# SATELLITE IMAGERY OBSERVATIONS OF ROCKFALL RISKS IN THE NANTOU COUNTY, TAIWAN

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**ABSTRACT:** Taiwan's unique geographical location makes it susceptible to frequent earthquakes and typhoons, which leads to the vulnerability of mountainous regions to landslides. The restoration of vegetation after a landslide has a significant impact on the development of the ecological environment, which makes it necessary to conduct a detailed study of the trends of post-landslide restoration. The study area is near the Meng-Gu Falls in Nan-Shan Creek, Nan-Feng Village, Ren-Ai Township, Nantou County, Taiwan. In order to conduct this study, we used satellite images from SPOT 5, SPOT 6, and SPOT 7 to calculate the normalized difference vegetation index (NDVI) and to investigate changes in the stable vegetation growth areas after a landslide. Monthly satellite images from 2004 to 2022 were collected, and the NDVI values of each pixel were calculated for monthly time-series data. Subsequently, a simple linear regression was applied to each pixel to calculate the slope. Two hypotheses were proposed: the null hypothesis ($H_0$) that the NDVI values of the pixels remain unchanged over time, and the alternative hypothesis ($H_a$) that shows an increasing trend in the NDVI values over time. We tested these hypotheses using the one-tailed test in Student's t-test, with the null hypothesis ($H_0$) assumed that the slope is equal to zero, while the alternative hypothesis ($H_a$) assumed that the slope is greater than zero. By calculating the t-value that corresponds to the slope of each pixel, we established a significance level of $\alpha$ as 0.05 and
determined the critical t-value. The conclusion is that if t > the critical t-value, we reject the null hypothesis ($H_0$ ), indicating a significant increase in the slope of the pixel. On the contrary, if the t ≤ the critical t-value, we cannot reject the null hypothesis ($H_0$), which indicates that there is probably no trend or a decreasing trend for that pixel. Finally, we identified vegetation growth areas based on pixels in which the null hypothesis ($H_0$) was rejected, indicating significant vegetation growth trends. Furthermore, we performed significance tests at two more levels ($p < .01$ and $p < .1$) to evaluate the reliability of the results at different levels, and the results are consistently very close across all levels. The method can be applied to the regional analysis of the NDVI time series to identify possible ecological restoration opportunities. However, it is important to note that the results of the regrowth area obtained using this methodology were not entirely consistent with expectations, possibly due to inherent limitations of the methodology. The results of this study can continue to serve as useful reference data to understand the ecological changes and the health of the

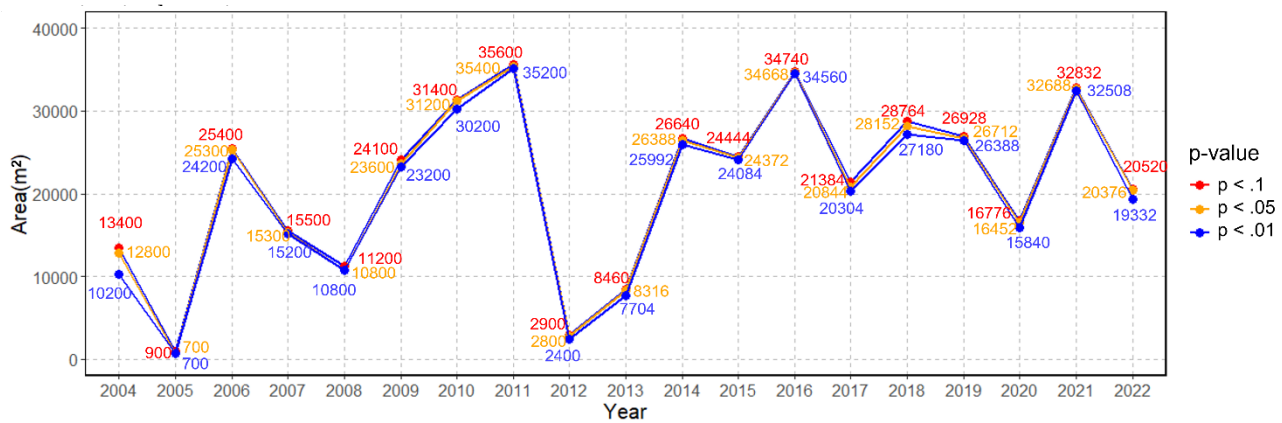


Figure 1. The vegetation growth areas obtained by the proposed method.

**KEY WORDS:** Restoration, SPOT, NDVI

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