EXTRACTION OF REMOTE SENSING INFORMATION OF BANANA UNDER SUPPORT OF 3S TECHNOLOGY IN GUANGXI PROVINCE

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Abstract: This paper presents an automatic approach to planting areas extraction for mixed vegetation and hilly region, more cloud using moderate spatial resolution and high temporal resolution MODIS data around Guangxi province, south of China. According to banana growth lasting more 9 to 11 months, and the areas are reduced during crush season, the Maximum likelihood was used to extract the information of banana planting and their spatial distribution through the calculation of multiple-phase MODIS-NDVI in Guangxi and stylebook training regions of banana of being selected by GPS. Compared with the large and little regions of banana planting in monitoring image and the investigation of on the spot with GPS, the resolute shows that the banana planting information in remote sensing image are true. In this research, multiple-phase MODIS data were received during banana main growing season and preprocessed; NDVI temporal profiles of banana were generated; models for planting areas extraction were developed based on the analysis of temporal NDVI curves; and spatial distribution map of planting areas of banana in Guangxi in 2006 were created. The study suggests that it is possible to extract planting areas automatically from MODIS data for large areas.

Keywords: MODIS, 3S technology, banana, remote sensing information extraction

1. INTRODUCTION

Banana is a monocotyledon which belongs to Musaceae from Musa. It is one of the four most famous fruits in the world. It has high yield, quick product, tastes good and crisp and rich nutrition. The banana output in china rank third in the world, and the planting area reached 80,000Ha in 2007. It is the second place in Chinese. Guangxi located in the area of low latitude (20o-27o) complicated geographic environment. Meteorological disaster such as frost injury, cold wave and drought could seriously affect banana production, especially in 2008. The most continuously lower temperature, rainy and snowy, freeze injury weather took place from on Jan 12th to Feb 12th in the southern of China. The disaster occurs once in fifty years. Banana and other sub-tropic crops were suffered injury severity. However, due to the laggard monitoring method and monitoring means, disaster loss evaluation had not been exactitude evaluated till on Apr 1st , 2008. The exactly and quickly evaluating disaster losing have become a focus issue for government .Planting spatial distribution information is key factor in quickly disaster losing evaluation. With the development of satellite remote sensing technology, extraction of remote sensing information of banana planting spatial distribution by using "3S" technology has become reality.

Guangxi Province is the second biggest region of banana planting in China. Taking banana planting of Guangxi Province as example, the article try to use MODIS data for extraction of remote sensing information of banana planting spatial distribution. The objective is to make better use of "3S" technology to serve the society.

2. METHODS

2.1 Study area and data source

This study area is located in Guangxi province, south of China. It's latitude is 20° 54′ ～26° 23′ N and longitude is 104° 29′ ～112° 04′ E, total area is 236700.0km^2. It belongs to monsoon region of south subtropical zone and north tropical zone without four clearly demarcated seasons of spring, summer, autumn and winter. The climate here is hot and humid in summer and warm and dry in winter.

Data input to the method is assumed to be calibrated and navigated level 1B radiance data which offered by National Satellite Meteorological Center and DVBS of GuangXi Institute of Meteorology. The time segment of

complete data is from 2002 to 2007. The MODIS data used to this method must be clear without cloud or little cloud images.

2.2 Extraction of remote sensing information method

Due to the relationship between vegetation indices calculated by different algorithms, reflectance of bands and field measurements of NDVI, we retrieve NDVI by using EOS/MODIS data. A NDVI retrieval model for study area can be established with this relationship. The specific flow chart of retrieval technique is shown as Fig. 1.

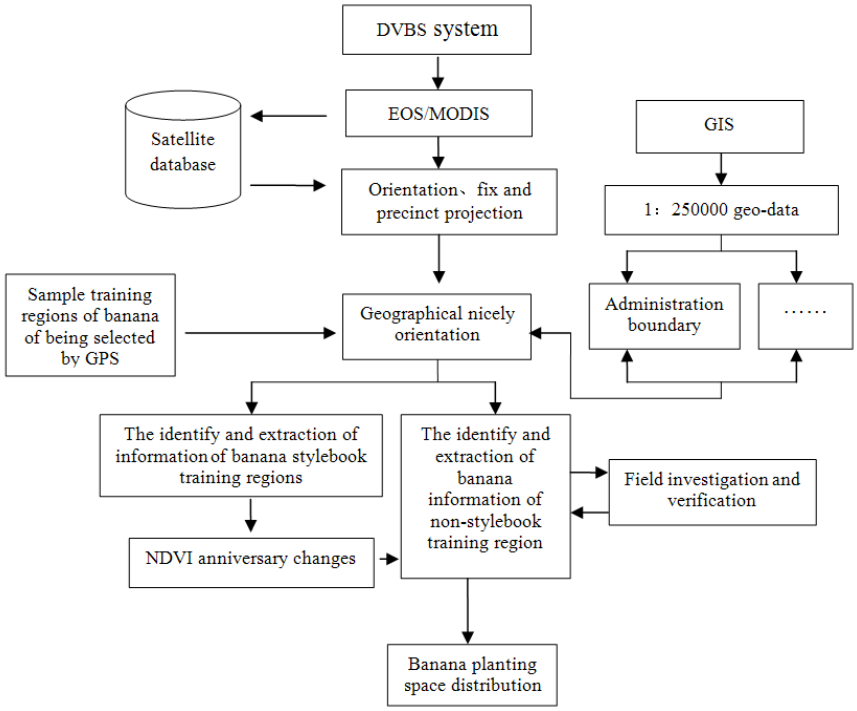

Fig.1. The flow chart of the identify and extraction of banana planting space distribution information based on EOS/MODIS data

Based on the above flow chart of technique, detailed steps are described as follows:

(1)Inversing reflectance for EOS/MODIS imagery

The objective of atmospheric correction for EOS/MODIS data is to attain related parameters which can indicate the vegetation inherent properties of the region. Since the remotely sensed image was affected by reflective solar energy, solar elevation, zenith angle, the thickness of aerosol and the

bidirectional scattering due to the mutual influence of ground environment factors, we should take into account both atmospheric and bidirectional scattering to obtain accurate ground reflectance. Because the parameters of atmospheric profile based on measurements data or standard atmospheric profile were not established in China, in this paper we adopted international standard parameters of atmospheric profile to correct EOS/MODIS image.

(2) Obtaining characteristic parameters of vegetation

Due to the chlorophyll and inner architecture of foliage, a special reflective spectrum of vegetation foliage was formed like intensive absorption in the red waveband and intensive reflection in the near infrared waveband. Normalized difference vegetation index (NDVI) is chosen to obtain the vegetation coverage information from the satellite images. This index combines the algorithms of EVI, DVI and DDVI together with high fidelity of indicating the vegetation on the ground. It is one significant indirect index of the growth and number of vegetation and has a linear correlation with the vegetation coverage density. The formula is shown as:

NDVI=(NIR-RED)/NIR+RED） -1≤NDVI≤1 (1)

In which NIR and RED represents the reflectivity of the vegetation coverage on the near-infrared band and red band respectively.

From the equation we can see that the water area and roadway area and city or town area, theirs value of NDVI are below 0 or approach constant value in different seasons. But the land surface with cover foliage, NDVI ranges from 0.1 to 0.7. NDVI has been applied in many fields, such as land cover or change, vegetation and environment change, net primary productivity and the assessment of crop yield.

(3)Sample training regions of banana of being selected by GPS

To the same foliage, its value of NDVI is various with its growth process. As result, the values of NDVI between foliages are diversity in different seasons. In order to mastery the spectrum characteristic of banana and distinguish banana from many kinds of foliages, some sample training regions of banana (the area must be bigger than 7 ha^2) in different county of Guangxi were selected by GPS (the Global Positioning System).

(4) The identify and extraction of banana planting information based on EOS/MODIS data

In the first place, the values of NDVI of sample training regions of banana during the main growing seasons were calculated. As result, we could find the variety trend of curves of banana in regions being consistent (Fig.2).

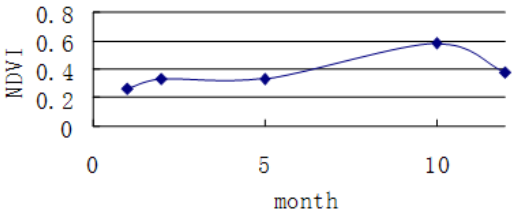

Fig2. The curse of NDVI of banana in Dacheng Town

Banana's growth lasts more 9 to 11 months, the main of crops is banana in Guangxi province during winter, and the areas of banana cover are reduced during crush season. When the crush season was over, the values of banana planting areas approached zero.

The same time, corn and rice and soybean, theirs growth (from sowing to harvest) are general lasting 3 or 4 months. The south subtropical zone and north tropical zone forest growth lasting more than 12 months, but its value of NDVI anniversary approach constant. Consequently, the curves of NDVI variety in different foliages during the main growth seasons are difference. We can use the Maximum likelihood to extract the information of banana planting and its spatial distribution through the calculation of multiple-phase MODIS-NDVI from different foliages in Guangxi province. The result shows that the information of banana planting and its spatial distribution in 2006 were clearly in remote sensing imagine (Fig.3). The survey of field also showed that the information of banana planting based on multiple-phase EOS/MODIS data was highly reliable and truth.

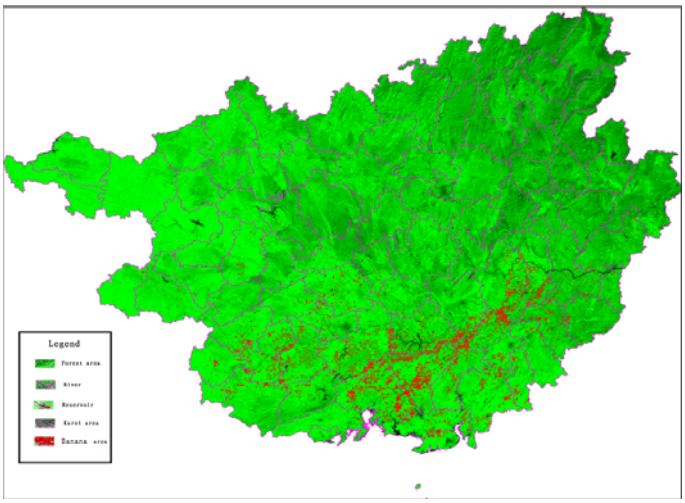

Fig3. the imagine of banana planting and its spatial distribution based on EOS/MODIS in Guangxi provin*ce*

3. CONCLUSION AND DISCUSSION

Based on the above study and analysis, some conclusions can be drawn as follows:

(1) It is first used for extraction of banana planting spatial distribution information by using MODIS data.

(2)Method for extraction of banana planting spatial distribution information by using MODIS data is given in this paper.

(3) Decomposition of Mixed pixel is a difficulty points in calculating area of banana, so this paper does not calculate area of banana.

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