



PRECISE APPLICATION OF CHEMICALS THROUGH PRECISION FARMING

**Dr Arina Mohd Noh, Dr Azman Hamzah, Ir Dr Badril Hisham Abu
Bakar, Mr. Mohd Nadzim Nordin**
Engineering Research Center, MARDI
Malaysia

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Introduction

- Paddy is one of the most important food crop in Malaysia.
 - Rice is the staple food for the majority of the population.
 - The crop provides the primary source of income and livelihood, particularly for small-scale farmers and landless agricultural workers.
- Current self sufficiency level (SSL) for rice output is between 60 – 70%
 - Government sets SSL target at 75% by 2025
- To achieved the targeted SSL - increasing yield is one of the measures. To increase yield, precise chemical application is important especially in reducing pest and disease, and to optimize fertilizer application.

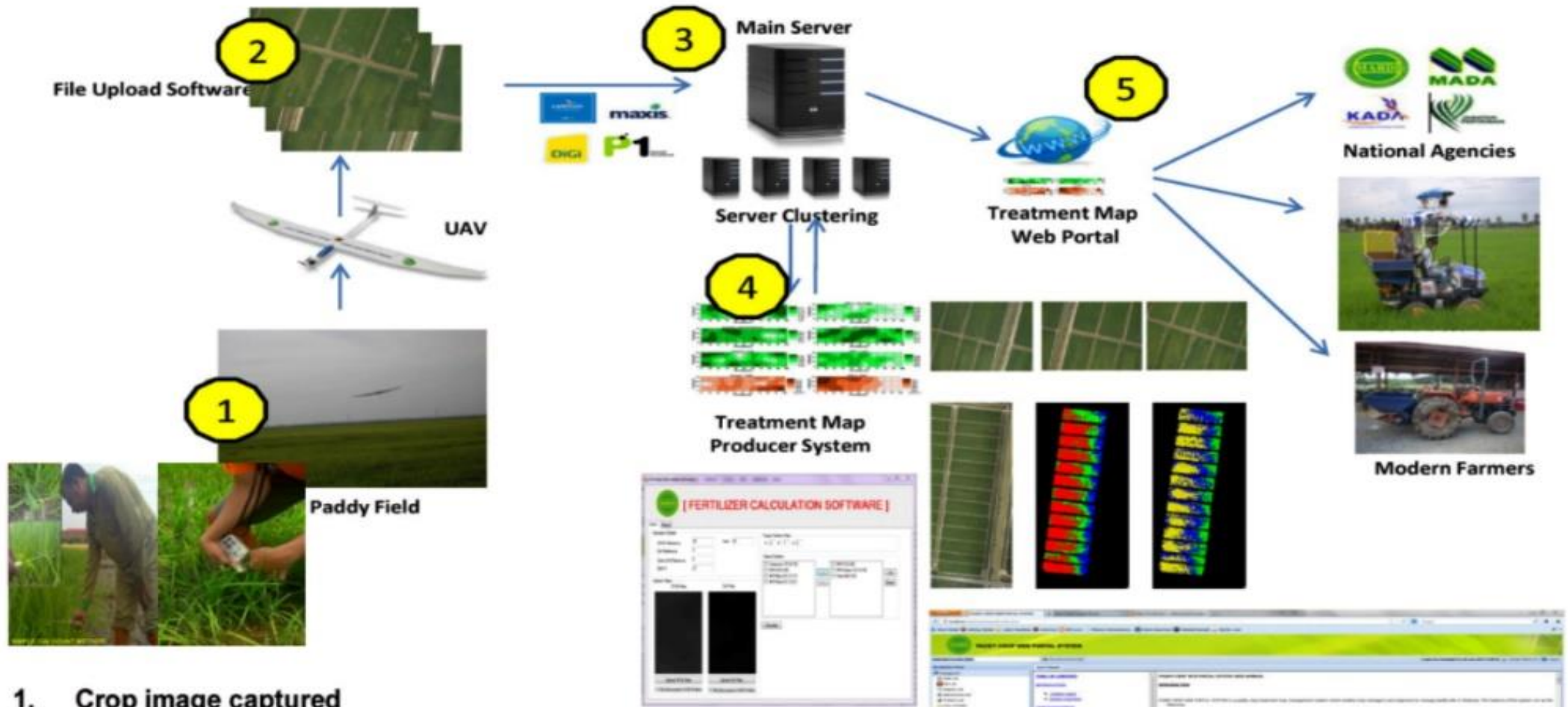
Needs

- The application of pesticides on crops is necessary to prevent unacceptable losses of the crop production. However 30.6% of farmers either uses more or less than the required quantity.
- Most of the time, severity of pest and insects forced farmers to use over dose pesticides.
- In addition to that, some farmer missed to apply pesticide in appropriate time which led to the spreading of weeds and eventually they were forced to fight the weeds with herbicide in order to keep the crops
- Furthermore, majority of workers or 76.83% do not adopt security measure during pesticide application and this may pose health risks to the farmers as a consequence of improper or careless handling of chemicals.
- Increasing trend in fertilizer usage (kg per hectare of arable land) from 98.2 kg (1961) to 2491 kg (2018) – 2nd highest in the world ranking – need to optimize to reduce production cost.

Precision Farming (PF)

- Farming management concept based on observing, measuring and responding to inter and intra-field variability in crops
- Reduces uncertainties and managing variabilities in farm management
- allows efficient use of resources.
- reducing undesirable excess chemical loading that would bring adverse effect to the environment and reduce profitability
- MARDI introduce PF technology including application of early warning system (EWS) to reduce pesticide application, Variable rate application of fertilizer and drone application in pesticide and fertilizer application

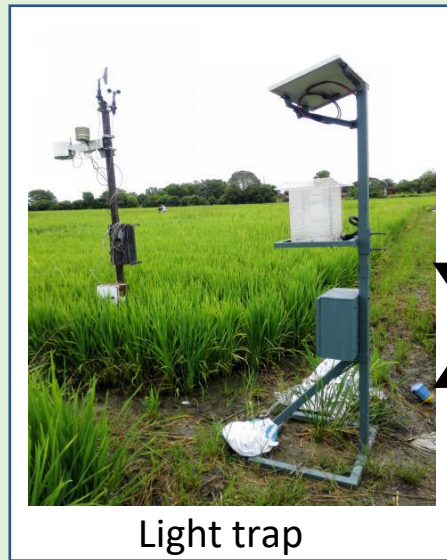
VARIABLE RATE FERTILIZER APPLICATION SYSTEM



1. Crop image captured
2. Captured crop image uploaded to server
3. Image processed in the server to produce SPAD and GAI map
4. GAI treatment map by treatment map producer system
5. Access by user through treatment map web portal

- Fertilizer applications with VRT provide specific nutrients for plant needs
- The conventional practice of fertilization is on a blanket basis without taking into account the needs of the plant and the nutrient content available to each plot
- This will eventually result in inefficient use of fertilizers which is a situation where there are areas that receive more or less fertilizer regardless of the fertility status of the local soil.
- This leads to increased input costs and adverse effects on the environment.
- MARDI VRT Fertilizer System is based on the Green Area Index (GAI) model which assesses soil fertility and local crop conditions.
- This system is observed to save 17% of the total cost of fertilization with an increase of around 20% efficiency compared to conventional fertilization methods.

EARLY WARNING SYSTEM (EWS)



**EWS
model**



Outbreak Risk Index

Low risk– No need control

Medium risk– Need to control

High risk– Need immediate control

- To control the Brown Plant Hopper (BPH) outbreak in paddy production
- Current practice – schedule spraying – based on plant stages
- Using EWS, risk map of the area was generated from EWS model developed to predict the pest outbreak risk. The EWS model calculated the risk based on important parameters such as current population of the BPH in the field and environment parameters..
- By using EWS, farmers only spray when the risk of the area is medium or high
- This system not only can assist farmers to only apply the pesticide when necessary but also helping farmers to take early preventive measures before the outbreak occurs to avoid significant yield loss



DRONE : EYES IN THE SKY

- **Essential component in precision farming.**
- **Equipped with cameras, sensors, GIS data collection devices - act as 'eyes in the sky'**
- **Surveying crop pest and disease area and identify insufficient water and nutrient deficiency area**
- **Installed with fertilizer or pesticide sprayer for fertilizer and pesticide application.**

Advantages.

- Efficient use of fertilizers and pesticides
- Time of spraying inputs such as fertilizers or pesticides can be shortened and the cost of spraying can also be reduced
- Enables more accurate spraying – treatment map
- Drone pressure sensor and flow sensor able to monitor the spraying rate in real-time allowing for dynamic control of spray speed and amount during operation
- Drone spraying system responds to commands precisely, increasing the precision and effectiveness of spraying operations.

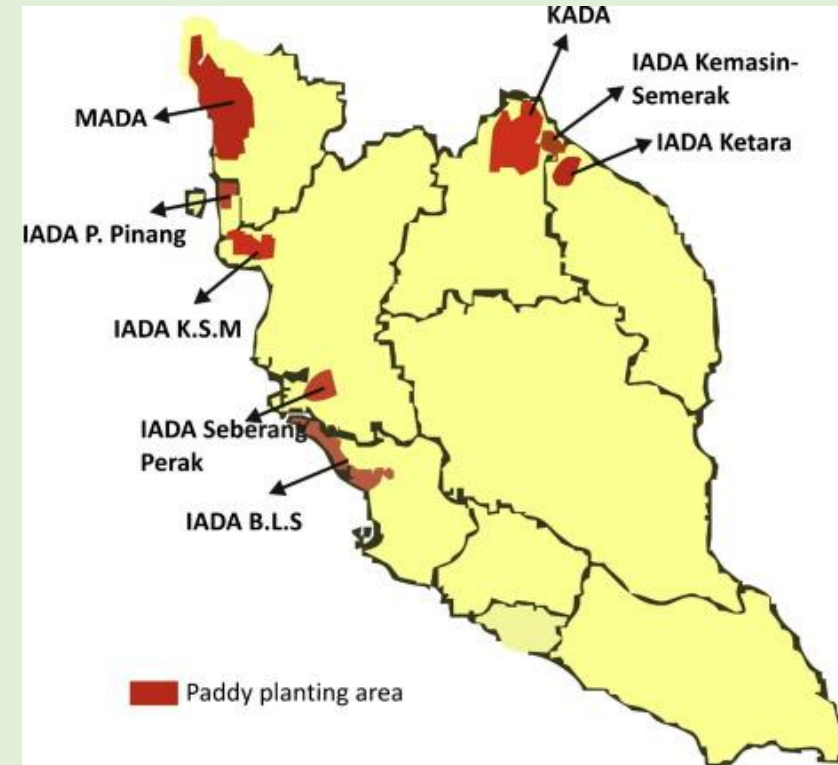


ISSUES AND CHALLENGES

- Implementing advance technology and machineries will involved high capital and maintenance cost.
- Not suitable for small scale farmers.
- The rapid growth of technology has been described as one of the causes of job losses for semi-skilled workers in developing countries. As a result, the income gap is widening, which would almost certainly have a negative social effect.

SOLUTION

- Government initiative – increase food safety- National Agro-food Policy 2.0 (launch on 25 October 2021) – drafted to drive the development and modernization of agri-food industry for the period of 2021 to 2030.
- Strengthening technology application in agro-food sector is one of the main focus – initiative on modern technology adoption
- Adoption of technology by extension agencies and private sector – each granary area was manage by specific extension agencies.
- This extension agencies or private company can acquire the technology and provide service to farmer –
- Farmer only pay for the service – don't have to invest on high capital and maintenance cost.



CONCLUSION

- Precise application of chemicals in crop production is important to ensure 100% SSL can be achieved.
- New technology developed through R&D for precise chemicals application was already available, however to ensure these technology is successfully implemented by the target user, cooperation from all stake holder and government support is needed.



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謝謝

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спасибо

thank you

gracias

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