OIL PALM MAPPING

Palm oil production is a significant industry in several Asian countries. Airborne hyperspectral imaging has proven to provide a sensitive and high resolution tool to map the health condition in individual palm trees.

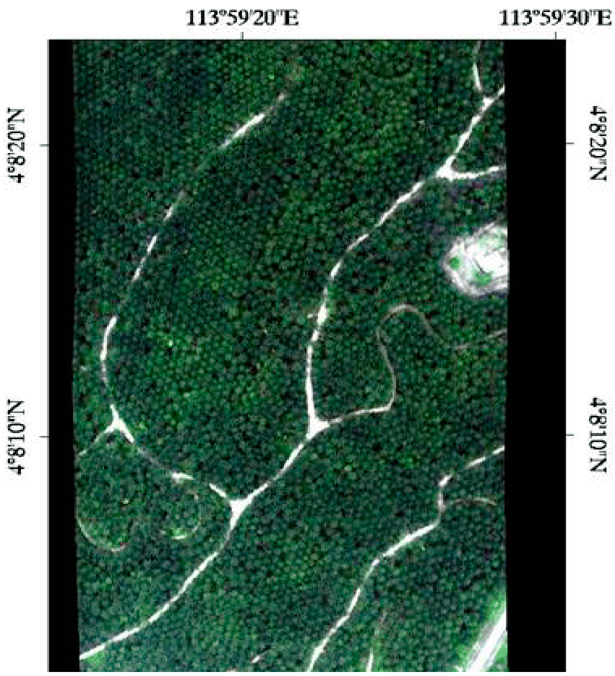

Figure 1

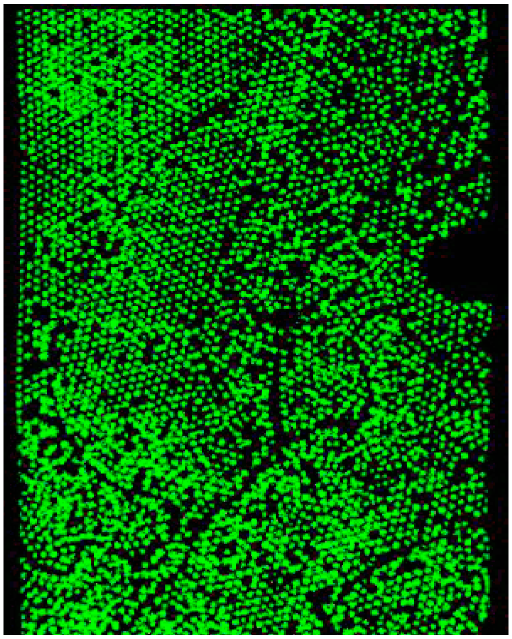

Figure 2

In this forestry application example, Forestry Department of Sarawak State in Malaysia employs a hyperspectral imaging method to monitor and map the distribution of specific fungus infection in oil palm forests. The mapping method helps sustainable management of forest maintenance and oil production.

Forest Department of Sarawak operates an AisaEAGLE system, which acquires hyperspectral data in the VNIR range of 400-1000 nm at high spectral and spatial resolution. In this example, The Forest Department flew over an oil palm plantation which included mature palms over 10 years in age. Flying altitude was 2500 ft (760 m) and speed 140 knots (72 m/s). Data from the AisaEAGLE was collected at 27 application specific spectral bands, and with 72 images/s for achieving 1 m ground resolution. The weather conditions during data collection were overcast clouds at ca 4000 ft (1200 m) and moderate visibility of 2.5 km due to slightly hazy atmosphere. Even in these conditions, the high sensitivity of the AisaEAGLE sensor made it possible to collect high quality data required by this mapping application.

MAPPING OIL PALM HEALTH CONDITION

As a first step in data processing, SPECIM's preprocessing software Caligeo was used to turn the raw hyperspectral data to radiance and to georectify the image to a map. Figure 1 shows part of a georectified flight line over the plantation, visualized in true colors. Secondly, the Forestry Department applied a palm tree detection algorithm to remove the background and create a palm tree map (Figure 2). The purpose of this mapping application is early phase detection of trees infected by Basal Stem Rot fungus (Ganoderma boneninse). The Forestry Department of Sarawak employs an optimized detection algorithm, which utilizes sensitive spectral information particularly in the red edge region.

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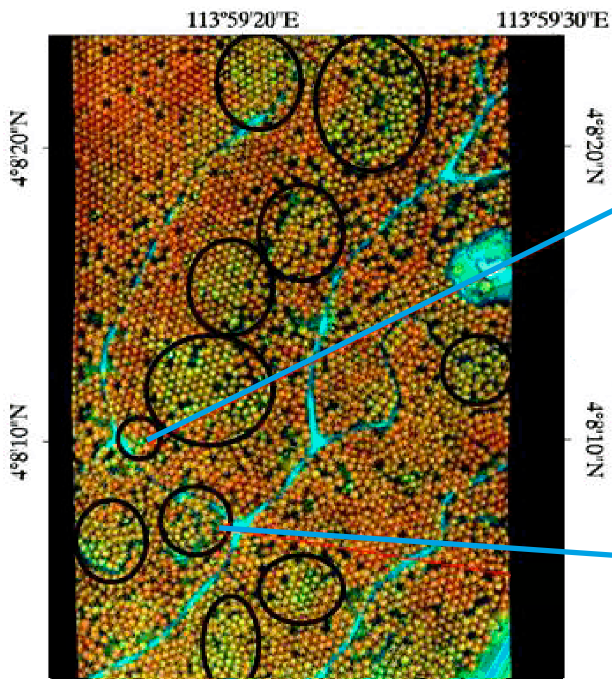

Figure 3

Photographs of infected palm trees.

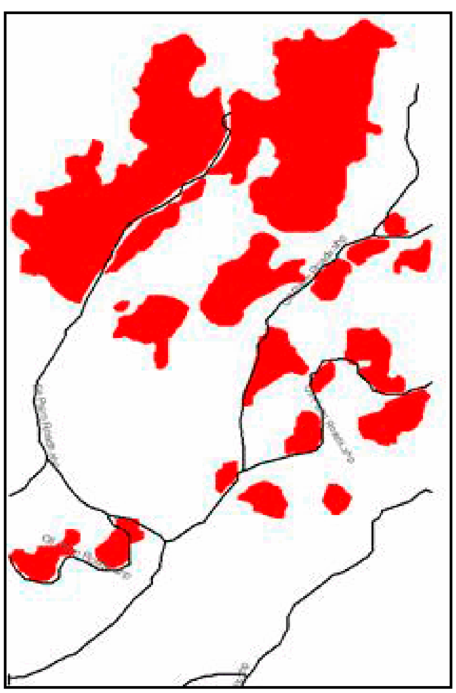

Figure 4

Figure 3 shows the tree map after the fungus detection algorithm is applied. Infected trees are visualized in range of yellow color, and healthy trees in brown.

As final step, the classification result, the mapped information about the infected areas, is transferred to a geographic information system (GIS) to guide ground workers in their actions.