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應用地球空間資訊技術於土石流災害與坡地農墾關係及崩塌地植生恢復之評估

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摘　　要　本研究應用地球空間資訊技術評估南投縣潭南地利土石流災害與檳榔園之空間關係及崩塌地植生恢復之狀態。本研究使用五期 SPOT 衛星影像，變遷偵測崩塌地及植生恢復狀態。試區 50 % 以上之檳榔園雖屬超限利用，但大多數崩塌地與其相距甚遠，因此兩者之空間關係極低，故非引發之主因。本區地質破碎，地形陡峭，降雨強勁集中，地震和颱風應爲災害之主因。但土石流沿溪向下流竄，檳榔樹難有效抑制災情，故陡峻地種植檳榔，有待商榷與深入探討。比對五期植生指標影像，85 %的崩塌地植生尚無恢復跡象，復因颱風豪雨沖刷更達到 91 %。崩塌地因地形險阻，整治及復育艱困，事倍功半，故除危險須立即處置者外，仍應採地球空間資訊技術長期監測，以瞭解其自然恢復狀態。

關鍵詞：地球空間資訊系統、全球定位系統、遙感探測、土石流、規整差植生指標。

Application of Geo-spatial Information Technologies to Assessing Relationship between Debris Flow and Slope-land for Farming Use and Re-vegetation of Landslide Scars

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ABSTRACT　The study was to evaluate the spatial relationship between the debris flows and areca fields and natural recovery of plants on the landslide scars in the Tan-Nan and Dee-Lee area at Nan-Tou Prefecture of Taiwan by using geo-spatial information technologies. Relative radiometric normalization, change detection, and GIS techniques were applied to five-date SPOT satellite images to achieve the goal. The study found that most of the landslide scars occurred in the area of stream origin situated on the steep-slope mountains with land-cover of deciduous forest and grass. Because of landslide scars at a distance far from the areca fields, there was a relatively low spatial relationship between them. According to the historical records of landslide in the area, landslides were highly associated with the characteristics of geology, terrain, and rainfall of the area. Hence, the occurrence of the debris flows in the area could not be attributed to areca fields, but to the Chi-Chi earthquake and subsequent Toraji typhoon. Arecas, however, could not effectively repress debris flows due to areca's

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shallow roots and slim trunk. Hence, planting arecas on steep slope-land, which may be detrimental to soil and water conservation, should be examined further. Eighty-five percent of the land scars have not shown a significant plant recovery, after Toraji typhoon up to 91% owing to flushing of its pouring rain. Nevertheless, the result does not mean that engineering treatment and reforestation should be performed immediately over bare lands. Reforestation may generally achieve little result despite Herculean effort because of shallow soils and difficult terrain over bare lands. Hence, long-term monitoring plant recovery over bare lands using geo-spatial information technology should be taken, except for urgent cases.

Key Words: geo-spatial information system (GIS), global positioning system (GPS), remote sensing, debris flow, normalized difference vegetation index (NDVI).