

# STUDY ON TOBACCO DISTRIBUTION PATTERN BASED ON REMOTE SENSING AND GIS METHODS IN HENAN PROVINCE, CHINA

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## 1. INTRODUCTION

Industry spatial agglomeration is a world-wide phenomenon. The industries with advantage of competition mostly are concentrated in a specific area. As the raw material of flue-cured tobacco industry, tobacco is the only economic crop which is intensive produced in China at present. Tobacco sown area is dispersed and the distribution characteristic varies significantly in different regions of China. The statistic data are used to analyze the regional specialization and agglomeration of tobacco planting industry, but the spatial pattern of tobacco sown area is always neglected. Study on region distribution situation of tobacco sown area using remote sensing and GIS method, could not only offer the present spatial distributional situation and development potential of tobacco industry, but also provide the strong technical support for the reasonable planning and optimization of tobacco planting industry.

## 2. ANALYTICAL PROCEDURE AND METHOD

As one of the important tobacco production area in China, Henan province has a whole tobacco sown area of about 1.65 million acres, and is the third tobacco production province in China. The fields of tobacco widely scatter in 63 counties. The wide and dispersed distribution situation is representative in China. So Henan province is chosen as the study area, the distribution pattern of tobacco sown area has been researched with RS and GIS method.

While the growth period of tobacco is short and it is grown widely and dispersedly in Henan province. For a long time, it is hard to monitor the tobacco sown area and its growth condition by remote sensing method. The Beijing-1 Micro-satellite (High performance earth observation Micro-satellites, DMC+4) owns high spatial resolution and very short return cycle, and the field angle is very large. All of these characteristics provide a new opportunity for monitoring tobacco sown area. So according to the analysis of phenology characters of crops, the tobacco sown area and its growing condition was monitored using two-temporal data, which were in Jan and June 2008 respectively. The field validation showed that the accuracy could reached 86% [1].

Then the tobacco sown area of each county was calculated and tobacco patch was derived using ARCGIS 9.0. According to the result, the regional Geordie coefficient which indicates industry agglomeration distribution status is studied. A tobacco planting industry location quotient for each county in Henna province is calculated as follows:

$$LQ_{ir} = \frac{Y_{ir}/Y_r}{Y_r/Y} \quad (1)$$

Where  $Y_r$  is the monitoring flue-cured tobacco sown area in county  $r$ ,  $Y_r$  is the total sown area of crops in county  $r$ ,  $Y$  is the total sown area of crops in the whole province. The bigger the location quotient, the higher degree of the tobacco industry specialization in the county.

The Gini coefficient of tobacco planting industry in Henan province is calculated as follows:

$$G_i = \frac{\sum_{i=1}^n \sum_{j=1}^n |LQ_i - LQ_j|}{2n(n-1)\mu} \quad (2)$$

Where  $LQ_i$  and  $LQ_j$  are respectively the location quotients of tobacco planting industry of county  $i$  and  $j$ ,  $\mu$  is the mean of  $LQ$  of all tobacco planting counties. The low Gini coefficient indicates the ability of industry agglomeration weaker, while the high Gini coefficient indicates the stronger industry agglomeration ability.

Tobacco fields distribution pattern index such as spatial fragmentation of each county is also calculated using spatial analysis method. The relationship between spatial distribution pattern index and the regional Geordie or Gini coefficient in each county is also studied. The county owns high fragmentation index, its regional Geordie coefficient is always very low.

### 3. CONCLUSION AND DISCUSSION

The study showed that tobacco production in Henan Province had significant geographical differences, in the western of Henan, Sanmenxia and Luoyang were the comparative advantages of tobacco production area. The aggregation level of tobacco production in Henan province was high, the regional Geordie coefficient reached 0.61, the main aggregate region included Lushi country and the other 9 countries, while other regional were dispersion. But the fragmentation index of tobacco distribution in the whole province was also high, only two or three counties were excepted. The lower the fragmentation index is, the higher the regional Geordie coefficient is. Therefore the tobacco sown area of the 10 countries should be stable and enlarge, in order to implement the higher intensive and specialization production.

### 4. REFERENCE

- [1] D. Wu, F. Li, W. Fan, et al., "Monitoring Tobacco Sown Area Based on Multi-temporal DMC+4 Images," DMC+4 application seminar, in press, 2008.
- [2] Q. Liang, Industrial agglomeration theory [M], Beijing: the commercial press, 2004.
- [3] X. Li, J. Zhou, M. Deng, "Studies on comparative advantage of flue-cured tobacco production of different cities of Henan province", China tobacco journal, 2007.
- [4] C. Zhao, Z Nan, G Cheng, "GIS-assisted modeling of the spatial distribution of Qinghai spruce (*Picea crassifolia*) in the Qilian Mountains, northwestern China", Geoscience and Remote Sensing Symposium, Volume 1: 534-537, 2005.
- [5] B. Kuijpers, A Vaisman, "A Data Model for Moving Objects Supporting Aggregation", Data Engineering Workshop, 546-554, 2007.