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Native forest *C* factor determination using satellite imagery in four sub-catchments

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Abstract The cover management (*C*) factor in RUSLE represents the significance of changes in cropping, forest cover, and vegetation growth stages on soil loss rate. The *C* factor is one of the most important parameters in a number of hydrological models. This study was carried out to evaluate the performance and accuracy of two recently developed approaches in mapping raster-based *C* values against traditional methods in subtropical forest catchments in New South Wales, Australia. A raster-based Normalised Difference Vegetation Index (NDVI) map was calculated from the biomass spectral data of SPOT 5 imagery acquired in January 2011 when vegetation cover sampling was conducted. A regression relationship was developed between the vegetation index of NDVI values for individual sampled locations and their corresponding *C* factor values obtained from RUSLE look-up tables. The stochastic method of Sequential Gaussian Simulation (SGS), which has the ability to evaluate single- and multi-location uncertainties of predictions, was also used to estimate the spatial distribution of *C* values using 100 realisations. To illustrate this objective, the uncertainty of estimations was evaluated by histogram and semivariogram of the simulated data *versus* observed values. *C* values were estimated for non-sample locations at the cell level based on 41 sampled locations and an additional 40 NDVI values extracted from the image on bare soil. Those values were then extended to all pixels in the sub-catchments using regression analysis and the SGS approach. The *C* map developed by the regression model was compared with the outputs of simulated values to determine a more realistic technique for future estimations of multi-temporal changes in catchment vegetation cover.

Key words sequential Gaussian simulation; NDVI; crop management; spatial uncertainty; soil erosion; RUSLE; northern New South Wales, Australia