The Research on Natural Vegetation's Response to Agriculture in Tarim River Basin in Recent 50 Years Using Multi-Source Remote Sensing Data

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THE RESEARCH ON NATURAL VEGETATION'S RESPONSE TO AGRICULTURE IN TARIM RIVER BASIN IN RECENT 50 YEARS USING MULTI-SOURCE REMOTE SENSING DATA1*

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Abstract: Excessive water is used by farm field in Tarim river basin, it is very important to deep study on the relation between area of farm field and natural vegetation in recent 50 years. Collecting and processing various decades of remote sensing data, and got area of farm field, grass, forest, town and non-serviceable field. These results indict that: Because of the high flow period between 1950 and 1972, a part of grassland converts forest. From 1972 to 1990, because of increase of farm field, limited water isn't enough to grassland and forest, and a fraction of forest area converts grassland again. With rapid increase of area of farm field, more water need from the river and underground, which causes water level depression, and natural ecology becomes deteriorative from 1990 to 2000. Comprehensive analysis indicts that agriculture control implemented by government is necessary to recovery of ecology, or farm field also would be lost eventually with destruction of natural ecology.

Keywords: relation between natural vegetation and farm field multi-source remote sensing data inner cause analysis Tarim river basin

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1. INTRODUCTION

Tarim river is called mother's river, which is the main source of farm field and ecology. However, unrestricted water consumption causes negative influences such as considerable deforestation, desertification, and increased soil salinity [1-5]. The ecological environment in the Tarim River basin is extremely vulnerable [6-9]. The local and center government have paid great attention to deterioration of the ecology and environment. In an attempt to restore the ecological system, some significant improvements have been made in regulating the stream flow of the Tarim River for flood control and ecological water releases from Boston Lake through Daxihaizi Reservoir were carried out several times from 2000. It is very important to deep study on the relation between area of farm field and natural vegetation in recent 50 years. Collecting and processing various decades of remote sensing data, we got area of farm field, grass, forest, town and non-serviceable field using multi-source remote sensing data such as MSS, Landsat-TM, aerial photograph, time series MODIS products NDVI (250m) [10-14].

2. HISTORICAL DATA PROCESSING AND ANALYSIS

2.1 Data processing

To study the relation between farm field and area of vegetation, it is hard to analyze the tendency using short time series of data. We select the time from 1950s to 2000s and the remote sensing data of various sources which include Land sat MSS, Landsat TM and so forth, and the data processing methods include the transition from raster to vector data, supervise classification and so forth. For example, time series of MODIS data were used to extract farm field information using variance method (Fig.1). Finally, we got statistical data of various land use and cover (Fig.2).

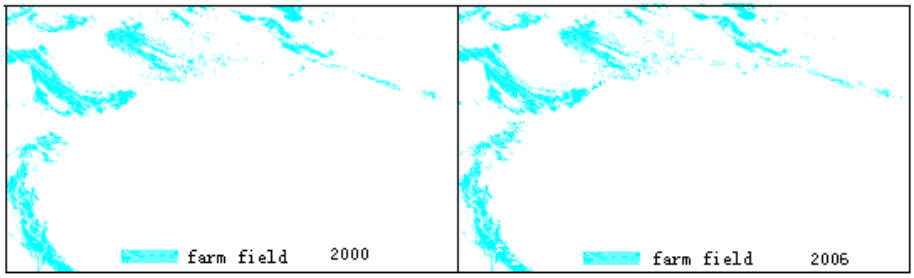

Fig.1 Farm field area in 2000 and 2006

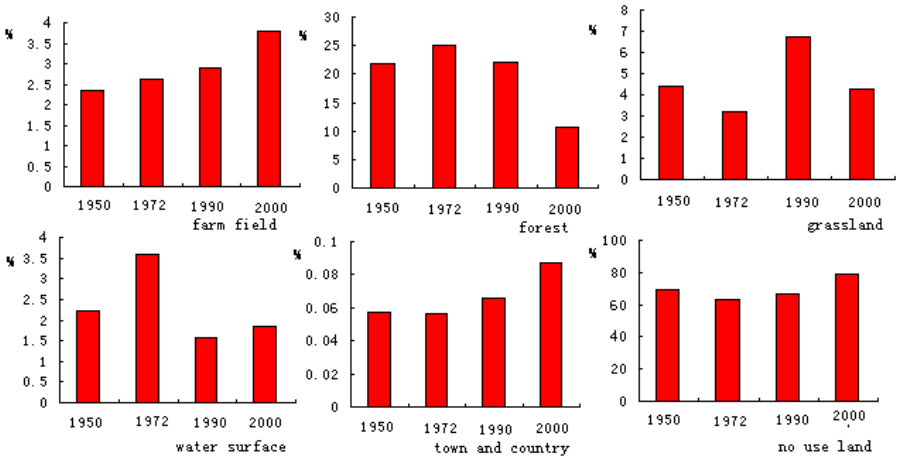

Fig. 2 Land use and cover change analysis form 1950s to 2000s

2.2 Data analysis

The analysis from Land use and cover change figure of Tarim river basin shows that the land use and cover always changes from 1950s:

(1) From 1950 to 1972, area of farm field has a tiny increasing rate of 2.35-2.73% (percentage of statistical area), at the same time, forest area had a little increase of 22.12%-25.13%, but area of grassland had a little decrease of 4.51% - 3.13%. (2) From 1972 to 1990, area of farm field still has a little increase rate of 2.73-2.92% compared with the changes from 1950 to 1972. At the same time, forest area decrease to about 22% again, but area of grassland has a rapid decrease from 3.13% to 7.02%. (3) From 1990 to 2000, area of farm field has a rapid increase rate of 2.92-3.82% compared with the

changes from 1970 to 1990, but area of forest and grassland has a sharp increase trend, and that of forest rapidly decreases from about 23% to about 10% and that of grassland from 7.02% to 4.48%. (4) From 2000 to 2006, area of the farm field keeps stable, but the area of forest and grassland increase obviously using method of variance of time serious MODIS data products. As for area of town and City, there is a continued increase from 1970, and which becomes obvious from 1972 to 2000.

Comprehensive analysis indicts that agriculture control implemented by government is necessary to recovery of ecology, or farm field also would be lost eventually with destruction of natural ecology. According to historical material and above results, because of the high flow period between 1950 and 1972, a part of grassland converts forest. From 1972 to 1990, because of increase of farm field, limited water isn't enough to grassland and forest, and a fraction of forest area converts grassland again. With rapid increase of area of farm field, more water need from the river and underground, which causes water level depression, and natural ecology becomes deteriorative from 1990 to 2000. Water releases from Boston lake for restoration of the ecosystem agriculture control implemented by government help recovery of natural vegetation after 2000.

3. THE RELATION ANALYSIS BETWEEN FARM FIELD AND NATURAL VEGETATION

We analyzed the relation curve of farm field and vegetation from 1950s to 2000s, and the result indicts that the correlation coefficient between natural vegetation and farm field be 0.8775. It is higher than that of vegetation (natural vegetation and farm field) and farm field. It indicted that more water need from the river and underground, which causes water level depression, and natural ecology become deteriorative , with rapid increase of area of farm field.

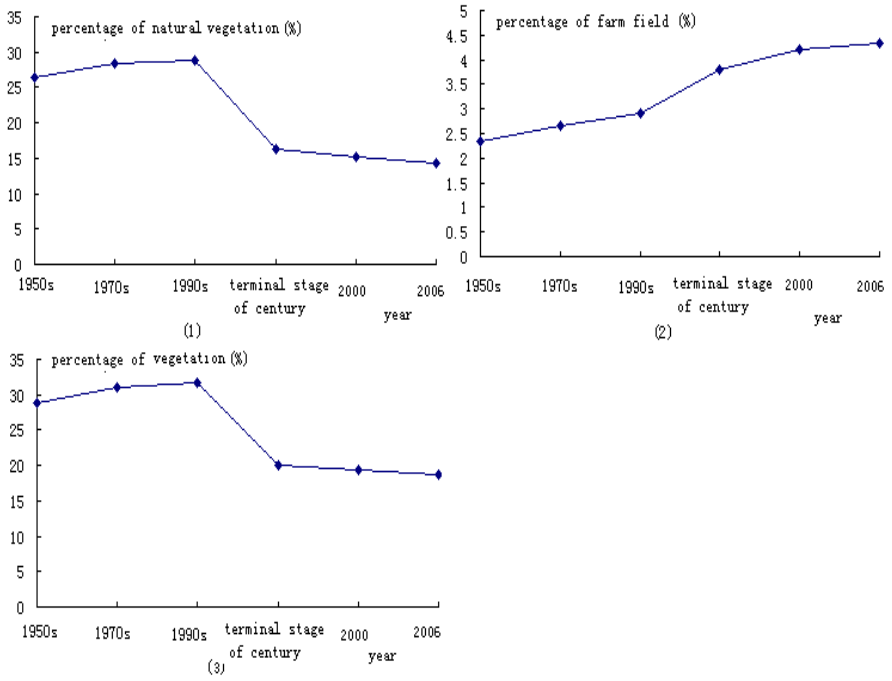

Fig.3 Changes of farm field and vegetation

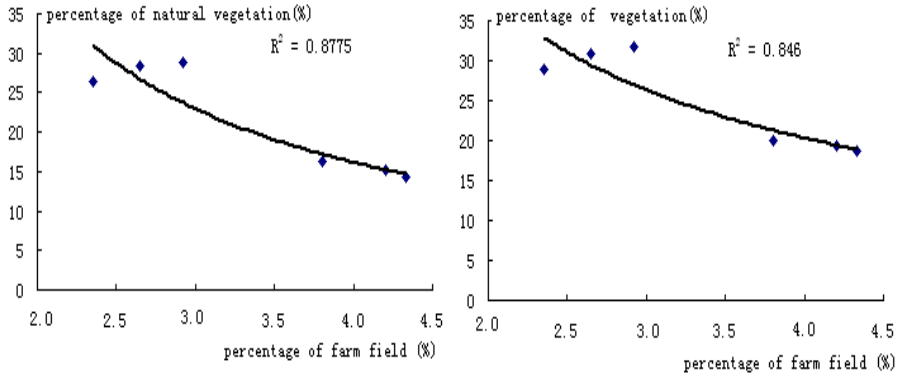

Fig.4 Correlation coefficient between farm field and natural vegetation

4. CONCLUSION

Currently, Some significant improvements to restore the ecological system have been made in regulating the stream flow of the Tarim River for

flood control and ecological water releases from Boston Lake through Daxihaizi Reservoir were carried out several times from 2000. Water releases from Boston lake for restoration of the ecosystem agriculture control implemented by government help recovery of natural vegetation after 2000. As a result, the natural vegetation begin to restore.

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