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High- Resolution data for Land Use Land Cover Assessment in Salem Taluk, Salem District, South India

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ABSTRACT

The present land use land cover investigation made by using Recent and High resolution data IRS-Resource sat 2, L4FX. In this study proposes a 2014 land use land cover assessment of the study area. Based on land use land cover classification, the study area contains a seven type of classes. The Seven classes are Deciduous Forests, Build up/Mine area, Agriculture/ crop land areas, Evergreen and Semi evergreen forests, Cultivation and Plantation, Barren Land and Water bodies are occupying areas of 27%,18%,18%, 16%,15%, 6%, 0.4% respectively. Classified image was carried into accuracy assessment. The accuracy assessment gives a result of overall accuracy - 90%, Kappa Accuracy - 88%, Producer Accuracy - 90% and User Accuracy - 91%.

Introduction

The recent and high-resolution satellite data are very precious for strategic studies like Land use land cover, Geomorphology, Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI), etc., Mostly the high resolution data give accurate results. Land use land cover studies have very significant applications for current strategies for managing natural resources and monitoring environmental changes, and it is an active process of finding habitation on the bio-physical surfaces (Ravat et.al., (2013)). Appropriate Land use land cover data is important for urban planning and management (Zhixin Qi, et, al, (2012)). The advance development of geospatial technology helps an accurate assessment on Land use land cover change studies (Arulbalaji et.al. (2014)). Monitoring LULC change provides information to mitigate or minimize negative impacts (Danielle Jones. Et,al.,(2009)). Land cover is a basic variable that influences and connection with many parts of the human and physical environments (Giles Foody (2002)). The study area contains plenty of natural resources like magnesite deposits, magnetite deposits, Agriculture land and Forests. Land cover arrangement and alteration are significant factors that affect ecosystem condition and function (Ross Lunetta (2006)). High-quality and gap- free satellite time series are very essential for reliable spatial monitoring (Aleixandre Verger et.al. (2011)). Many developing countries like India have many crucial requires and objectives. It can be equally conflicting, and the use of resources can be competitive (Ranitha et.al.,(2007)). The main objective of the study is to create recent land use land cover map based on NRSC classification and assess the accuracy of the classified image using error matrix method and Kappa method. Accuracy of the map is very essential for finding and taking decision for during the assessments. The error matrix is the best method to find the accuracy of remote-sensing image classifications, like as LULC (Alexis Comber. Et, al.,(2012)). The accurate and timing information is very helpful to describing the nature and spatial resources (Fei Yuan, et.al.,(2005)).

Study Area

The present Land Use Land Cover study concentrates on the Salem Taluk at Salem District in South India. It is situated in Lattitude 11°39'52" and Longitude 78°8'45" and the total area covered by 542 Km^2. The study area is located at the centre to the Salem district and Nagaramalai hill, Kanjamalai Hills, Godumalai Hills are located within the study area. The average elevation is 278m(912ft). The following image representing the basic information of study area (Fig.1).

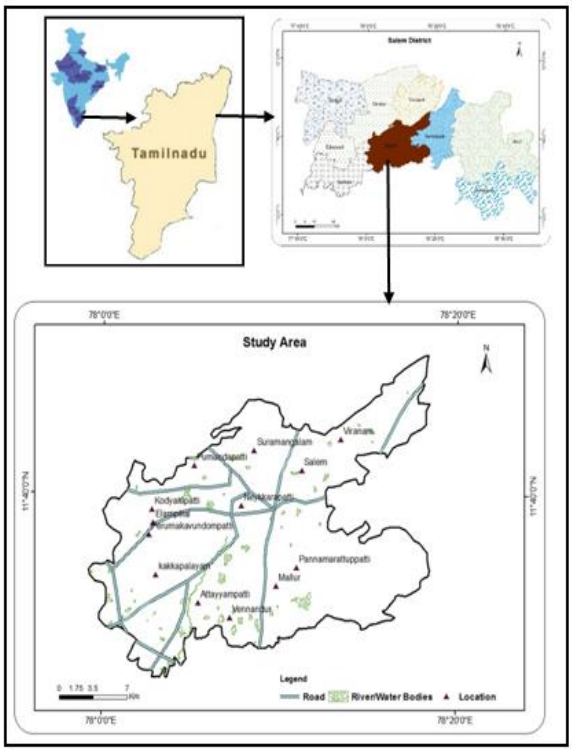


Fig 1

Materials and Data Used

Survey of India Toposheet- 1:50,000 scale,(1972-74) The High resolution remotely sensed data were purchased from NRSC, Hyderabad.

Satellite ID: IRS Resourcesat-2

Sensor: L4FX

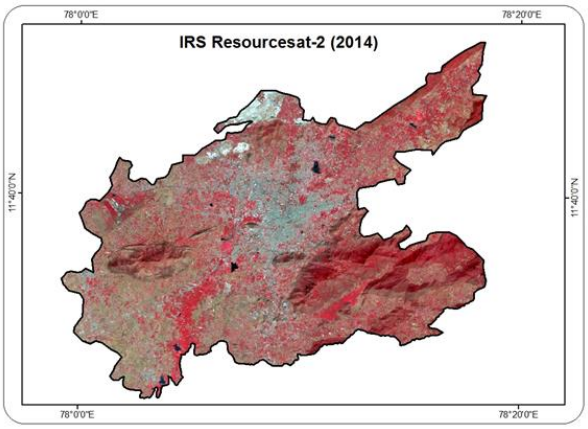
Spatial Resolution: 5.8 m

DOP: 14-Jan-2014.

Gen.Time: 25-march-2014.

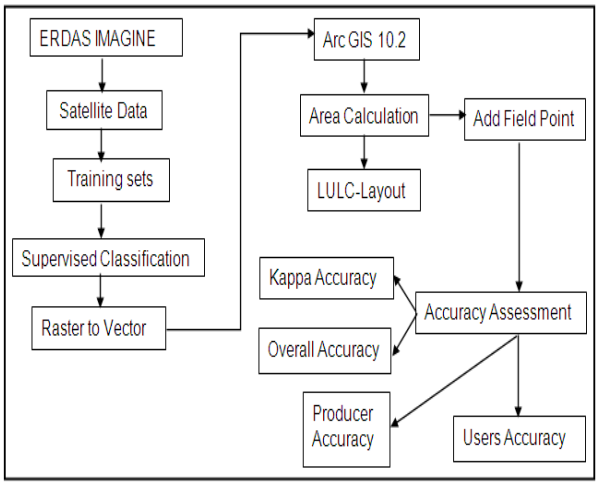
Tele:

E-mail addresses: arulbalajigeo@gmail.com



Methodology

The following flow chart is representing the different methods were used in this study.



Results and Discussion

The LU/LC map was prepared based on maximum likelihood classification method in supervised classification using ERDAS IMAGINE software. The classified image is showing the different land use land cover classes like Water bodies, Evergreen and Semi-Evergreen Forests, Deciduous Forests, Cultivation and Plantation, Build up and Mine area, Barren Land and Agriculture / Crop land. Among these classes, the Deciduous Forests is mostly occupying the study area. In this study, area has very less percentage of water bodies. Other classes are commonly found within the study area. The following table-1 and chart-1 are depicting the statistics of Land use land cover classification.

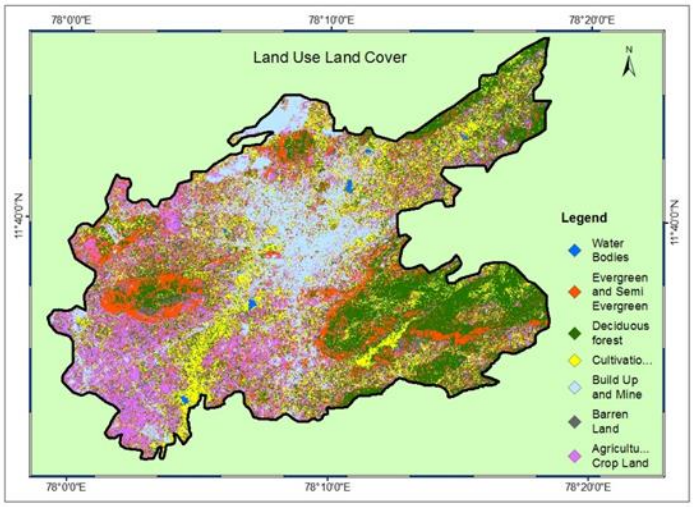


Fig 2

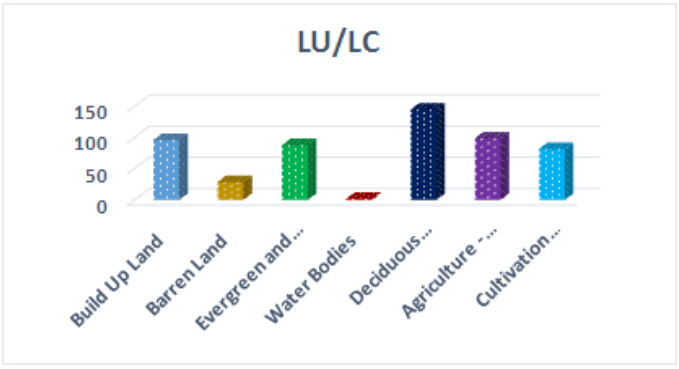


Chart 1

Accuracy Assessment

Evaluation of the quality as a classification result is very important in remote sensing, and it gives evidence of the classifier to extracting the objects from the image (Rejaur Rahman et.al.,(2008). The quality of LULC map prepared by using error matrix method (Kiptala et.al.,(2013)). Ground truth point has applied to the accuracy assessment. An error matrix statistics report on this study has given in the following table-2. The results are showing the overall accuracy- 90%, and the user (chart-2) and producer's accuracy (chart-3) are calculated for all the classes in LULC classification, and its overall percentage of user accuracy is 91%, overall percentage of producer accuracy is 90%. The kappa statistics are calculated by following procedure. The kappa co-efficient percentage is 88%.

$$K = \frac{N\sum_{i=1}^{r} Xii - \sum_{i=1}^{r}(xi + * x + i)}{N^2 - \sum_{i=1}^{r}(xi + * x + i)}$$

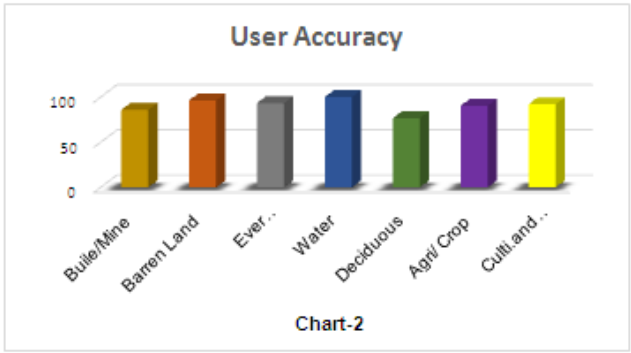


Chart-2

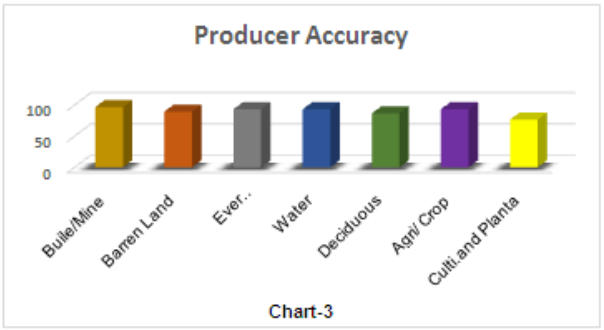


Chart-3

Conclusion

The results depicting that high-resolution satellite data classification can be used to produce accurate land use land cover maps and statistics. Based on the results deciduous forests and Evergreen/Semi-evergreen evergreen forests found in 145 Km^2 & 99 km^2 respectively, for the reason is Godumalai, Kanjamalai and Nagaramalai hill are located within the study area. Agriculture/ Crop land and cultivation / plantation occupied in 99 km^2 & 82 km^2 respectively, the main sources of water for agriculture to the study area depend upon the Cauvery River and Thirumanimutharu River. Especially Thirumanimutharu River is flowing through the study area.

Build up and mine areas are 97 km^2, because Tamil Nadu magnesite mine is occupying the study area and according to the 2011 census, the Salem taluk had a population of 1,274,432. These are main factor for 2014 LULC of the Salem Taluk.

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