

ANALYSIS ON DRIVING FACTORS OF DESERTIFICATION IN NORTHERN CHINA: A CASE STUDY OF YANCHI COUNTY

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Desertification is one of the most serious environmental and economic problems in the world nowadays. About two-thirds of the countries, one-fifth of the global population and one-fourth of the earth land are now affected by desertification [1]. There are a large scale of areas widely covered by deserts and heavy losses from desertification in Northern China [2]. Understanding the causes of desertification was the key to combat land desertification [3-5]. However, there were considerable debates on the causes of desertification in Northern China [6, 7]. In this paper the driving factors of land desertification had been analyzed on the case of Yanchi County in Ningxia Hui Autonomous Region to understand the reasons of land desertification.

Yanchi County is classical in the agro-pastoral mixed regions in Northern China, with the landscape of alternate distribution of farmland, grassland and sand dunes, where desertification is severe. In this area, the remarkable feature of land desertification is the landscape changing from grassland and farmland to desert (such as sand dunes). Using the Landsat TM imagines of June in 1986, 1995, 2000 and 2005 as the digital sources, the vector and grid landscape maps of distributions of the study area were derived. The dynamic process of landscape pattern had been analyzed on the basis of the software of ArcGIS 9.0. The results showed that the performance of landscape change is the increase of farmland and the decrease of grassland, and the farmland increase is at the cost of the grassland decrease. At the same time, the fragmentation of grassland landscape is increasing continually, while the farmland is

linked up on space with the decreasing landscape fragmentation. The land desertification in this county is severe from 1986 to 1995, but after 1995 it is looking up gradually, and the landscape change is affected more and more by the human activities. Desertification reversion happened after 2000 for the ecological policies reason. Based on grads analysis of the habitation buffer zone, five landscape elements (farmland, grassland, deserted grassland, woodland and sand) showed the same characteristic in different buffer zones, that was to say that the areas of different landscape elements increased first and then decreased gradually along with the increasing distances to the habitation. In addition, farmland was influenced mostly by the distribution of settlement, and the affected distance of habitation to the farmland (increase of farmland areas) extended gradually.

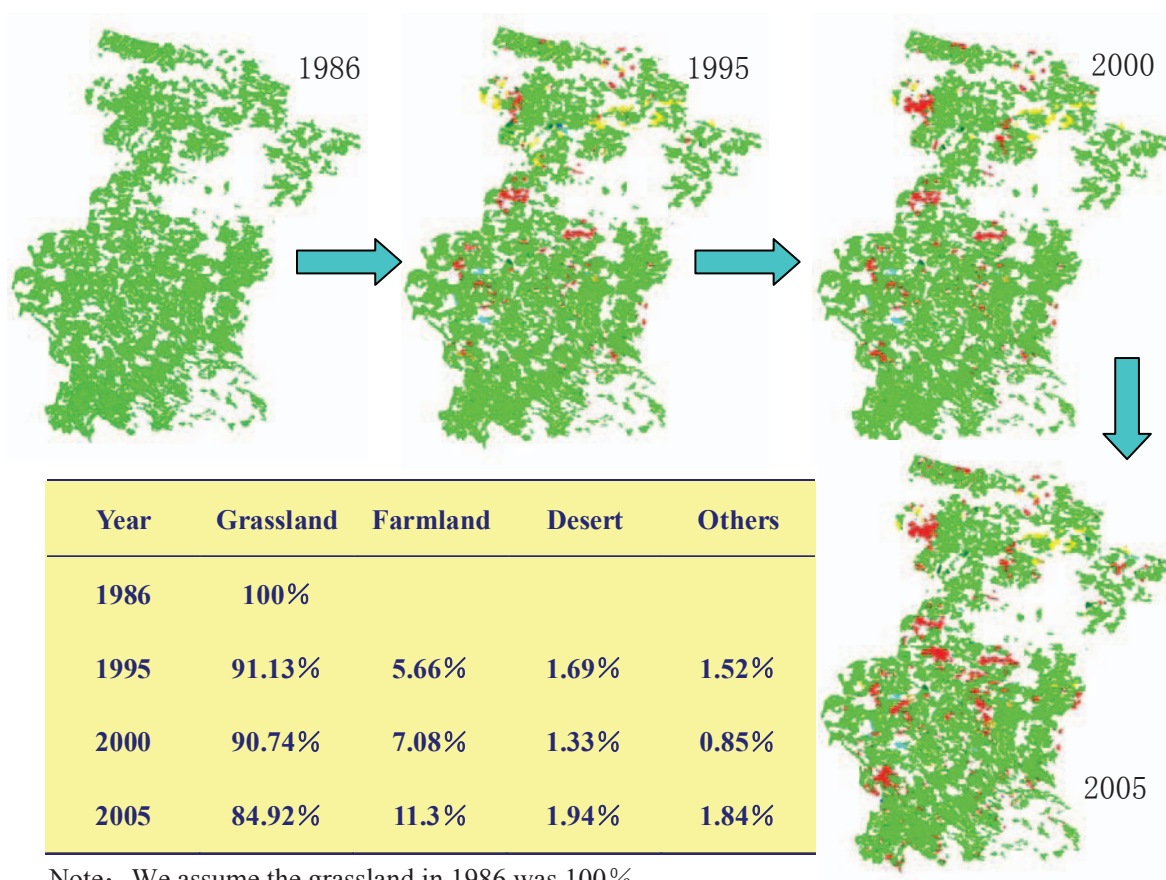


Figure 1 The percentage of grassland transfer to other landscape from 1986 to 2005 in Yanchi County

Based on the economic data and the meteorological observation data, the contribution rates of the driving factors and their temporal change in the process of land desertification are researched using factor analysis in Yanchi County. The results show that the human activity factor contribution rates are 60.66%, 72.22% and 57.82% respectively in the three periods of 1953-1980, 1981-2002 and 1981-2006, showing that human activity is the leading factor to the land desertification development. The human activity intensity in the period of 1981-2002 is stronger than that in the periods of 1953-1980. The result indicated that the affects of farmers' operating activities increased after the application of the household contract responsibility system, and the human activity contribution to the land desertification decreased after application of prohibiting graze policy in 2002, meaning that prohibiting graze policy played an important role in controlling land desertification.

Whether the ecological protection policies can play an important role depends largely on the acceptance of farmers in the economic interests. In recent years, a series of ecological protection policies have been carried out, including prohibiting graze policy to protect and recover the grassland eco-environment. The research indicated that there were two basic contradictions between the present ecological protection policies and the farmers' operation behaviors. One of them is the chronicity of ecological benefits and the short-term benefits pursued by farmers; the other one is the externality of eco-environment and individual interest of farmers. In different tenure systems, the impacts of the farmers' operation behaviors to the eco-environment are simulated. The results show that if the grassland has been hold completely by farmers, the grassland utilization will be most efficient; If the grassland has been regarded as common resource, its utilization could not be optimized, because it will be overused and then the destruction of eco-environment will happen. The conclusions of this research can provide the scientific basis of desertification control for Yanchi County and other similar regions, constructing harmonious and sustainable development mode between human and the nature.

Key words: Land desertification; Landscape pattern; Driving factors; Ecological policies; Northern China

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