Spatiotemporal dynamics of climate and agricultural landscape patterns in Xinjiang, China (2000-2015)

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Abstract. This study integrated remote sensing, geographic information system, landscape ecology, and spatial analysis, and is based on meteorological data and four remote sensing images (2000-2015). The aim of this study was to analyse climate trends and spatiotemporal changes in agricultural landscape patterns, and calculate agricultural ecosystem service value (AESV) in Xinjiang, China. In addition, correlation analysis further enabled the quantification of agricultural landscape pattern changes in response to climate change. Results showed that temperature and precipitation registered a fluctuating ascending trend in most areas of Xinjiang. Landscape diversity and fragmentation increased during the same period. AESV showed a trend of gradual increase, the waste disposal and the water retention are the most important ecological functions. Besides, agricultural landscape pattern significantly correlated to climate and the effect of precipitation on agricultural landscape patterns has been greater than the effect of temperature during 2000-2015.

1. Introduction

Sustainable development is a key factor that characterizes modern agricultural practices [1, 2], and ecological agriculture is the foundation for the sustainable development of agriculture. Thus, ecological agriculture has gradually become a relevant research topic [3]. An agricultural landscape is formed by the interaction of a patch, which is one of the most widely distributed landscape types in the world. Indeed, because of the effects of the natural environment and human activity, agricultural landscape structures are constantly changing, and tremendous efforts have been made to understand the driving forces [4] underlying agricultural landscape patterns, and their ecological environmental effects [5] and so on. Recently, climate change characterized by global warming has become one of the most important environmental problems in the world [6]. Climate change has not only a significant impact on agricultural production [7, 8], but also leads to alterations in the composition, structure, and function of agricultural ecosystems, as well as changes in biodiversity [9]. Studies on the dynamic changes of agricultural landscapes as a result of the background effects of climate warming will make great contribution to farmers and science community [6]. Agricultural ecosystems play important roles in water conservation, gas regulation as well as in many other dynamics [10], and agricultural ecosystem service value (AESV) is one embodiment of agricultural ecological effectiveness. In previous work, Costanzo [11] has had the most far-reaching impact on the quantification of values for global ecosystem services.