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# SPATIOTEMPORAL CHANGES IN COTTON GROWING AREAS IN XINJIANG (2000-2015)

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**Abstract**

Cotton planting is the important basis of local and national economic development. In this study, cotton growing areas were first regionalized according to environmental, social and economic conditions, and then an optimized model of extracting cotton growing area from MODIS data was constructed for each individual region. The method was used to map the cotton growing area in Xinjiang, over the past 16 years and to analyze the spatiotemporal changes in cotton growing area and the related environmental and socio-economic drivers behind these changes. The results show that: (1) the method of extracting cotton growing area has a high accuracy at a regional level with a determination coefficient $R^2$ of 0.983 for the linear correlation between the growing areas obtained from remote-sensing and statistical data; (2) the cotton growing area in Xinjiang showed an upward trend during the period of 2000 - 2015 with a major increase in southern Xinjiang, a substantial increase in the east, and a relatively smaller increase in the north; (3) the spatial pattern of change in cotton growing area in the southern Xinjiang Aksu and Kashi regions exhibited the most significant spatial expansion, followed by the Tacheng, and Bortala Mongol Autonomous Prefecture region in northern Xinjiang; and (4) from 2000 to 2013, the natural factors have little effect on cotton growing area changes. However, socio-economic factors, such as the agricultural output value, total power of agricultural machinery, and effective irrigation area, significantly affected the spatial and temporal changes in cotton growing area.

## Introduction

Cotton is one of the main economic crops in Xinjiang, China and its development plays an important strategic role in the economic development of Xinjiang (Muhammad *et al*. 2015). Rapid and accurate estimation of cotton growing area, as well as its spatiotemporal changes and drivers underlying changes, provides the basis for decision making and management in the agricultural production sector, government departments, agricultural insurance industry, and on the farm.

Remote sensing provides a quick and efficient tool to identify cotton growing area over large areas (Liu *et al*. 2015a, Liu *et al*. 2015b). Several remotely sensed data have been used to extract the cotton growing area. For instance, Landsat TM and CBERS-1 images were widely used to monitor cotton growing area in Xinjiang (Yang *et al*. 2003, Cao *et al*. 2004). Identification and area extraction of different cotton varieties from ASTER images (Liu *et al*. 2005) expands the data combination characteristics of the multi temporal HJ satellite to achieve the extraction of cotton growing area by removing interference (Wang *et al*. 2012). NOAA, AVHRR, and MODIS data have been applied in studies aimed at extracting large-scale crop growing areas (Hame 1997, Zou *et al*. 2007, Becker-Reshef *et al*. 2010, Franch *et al*. 2015). In recent years, MODIS data have been widely applied in the field of large-scale remote sensing monitoring of crops. With the help of MODIS data, the cotton area extraction model for Xinjiang was established to obtain the spatial

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