

## Spectral Signatures of Leaf Fall Diseases in *Hevea Brasiliensis* Using a Handheld Spectroradiometer

### ABSTRACT

Subtle sensitive changes in leaf canopy reflectance of a disease infected trees can be detected by a spectroradiometer. A typical method of detecting tree stress caused by diseases or pest infestations includes the analysis of spectroradiometry. Early detection of forest tree stress would be useful to minimize tree losses especially in a forest plantation area. The main purpose of this study is to develop the spectral library of individual rubber trees being attacked by diseases using a ground-based handheld field spectroradiometer. The specific objective is to identify the spectral signature characteristics of healthy (control) and “unhealthy” or stressed rubber trees due to leaf diseases as causal factors. The spectral reflectance of each infected rubber tree was separated according to the different wavelength and percent reflectance. The spectral signatures of rubber trees being attacked by diseases were characterized by a low reflectance probably due to the low chlorophyll content in the leaves leading to the tree under stress, thus easily separated from the healthy rubber. Results indicated that three groups of infected trees were well separated at the 530 - 650 nm (visible) wavelength averaging from 0 – 30 percent reflectance. The spectral reflectances of rubber trees with leaf disease in visible (VIS) wavelength were not consistently separable. However, the spectral reflectance of leaf diseases can be well separated at the near infrared range region covering from 700 - 850 nm wavelength with a 30 – 80 percent reflectance for leaf diseases, respectively. The study implies that leaf diseases for rubber trees can only be identified successfully at the NIR range of wavelength from 700 – 850 nm with a 20-80 percent reflectance. The development of such signature library profile of disease affecting rubber trees will certainly assists in the development of an early disease warning system using an airborne hyperspectral imaging system technology being currently developed in UPM’s Forest Geospatial Information & Survey Laboratory, at Lebu Silikon, Universiti Putra Malaysia, Serdang.

**Keyword:** Spectral signature; Rubber; Near-infrared; Leaf fall disease; Spectroradiometer