



## **A rule-based image analysis approach for calculating residues and vegetation cover under field conditions for soil erosion studies**

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Estimation of soil cover by residues and vegetation is a fundamental issue for soil erosion, because the amount of cover is a basic driver for erosion risk. Soil cover measurement in the field and catchment scale is sometimes very time consuming or subjective. Our ambition for this study was to develop a quick and easy-to-handle field method for calculating the amount of different soil cover types, i.e. dead and living biomass, in a single-step analysis at field scale. We used an object-based image analysis methodology (OBIA) to quantify different cover types. Classification of the images used resulted in the following classes: residues, vegetation, stones, shadow and uncertainty. The shadow and uncertainty classes were used as an image quality parameter.

We compared this method to manual image analysis for the range of between 0 and 50% total cover and different catch crops and winter crops. To increase the accuracy of manual analysis, it was necessary to repeat the assessment five times per image. Degree of agreement between the OBIA method and manual assessment for each of the three different cover types was in the region of 0.8 ( $r^2 = 0.78$  for total cover,  $r^2 = 0.75$  for residue cover,  $r^2 = 0.82$  for vegetation cover). Slopes of the regression intercepts between manual and automated analysis were not different from 1 for total cover and vegetation cover. 95% confidence intervals for the regression lines indicate that confidence limits at total soil cover of 25% (the mean of the investigated range of soil cover) are similar for both the manual evaluation ( $CI_{95\%} = 2.8$ ) and the OBIA method ( $CI_{95\%} = 3.1$ ). The time needed for evaluation was calculated at 115 min per manual image classification and 15 min per automated image classification, which we regard as a major advantage of the OBIA methodology. Finally we suggest that, while similar accuracies of evaluation for both methods have been obtained, the OBIA method allows greater objectivity because of predefined classification algorithms and thus the possibility of back tracing results.