

# Polar Star Space Co., Ltd.

## Oil palm disease early detection business by ultra-high precision spectrum measurement



### Object of the project

Object : To significantly reduce the damages caused by diseases in oil palm plantations by developing a system for early detection of infected trees through the monitoring of plantations with drones, and by providing the system to large-scale plantations.

Background : Oil palm is one of the major industries in Malaysia, but every year it is suffering from severe damages caused by diseases. There is no specific treatment for affected trees, and once infected, the trees must be cut down, including those in the surrounding area. Therefore, it is important to find diseases at an early stage and minimize the infected area.

### Cooperation with local companies/governments

#### Local partners

- SimeDarby, KLK (Kuala Lumpur Kepong Berhad): Manufacturers of palm oil. Offered plantations, Supported field tests.
- Universiti Teknologi Malaysia : Drone operations
- University Putra Malaysia : Advice on early detection of diseases, introduction of local companies
- Malaysian Palm Oil Board (MPOB)

Measured & analyzed spectral data of healthy/infected trees with a drone-mounted camera. Developed and tested a quadruple camera, as well as IT platform and system for analysis/reporting.

### Targeted economic/social issues

Palm oil is the most demanded plant oil in the world, with sales exceeding 4 trillion yen annually in Malaysia and Indonesia, meeting 90% of the global demand. It also is an important industry in ASEAN region. In large plantations, economic loss caused by diseases is reported to account for 10% to 15% of sales (annual damage of over 400 billion yen) and is a big issue in plantation business.

Currently, disease detection is conducted manually (visually) over large areas of land, making early detection almost impossible. In addition, to confirm infection with some diseases, it is necessary to confirm the presence of the bacteria not only visually, but also by testing, which is not suitable for large-scale field monitoring. As a result, when an infected tree is found, the infection has already spread extensively.

And local work heavily relies on workers from abroad because of their low wages. 60-70% of them come from Bangladesh, Cambodia, and the Philippines. Recently the number of workers has decreased due to the COVID-19 pandemic, causing sluggish production of palm oil. As a result, the international price of palm oil has risen significantly. Less number of workers also impacts operations to find diseases and further spread of infections is increasingly concerned.

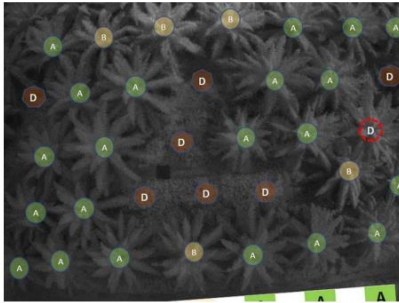
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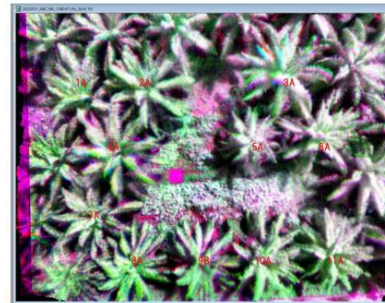


### Details of demonstration

1. Identified wavelengths to distinguish healthy and affected trees by measurements and analysis of spectral data from LCTF camera with training data.



Marked level of diseases on the picture taken from 50 meters above. A: Healthy, B: diseases in early stage, C: middle stage, D: late stage



Merged 120 bands data taken by LCTF camera into one

2. Developed a quadruple camera with 4 wavelengths identified above.
3. Developed a system to display locations of affected trees on the map.



Quadruple camera



Data taken by quadruple camera from 100 meters above

### Project outcome / Future plans

#### Project outcome:

- In addition to the demonstration results, cooperative relationship with local partners was well established. We plan to ask for their continuous support to improve the system and its accuracy.
- Also developing starting a collaborative project with Universiti Putra Malaysia on measurement and analysis methods.

#### Future plans:

- Will improve the accuracy of analysis further and launch the service within this year. Initially the service will be offered as beta version with reasonable price or charge-free to get additional data for further improvement of accuracy.
- Will expand the business to other areas.
  - A business alliance has been concluded with KAO Corporation to establish a system to monitor Ganoderma disease in oil palm farms in Indonesia. Will start demonstrations with Asian Agri, a palm oil manufacturer.
  - Will apply the same method on banana plantations in the Philippines to monitor diseases on banana trees. Will start demonstrations with Sumifru, a fruits manufacturer and importer.