PHOENIX RESEARCH STATION

PALMWATCH
Red palm weevil infection detection with remote sensing
**BACKGROUND**

- Date palm production is an **important commodity crop** with a fairly large economic value:
  - US$ 2000 per ton for prime quality.
  - Yields: 11-17 tonnes/ha.

- The **red palm weevil (RPW)** is spreading fast across palm producing countries and causes palm trees to collapse.
  - Production losses & delay.
  - Slow plantation re-establishment.

- Extremely important crop from **cultural** point of view: gardens and public parks

- Frequent **inspection** and **trapping poorly implemented** although efficient if palms owners and gardeners were mobilized and trained

*These are compelling reasons for defining a solution to the problem of red palm weevil infestation.*
The RPW is spread by:
- Flying of adult beetles
- Trade of infested plants

The RPW causes:
- A decrease in photosynthetic rate
- A decrease in water use efficiency
- Water loss
- Yellowing
- Higher canopy temperatures
- Lower stomatal conductance
- Structural damage (e.g., chewing)
PalmWatch - Key Questions

- Can we detect RPW using available RS techniques?
- At what stage will we be able to detect RPW?
Palmwatch - Objectives

RQ1: Can leaf biochemical changes be assessed?

Chlorophyll

Three-dimensional hyperspectral cube is assembled by stacking two-dimensional spatial-spectral scan lines

spectral

thermal
**Palmwatch - Objectives**

RQ2: Can *tree vitality parameters* be used to detect RPW?

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<th>Platform</th>
<th>Resolution</th>
<th>Spatial</th>
<th>Spectral</th>
<th>Temporal</th>
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![NDVI Graph](image)

- Abandoned oil palm
- Non abandoned oil palm
LOCAL MAPPING WITH OBJECT DETECTION

Coconut palm detection model applied to oil palm

Coconut palm detection model
LOCAL MAPPING

- Understanding the physiological response of the trees to RPW infection and link to RS
- Set-up an innovative RS monitoring system for a non-destructive effective local detection of RPW
REGIONAL MAPPING

Regional palm tree maps

Temporal tracking

Targeted risk area mapping
CREATING GROUND TRUTH FOR S1 AND S2

Main concept: use high resolution maps to generate low resolution training data

> 50% of S2 covered: palm tree pixel
< 50% of S2 covered: background pixel

In case of palm tree pixel:
density = amount of objects

- While the Pleiades-based maps will serve as training data generation
- Additional manual 1m training data will be generated for independent validation