APPLICATION OF COMBINED PIXEL-BASED AND SPATIAL-BASED APPROACHES FOR IMPROVED MIXED VEGETATION CLASSIFICATION USING IKONOS

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KEY WORDS: *pixel-based, spatial-based, mixed vegetation classification, coffee gardens, Lampung, Indonesia*

ABSTRACT

Classifying a mosaic of coffee systems, each in a different stage of structural complexity is not obvious when that ranges from monoculture to a complex agro-ecosystem, with various shade and fruit trees mixed in different degrees of density. Distinction into different sub-classes incorporating tree complexity and tree cover, is important as tree density and the generally related amount of litter are important from a soil erosion perspective. In this study, the objective was to classify different coffee garden systems plus several other minor vegetation classes existing in the area using IKONOS in Sumberjaya district, Lampung Province, Indonesia. Pixel-based classification approach was integrated with spatial-based approach to reach an improved classification result. In the supervised pixel-based approach training samples are collected to generate statistical parameters for the classifier to classify the whole image. The spatial-based approach refers to segmentation procedure, known also as object-based classification. Two methods of integration were explored and pure pixel-based-approach was as well conducted for comparison purpose. Results were then tested using ground check data. The methods tested are: pure spectral approach of (a) supervised classification using maximum likelihood classifier, integration with segmentation which was done in two ways, by (b) classifying the segments and by (c) combining the pixel-based classified image with segment image using majority rule. Of all the three methods the combination using majority rule showed the highest overall accuracy. Several points were discussed as feedback to the methods tried as well as to improve the classification result

INTRODUCTION

Sumberjaya district located in the northwestern part of Lampung Province, Indonesia is dominated by coffee gardens, which cover 70 % of the area (Dinata, 2002). The district, which also coincides with the catchment of Way Besai, the major river in the area, was a conflict area between guardians of state forest land and farmers, triggered by deforestation and a perceived loss of watershed function related to erosion and river sedimentation during the last decades. For that reason it was considered important to obtain detailed information on land use, with a special focus on the various coffee systems as they are considered an important factor in the erosion process.

Low resolution imagery like LANDSAT (E)TM or SPOT allows to discriminate to a certain extent between monoculture coffee on one hand and multistrata systems on the other. From imageries from 1973, 1986 and 2000 (Dinata, 2002). It was concluded that besides deforestation there was a parallel evolution from monoculture systems towards various multistrata systems. To what extent can high resolution imagery like IKONOS be useful to differentiate in more detail between those various mixed coffee systems.

SITE DESCRIPTION

The study area is located in the district of Sumberjaya, Lampung Province, Indonesia. Figure 1 shows the location of Sumberjaya District and the study site within this district. Coffee gardens is the major land use in this area, which occupy most of its undulating terrain.