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ORIGINAL PAPER

GEOSCAPE

Multi-temporal monitoring of cotton growth through the vegetation profile classification for Tashkent province, Uzbekistan

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Abstract

As satellite data of the Earth surface seems to be of vital importance for many applications, classification of land use and land cover has been found to vary dramatically in different approaches. In this paper, modified classification algorithm of remote sensing data is presented for processing medium and high spatial resolution satellite images like Landsat and Sentinel in Tashkent province of Uzbekistan. The results of NDVI (Normalized difference vegetation index) profile analysis via Spectral Correlation Mapper classification are shown for the period 1994-2017. It is implied, that combination of optical and radar data with application of Spectral Correlation Mapper classification improve the results of classification for a specific dataset by considering such factors as overall classification accuracy and time and labor involved.

Highlights for public administration, management and planning:

- The Spectral correlation classification method of NDVI profiles is presented resulting in higher accuracy of cotton growth-related land use estimations.
- A change in agricultural land use of Uzbekistan since the 1990s was detected, in spite of the decreasing trend of cotton plantations after 2004.
- The presented approach may assist to reveal the effects of agricultural policies and environmental change on land use.

Keywords

Agriculture,
Land use classification,
Remote sensing,
NDVI profile,
Spectral correlation mapper,
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1 Introduction

History of the cotton production is quite long in Uzbekistan and its production and export is one of the leading branches of agriculture. If in Central Asia 2 million tons of cotton fiber are grown per year, 1.4 million of them are Uzbek fiber. Another name of cotton in Uzbekistan is “white gold”. Nowadays, cotton–wheat–rice or cotton-wheat crop rotations are the main crop system in Uzbekistan (Djanibekov et al. 2010). During the years of sovereign development in the republic, the task was set - to achieve grain independence. The structure of the acreage was changed, the farms gained autonomy and could themselves decide which crop to sow. In such conditions true understanding of the LULC spatiotemporal change process in Uzbekistan since 1991 is in importance (Kahriz et al. 2019).

Remote Sensing images in recent years became an indispensable tool in a variety of surface land use studies. According to some authors (Seto et al. 2002), land use and land cover are often used interchangeably, but the two concepts are not exactly the same. The latter measures the physical attributes or characteristics of the Earth’s surface, while the former describes how land cover is utilized. Remote Sensing (RS) detects land cover, not land use, though in most cases one can derive land use from land cover. RS change-detection studies use the two concepts interchangeably (e.g. Heikkonen & Varfis 1998; Muttitanon & Tripathi 2005) because land use often corresponds to land cover. For instance, in cultivated environments, cropland could describe land use type, while at the same time it is a form of land cover. In such scenarios, the two concepts could be considered as synonymous (Kiage et al. 2006). In this article the term land use will be used.