ANALYZING THE EFFECTS OF TOPOGRAPHIC WETNESS INDEX AND TOPOGRAPHIC CURVATURE ON SPECIES DISTRIBUTION MODELS

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ABSTRACT: Species distribution model (SDM) is commonly used for analyzing the relationship between species and environment and predicting its distribution. Japanese Elaeocarpus (JE), red-stripe rhododendron (RF) and Chinese guger-tree (CGT) widely distributed in central Taiwan were chosen as target species. JEs are a xeric pioneer and usually grow on uplands with strong sunlight and low soil moisture. RFs have clumpy distribution and form pure stands and can grow on well-drained uplands with sufficient sunlight and acidic soils. CGTs are shade-tolerant and incline to grow in lowlands with wetter soils but need moderate sunlight and have scattered distribution. Hence, the study attempted to develop the SDMs based on terrain-related variables to predict the suitable habitats of these species in the Huisun area in central Taiwan. The base model included elevation, slope, and terrain position and expanded models included the three variables plus topographic wetness index (TWI) and topographic curvature (TC), and these models used the maximum entropy (MAXENT), decision tree (DT), and BIOCLIM algorithms. The accuracies of the expanded models plus TWI (or TC) were better than that of the base model, regardless of which algorithms being used. The MAXENT and DT models were equally matched in predictive accuracies, and performed much better than BIOCLIM. More importantly, the smaller the TWI or the smaller the TC in negative value, the higher likelihood a JE or RF tree has to grow at a given location, the opposite is true for CGT. Consequently, this outcome shows that these species have the above-mentioned ecological traits and agrees with our observations from field surveys. The improvement is limited although these proxies can improve the predictive ability of these SDMs. Therefore, the proxy of solar radiation and high-resolution DEM derived from LiDAR will be incorporated into SDMS so that their predictive ability can be substantially improved.