



IoT and Decision Support Systems for Sustainable Rice Cultivation



by **Vishnu Nair**

Regional Director,
Pessl Instruments GmbH
vishnu@metos.asia

History

Founded in 1984, Pessl Instruments became a leading manufacturer and developer in smart technology agriculture on all continents. A complete range of wireless, solar-powered monitoring systems under METOS® brand and app FieldClimate, which was born in 2005 as the first-ever web platform for collecting and displaying agro-meteorological data, became an indispensable partner of every farmer who uses them.

1984

Establishment

1988

METOS® Classic

1992

METOS® Compact

1994

Windows graphic software;
disease & irrigation models

1997

Wireless age – data transfer via mobile networks (GSM)

2000

µMETOS®

2005

METOS® goes online,
FieldClimate launched

2006

New software and decision support system for irrigation management

2009

25 years; T-monitor launched

2009

METOS® MX

2010

iMETOS® ICA

2011

iMETOS ECO D2

2012

METOS® goes mobile – Apps for Android and iOS are launched

2013

METOS® goes wireless
METOS® BRASIL, MOLDOVA

2014

CropView®
µMETOS® Blue
iMETEO Pro
METOS® USA

2015

METOS® TURKEY

2016

Huawei, Vodafone partnerships; the first company from the agriculture to work on NB-IoT

2017

METOS® ANZ, IBERIA, POLSKA, UK

2018

Insect recognition,
John Deere, EIMA award

2019

35 years, **iMETOS** VWS, LoRAIN, Agritechnica award

2020

EIMA award, **METOS®** webshop, LoRATH

2021

METOS® ITALY
Company growth (20+ employees + **METOS®** Italia);
Davis Instruments, xarvio

2022

nMETOS® Launch

Value Proposition – De-risking the World with Field IoT



The METOS® Decision Support Systems plays an important role in collecting environmental data, used for the optimization of farm management activities and enhanced fieldwork planning including:

Irrigation management

Insects & disease monitoring

Plant protection & fertilizer application

Field accessibility & field activities in only optimum conditions

Sowing, seeding, harvesting.



**BETTER MANAGEMENT, OPTIMISED INPUT,
BETTER QUALITY, RISK REDUCTION, HIGHER ROI**



SEEDING



WORK FORCE
MANAGEMENT



IRRIGATION



FIELD
ACCESSIBILITY



INSECT
MONITORING



REAL TIME
ALERTS



SPRAY
WEATHER



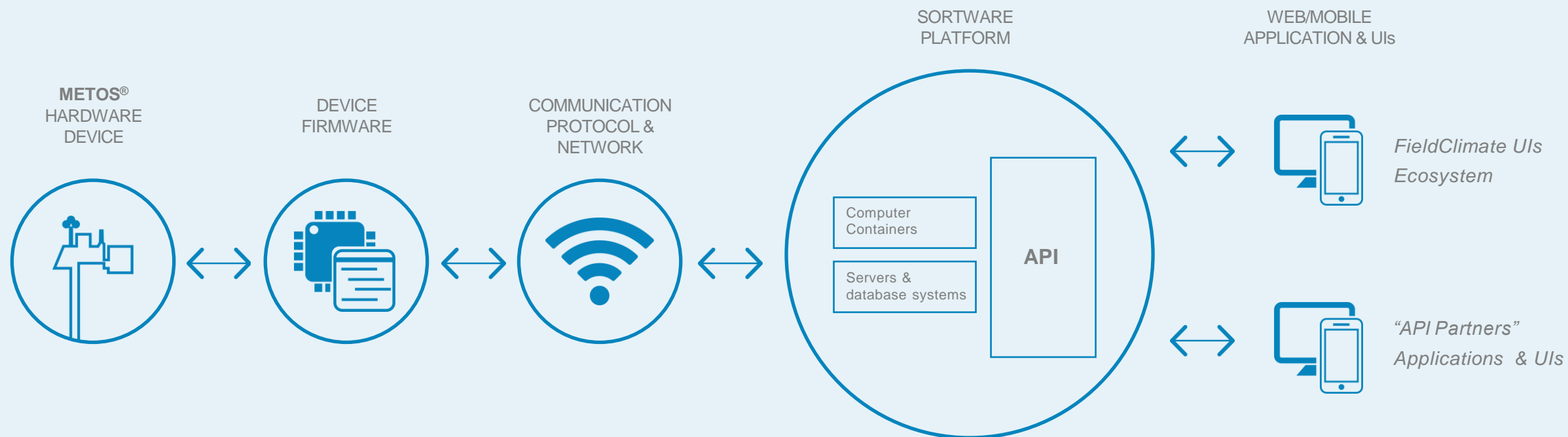
DISEASE
MODELING



REACT ON
TIME

Pessl Instruments

IoT Technology Ecosystem



Weather
Stations



Soil Moisture
Sensors



Drone
Support



Automated
Pest Traps



Machine
Tracking



Water Level
Sensors



Satellite
Monitoring



Connectivity
Gateway



Soil
Nutrition



In the past 18 months we have been collaborating with many stakeholders to adapt existing IoT and field monitoring devices to South East Asian paddy cultivation. Existing agrometeorological equipment are not suitable for large scale adoption due to:

Smallholder
Ecosystem

Lack of
Technological
Adaptation

Lack of Integrated
Decision Support
Solutions

Modified Insect Trap (Pessl IoT Adaptation)

Development of a new insect trap to capture the brown planthopper (*Nilaparvata lugens*)



Image 1 BPH in natural environment



Image 2 shows the overall set up of the modified iScout Pheromone Trap

Addition of mesh to filter unwanted trapped insects

Identify the best time range for the light to intermittently blinking at night



Image 3 shows when the UV light is blinking at night to attract the insect pest

Customised Field Water Tube (FWT) (Pessl IoT Adaptation)

Development of a FWT for the alternate wetting and drying method in rice fields



Image 4 shows the early customization plan for the FWT with ultrasonic sensor connected to nearby datalogger

Design plan is to increase the tube to 500mm in length with the sensor calibrated at that length. (200mm part of it will be inside the soil)

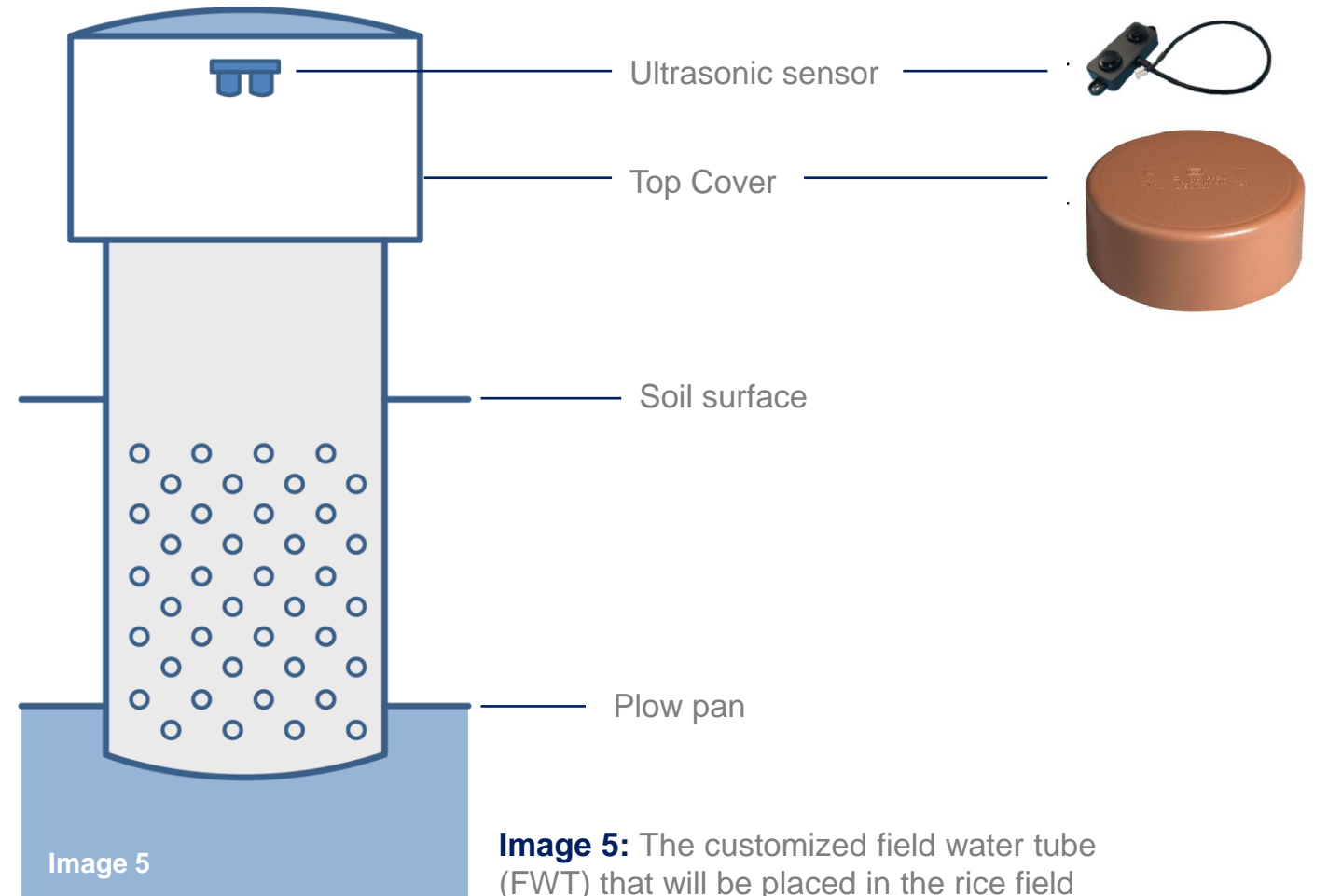


Image 5: The customized field water tube (FWT) that will be placed in the rice field

MobiLab for Sap Testing (Pessl IoT Adaptation)

Development of a benchmark tool to measure nutrition in paddy



Image 6: The MobiLab for sap analysis for nutrient content such as NO_3^- , NH_4^+ , K^+ , Ca^{2+} , Mg^{2+} , Cl^- , Na^+ , and SO_4^{2-} .

Image 6 shows the MobiLab, the sap analyzing tool of paddy.

Standard protocol will be set - to collect sap from a proper plant part for an accurate representation of nutrient content in paddy.

MobiLab can analyze:

1. Nitrate
2. Ammonium
3. Potassium
4. Calcium
5. Magnesium
6. Sodium

DSS Partner (Malaysia)



AGROCLOUD

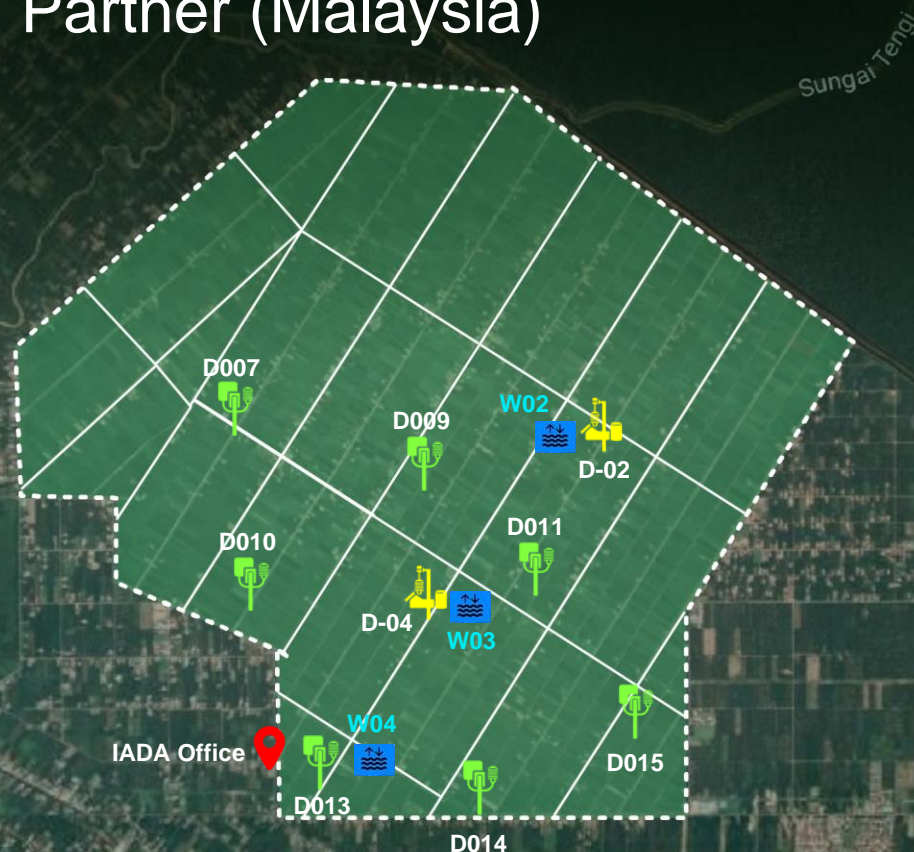
VISION

Adoption of existing agricultural innovations into viable solutions for the tropical agricultural industry focusing on smallholder development and improving national food security.

MISSION

To assist the upstream farming value chain by reducing costs of production and increasing yields by leveraging the latest technologies.

www.agrocloud.com.my



D-04



D-02



D014



D015



D011



D009



D007



D010



D013



W04



W02



W03

MANAGEMENT PLATFORM

By clearly identifying real problems and solutions, Agrocloud aim to optimize and simplify the function of national crop agencies by delivering custom management platforms focused on their immediate concern.

Currently development is focused on paddy, but soon we aim to support all Malaysian agricultural agencies with the best-in-class management tools anchored by the latest available technology.



FARMER'S MOBILE APP

The ultimate beneficiary of an agricultural decision support system should always be the farmers. Developing simple and prescriptive mobile application for smallholders is a fundamental component of our approach, and we strongly believe that these apps should be made available at no costs to the farmers of Malaysia.



Pessi APAC Strategy:

To own and operate the largest network of agrometeorological IoT devices on earth. We will install 100,000 weather stations between 2022 and 2024 to become the world's largest agrometeorological Data-As-A-Service provider. Our focus is to immediately identify paddy clusters to test our model.



We are investing heavily to rebuild our APAC business unit under this new strategy. By owning and operating our own networks, we remove the huge CAPEX risk of acquiring agrometeorological data which expect will liberate the Farm Advisory sector with many stakeholders able to focus on improving their software services.



As part of this new strategy, we are rationalising our production and logistics to enable bigger savings in cost. We plan to manufacture and assemble all IoT hardware in Asia with my production hub to be in China. This reduced cost structure will translate to lower data subscription costs to our partners.

Network Configuration (proposed)

1. μ METOS ET₀ DISEASE

Rain gauge, air temperature and humidity, leaf wetness, global radiation, wind speed and direction ultrasonic.



2. nMETOS 200

Rain gauge, air temperature, air humidity, leaf wetness sensor and calculated sensors: dew point, VPD and Delta T.



GRID SYSTEM

The design of the network will be underpinned by two differently configured stations. Not all meteorological parameters require the same geospatial density in measurement. We have identified two configurations with differing installation densities optimal data granularity.





Data Driven Agriculture for South East Asian Rice Farmers

Introduction to Agro-Meteorological Networks and Digital Farm Advisors

Co-financed by:



Partner:



In Association with:



Sustainability



Improvement of Food Security

It focuses on rice, the staple food of Southeast Asian countries, to improve food security in partner countries.



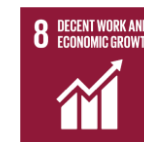
Achievement of Gender Equality

It focuses on rice, the staple food of Southeast Asian countries, to improve food security in partner countries.



Economic Development

This gives agricultural-based countries opportunities for economic development and helps create many jobs in partner countries through this business model.



Adaptation to Climate Change

This gives agricultural-based countries opportunities for economic development and helps create many jobs in partner countries through this business model.



Key Actions – Technology & Training



Technology

The deployment of a regional Agro-Meteorological IoT Network with METOS monitoring Systems will serve as critical infrastructure that will support Climate Smart Agriculture(CSA) Adaptation



Training

The training and certification of local village talent into trained technical advisors called Digital Farm Advisors (DFA) will be the primary interface for the propagation of CSA advisory to the smallholder farmers



THANK YOU