

LAND USE MAPPING USING ETM+ DATA (CASE STUDY: CHAMESTAN AREA, IRAN)

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ABSTRACT:

Land use maps are useful tools for agricultural and natural resources studies as a base data. Due to dynamism of natural resources, updating these maps is essential. Employing traditional methods through aerial photos interpretation to produce such maps are costly and time consuming. Satellite data is suitable for such purpose, as a consequence of its fast repeatability, wide and unique view and availability of data from most part of electromagnetic spectrum. The present study is conducted to investigate the capability of ETM⁺ data on land use mapping of Chamestan region, Mazandaran, Iran. The studied area was 67000 ha. Image of 18th July, 2000 were registered to 1:25000 digital topographic maps. Images were enhanced using contrast enhancement, False Color Composite (FCC), Principal Component Analysis (PCA), Tasseled cap transformation and vegetation indices. The Optimized Index Factor (OIF) and correlation technique were employed to determine the best band sets for FCC and consequently for classification analysis. Unsupervised (clustering) and supervised (maximum likelihood, minimum distance and parallelepiped classifiers) classification methods were used. Finally Hierarchical method was applied to increase maps accuracies. The results showed that contrast enhancement, FCC, PCA and Tasseled cap have effective role in features enhancement. Using the best bands set (156H) caused to highest accuracy in classification. In supervise classification, overall accuracy and Kappa coefficient for maximum likelihood classifier were estimate 85,83% and 62,81% respectively, for minimum distance method 73,77% and 47,12% and for parallelepiped 34,27% and 19,03%. The highest overall accuracy and Kappa coefficient related Hierarchical method is 94% and 84.89%.

INTRODUCTION

Land use maps are useful tools for agricultural and natural resources studies as a base data. Due to dynamism of natural resources, land use map updating is essential. Traditional methods utilization through aerial photos interpretation to produce such maps is costly and time consuming. Satellite data is suitable for such purpose, as a consequence of its fast repeatability, wide and unique view and availability of data from most part of electromagnetic spectrum.

Land cover map of the tropical forest rehabilitation was produced applying NDVI to TM data (Apan et al 1997). Also land use map of Mouk area, Iran was produced using Landsat data and GIS (Alavipanah et al 2001). Gomarasca (1993) assessed land use changes in the metropolitan area of Milan (Italy) employing maximum likelihood classification of TM data, aerial photo and topographic maps. Zahedifard (2002) produced land use map of Bazoft area, Iran, by means of TM data. She used maximum likelihood, minimum distance and parallelepiped algorithms for supervised classification. In addition hybrid method and GIS was implemented to improve the classification accuracy.

MATERIAL AND METHODS

The studied area is located in Mazandaran province, northern Iran, between 36° 14' to 36° 30' Longitude and 52° 0' to 52° 15' Latitude. Mean annual precipitation is 1200mm. The studied area was about 67000ha. Landsat ETM⁺ images of 18th July, 2000 were georeferenced to 1:25000 digital topographic maps by nearest neighbor resampling algorithm and the RMSe was

less than one pixel. Images were enhanced using contrast enhancement, False Color Composite (FCC), Principal Component Analysis (PCA), Tasseled cap transformation and vegetation indices. The Optimized Index Factor (OIF) and correlation technique were employed to determine the best band sets for FCC image and consequently for classification analysis. Unsupervised (clustering) and supervised (maximum likelihood, minimum distance and parallelepiped classifiers) classification methods were used. Finally Hierarchical method was applied to increase maps accuracy.

Hierarchical method: Assessing the supervised classification results has proved the high spectral similarities between rangelands and dry farmlands. Where the rangelands are located in south and the wheat dry farmlands are located in the north part of the studied areas. This similarity causes a low accuracy on classification results. The below mentioned hierarchical method was used to solve this problem. First of all, the rangelands and the dry farms were masked, and they were classified separately. Then the rest of the image was classified to the other features such as forest, rice fields, urban area and etc. Finally the whole classified land uses were integrated to develop the final map. Ground truth points were produced through field surveying with GPS as well as using topographic maps.

RESULTS AND DISCUSSION

The Landsat ETM⁺ image was classified to the nine different land uses (Table 1).

causes dominance of background soil reflectance on reflectance of vegetation. On the other hand in wheat fields since July is the time that wheat has been harvested hence there is no green vegetation and the majority of reflectance related to soil, there is confusion between rangelands and wheat field's reflectance.

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