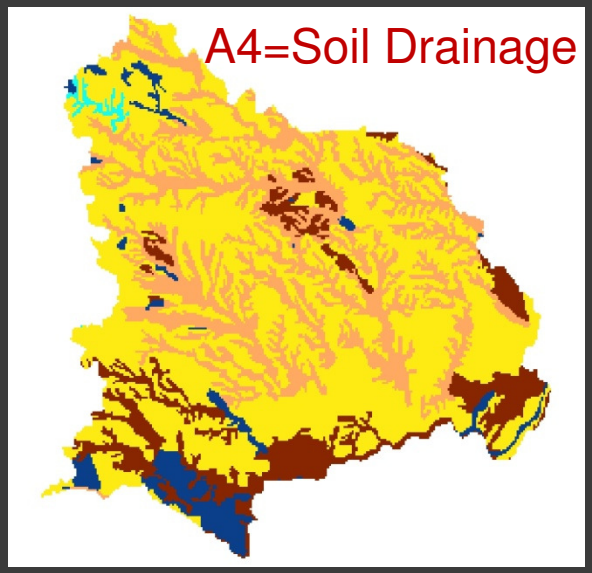

A5=Soil Erosion

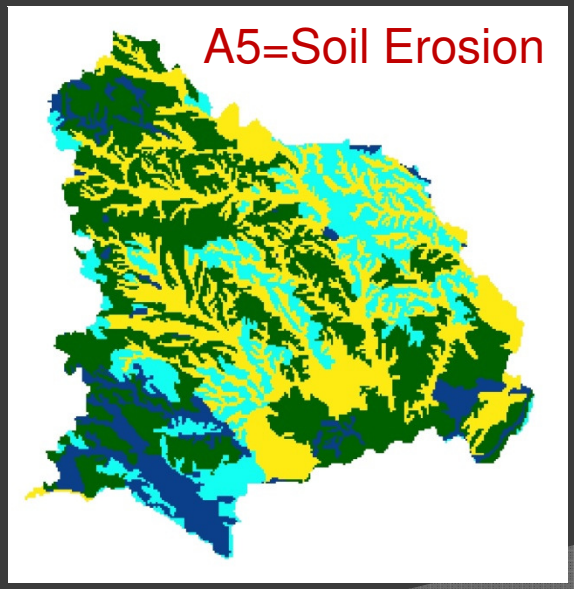
## Reclassified Images

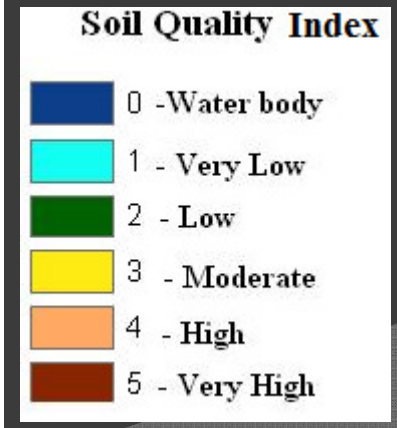


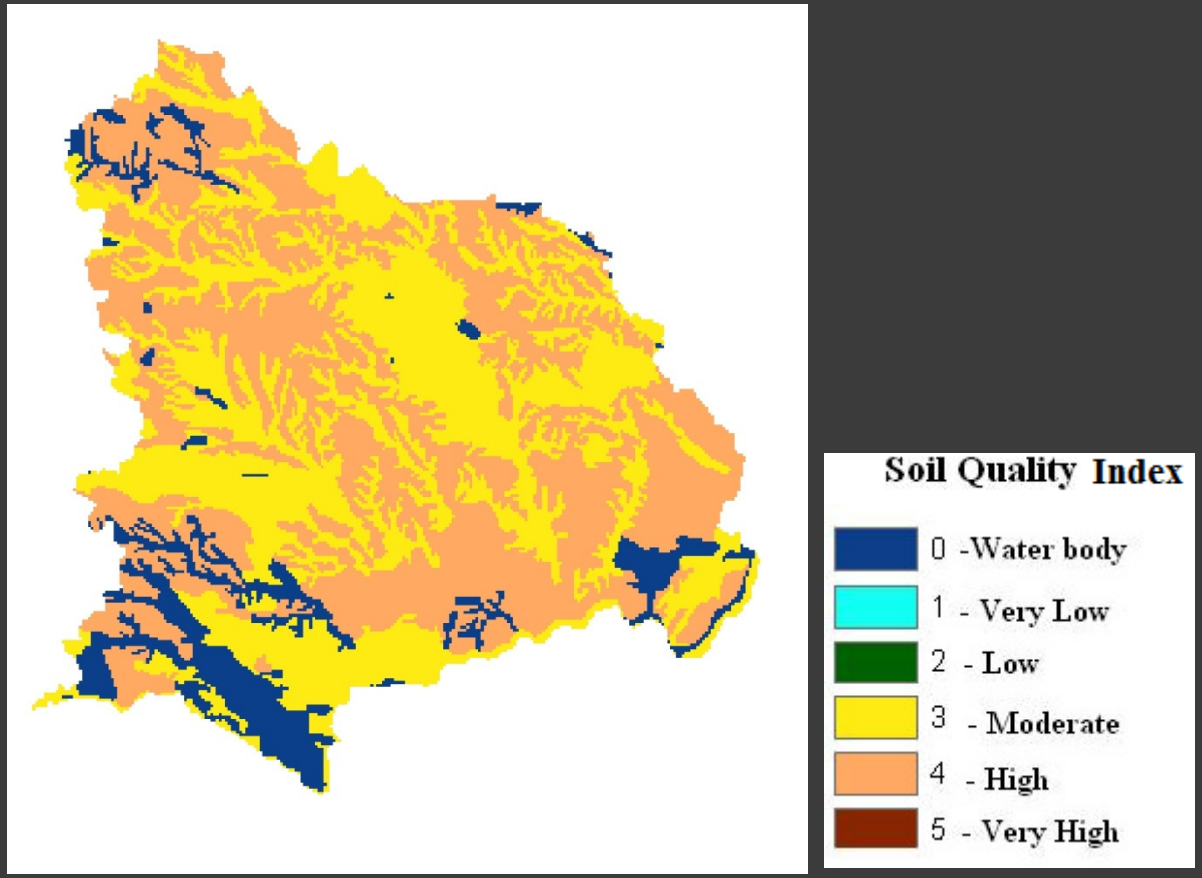



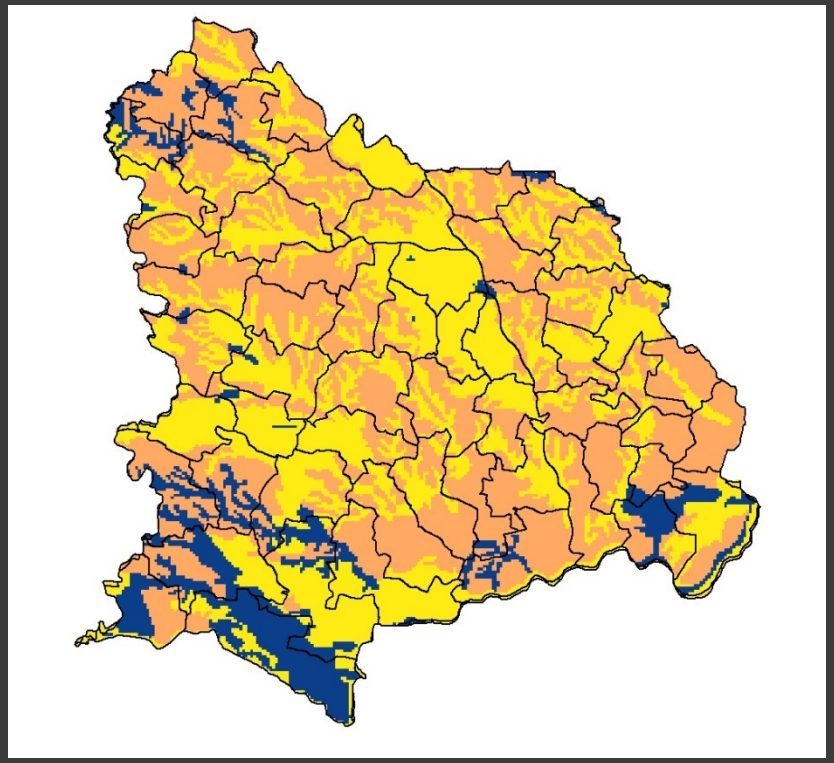
# Soil Quality Index- Nalgonda district

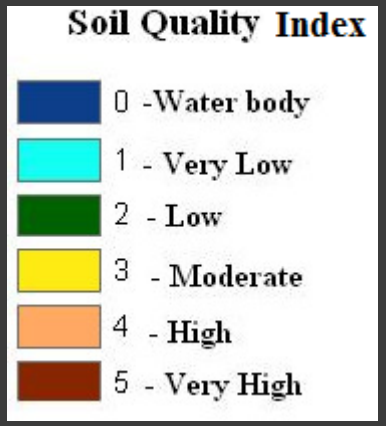



Nalgonda Mandal Map

| | | | |
|---|---|---|---|
| 1 | Bommalaramaram | 32 | Vemulapalle |
| 2 | M Turkapalle | 33 | Thipparthi |
| 3 | Rajapet | 34 | Nalgonda |
| 4 | Yadagirigutta | 35 | Munugode |
| 5 | Alair | 36 | Narayanapur |
| 6 | Gundala | 37 | Marri Guda |
| 7 | Thirumalagiri | 38 | Chandur |
| 8 | Thunga Thurthi | 39 | Kangal |
| 9 | Nuthankal | 40 | Nidamanur |
| 10 | Atmakur (S) | 41 | Thripuraram |
| 11 | Jaji Reddi Gudem | 42 | Miryalaguda |
| 12 | Saligouraram | 43 | Garide Palle |
| 13 | Mothkur | 44 | Chilkur |
| 14 | Atmakur (M) | 45 | Kodad |
| 15 | Valigonda | 46 | Mellachervu |
| 16 | Bhuvanagiri | 47 | Huzurnagar |
| 17 | Bibinagar | 48 | Mattampalle |
| 18 | Pochampalle | 49 | Nered Cherla |
| 19 | Choutuppal | 50 | Dameracherla |
| 20 | Ramannapeta | 51 | Anumula |
| 21 | Chityala | 52 | Peddavura |
| 22 | Narketpalle | 53 | Pedda Adiserlapalle |
| 23 | Kattangoor | 54 | Gurrampode |
| 24 | Nakrekal | 55 | Nampalle |
| 25 | Kethepalle | 56 | Chintha Palle |
| 26 | Suryapet | 57 | Devarakonda |
| 27 | Chivvemla | 58 | Gundla Palle |
| 28 | Mothey | 59 | Chandam Pet |
| 29 | Nadigudem | | |
| 30 | Munagala | | |
| 31 | Penpahad | | |

# Overlay of Mandal map with Nalgonda SQI map





- This model will be further validated with the ground truth data.
- With analysis by Soil physical quality index , it is possible to assess land suitability with higher accuracy.
- Therefore, the present model will provide logical guidance for new land allocation for the cultivation of rice and potentially for other crops.

# Thank you all