

DETECTION OF LAND USE AND LAND COVER CHANGES IN DIRAB REGION OF SAUDI ARABIA USING REMOTELY SENSED IMAGERIES

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ABSTRACT

Knowledge of Land Use and Land Cover (LULC) changes is important for many planning and management activities. It is thought to be an essential element for modeling and understanding the major land forms, especially in arid regions like Saudi Arabia. This study investigates the LULC changes in Dirab region of Saudi Arabia between 1980 and 2010, using Landsat TM/ETM+ images. After the geometric correction and radiometric normalization, multi-temporal image data sets were spectrally enhanced separately using Principal Component Analysis (PCA) and Tasseled Cap Transformation (TCT). Each image was then separately subjected to supervised classification and processed to identify and quantify LULC changes (vegetation, barren land and built-up area). Post Classification Comparison (PCC) method was adopted for LULC change detection. Change trajectories ("from-to" classes) and accuracy assessments were made by comparing the detected land use change layers with medium/high resolution images of Google Earth data base. The TCT enhanced procedure gave better identification of the changed areas than PCA based method. The overall accuracy of PCA based change detection was 64.58, 62.68 and 62.12% for 1980-1990, 1990-2000 and 2000-2010 images, respectively. However, the TCT based change detection resulted in higher accuracy of 77.78, 75.62 and 77.92% for 1980-1990, 1990-2000 and 2009-2010, respectively. The results suggested that significant land use changes occurred in Dirab area from 1980 to 2010, which may be related to rapid development of agriculture between 1980 and 2000 and economic development and urban expansion between 2000 and 2010. It was further noted that most changes occurred in cropland areas due to urban encroachment.

Keywords: Principal Component Analysis, Tasseled Cap Transformation, Temporal Changes, Post Classification Comparison, Saudi Arabia

1. INTRODUCTION

Information on land use/land cover change is essential for the selection, planning and implementation of land management schemes to meet the increasing demands for basic human needs and welfare (Reddy and Gebreselassie, 2011). Remotely sensed change detection based on multitemporal, multispectral and multisensor imagery provides this information (Singh, 1989; Othman *et al.*, 2013). LULC studies include, image enhancement, LULC

classification and change detection. Principal Component Analysis (PCA) and Tasseled Cap Transformation (TCT) are more commonly used image enhancement methods (Lu *et al.*, 2004). Principal Component Analysis (PCA) transforms a set of correlated image bands in to a new set of uncorrelated image bands that are ordered based on the amount of variance explained in the original data (Eastman and Fulk, 1993). PCA was used for LULC change studies from Landsat TM (Mather, 1999), SPOT (Carr and Matanawi, 1999), IKONOS (Bernardini *et al.*,

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