



Deutscher Tropentag, October 8-10, 2003, Göttingen

“Technological and Institutional Innovations  
for Sustainable Rural Development”

## Evaluation of Land Conservation Measures in West Africa with Remote Sensing, Possibilities and Limitations

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### Abstract

The natural resources in West-Africa are under pressure. Fast growing population, numerous migrants and changing climatic conditions result in deforestation and soil erosion. As well, uncontrolled bushfires lead to a severe loss of nutrients. For protection of the environment and to secure food security, numerous development agencies undertook projects to protect forests, address soil erosion and incorporate appropriate fire management.

However, it is difficult to evaluate the success of these measures. Traditionally the measures are evaluated by field campaigns, but this method is expensive, time consuming and cannot cover the whole area of intervention. Remote sensing offers a better solution by observing wide areas at the same time.

In this contribution the possibilities and limitations of an evaluation of land conservation measures with remote sensing is presented. The research was carried throughout different test sites in West Africa.

To evaluate the success of forest protection and anti erosion measures, time series of LANDSAT images are utilised. Changes in the vegetation cover were detected with different change detection methods like principal component and change vector analyses, with the best fitting method for the specific conditions determined. Results of that investigations were tested by intensive ground truth campaigns.

To fulfil a sustainable fire management, it is forbidden in several parts of Benin to light bush fires after than a certain date to prevent nutrients being washed away with the onset of the rainy season. With three LANDSAT images representing different situations within the dry season, fire affected areas were detected by their spectral signature. It was then possible to detect areas with “late fires” and locate the villages which have broken the corresponding contracts. Also areas where fire is banned totally can be supervised.

The investigation shows that change detection with high resolution remote sensing is a suitable, efficient and comparatively cost-saving tool to evaluate the success of measures for land conservation. Limitations are caused in general by insufficient temporal, spatial or spectral resolution of the remote sensing scenes.

**Keywords:** Benin, evaluation, land conservation, remote sensing, West Africa