Afforestation monitoring using long-term remotely sensed data in Chinese semi-arid area

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The Conversion of Cropland to Forest Program (CCFP) has been implemented since 1999 to prevent the land degradation in the Loess Plateau, China. Many croplands in this region has been converted into plantation sites according to the CCFP, however the situation (such as growth, stability, or adaptation) of planted trees is not well monitored continuously over space. Satellite sensors have observed terrestrial surface since 1980s which fully covers the pre/post implementation period of the CCFP and available multi-temporal satellite images enable us to analyze vegetation response through the trajectory of Vegetation Index (VI). Therefore we attempt to evaluate the afforestation program by using VI time-series of LANDSAT and MODIS over the long term. The occurrence of afforestation, timing of planting, and temporal greenness trends are analyzed by Breaks For Additive Season and Trend method. As a case study, we choose Wuqi County in the northwest Shaanxi Province, located in the central Loess Plateau. This county is on the semi-arid transit zone between forest and grasslands, and has been designated as the national pilot model county for CCFP. Results showed that VI time-series could detect and measure the plantation forest growth spatially as a consequence of CCFP. It can be said that this study explored the new possibility for understanding the positive/negative effects of CCFP and evaluating how the afforestation by CCFP worked against land degradation.

Keywords: Remote sensing, Vegetation-Index time series, Afforestation, Semi-arid areas, Chinese Loess Plateau