



**Candidate**

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Master Thesis (Year: 2010)

The capabilities of SPOT4 and Landsat SLC-off data to obtain consistent extensions of existing Landsat-derived land cover time series data for tropical forest areas in East Africa.

**Referee**

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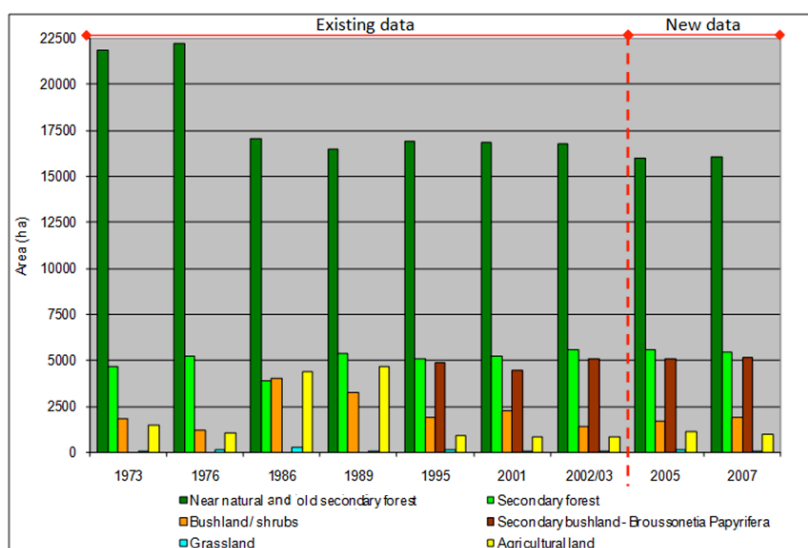
**Key Words**

High resolution satellite imagery, Landsat SLC-off, SPOT, supervised classification, artificial bands, accuracy assessment

**Summary**

The BIOTA East Africa sub-project E02 uses remote sensing time series data for investigating the influence of fragmentation and human use on the biodiversity of three East Africa rainforest areas: Kakamega-Nandi forests area in Kenya, Mabira and Budongo Forest areas in Uganda. Analyses of the land cover changes since the early 1970s until 2003 for these three rain forests were done (Lung & Schaab, 2010) by processing Landsat Multispectral Scanner (MSS), Thematic Mapper (TM) and ETM+ imagery for eight or seven time steps at regular intervals. This has resulted in 12 land cover classes for Kakamega-Nandi and Budongo forests areas and 10 classes for Mabira Forest area out of a consistent set of 15 land cover classes. For continuous forest change analysis, the three existing time series data had to be extended by another two time steps from more recent years (2005/2006 and 2007/2008).

Since, on 31 May 2003 Landsat ETM+ suffered the loss of its scan line corrector (SLC) with a data loss of about 22% per scene, the task of this thesis was to test for alternative solutions for nevertheless extending the Landsat-based time series. One alternative approach is the continuous use of Landsat but handling the SLC-off data gap issue. The second approach is the use of SPOT data instead with all its differences mainly regarding spatial and spectral resolutions compared to Landsat. SPOT imagery for the Mabira Forest area was used to test whether forest class separability can be improved by including artificial bands. None resulted in an obvious improvement. But the classification results nevertheless proofed to be useful (see Figure). In the case of the Kakamega-Nandi forest area the challenge was its splitting across two scenes with unsolvable problems of distortions along the edges and differences in classification results for the farmland. For Budongo Forest area, SLC-off imagery was the choice with one scene available from the vendor with already



filled gaps and the other with gaps not stretching across forest areas. Due to haze, the developed methodology became even more complex by running and combining five different classifications. It can be concluded that even though a fully working Landsat would be preferred, the selected data proofed to be suitable for extending the existing times series by truly comparable time steps, although it meant considerable more work. The achieved quality was for example demonstrated by an accuracy assessment.

Figure: Land cover area for Mabira Central Forest Reserve from 1973 to 2007.