

## Assessment of Temporal Land Cover Changes in Saudi Arabia Using Remotely Sensed Data

<sup>1</sup>K.A. Al-Gaadi, <sup>2</sup>M.S. Samdani and <sup>2</sup>V.C. Patil

<sup>1</sup>Department of Agricultural Engineering, Precision Agriculture Research Chair, College of Food and Agriculture Sciences, King Saud University, Riyadh, Saudi Arabia

<sup>2</sup>Precision Agriculture Research Chair, College of Food and Agriculture Sciences, King Saud University, Riyadh, Saudi Arabia

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**Abstract:** The natural vegetation in desert environments is a precious resource. Space imagery can be very useful in monitoring the vegetation in a large country like Saudi Arabia. The goal of the study was to assess the temporal land cover changes from 1990 to 2006 and in-season changes in vegetation during the years 2000 and 2006, in Dirab region of Saudi Arabia. Landsat TM and ETM+ images were used for the study. Normalized Difference Vegetation Index (NDVI) supported by GIS (ArcMap) was employed to detect the land cover and vegetation changes. Results revealed significant changes in land cover and vegetation of the region during the study period. The mean NDVI values of the region ranged from 0.091728 during September 2000 to 0.462475 during January 2006. Similarly, the maximum NDVI of the region increased from +0.373933 in September 2000 to +0.995817 in January 2006. The in-season variations observed in vegetation of the region were mainly due to changes in agricultural crop cover. Such studies on temporal analysis of land cover changes can help in monitoring the pattern of land cover changes and in planning for attaining sustainability of land use pattern. The results could be integrated with socio-economic information to develop strategies for efficient utilization of available natural resources in the region.

**Key words:** Land Cover mapping • In-season vegetation changes • Landsat imagery • NDVI • Temporal changes

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### INTRODUCTION

The natural vegetation is of crucial importance to the stability of the fragile desert ecosystem of Saudi Arabia. Periodic monitoring of temporal land cover changes in such environments would help in effective management of the scarce natural resources. The expansions of urbanization, lack of planning and socio-economic factors determine land use and land cover changes [1]. The human activity and the environment are the interactive components, which affect land use and land cover changes [2]. Land degradation due to urbanization can be observed using remotely sensed data [3] at local, regional and global scales [4,5]. Recent developments in remote sensing coupled with availability of multi-temporal satellite images have provided a better opportunity to study and understand land cover changes in an effective

manner [6]. Studies on land cover changes have assumed greater importance in an era of rapid urbanization [7].

Temporal landsat images are very useful for assessing land use land cover changes and changes in vegetation [6-8]. The landsat imagery with coarse resolution are more effective in land cover mapping of larger areas [9] and can be used to provide a more meaningful linkage between surface energy fluxes and remotely sensed observations across multiple years [10]. Bagour *et al.* [11] used NDVI and PCA techniques to analyze AVHRR data for change detection of the vegetation cover in northeastern part of Saudi Arabia due to the Gulf war. Kelarestaghi, *et al.* [12] performed NDVI, PCA, tassell cap transformation and data fusion on Landsat ETM+ data for land use change detection. Time series data from Landsat images offer several unique advantages, such as coverage of larger area,

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**Corresponding Author:** K.A. Al-Gaadi, Department of Agricultural Engineering, Precision Agriculture Research Chair, College of Food and Agriculture Sciences, King Saud University, P.O. Box 2460, Riyadh 11451, Saudi Arabia, E-mail: kgaadi@ksu.edu.sa, Tel: +966(1) 4678396.