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Supporting IPM Across Southeast Asia

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Drones and Digital Integrated Pest Management

Welcome Note

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Lead, Innovation
Grow Asia

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Dr Alison Watson

Head
Fall Armyworm Action Plan Secretariat

Today's Agenda

Welcome	
Speaker Presentations	**Dr Lian-Sheng Zang,** Key Laboratory of Green Pesticide and Agricultural Bioengineering, Guizhou University **Dr Daniel Tan, Professor,** School of Life and Environmental Sciences, University of Sydney **Nehemiah L. Caballong,** Information Systems Researcher, Philippine Rice Research Institute (PhilRice) **Dr Mariette McCampbell,** Researcher, Knowledge, Technology, and Innovation Group, Wageningen University and Research **Dr Elisabeth Simelton,** Climate Change Scientist, World Agroforestry Centre (ICRAF)
Panel Discussion	**Adrian Soe Myint**, CEO, Village Link & Chief Digital Officer, Myanma Awba Group **Winnie Atieno**, Associate Director, PlantVillage **Anthony Tan**, Founder & Director, New Hope Corporation

Housekeeping

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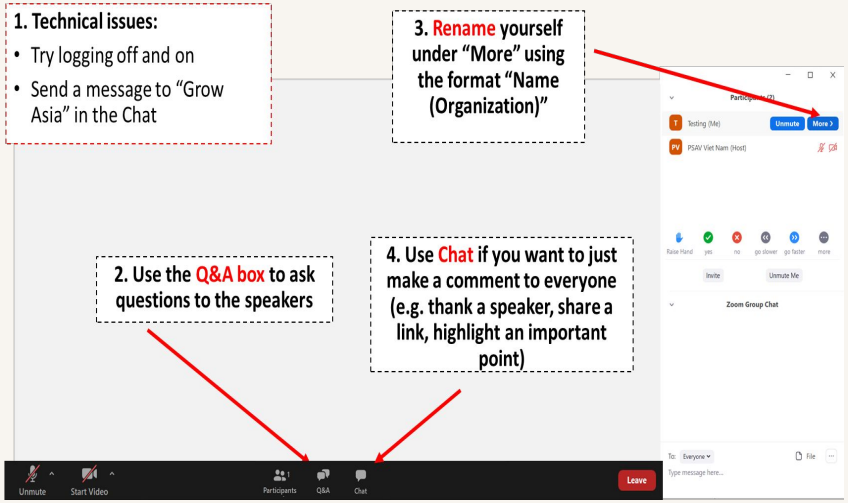


- For any technical issues with the platform during the session, send a message to Grow Asia in the chat or contact **+65 8755 1405 via WhatsApp**
- If you have any questions for the speakers, please type it into the **Q&A box**
- If you have any general comments, would like to share any work or your experience on the subject, or thank a speaker etc. please write that in the **chat.**
- Please also take the time to **introduce yourself briefly in the chat**.
- We will be recording the presentations and will send a link to the recording and a PDF copy of the presentations within one week of the session

Poll #1

Where are you based?

Poll #2

What type of organization do you represent?

Novel Use of Drones for Releasing Trichogramma Parasitoids against Agricultural Pests in China

Dr Lian-Sheng Zang

Key Laboratory of Green Pesticide and Agricultural Bioengineering of Ministry of Education, Guizhou University

Drones and Digital IPM Workshop

December 9, 2021

Novel Use of Drones for Releasing *Trichogramma* Parasitoids against Agricultural Pests In Northeastern China

Lian-Sheng Zang

Key Laboratory of Green Pesticide and Agricultural Bioengineering, Guizhou University

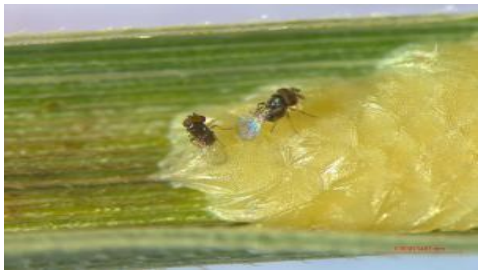
E-mail: lsz0415@163.com

Outline

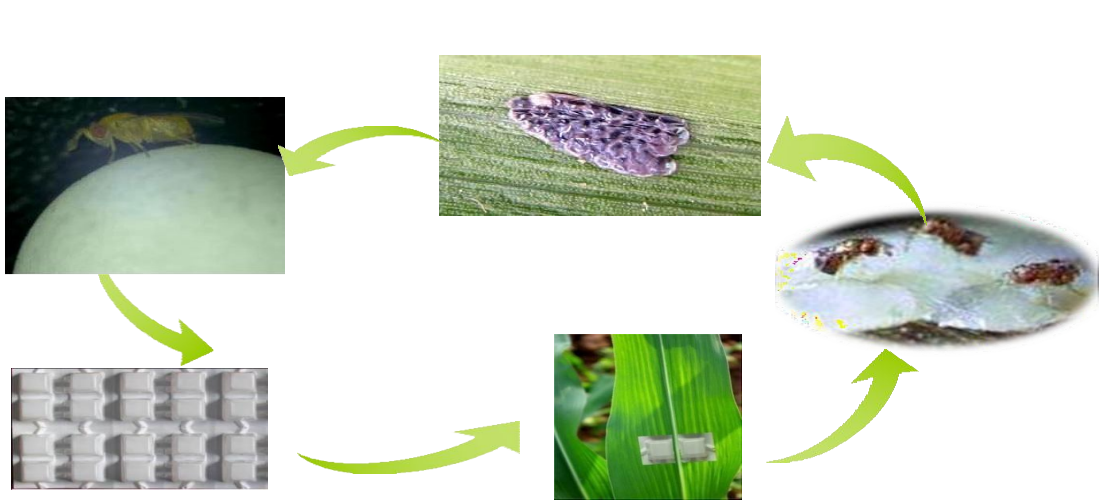
- Applications of *Trichogramma* Parasitoids against agricultural pests in northeastern China
- Why use drones to release *Trichogramma?*
- What we have done on use of drones for releasing *Trichogramma* pests ?
- How use the dones for releasing *Trichogramma a*gainst pests ?
- Could we use the dones for releasing*Trichogramma* against fall armyworm ?
- Summary

Trichogramma parasitoids：egg parasitoids

- attack most Lepidoptera pests;
- star natural enemies;
- longest history and largest area of application;
- most suitable for massive production with low cost.

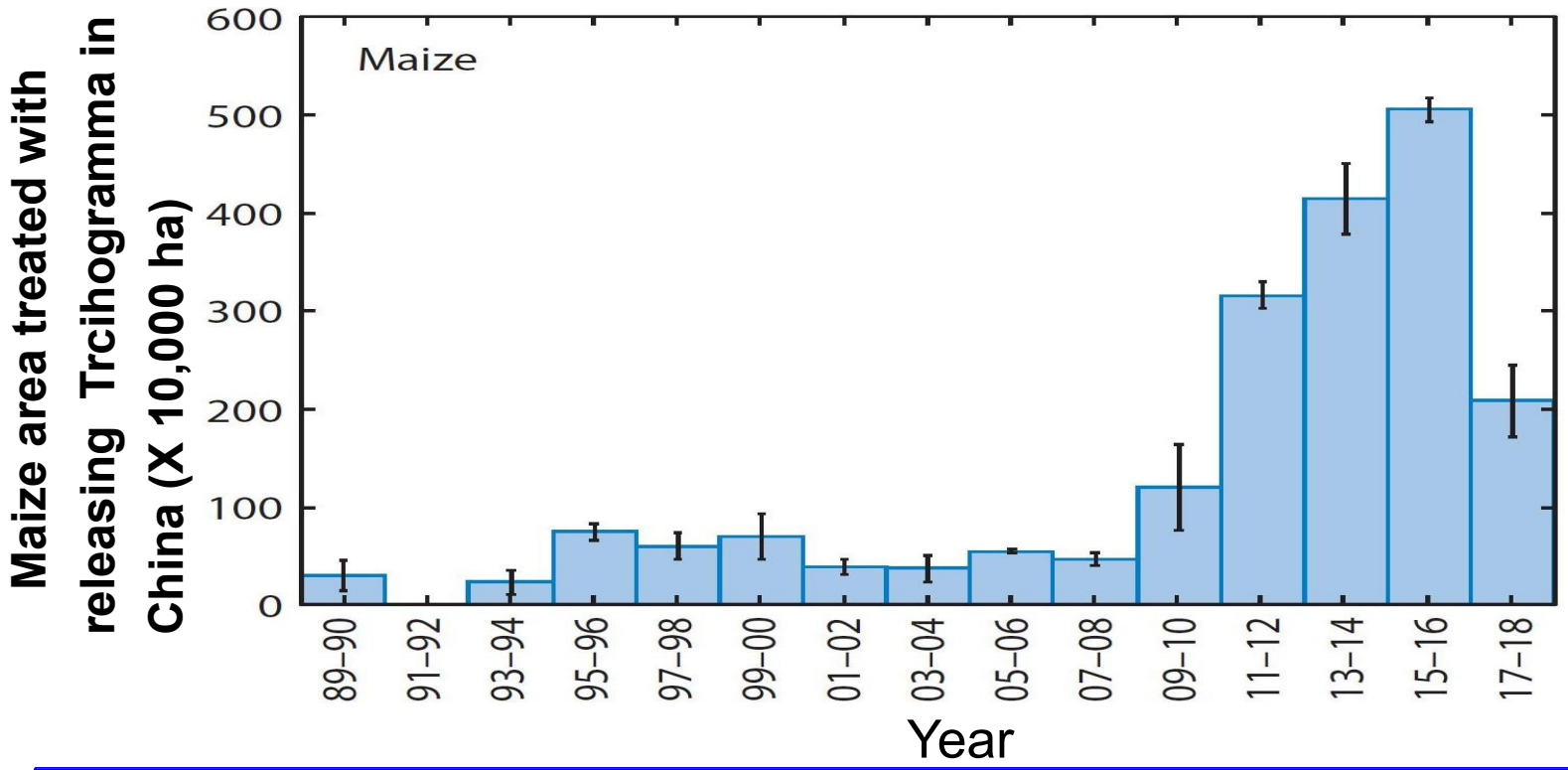


- Since 1980s, artificially-reared *Trichogramma dendrolimi* on large eggs of Chinese oak silkworm (COS) have been augmentatively released for controlling the corn borer in northeastern China
- There is an approximately three-decade application history, and the great success has been achieved in the biological control of corn borers with inundative releases of *Trichogramma* in China



Asian corn borer

A simple process of the corn borers suppressed with artificially-reared *Trichogramma* on eggs of Chinese oak silkworm



2011-2018, release *Trichogramma* parasitoids control corn borers about 15 millions ha in China（Data provided by MOA）

Zang et al., 2021, Annu. Rev. Entomol.

- Northeastern China is the main region to produce maize, rice and soybean in China
- The plantation areas of maize, rice and soybean in this region steadily keep about 15, 4, 3 millions Ha
- For these crops, the corn borer, rice stem borer, and soybean pod borer are the most economical pests, and generally occur in this region

corn borer

Ostrinia furnacalis

rice stem borer

Chilo suppressalis

soybean pod borer

Leguminivora glycinivorella

During 2008-2018, our team developed a new biocontrol technology of the rice borers with *Trichogramma*:

Mix-releasing *T. denrolimi* reared on the large eggs of COS and *T. japonicum* reared on the small eggs of rice moth (RM) to control the rice stem borers

大卵繁育松毛虫赤眼蜂

T. dendrolimi reared on COS

小卵繁育稻螟赤眼蜂

T. japonicum reared on RM

大小卵蜂混合包装

parasitized eggs

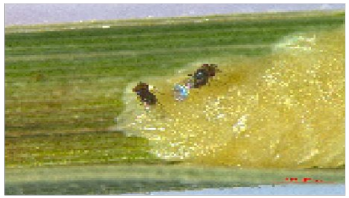
carrier

田间抛投放蜂器

release the carriers by hand in the field

放蜂器自动漂浮于水面

Carrier automatically floats on the water



赤眼蜂寄生二化螟卵块

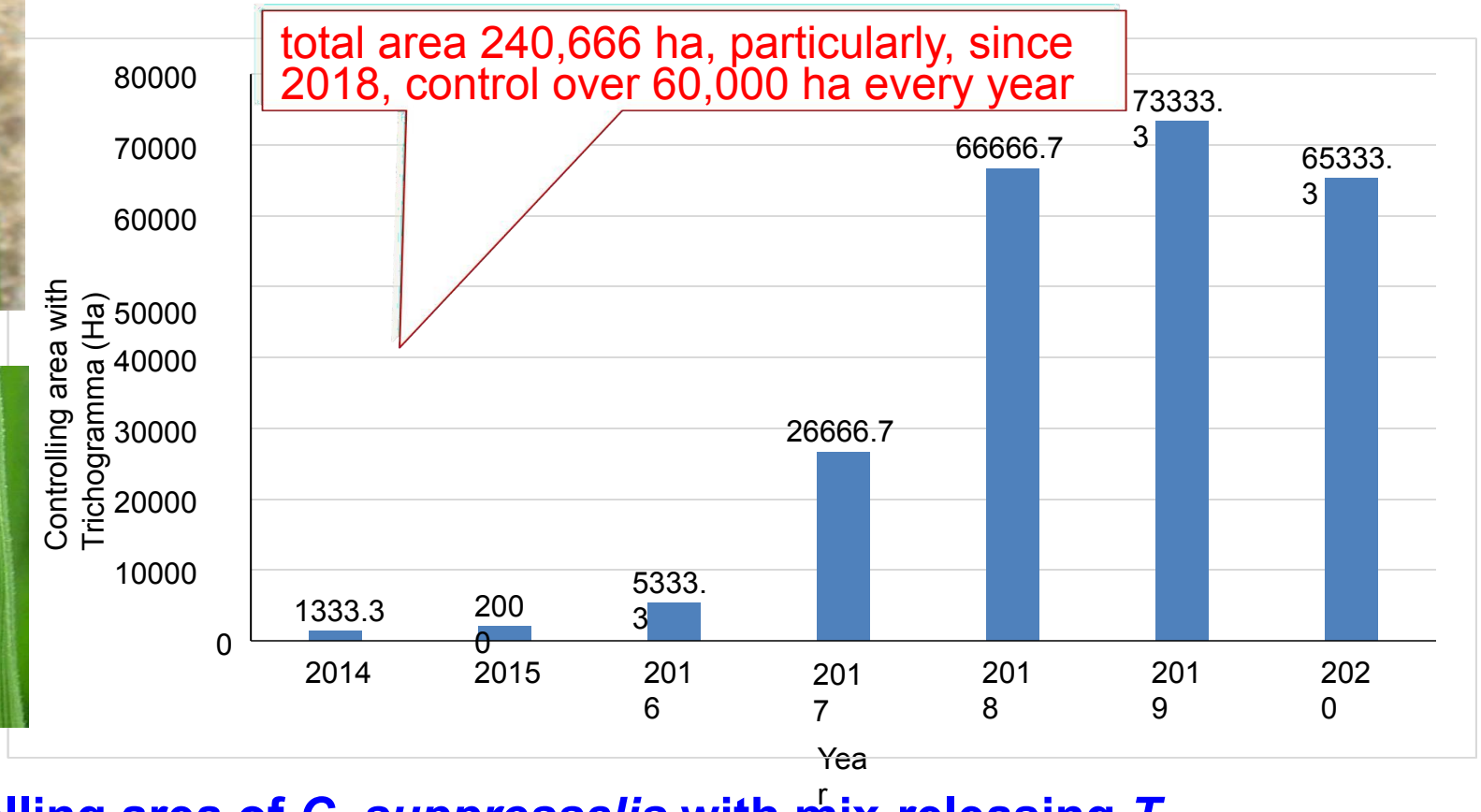
Trichogramma parasitizing eggs

水田环境快速降解的放蜂器

degradable carrier

A simple process of the rice stem borers suppressed with mix-releasing *Trichogramma* parasitoids

rice stem borer



Controlling area of *C. suppressalis* with mix-releasing *T. japonicum* and *T. dendrolimi* in Jilin Province since 2014

During 2012-2018, our team developed another biocontrol technology of the soybean pod borer (SPB) with *Trichogramma*:

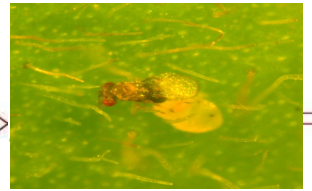
T. leucaniae reared on the large eggs of COS control the soybean pod borer

T. leucaniae reared on COS

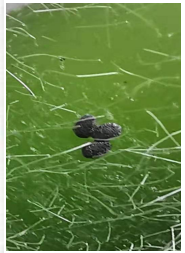
Carriers

oviposition period of SPB

release the carriers by hand in the field



parasitizing eggs



SPB eggs parasitized

A simple process of the soybean pod borers suppressed with artificially-reared *Trichogramma* on COS eggs

Why use drones to release *Trichogramma* ?

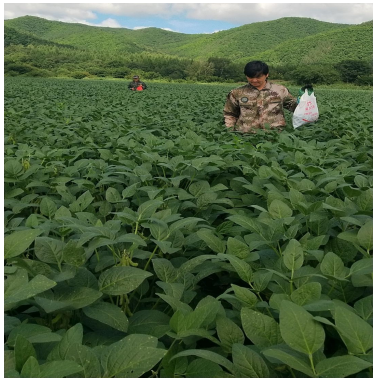
During the extension of *Trichogramma* against these pests, we found some factors influencing their applications...

(1) the impacts of crop growth stage on application during releasing *Trichogramma* against pests

Maize field: plant higher than 1.2 m; leaves with spines and hairs usually hurt farmers

Soybean field: plants higher than 1 m, crossing each other, farmers walking inside cause serious damagement on the soybean plants

release *Trichogramma* at the big flare period of maize



release *Trichogramma* at the pod-bearing period of soybean

(2) the impacts of field environment on application during releasing *Trichogramma* against pests

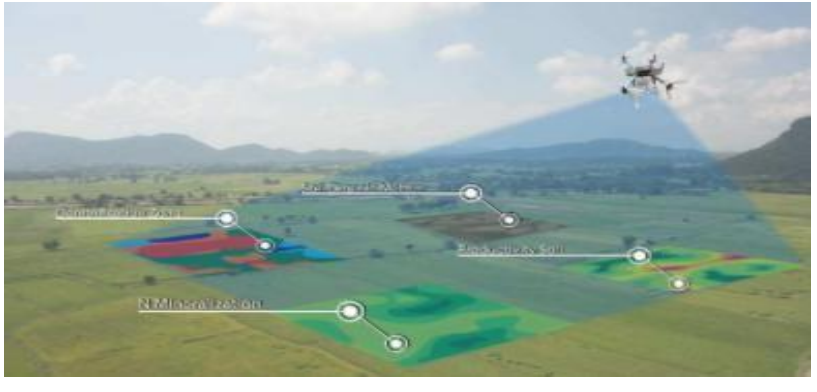
Rice field: have water and mud in the paddy field, a little bit of difficult to release carriers, randomly release carriers, and could not assure precision release

Other

(1) Because labor cost is more and more expensive, developing light and simplified and intelligent plant protection technologies have become a tendency in China

(2) Drones have been well developed in China, and widely used in plant protection, such as spraying chemicals and monitoring diseases and pests

(3) It is no doubt that the drones will conduct precision release than manually release



What we have done on the use drones for releasing *Trichogramma* against pests ?

Drones and release device developed by CAS

Cooperative partners:

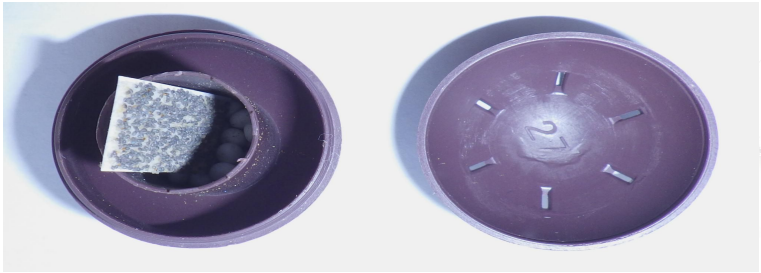
Institute of Biological Control, Jilin Agricultural University

Institute of Optics, Fine Mechanics, Physics, Chinese Academy of Sciences

Carriers matched with the drones developed by JAU

- ✔ The drones with six-arms drived by charged batteries
- ✔ The release device automatically release carriers according to the speed controlled by the program
- ✔ The drones work in 1 km with a remote controller
- ✔ One time departure may control about 20 ha

Carrier for paddy field

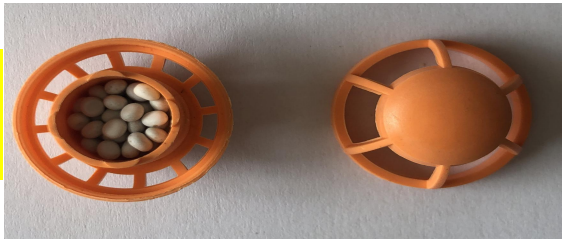


two chambers

automatically floating on water

- ✔ All carriers are designed as ball shape
- ✔ The color of all carriers is dark
- ✔ All carriers are degradable
- ✔ One carrier could carry about 4000 parasitoids

Carrier for upland field



parasitoids could crawl out from two ends; 3 cm in diameter

the bottom of one end with several holes

How to use drones for releasing Trichogramma against pests?

The drones have been used for releasing *Trichogramma* parasitoids against corn borers, rice borers, soybean pod borers in Northeastern China

Generally, the use of drones for releasing *Trichogramma* parasitoids against soybean pod borers is the most successful case in northeastern China

- ✔ In 2020-2021, controlling soybean pod borers **8000 ha** with drones releasing *T. leucaniae* was completely supported by the government of Jilin Province with **0.5 millions $**.
- ✔ The use of drones for releasing *Trichogramma* against SPB cover all these area

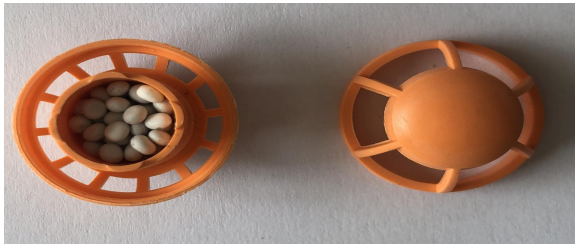
- The cost of controlling SPB with drones releasing *Trichogramma*: **total 50 $ per ha**

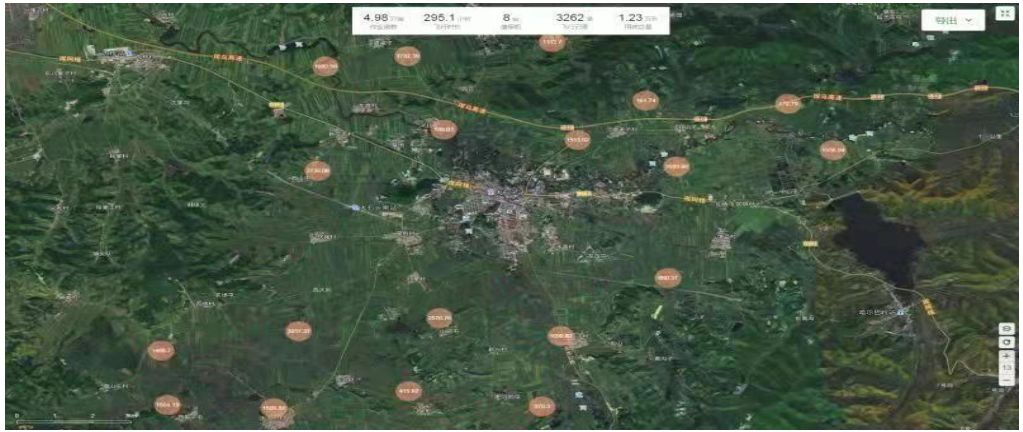
(1) the cost of *Trichogramma* with carriers: **35 $** (450,000 wasps; 90 degradable carriers)

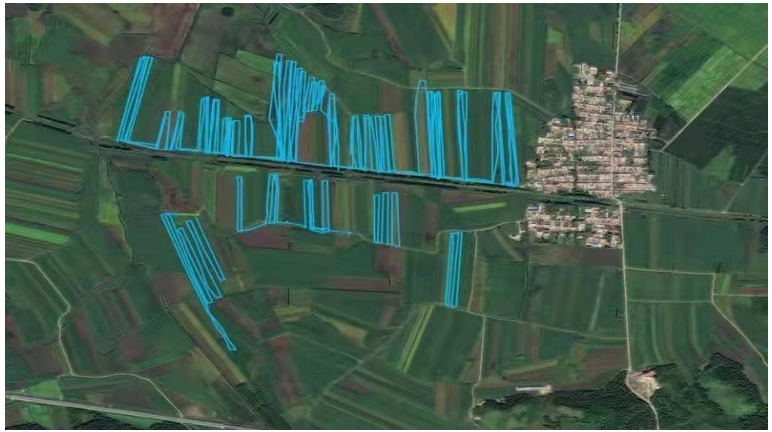
(2) the cost of drones releasing parasitoids: **15 $**

- The method of releasing *Trichogramma* with drones.

During the oviposition period of SPB (Aug. 5-15), release two times with the drones at 5-7 day intervals, 225,000 wasps evenly packed in 45 carriers per time. During the practical operation, release one carrier with drones at 10 m intervals







The figures indicate the real flying traces of drones releasing *Trichogramma* against SPB in the field

The biocontrol efficacy of large-aera releasing Trichogramma against SPB with drones in Dunhua, China in 2021

Treatments	Replicates	Pod damaged (%)	Seed damaged (%)	Control efficacy (%)
Release *Trichogramma* with drone (TL)	**5**	**3.86±0.82 b**	**3.11±0.54 b**	**85.21**
No any control (CK)	**5**	**18.86±1.51 a**	**21.03±2.19 a**	**-**
		t = 8.378, df = 8, P < 0.001	**t = 7.521, df = 8, P < 0.001**	

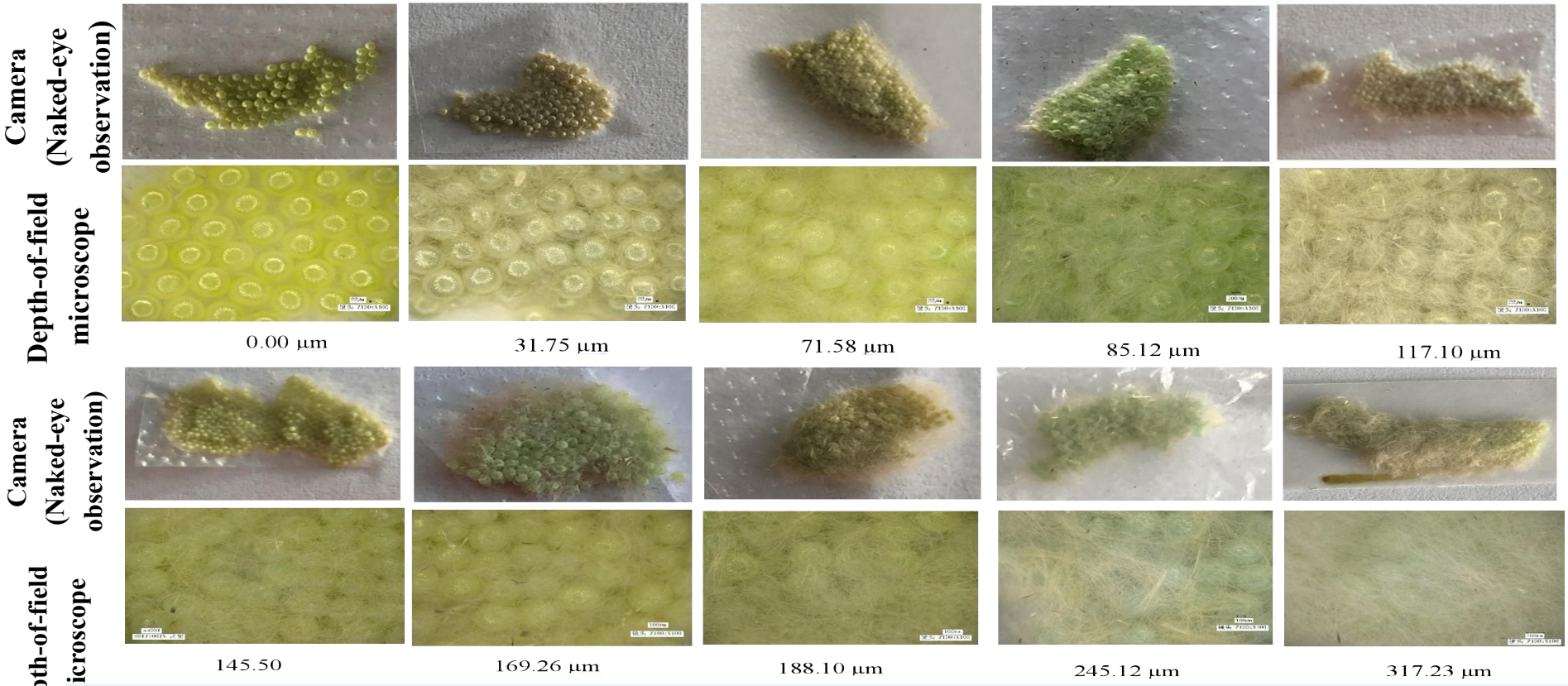
Video

Use of drone for releasing Trichogramma against corn borer

Video

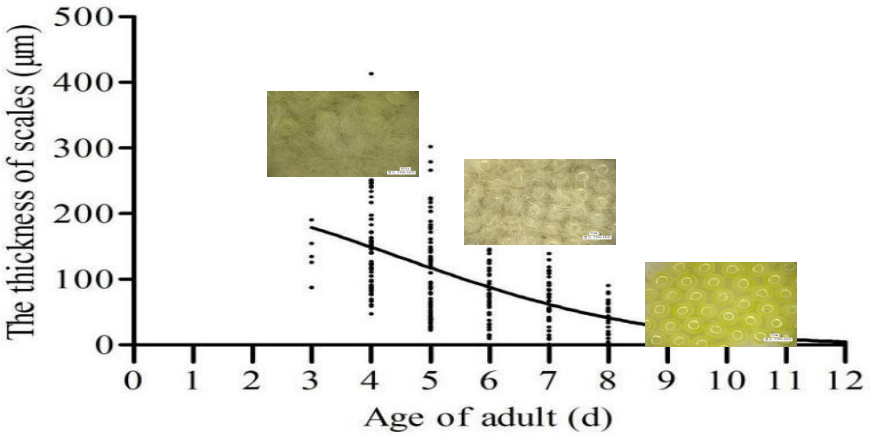
Use of drone for releasing Trichogramma against SPB

Could we use the drones for releasing *Trichogramma* against fall armyworm ?

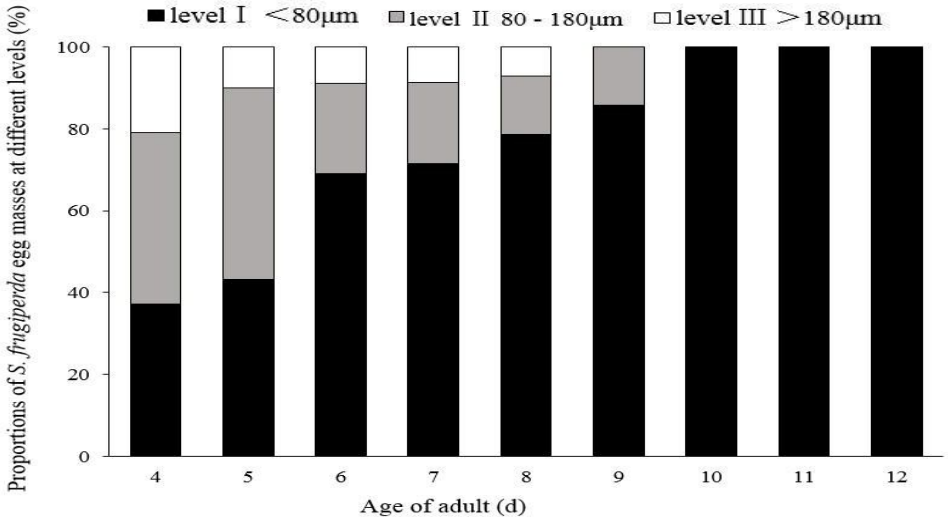


The thickness of the scale layer on FAW eggs masses

- The thickness of the scale layer on FAW egg masses ranged from 0μm to 400μm.
- The thickness of the scale layer on egg masses were graded into three levels: Level I: 0-80μm; Level II: 80-180 μm; Level III: >180 μm

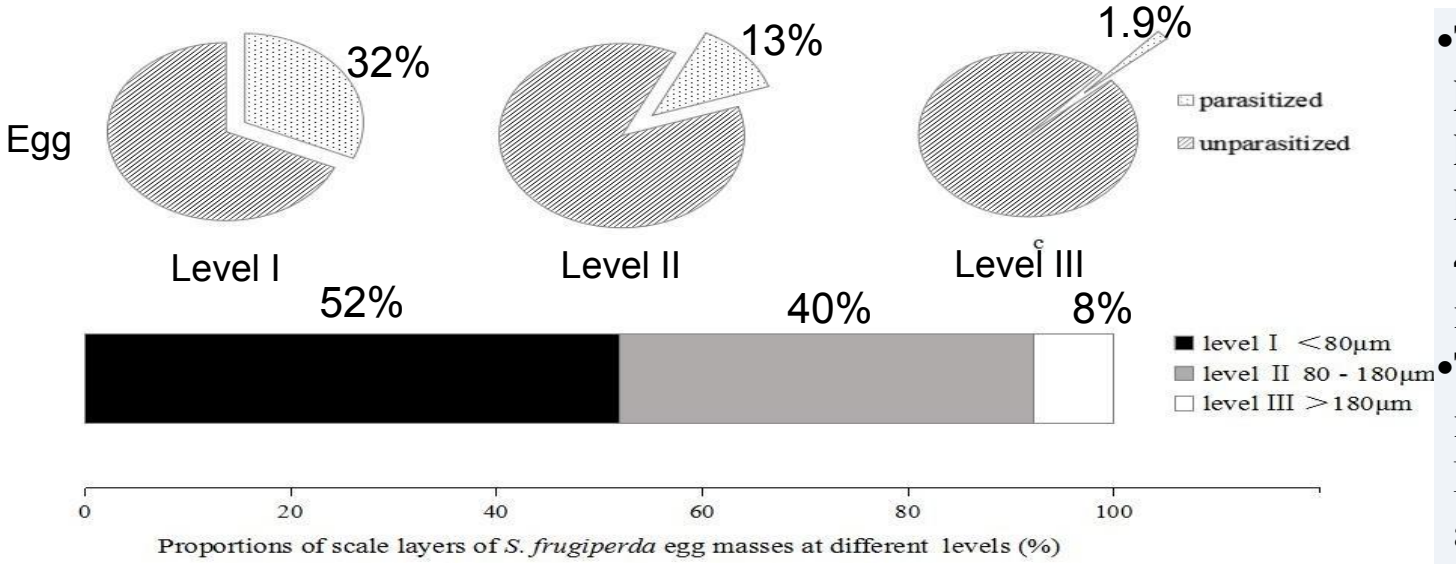


The variation tendency of scale thickness on the top of egg masses during FAW female aging



Proportions of FAW egg masses at different levels during oviposition period of female adults

- **The thickness of scale layer on egg mass significantly decreased along with the increase of FAW female age**
- **The proportion of FAW egg masses at level I significantly increased, but significantly decreased at levels II and III with female adult aging. The egg masses were all level I from 10th day after adult emergence**



Proportions of scale layers of FAW egg masses at different thickness levels and *Trichogramma dendrolimi* parasitism rates on FAW eggs and egg masses with scale layers at different levels.

- **The proportion of level I, II, III eggs laid in the whole life were 52%, 40%, 8%, respectively.**
- **The parasitism rate on level I and II eggs was 32% and 13%. Totally, 45% FAW eggs could be parasitized by Trichogramma**

Our results support the biological control of FAW with releasing *Trichogramma* parasitoids

Hou YY, Desneux N, Zang LS. 2022. Impact of host scale thickness on *Trichogramma dendrolimi* Matsumura performance when parasitizing eggs of fall armyworm, *Spodoptera frugiperda*. Entomol. Gen. (accepted)

Summary:

(1) The advantages of using drones for releasing natural enemies:

- ✔ higher efficiency than manual release, particularly suitable for controlling pests of large-area single crop land
- ✔ save labor
- ✔ precision release may avoid random releasing the carriers by manual release, and guarantee the biocontrol efficacy
- ✔ finish the release in short time so as not to miss the oviposition peak period of insect pests

(2) The disadvantages of using drones for releasing Trichogramma parasitoids:

unsuitable for controlling pests of small-area crop land in that it wastes much time on the road, always transfer from one land to other land

Summary (Continued):

(3) For the release carriers, it is recommended to design as ball shape, meanwhile, it should consider the impacts of crop growth stage and field environment on application

(4) *Trichogramma* parasitoids have the **great advantages** of controlling Lepidoptera pests, particular for the low cost (30,000 *T. dendrolimi* reared on COS eggs only 1$). *Trichogramma* parasitoids are suitable for large-area controlling corn borer, rice stem borer and soybean pod borer with drones

(5) Considering the cost and the potential of *T. dendrolimi* parasitizing FAW eggs with different level thickness scales, it is **recommended to large-area release** *Trichogramma* with drones against FAW combined **with other dominant natural enemies** such as *Telenomus remus*

谢 谢

Thanks for your attention

Evaluation of Agricultural Drone Services in Cambodia

Dr Daniel Tan

Professor,
School of Life and Environmental Sciences,
University of Sydney

Evaluation of agricultural drone services in Cambodia

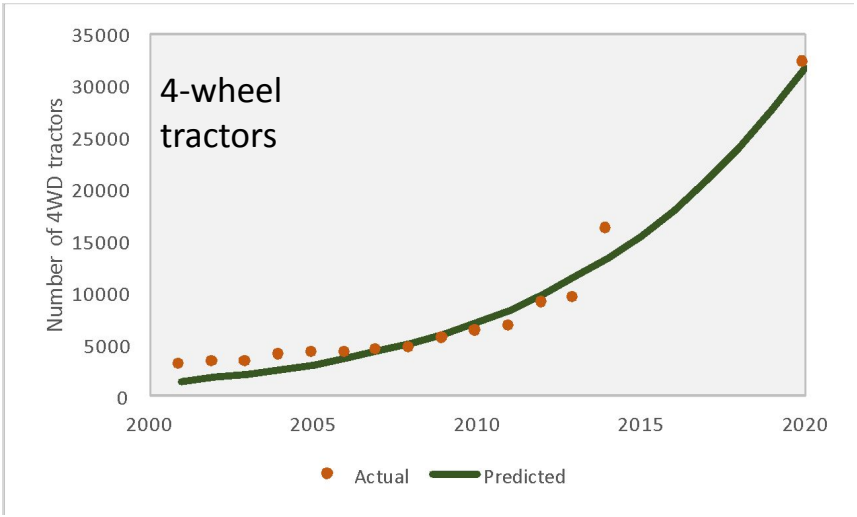
Presented by
Prof. Daniel Tan
Project Leader (CamSID – CSE-2015-044)
daniel.tan@sydney.edu.au

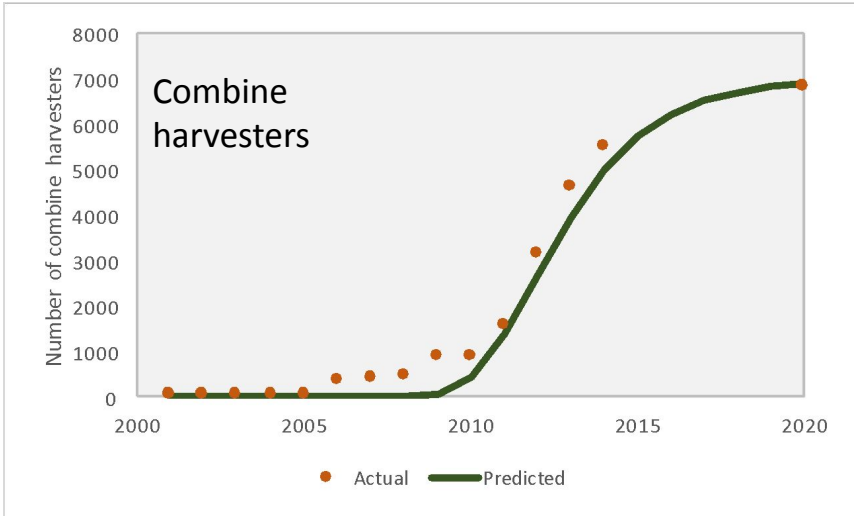
Co-authors: Bob Martin, Ratha Rien

THE UNIVERSITY OF SYDNEY

Agricultural mechanisation in Cambodia

As a result of the out-migration of agricultural labour, there has been rapid mechanisation of agriculture in Cambodia.





The majority of rice farmers rely on service providers for land preparation and machine harvesting but not for crop establishment or crop protection

Agricultural drones – scaling by CAVAC

- CAVAC has supported KPP Global Co., Ltd in 2019 to make drones available in Cambodia.
- KPP has imported a XAG drone from XAG Australia
- A drone can spray 20-30 ha in a day
- CAVAC supported the sale of drones by sharing service fee of 50% with farmers who access drone spraying provided by new buyers
- By Sept 2021, KPP sold out 24 units (five under COVID-19 support scheme) – 83% to service providers and 17% to large landholding farmers.

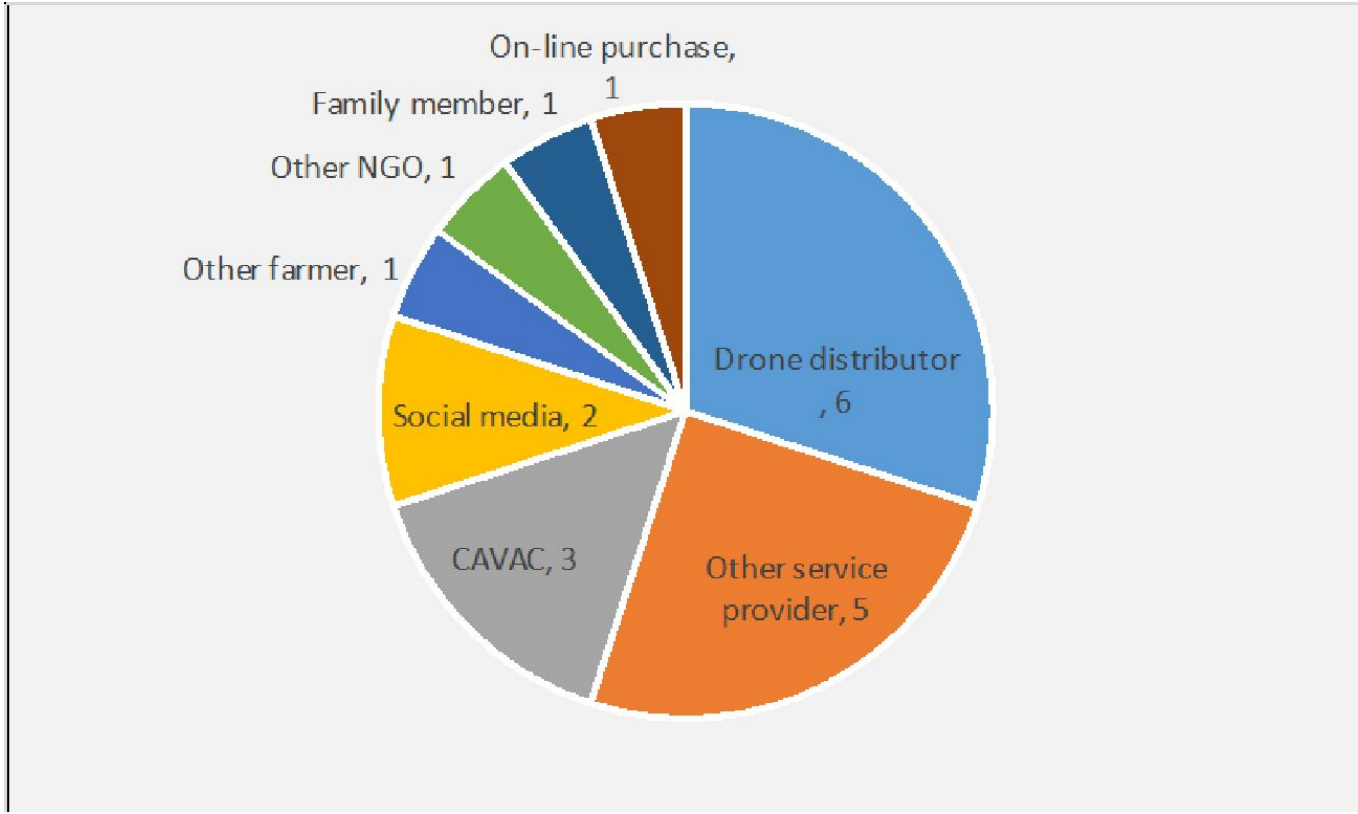
Agricultural drones

In 2021, CamSID carried out 11 demonstrations in 6 villages combining machine planting with drone application of post-sowing pre-emergence herbicide

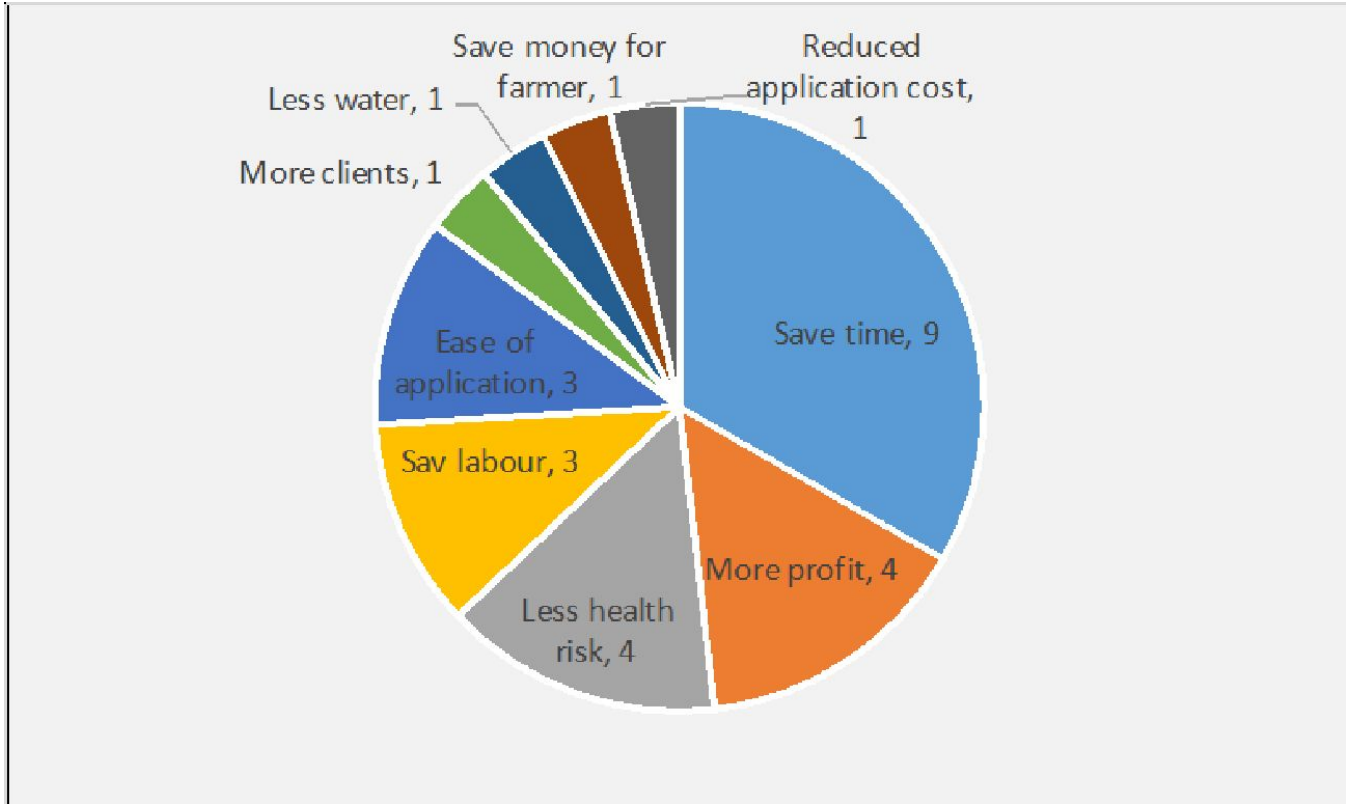
Survey of drone service providers

- A typical drone service provider has 80 farmer clients and services 350 ha at a rate of 15 minutes/ha.
- The median service fee is $10/ha which is competitive with ground application.
- **Advantages**: much quicker than ground application; avoids problems finding labour; and the low water volume does not reduce efficacy.
- **Disadvantages**: repair and part replacement costs (e.g., batteries, propellers, motors).
- Can recover the drone purchase cost within 1-2 years.
- Predictions of peak adoption ranged from 15 to 90% with a median of 70%.

How did you learn about the drone applicator?



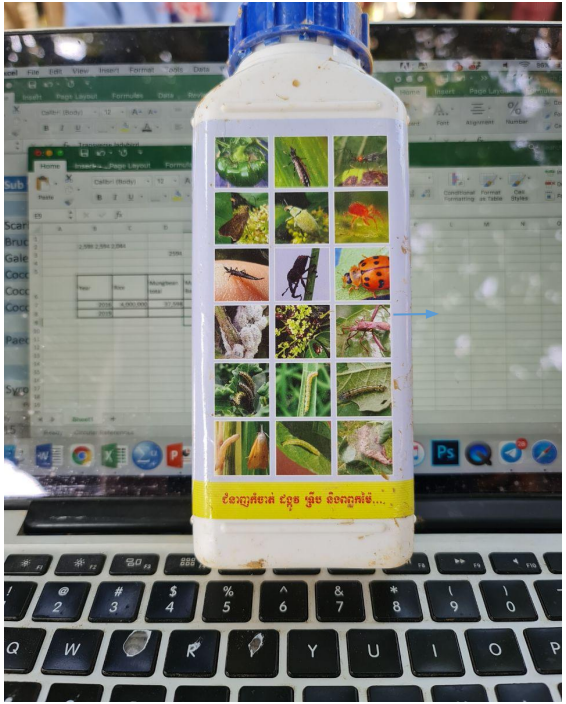
What expected benefits influenced you to purchase a drone applicator?



Information and training needs of drone service providers

- Priorities for training: choosing correct products to apply; business planning and financial management; identification of weeds, insect pests and diseases; integrated pest management (IPM); and safe operation procedures.
- Priorities for training methods: on-farm demonstrations; farmer field schools; and village workshops.
- Telegram groups were seen a good idea.
- Farmers rely on drone service providers for advice on crop protection.

Pesticide mislabels – let's kill ladybirds!
- so that we can sell more insecticides!



Harmonia octomaculata

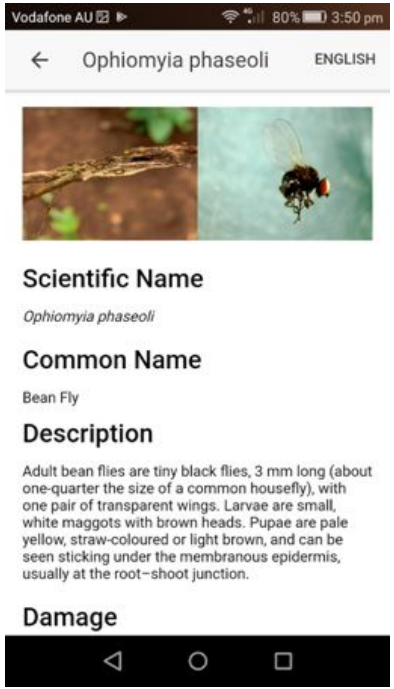
Coccinella transversalis

Weed ID App

https://play.google.com/store/apps/details?id=com.usyd.weedid&hl=en

https://itunes.apple.com/gb/app/weed-identifier/id1165963850?mt=8

Mungbean pest ID App



https://play.google.com/store/apps/details?id=com.usyd.pestid01

Provincial Dept of Ag and Input Seller engagement

Training of Provincial Dept of Ag (PDAFF) staff on project outcomes – PDAFF will incorporate training into input seller certification course (December 2020).

CamSID-CAVAC-NUBB collaboration on drone applications

Planned activities:

1. Capacity building on agricultural drone operation for drone owners and operators
2. Field trial on drone broadcasting in rice production
3. Integrated weed and pest management with a focus on dry direct-seeded rice

Activity	2021			2022	
	Nov	Dec	Jan	Feb	March
1					
2					
3					

Australian Ambassador H.E. Pablo Kang speaking at drone demonstration

Collaborators

- CAVAC
- Agricultural Cooperatives
- CGIAR Excellence in Agronomy (EiA)
- Direct Seeded Rice Consortium (DSRC)
- Don Bosco Foundation
- Harvest Center Cambodia (HCC)
- IRRI EPIC Project
- National University of Battambang
- Royal University of Agriculture

Thank you

Bob Martin, Ratha Rien

Drone Research and Emerging Policy in the Philippines

Nehemiah L. Caballong

Information Systems Researcher,
Philippine Rice Research Institute (PhilRice)

Use of Agricultural Drones for Rice in the Philippines

Nehemiah L. Caballong
Digital Solutions Specialist

Outline

- OVERVIEW
- REGULATIONS
- PEST MANAGEMENT
- DIRECT SEEDING
- WAYS FORWARD

Outline

- OVERVIEW
- REGULATIONS
- PEST MANAGEMENT
- DIRECT SEEDING
- WAYS FORWARD


R-MAX
YAMAHA

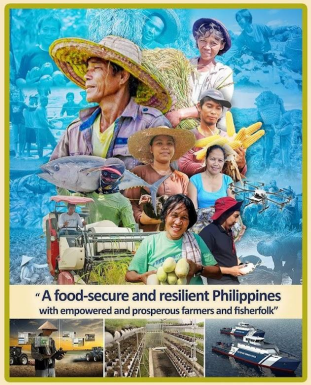
Transforming Philippine Agriculture

OneDA REFORM AGENDA: KEY STRATEGIES

OneDA

Masaganang ANI Mataas na KITA

2021 Target Growth: 2.5%



STRATEGIC COMMUNICATIONS

CONSOLIDATION

1. Bayanihan Agri Clusters
2. Collective Action/Cooperatives Development
3. Province-led Agriculture & Fisheries Extension Systems
4. Mobilization & Empowerment of Partners
5. Diversification
6. Credit Support

MODERNIZATION

7. Technology & Innovation including Digital Agriculture
8. Farm Mechanization & Infrastructure Investments
9. Climate Change Adaptation & Mitigation Measures
10. Food Safety & Regulations

INDUSTRIALIZATION

11. Agri Industrial Business Corridors
12. Global Trade, Export Development & Promotion
13. Postharvest, Processing, Logistics & Marketing Support

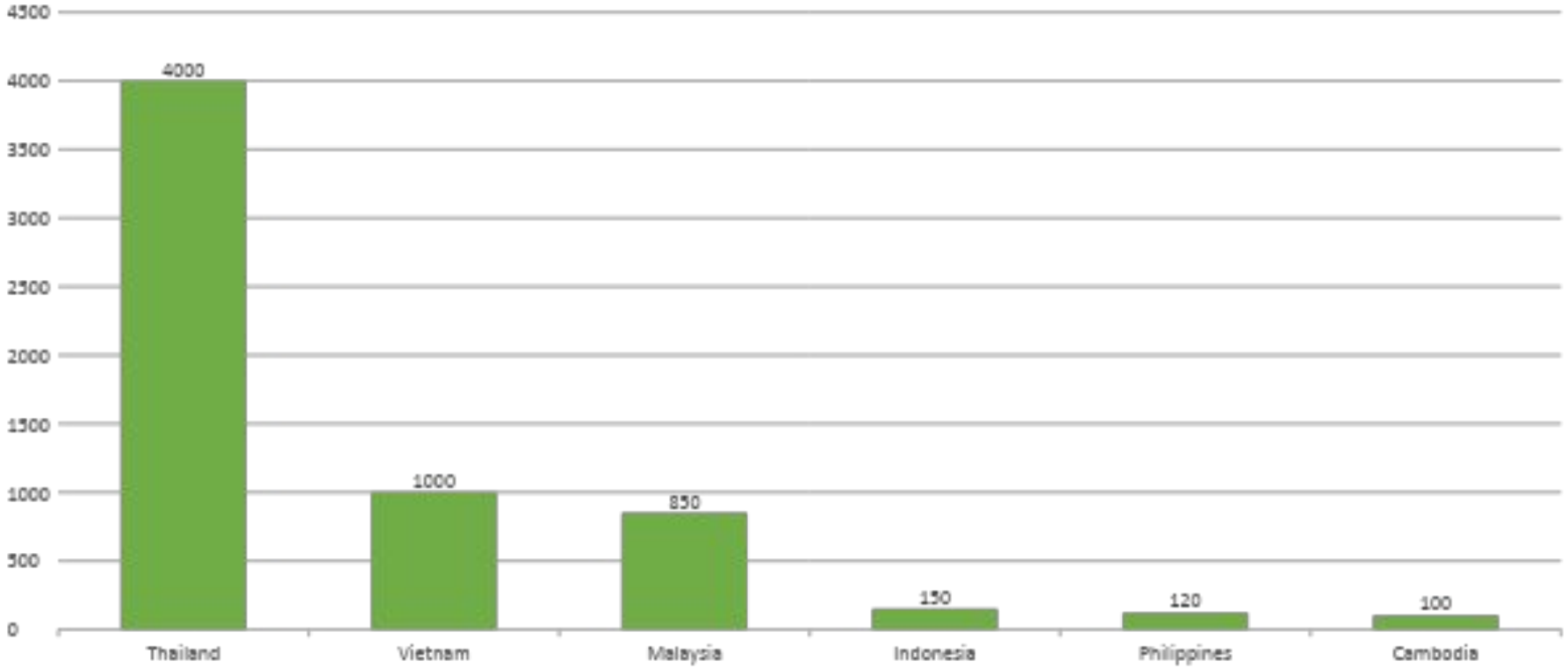
PROFESSIONALIZATION

14. Agriculture Career System
15. Edu
16. You
17. Eas

7

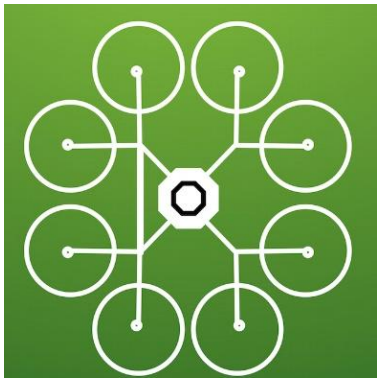
TECHNOLOGY & INNOVATION INCLUDING DIGITAL AGRICULTURE

Unit sales of agricultural drones in SEA by DJI



Brands of agricultural drones in the Philippines

Sellers of agricultural drone in the Philippines



NEW HOPE CORPORATION

Outline

- OVERVIEW
- REGULATIONS
- PEST MANAGEMENT
- DIRECT SEEDING
- WAYS FORWARD

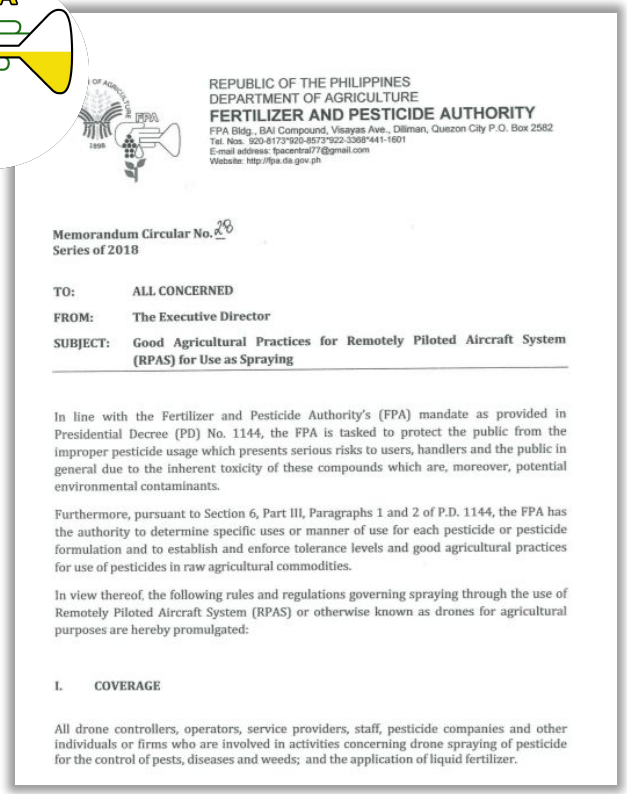
Regulatory agencies on the use of agricultural drones

Authorizations to be secured from regulatory bodies by drone service providers

- RPAS Registration
- RPAS Pilot Certificate
- RPAS Operator Certificate

- Annual Certificate of Registration
- Certificate of Authority

- License to Operate
- Certification as Pesticide Applicator (crew members)



REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE
FERTILIZER AND PESTICIDE AUTHORITY
FPA Bldg., BAI Compound, Visayas Ave., Diliman, Quezon City P.O. Box 2582
Tel. Nos. 920-8173*920-8573*922-3368*441-1601
E-mail address: fpacentral77@gmail.com
Website: http://fpa.da.gov.ph

Memorandum Circular No. 20
Series of 2018

TO: **ALL CONCERNED**

FROM: **The Executive Director**

SUBJECT: **Good Agricultural Practices for Remotely Piloted Aircraft System (RPAS) for Use as Spraying**

In line with the Fertilizer and Pesticide Authority's (FPA) mandate as provided in Presidential Decree (PD) No. 1144, the FPA is tasked to protect the public from the improper pesticide usage which presents serious risks to users, handlers and the public in general due to the inherent toxicity of these compounds which are, moreover, potential environmental contaminants.

Furthermore, pursuant to Section 6, Part III, Paragraphs 1 and 2 of P.D. 1144, the FPA has the authority to determine specific uses or manner of use for each pesticide or pesticide formulation and to establish and enforce tolerance levels and good agricultural practices for use of pesticides in raw agricultural commodities.

In view thereof, the following rules and regulations governing spraying through the use of Remotely Piloted Aircraft System (RPAS) or otherwise known as drones for agricultural purposes are hereby promulgated:

I. COVERAGE

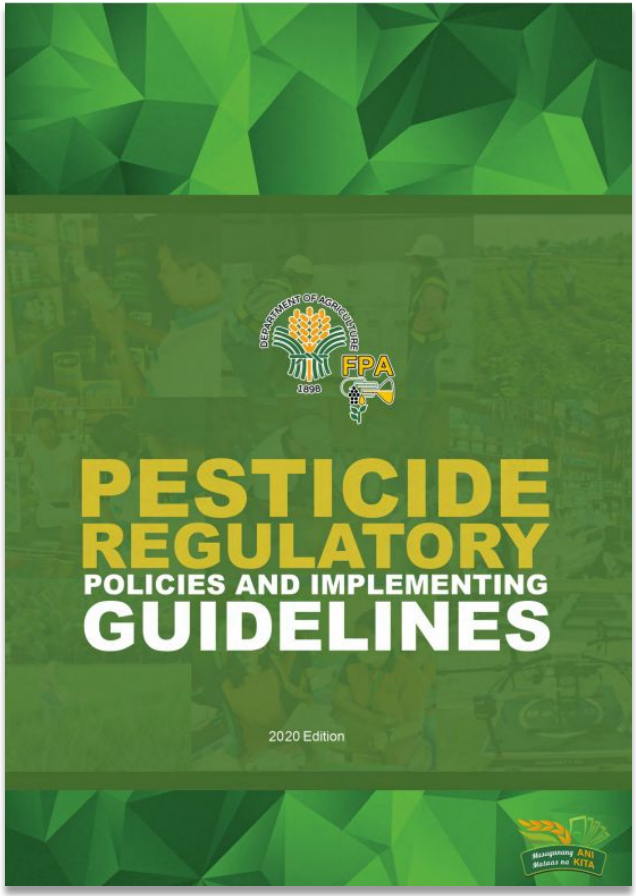
All drone controllers, operators, service providers, staff, pesticide companies and other individuals or firms who are involved in activities concerning drone spraying of pesticide for the control of pests, diseases and weeds; and the application of liquid fertilizer.

Good Agricultural Practices for RPAS for Use as Spraying

- **Drone Application of Pesticide**
- **Qualification, Training, and Accreditation**
- **Choice, Storage, and Condition of Pesticide**
- **Safety, Health, and Appropriate Equipment**

Choice, Storage and Condition of Pesticide

1. **Only FPA-registered pesticides for Drone Application should be used**, a copy of the Safety Data Sheet (SDS) should be available in the spray site.
2. Products should be properly labelled and be transported and stored in its original container and package.
3. Containers should be regularly checked for leak and damage.
4. Only pesticides that will be used within the day's operation should be loaded in to the transport vehicle.
5. Triple rinsed empty containers should be disposed of in FPA-authorized collection sites.



Agricultural chemical companies must first secure an Experimental Use Permit (EUP) in conducting bio-efficacy trials for label expansion

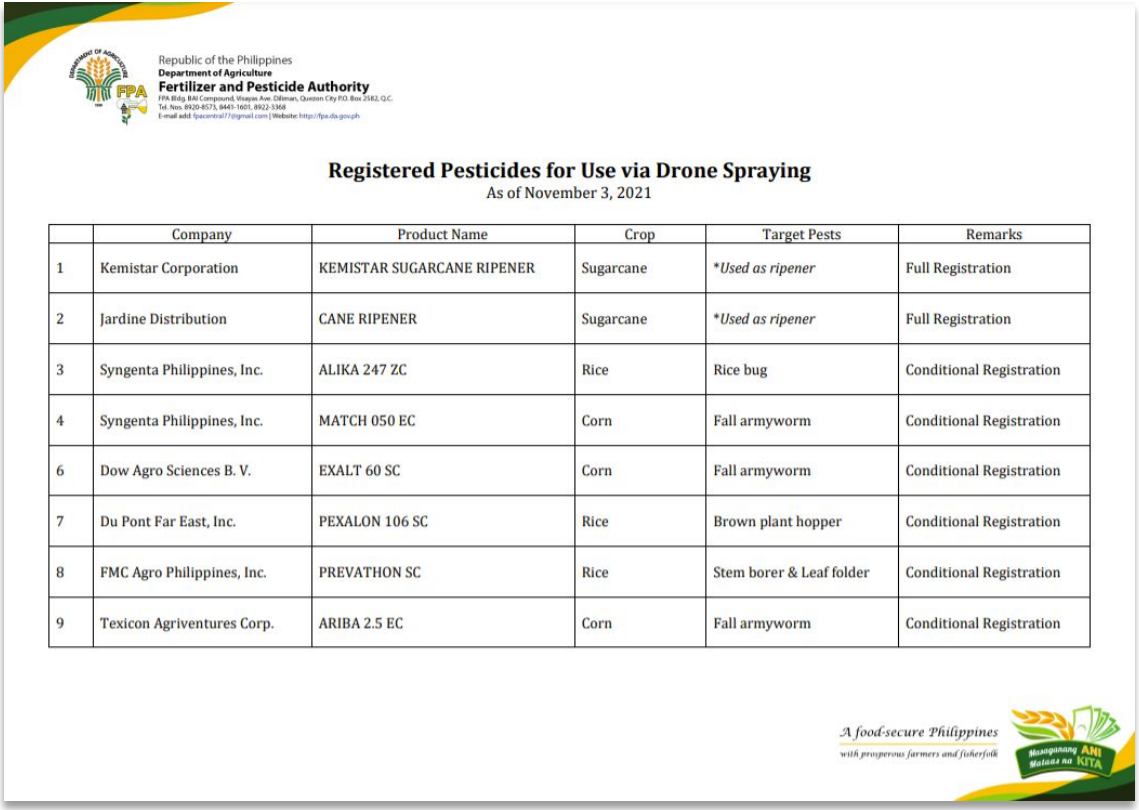
2.4.6 Experimental Use Permit for Drones as Method of Application

Registrants must secure Experimental Use Permit (EUP) prior to conduct of any bioefficacy and/or residue trial which utilizes drone as method of application. As per usual applications, EUP is issued upon evaluation and approval of the submitted test protocols and other data requirements (specified in Table 1 below).

All trials requiring EUP should be conducted only by FPA-accredited researchers along with an FPA-accredited drone operators. The bioefficacy and/or residue data generated from these trials may be used to support product registration, except for trials covered by EUP IA & IB.

2020 Registered Pesticide

314 new
1,003 renewed



Republic of the Philippines
Department of Agriculture
Fertilizer and Pesticide Authority
FPA Bldg. BAI Compound, Visayas Ave. Diliman, Quezon City P.O. Box 2582, Q.C.
Tel. Nos. 8920-8573, 8441-1601, 8922-3368
E-mail add: fpacentral77@gmail.com | Website: http://fpa.da.gov.ph

Registered Pesticides for Use via Drone Spraying

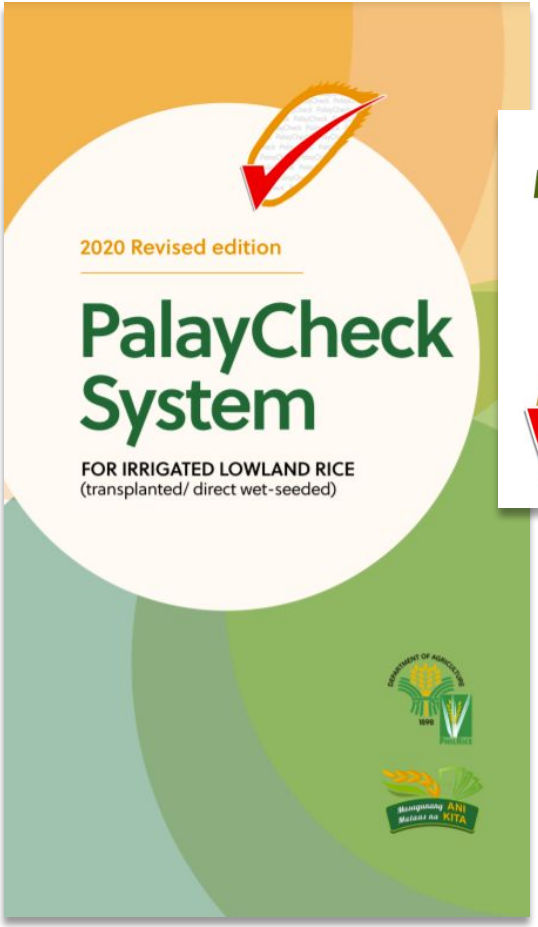
As of November 3, 2021

	Company	Product Name	Crop	Target Pests	Remarks
1	Kemistar Corporation	KEMISTAR SUGARCANE RIPENER	Sugarcane	*Used as ripener	Full Registration
2	Jardine Distribution	CANE RIPENER	Sugarcane	*Used as ripener	Full Registration
3	Syngenta Philippines, Inc.	ALIKA 247 ZC	Rice	Rice bug	Conditional Registration
4	Syngenta Philippines, Inc.	MATCH 050 EC	Corn	Fall armyworm	Conditional Registration
6	Dow Agro Sciences B. V.	EXALT 60 SC	Corn	Fall armyworm	Conditional Registration
7	Du Pont Far East, Inc.	PEXALON 106 SC	Rice	Brown plant hopper	Conditional Registration
8	FMC Agro Philippines, Inc.	PREVATHON SC	Rice	Stem borer & Leaf folder	Conditional Registration
9	Texicon Agriventures Corp.	ARIBA 2.5 EC	Corn	Fall armyworm	Conditional Registration

A food-secure Philippines
with prosperous farmers and fisherfolk

Outline

- OVERVIEW
- REGULATIONS
- PEST MANAGEMENT
- DIRECT SEEDING
- WAYS FORWARD



Pest Management

Key Check 7

No significant yield loss due to pests

Importance. Knowing how the rice crop interacts with biotic factors and the agroecosystem, and correctly identifying pests and applying ecologically sound management strategies can help prevent significant yield loss. They can also promote high-quality grains.

Recommendations to achieve Key Check 7

1. **Use varieties that are resistant to pests prevalent in the locality.** This is the first line of defense against pests and is compatible with the biological control method.

   Change or rotate varieties every 2-4 croppings.

2. **Practice synchronous planting after a 30-day rest period** (see Key Check 3, pp 21-22).

3. **Conduct regular field-monitoring from the early stage of crop growth onwards to identify potential pests at their initial stage of development.** Preventive disease management options can be applied before it spreads and reaches intolerable levels. For insect pests, preventive management options such as use of resistant varieties and synchronous planting are preferred. Insecticide application is a corrective measure to be deployed selectively when needed.

4. **Let the many beneficial organisms thrive in the rice ecosystem.** Such organisms regulate pest populations. The indiscriminate use of pesticides reduces biodiversity and disrupts the natural balance of insect pests and beneficial organisms. Conserving these organisms is economical and permanent.

Table 4. Management options for common rice pests

Pest/ disease	Management options
Insect pests and diseases	Do not spray against defoliators within 30 DAT or 40 DAS. Diagnose diseases correctly, and practice field sanitation and synchronous planting.
Weeds	• Control weeds within 0-45 DAT/DAS. • Use high-quality seeds. • Practice field sanitation. • Practice proper land preparation and water management. • Do manual and mechanical weeding. • Use herbicides as the last option.
Rats	Practice timely, integrated, and sustained community-wide control. Fill rat burrows with soil and water. Practice sanitation.
Golden Apple Snails	• Keep field saturated up to 25 DAS or up to 15 DAT. • Construct small canals and place attractants to facilitate snail collection. • Place wire/ bamboo screen at water in/outlets to regulate snail entry.
Birds	Scaring them away is the most practical approach to managing birds.

Outline

- OVERVIEW
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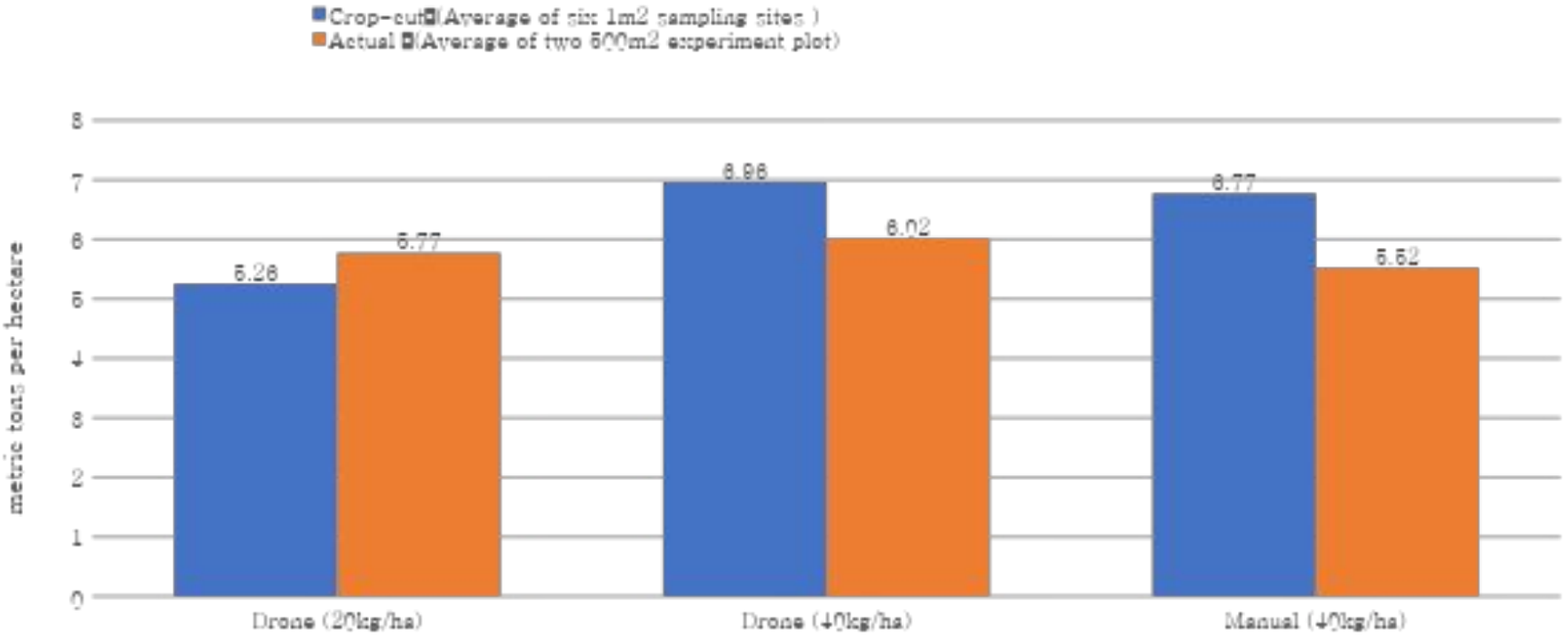
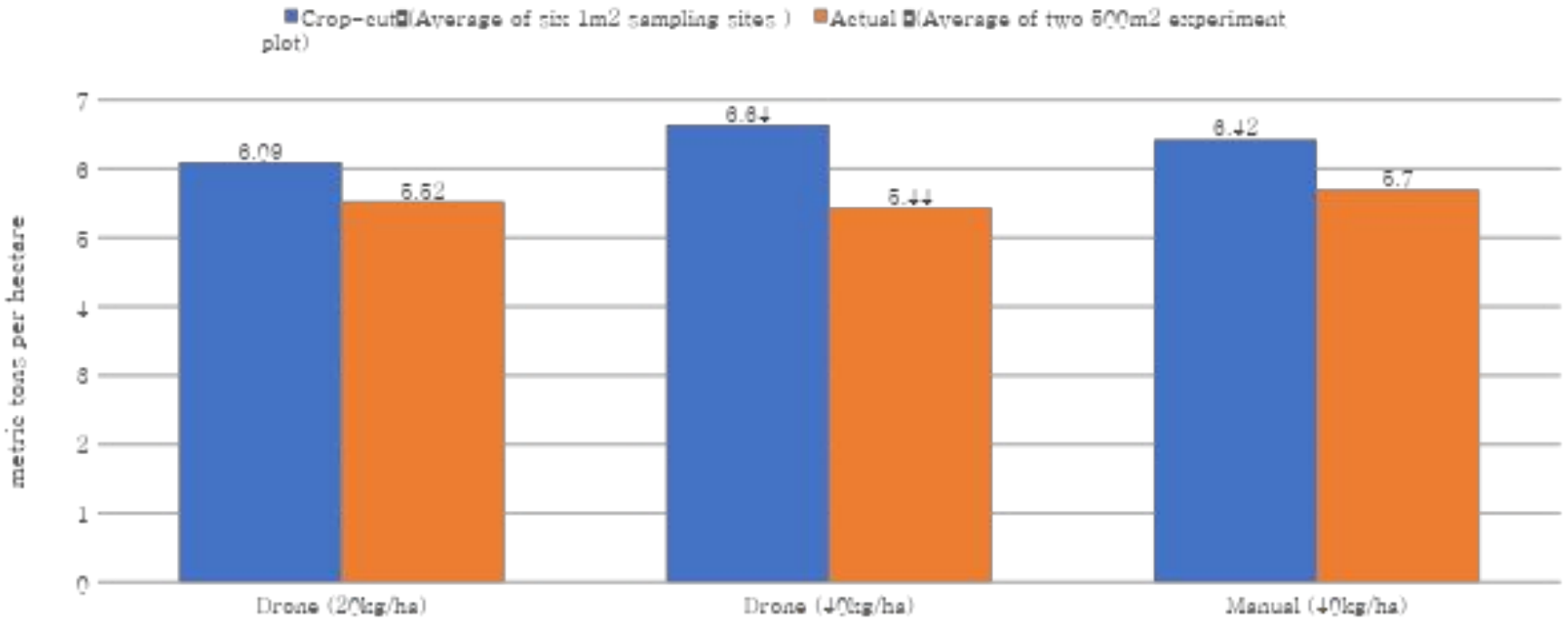
- PEST MANAGEMENT
- **DIRECT SEEDING**
- WAYS FORWARD

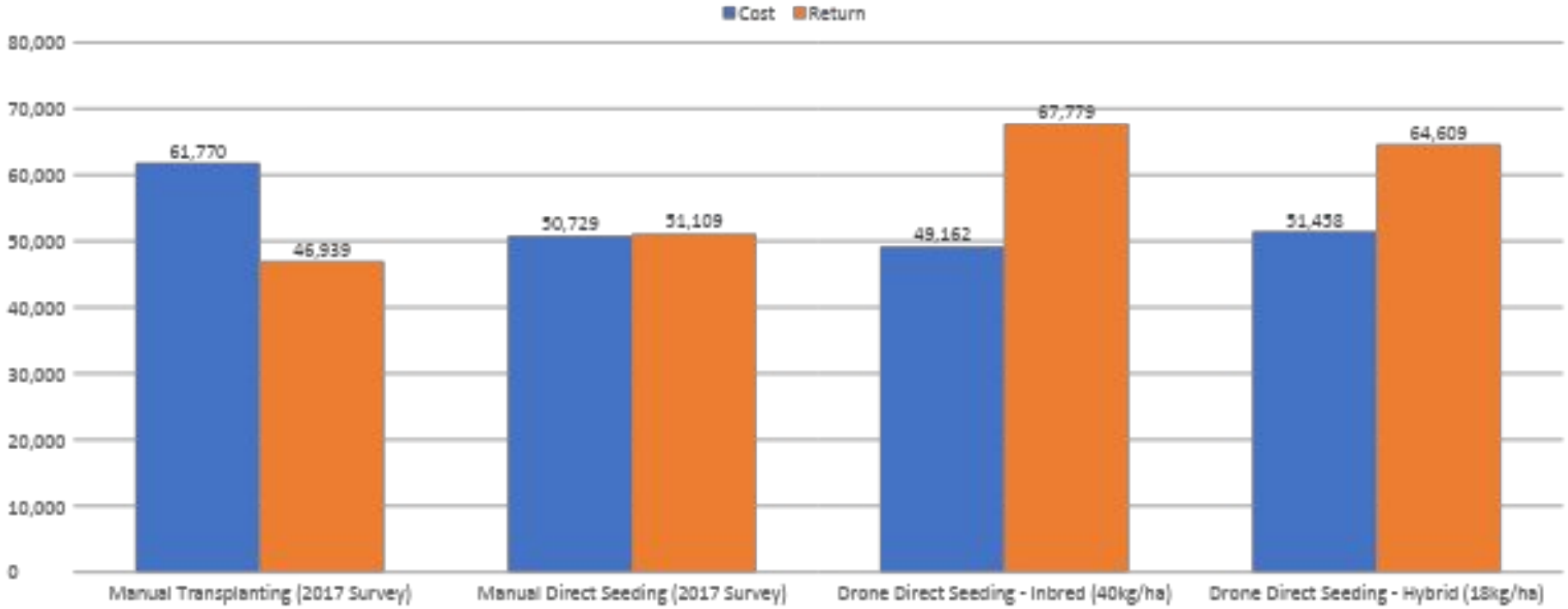
Yield comparison of drone and manual direct seeding methods for an inbred rice variety *(NSIC Rc402)*



Yield comparison of drone and manual direct seeding methods for a hybrid rice variety *(Mestizo 20)*



Preliminary cost-return analysis between crop establishment methods
(in Philippine Peso)



Outline

- OVERVIEW
- REGULATIONS
- PEST MANAGEMENT
- DIRECT SEEDING
- **WAYS FORWARD**

Agricultural Drone Vision for Rice

- Agricultural drone applications are well-integrated in the PalayCheck system – direct seeding, drone spraying, and fertilizer broadcasting.
- Fleets of agricultural drones doing farming operations
- DA and its attached agencies promoting the use of agricultural drones
- There will be enough service providers that will serve the farmers.
- There will be chemical products registered for drone application, should the farmer deliberates the need to spray.

Use of Agricultural Drones in the Philippines

Nehemiah L. Caballong
Digital Solutions Specialist

Thank you very much.

Stay healthy and safe!

DEPARTMENT OF AGRICULTURE
1898
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Lessons in the Development of Digital Applications for Southeast Asian Farmers

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Dr Mariette McCampbell (Main speaker)

Researcher, Knowledge, Technology, and Innovation Group
Wageningen University and Research

Dr Elisabeth Simelton

Climate Change Scientist, World Agroforestry Centre (ICRAF)

Lessons in the development of digital applications for Southeast Asian farmers

Artwork: Eisen Bernardo 2021

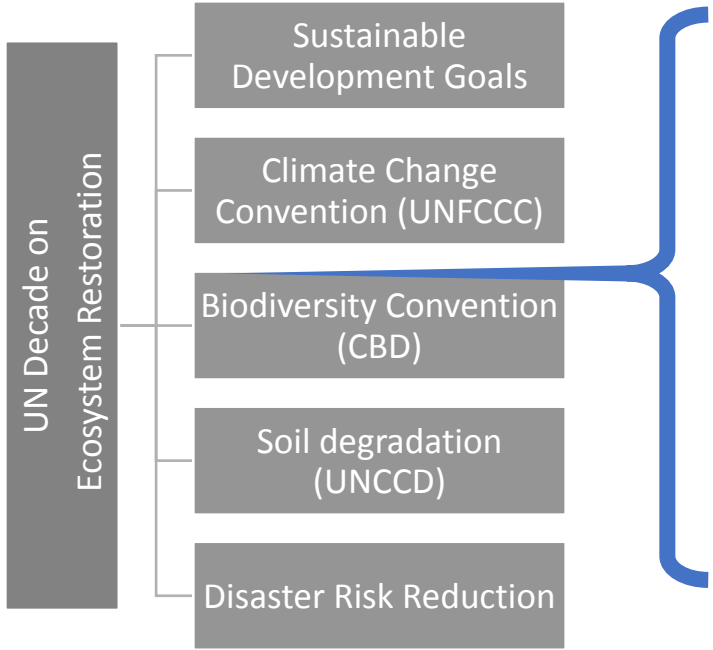
Mariette McCampbell & Elisabeth Simelton

Wageningen University | CIFOR-ICRAF Vietnam

Grow Asia Digital Learning Series, 9 December 2021

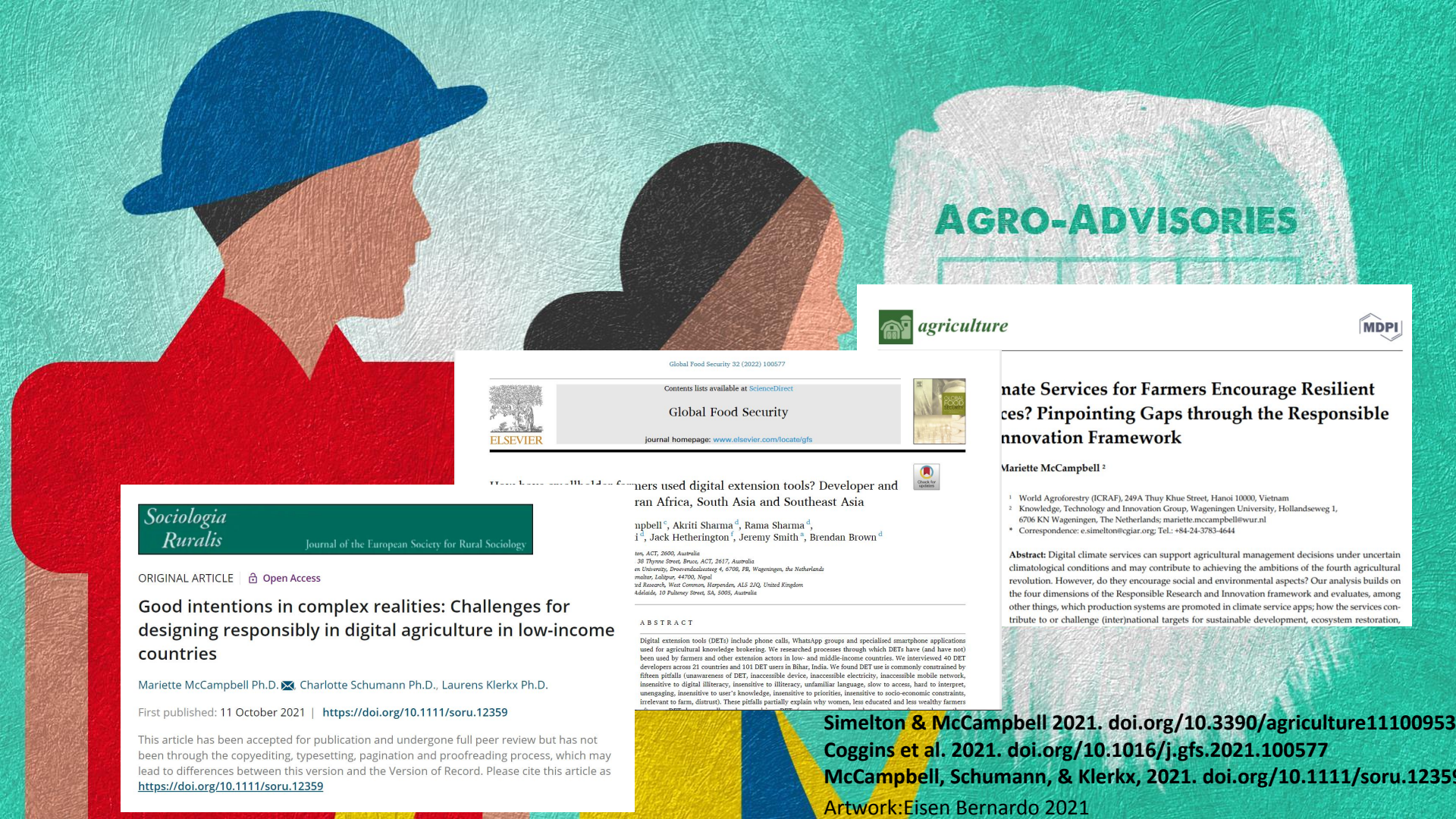
Zooming in on sustainable farming: Do apps contribute?

UNITED NATIONS DECADE ON ECOSYSTEM RESTORATION 2021-2030



Picture credit:
123rf.com

Principles for ecosystem restoration
http://www.fao.org/3/cb6591en/cb6591en.pdf



agriculture

MDPI

nate Services for Farmers Encourage Resilient
ces? Pinpointing Gaps through the Responsible
nnovation Framework

Mariette McCampbell [2]

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[2] Knowledge, Technology and Innovation Group, Wageningen University, Hollandseweg 1, 6706 KN Wageningen, The Netherlands; mariette.mccampbell@wur.nl
* Correspondence: e.simelton@cgiar.org; Tel.: +84-24-3783-4644

Abstract: Digital climate services can support agricultural management decisions under uncertain climatological conditions and may contribute to achieving the ambitions of the fourth agricultural revolution. However, do they encourage social and environmental aspects? Our analysis builds on the four dimensions of the Responsible Research and Innovation framework and evaluates, among other things, which production systems are promoted in climate service apps; how the services contribute to or challenge (inter)national targets for sustainable development, ecosystem restoration,

Global Food Security 32 (2022) 100577

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Global Food Security

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ELSEVIER

mers used digital extension tools? Developer and
ran Africa, South Asia and Southeast Asia

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i [d], Jack Hetherington [f], Jeremy Smith [a], Brendan Brown [d]

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en University, Droevendaalsesteeg 4, 6708, PB, Wageningen, the Netherlands
malta, Lalitpur, 44700, Nepal
d Research, West Common, Harpenden, AL5 2JQ, United Kingdom
Adelaide, 10 Pulteney Street, SA, 5005, Australia

ABSTRACT

Digital extension tools (DETs) include phone calls, WhatsApp groups and specialised smartphone applications used for agricultural knowledge brokering. We researched processes through which DETs have (and have not) been used by farmers and other extension actors in low- and middle-income countries. We interviewed 40 DET developers across 21 countries and 101 DET users in Bihar, India. We found DET use is commonly constrained by fifteen pitfalls (unawareness of DET, inaccessible device, inaccessible electricity, inaccessible mobile network, insensitive to digital illiteracy, insensitive to illiteracy, unfamiliar language, slow to access, hard to interpret, unengaging, insensitive to user's knowledge, insensitive to priorities, insensitive to socio-economic constraints, irrelevant to farm, distrust). These pitfalls partially explain why women, less educated and less wealthy farmers

Sociologia Ruralis

Journal of the European Society for Rural Sociology

ORIGINAL ARTICLE | Open Access

Good intentions in complex realities: Challenges for designing responsibly in digital agriculture in low-income countries

Mariette McCampbell Ph.D., Charlotte Schumann Ph.D., Laurens Klerkx Ph.D.

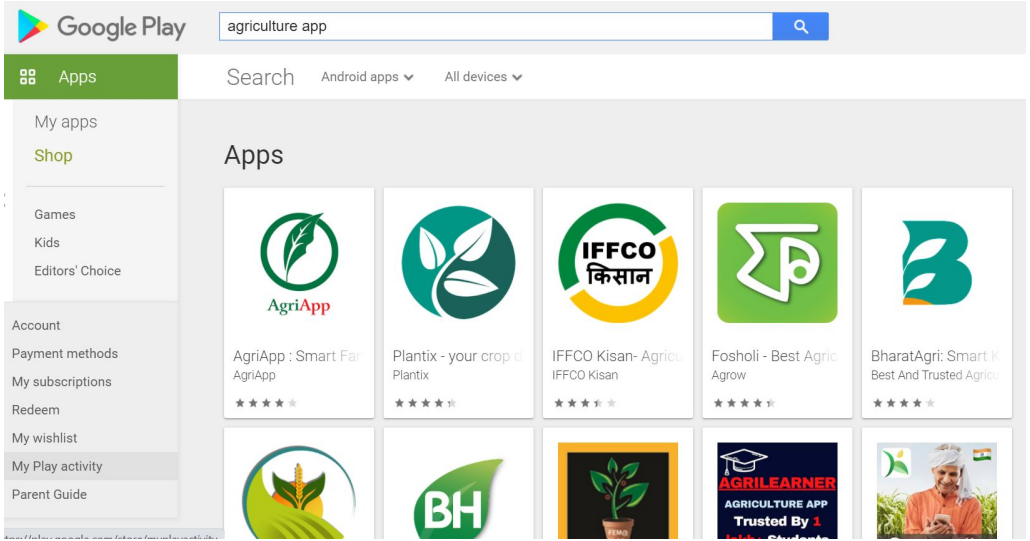
First published: 11 October 2021 | https://doi.org/10.1111/soru.12359

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as https://doi.org/10.1111/soru.12359

Simelton & McCampbell 2021. doi.org/10.3390/agriculture11100953
Coggins et al. 2021. doi.org/10.1016/j.gfs.2021.100577
McCampbell, Schumann, & Klerkx, 2021. doi.org/10.1111/soru.12359

Artwork:Eisen Bernardo 2021

How would a farmer find an app?



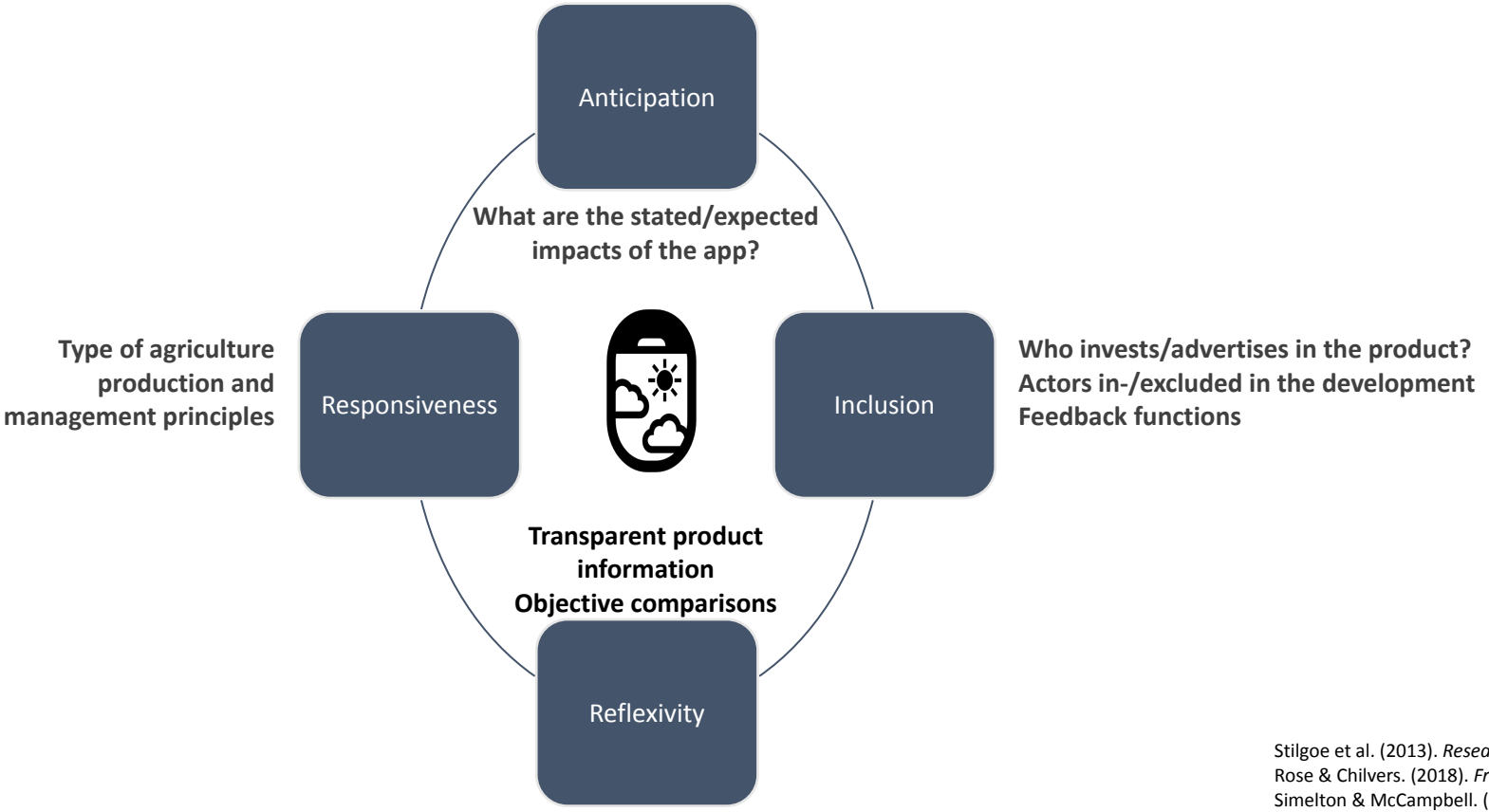
Criteria

Google Play

- Android
- Search term: agriculture
- Free app
- In English language
- Suitable for Southeast Asia

Google and **Web of Science**

Responsible Research and Innovation Framework



Stilgoe et al. (2013). *Research Policy*
Rose & Chilvers. (2018). *Frontiers in Sust. Food Sy*
Simelton & McCampbell. (2021). *Agriculture*
FAO Principles for ecosystem restoration
http://www.fao.org/3/cb6591en/cb6591en.pdf

Anticipation

… anticipating the consequences of a digital technology

•Little evidence of impacts on yields, income or resource use efficiency

- Downloads = impacts

•Mismatch between expected and realistic user readiness (esp. capabilities and opportunities) = the user that is designed for and the real-life user

•Capacity of users in an HCD approach to anticipate or assess if a digital tech is ethical and responsible are too limited, and no practice among developers to anticipate unintended/broader societal consequences

Inclusion

… including diverse actors in the innovation process to accommodate for the various concerns of various actors

- **Developers – driving the process and funding**
  - Public (foreign) and private (national and multinational ag-tech.) investors
- **Farmers – passive users, no feedback to developers**
  - When included in design process: issues with power, capacity etc.
- **Public agencies – invisible or minimal share of budgets**

Reflexivity

… adopting a reflexive approach to development

- **Inconsistent information and product information (before downloading)**
- **Descriptive reviews (what apps are about), no inter-app comparisons**
  - = lack of transparency
- **Power relations as well as project limitations (e.g., budget, time, deliverables) limit ability to be reflexive to user needs**
- **Focus on local context, but lack of attention for what would be responsible innovation (longterm, wider impact) or digital rights (privacy, security, consent)**

Responsiveness

… responding to emergent problems

•Field-based single crop solutions

•No in-app recommendations for agroecology or diversification
- Examples: pest spread alert

•No links to natural resources (ground-water budgets)

- **(governance) frameworks for digital ethics and RI are fragmented, not locally contextualized, and not used by designers and practitioners**
  - Sustainability frameworks are referred to (but hard to check real contribution)
- **Farmer's data becomes the product of interest**
  - Emerging data inequalities
  - Loss of control over data (Mann, 2018; Cinnamon, 2020)

Wrapping up (1)

- **Capacity for and inclusivity in digital agriculture**
  - Build capacity across the sector Skills and expertise of existing and new stakeholders Beyond basic e-literacy
  - Rethink inclusion
    - Give public actors a prominent role
    - Create space for appropriation of apps by users proactive involvement of users in tool development process
  - Develop a transparent app intercomparison protocol
    - User-friendly
    - Scientifically grounded

Wrapping up (2)

- **Impact of digitalization on agricultural problems and (sustainable) farming systems**
  - Attention for consequences of digital innovation necessary

    impact of digital tech. and services on individual and collective, local and (inter)national decision-making
    - Something may be gained Tailormade, timely information; more transparent VCs
    - Something may be lost or harmed National knowledge and capacity for early warning; Ecosystem restoration

  - Beyond the user Consider type of problem and context
    - Prioritize responsible innovations and design ‘future proof’ digital ecosystems = contributing to commitments toward sustainability and ecosystem targets , socially responsible

Thank you

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elisabeth-simelton

CIFOR World Agroforestry

WAGENINGEN UNIVERSITY & RESEARCH

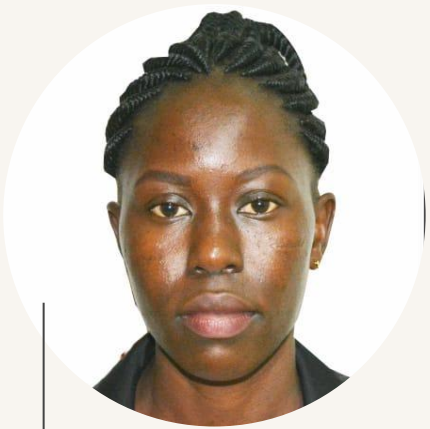
Panel Discussion

ASEAN FAW ACTION PLAN
Supporting IPM Across Southeast Asia

GrowAsia Digital Learning Series

Powered by padang &co

Adrian Soe Myint
CEO of Village Link and Chief Digital Officer of Myanmar Awba Group



Winnie Atieno
Associate Director of PlantVillage

Anthony Tan
Founder & Director of New Hope Corporation

Village Link Presentation

Drones and Digital IPM Workshop

9 Dec
2021

Netherlands Space Office

awba

WeatherImpact

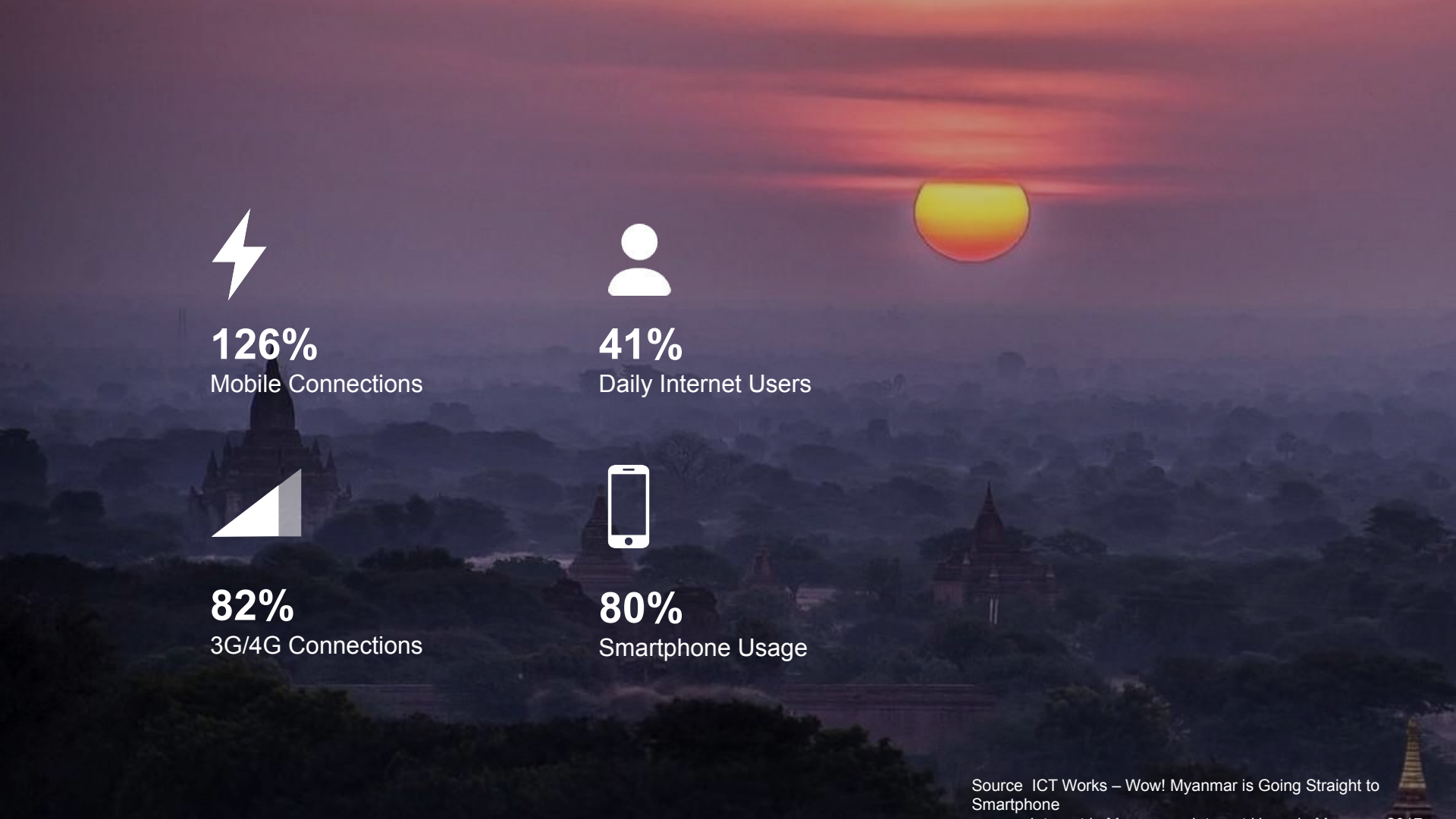
SarVision
Applications in remote sensing

G4AW
GEODATA FOR AGRICULTURE AND WATER

TerraSphere

Miaki

Village Link



Source ICT Works – Wow! Myanmar is Going Straight to Smartphone

Challenges

Traditional agriculture practices

Few Opportunities to attend trainings

Hard to get actionable guidance

Difficulties in accessing microfinance

Extreme weather

Paddy Yield

Myanmar

2.7
TON/HA

Vietnam

6.8
TON/HA

China

6.5
TON/HA

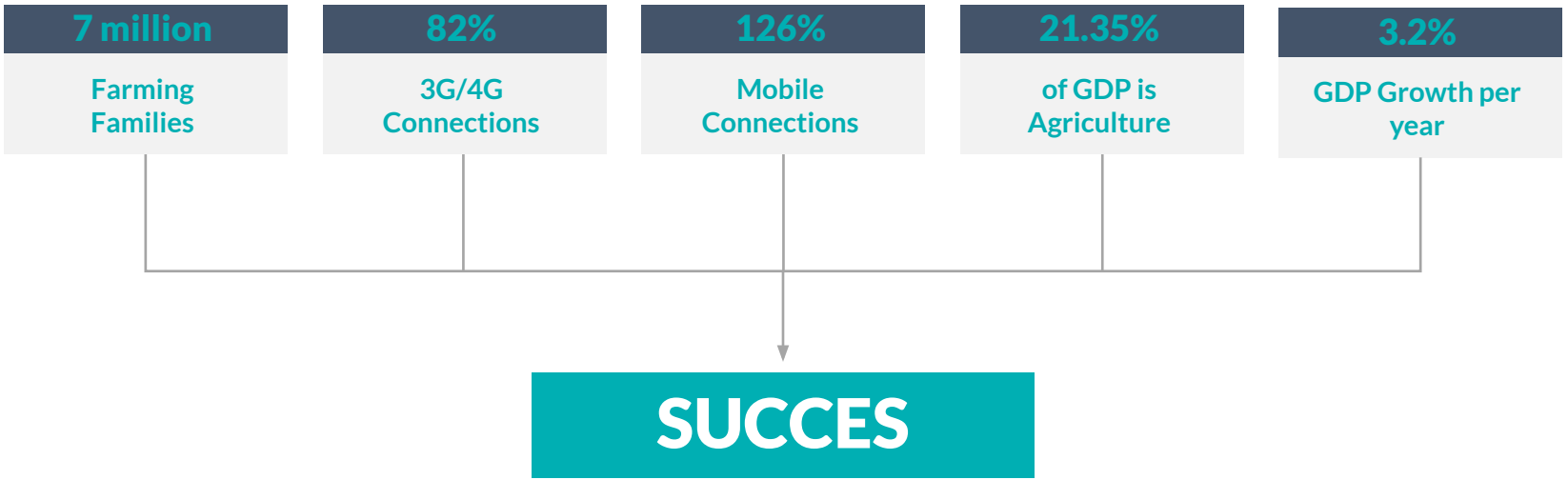
Thailand

5.7
TON/HA

Source: World Bank, Myanmar - Analysis of Farm Production Economics 2016

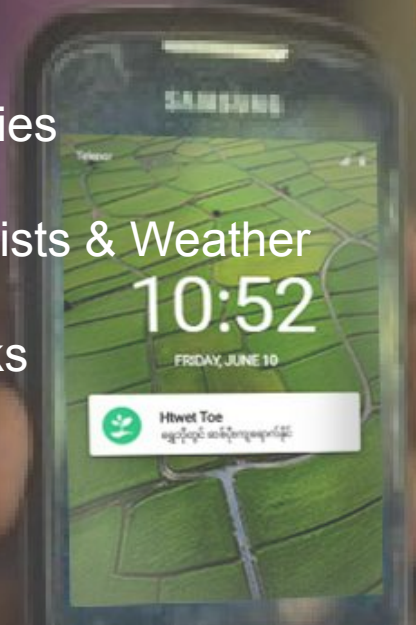
This photo taken on December 27, 2017 shows farmer San San Hla using a mobile app as she works in a rice field on the outskirts of Yangon.A free app on San San Hla's smartphone is her new weapon in the war against the dreaded stem borer moth that blighted her rice paddy in southern Myanmar for the last two years. New smartphone apps are providing farmers with up-to-date information on everything from weather, climate change, crop prices to advice on pesticides and fertilisers. AFP PHOTO

Big Opportunity for Digital Agriculture in Myanmar



Empower and enrich the lives of Myanmar's farmers through Agri-Tech

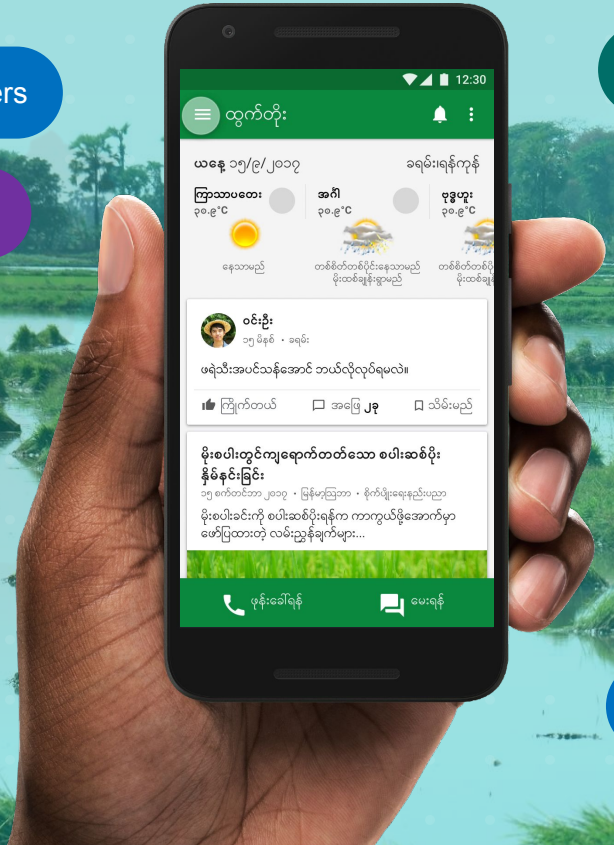
- Leading Agri-Tech
- Advanced Satellite Capabilities
- Community of farmers
- Knowledge pool of Agronomists & Weather experts
- Extensive Business Networks



Village Link

Htwet Toe

- Question & Answers
- Call Centre
- Crop Guides
- Weekly Crop Price
- News, Articles and Videos
- Loyalty Program
  DM Code Scan for products



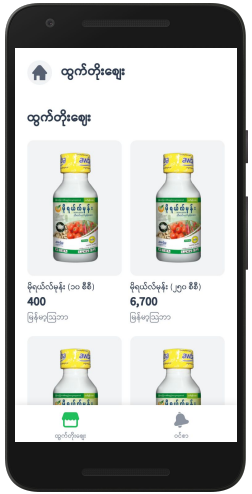
- Remote Sensing Analytics
- Weather Advisories
- Ecommerce with last mile delivery
- Drone Booking Service
- AI Diagnostics
- Financial Services

Revenue Strategy

Advertising & Customer Engagement

Partnerships

Transactional



Customer Service

Data

Performance

>750K
App Installs

75K
Questions

32M
Screen views

97%
Resolved

26%
Women

25+
Partnered Organizations

267K
Facebook Followers

79 M
Posts Reach

2.2 M
Reactions

20 Crop Guidelines
CABI and GAB Format

4,885 **Articles**
234 Crops

23,634 FAQs
32 Main Crops

154 Videos
Farming Guidelines

Financial Literacy

Village Link Satellite Services

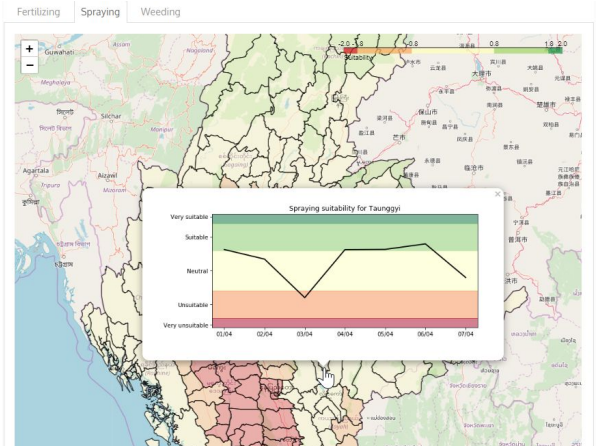
Village Link Satellite Services (VLSS) is a platform that aggregates satellite data related to agriculture and transforms them into key information which businesses and organizations can use to improve their operations and decision making.

Services on VLSS include localized weather monitoring, crop classification, crop extent measure, crop performance tracking, crop growth stage tracking and flood monitoring, all of which will benefit organizations working in the agriculture value chain; from input companies to financial service providers.

New farming system

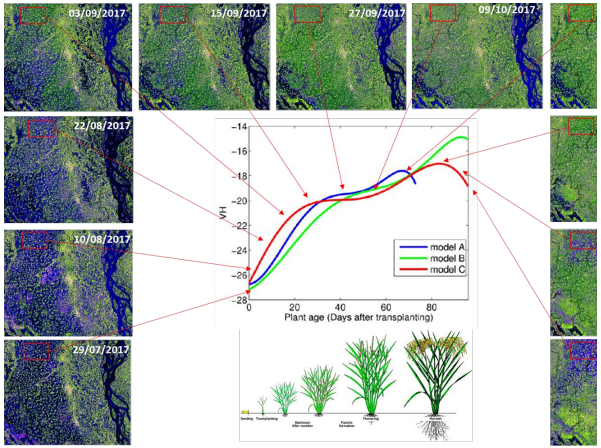
- **Sustainable**
- **Productive**
- **Resilient**

Geodata and Agriculture (VLSS)



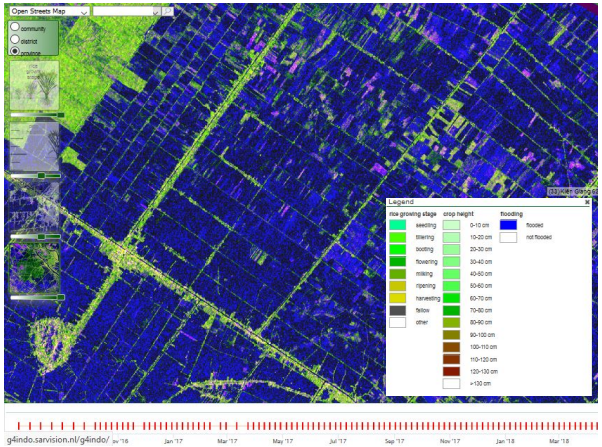
Weather Analytics

Monitors and provides more accurate weather, early warnings of droughts and floods



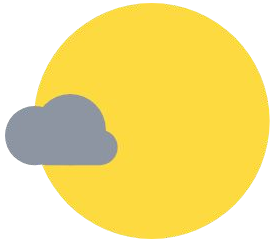
Crop Monitoring

Monitors and predicts crop biomass, growth stage and damage on large-scale crop growing areas



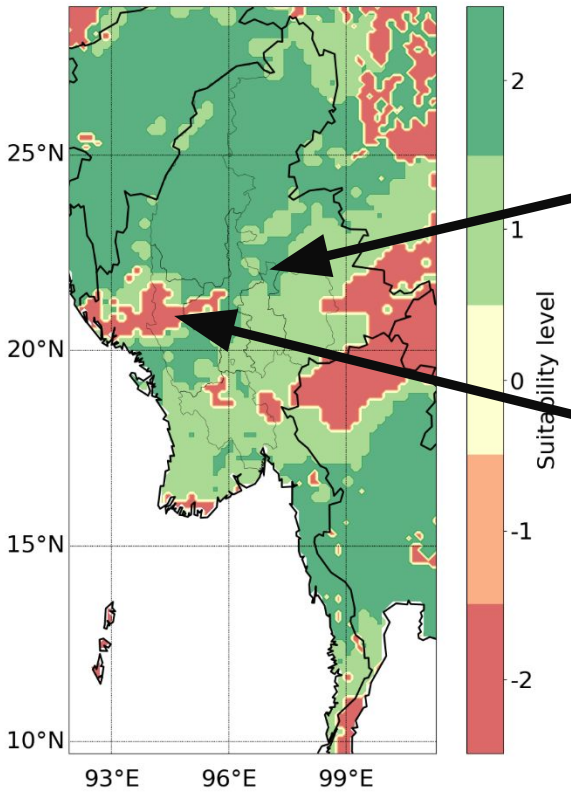
Land Monitoring

Provides crop growth, early impact assessment



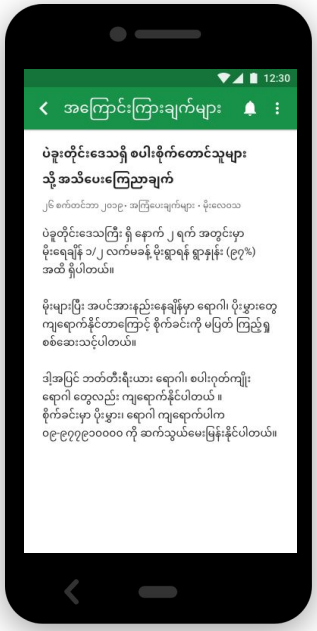
Weather Analytics

Agro-met Services



Farm advisory
The weather in your area is optimal to apply fertiliser!

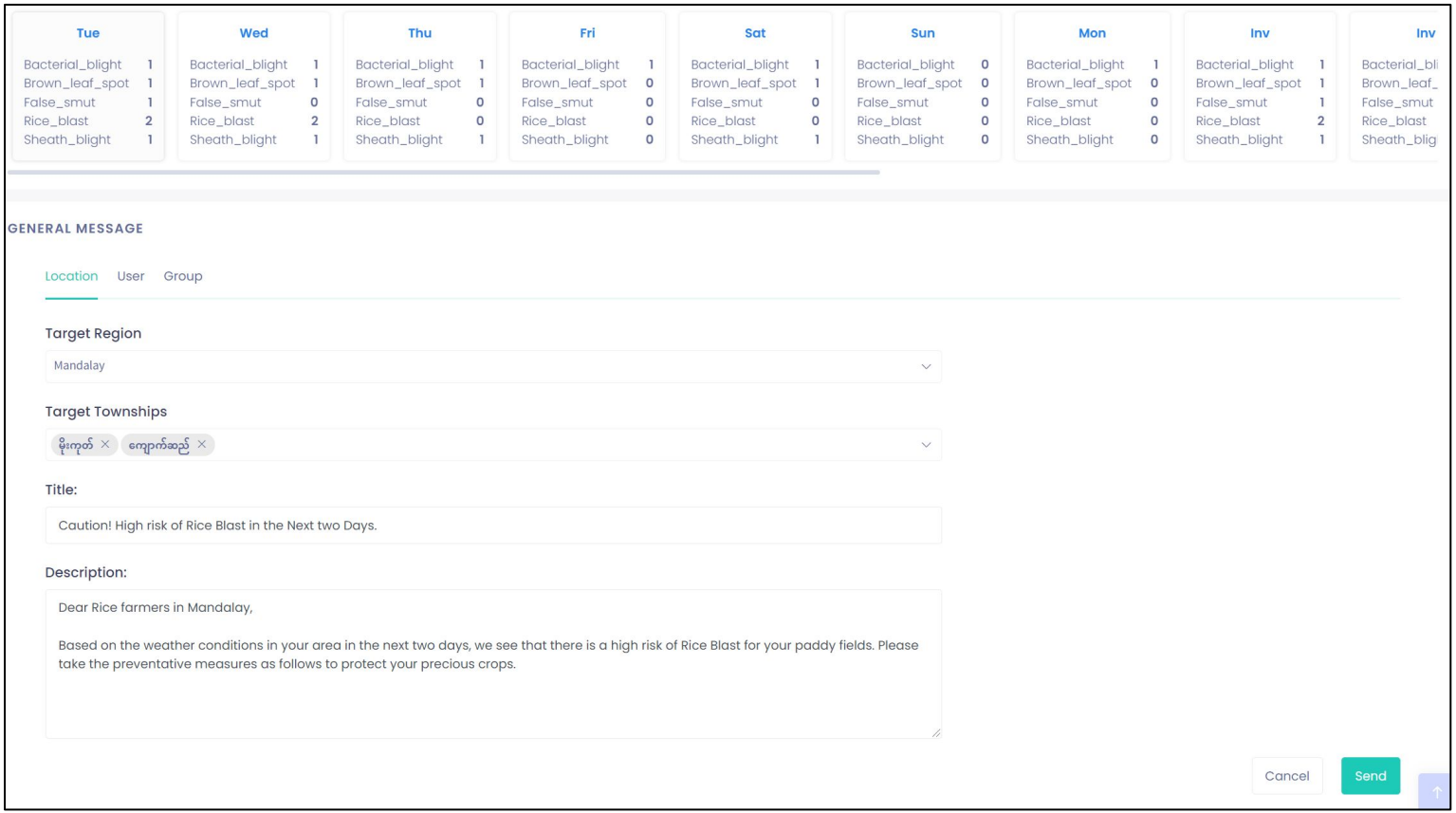
Farm advisory
Consider to postpone application of fertiliser until the weather conditions improve.



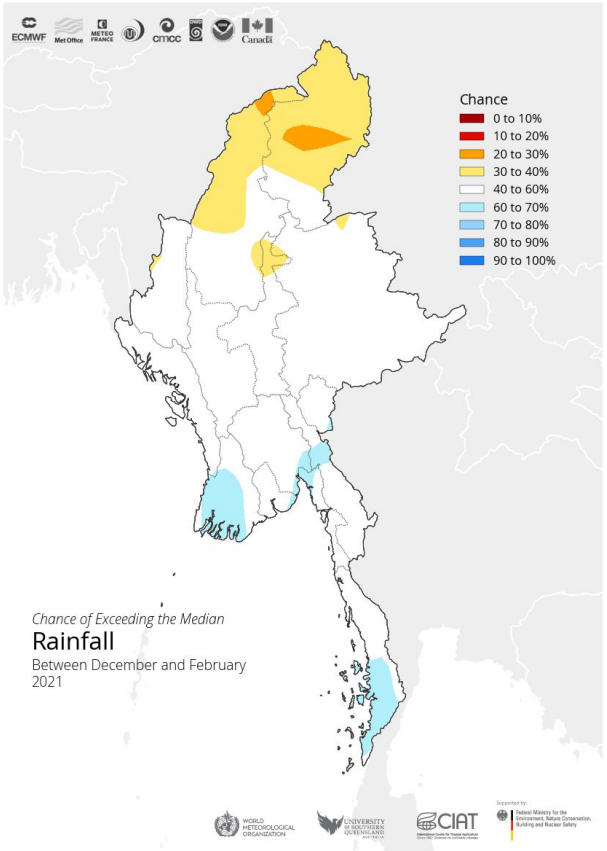
Weather Advisory

Activity suitability indices derived for irrigated rice from weather conditions predicted for Amarapura township in Mandalay. From a scale of -2 to +2, where -2 means “not suitable at all” to +2 means “very suitable”

Pest outbreak prediction

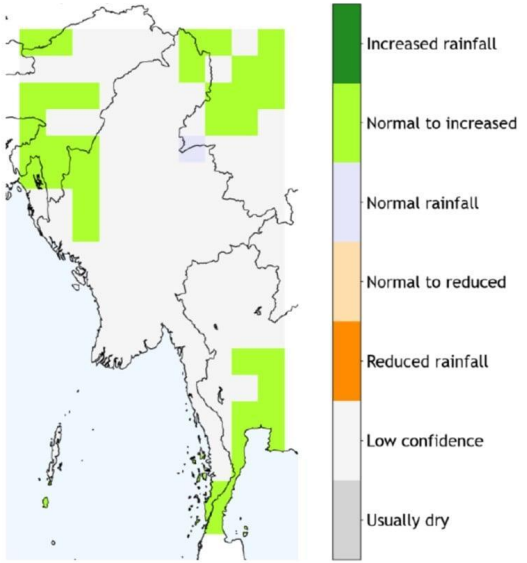


Seasonal Weather Forecasts (In collaboration with DeRisk)

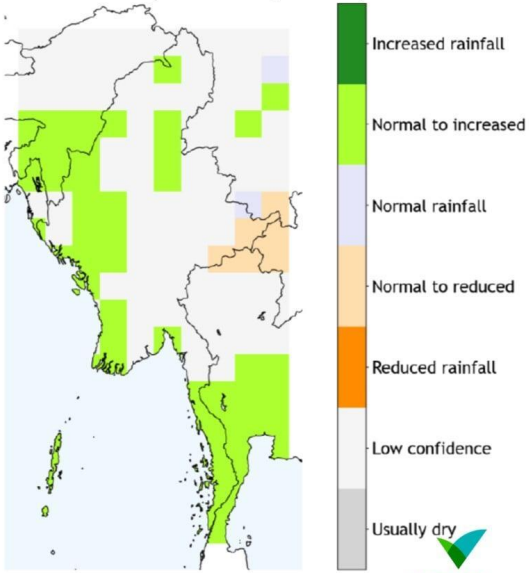


VLSS
Village Link Satellite Services

Seasonal Precipitation for September, October, November



Seasonal Precipitation October, November, December

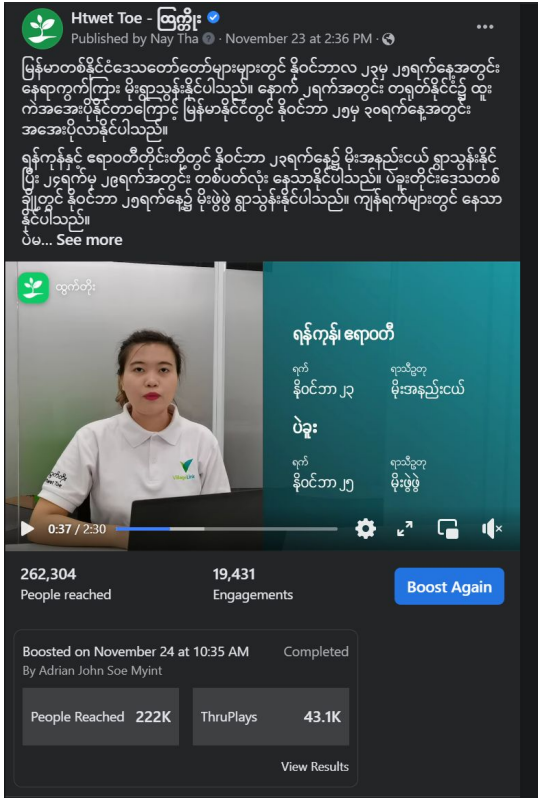


Village Link

Implementing Partners:

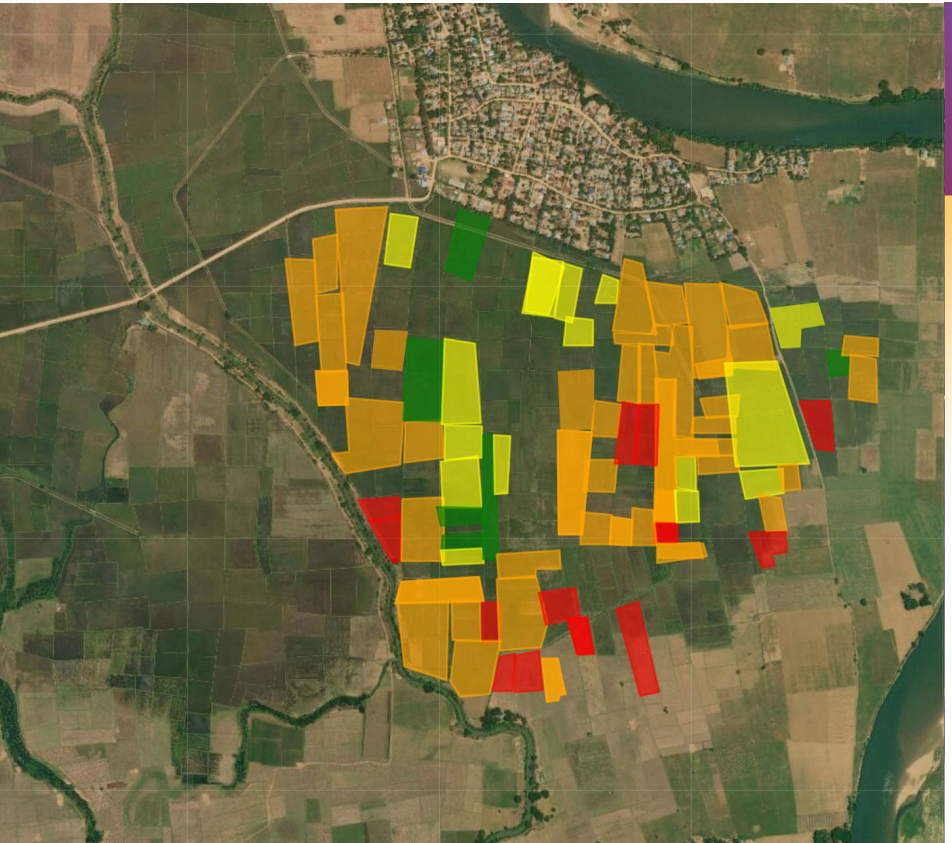
WORLD METEOROLOGICAL ORGANIZATION
UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA
CIAT
International Center for Tropical Agriculture

Weather Advisory Contents for both short term and seasonal forecasts



Crop Monitoring

Benchmarking of Crop Performance



PLOT

Daw Khin Kyi - A

N100

Field BM
0.94

VT BM
0.83

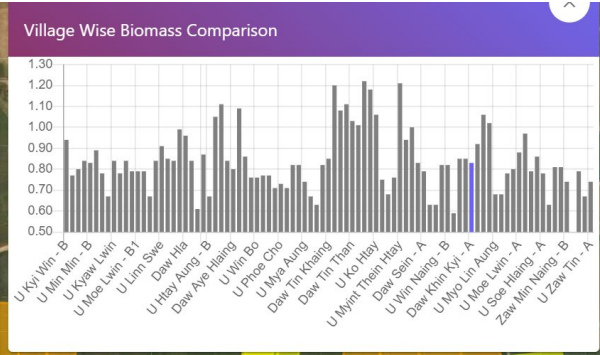
Region
Kyun Gyan
|
VT
Pi Tauk Chaung
|
Village
Kyun Gyan

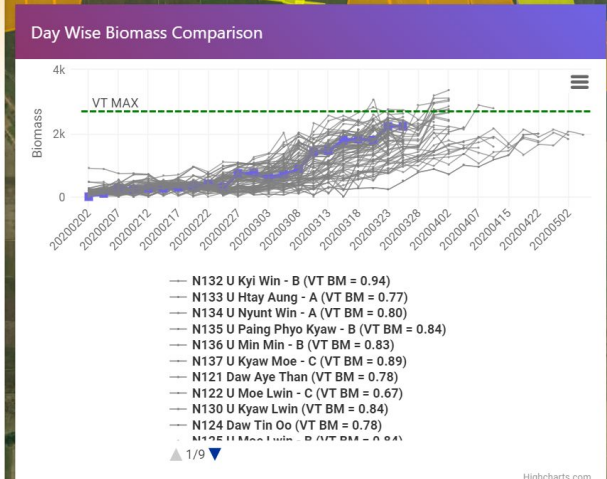
Last Year Biomass

Max VT
2686

Max Field
2238

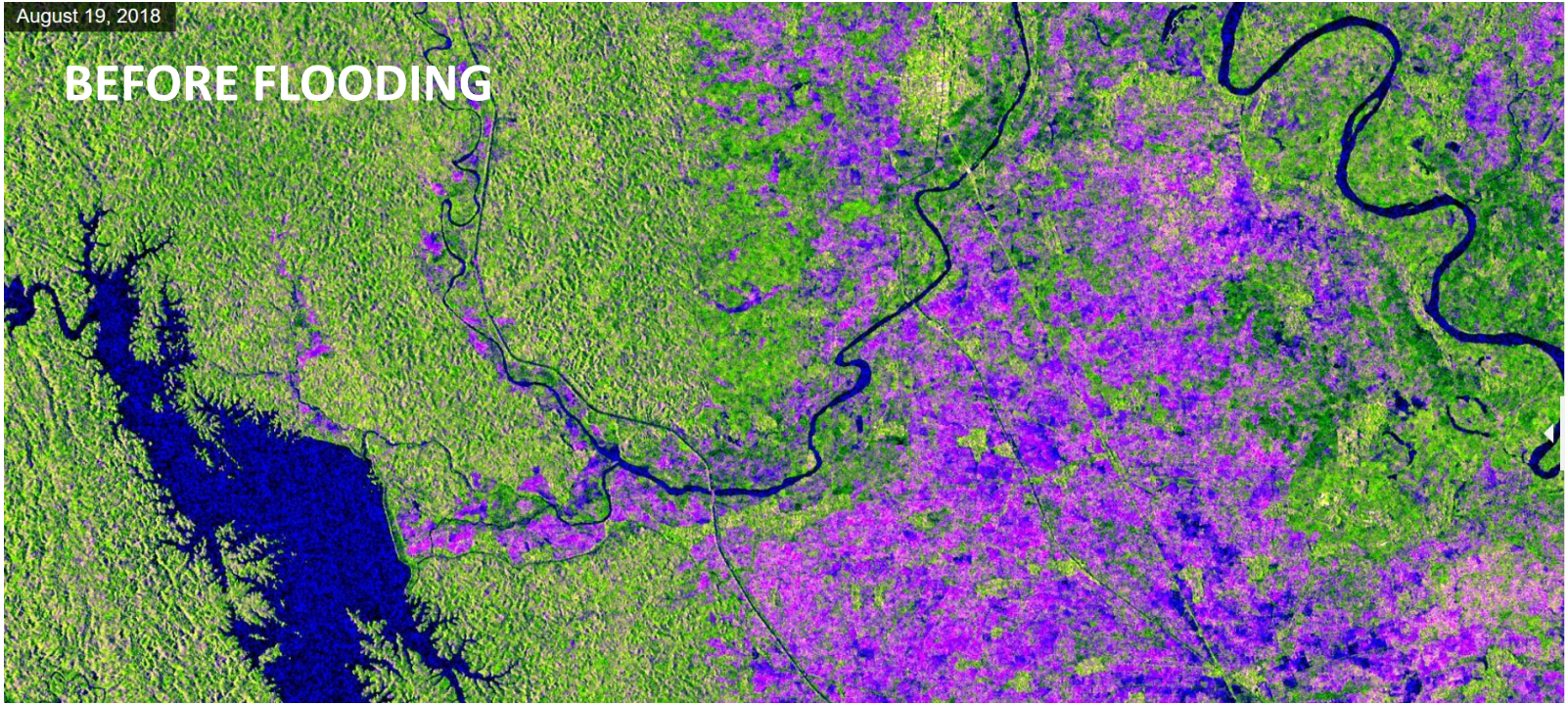
Overall Condition
Low



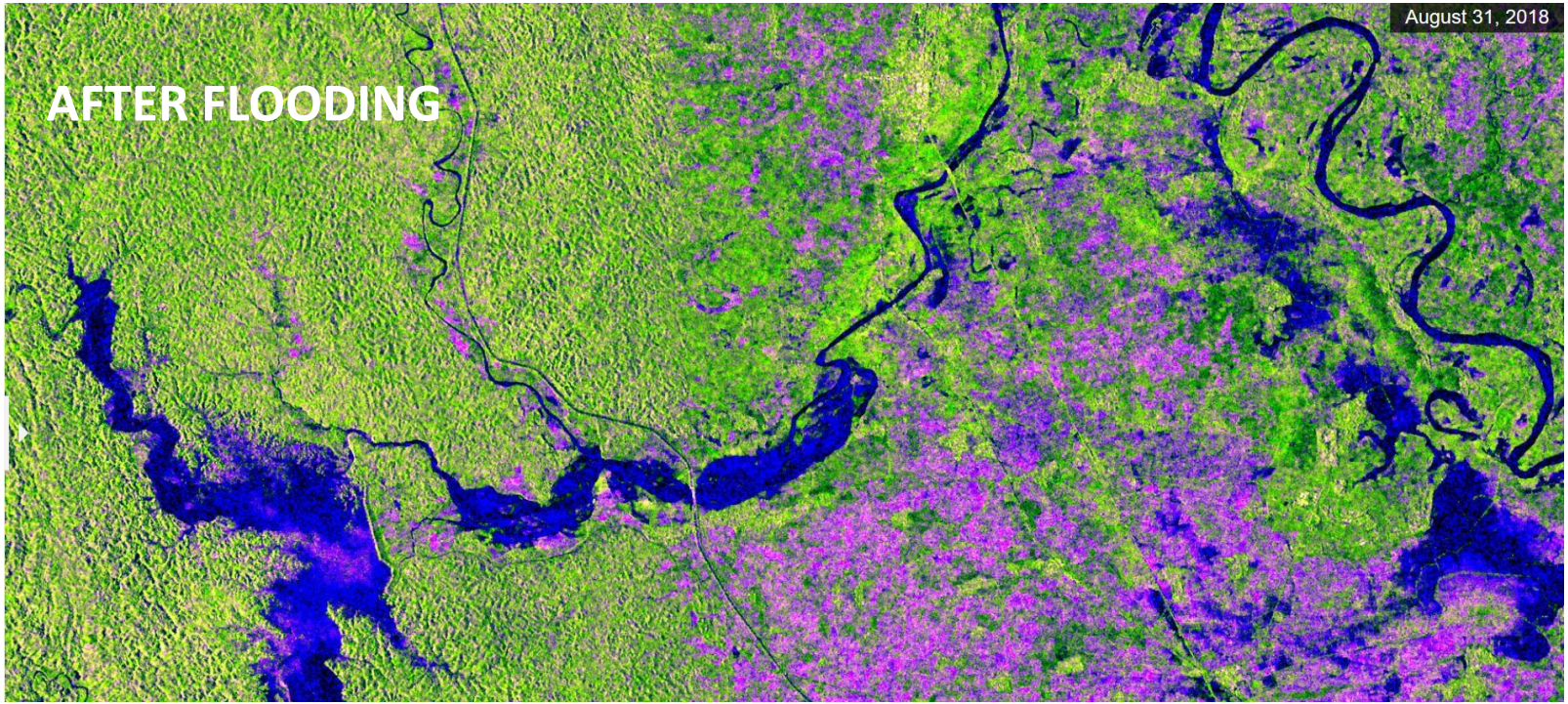


Land Monitoring

Rapid flood monitoring
Dam break Bago 2018



Rapid flood monitoring
Dam break Bago 2018



Thank you.

PlantVillage Nuru : A Farmers Digital Extension Agent

Drones and Digital IPM Workshop, ASEAN Action Plan on Fall Armyworm

Winnie Onyango winnieatieno50@gmail.com

Associate Director PlantVillage Kenya

What is the PlantVillage model?

Knowledge Platform

AI assistant in phone (computer vision)

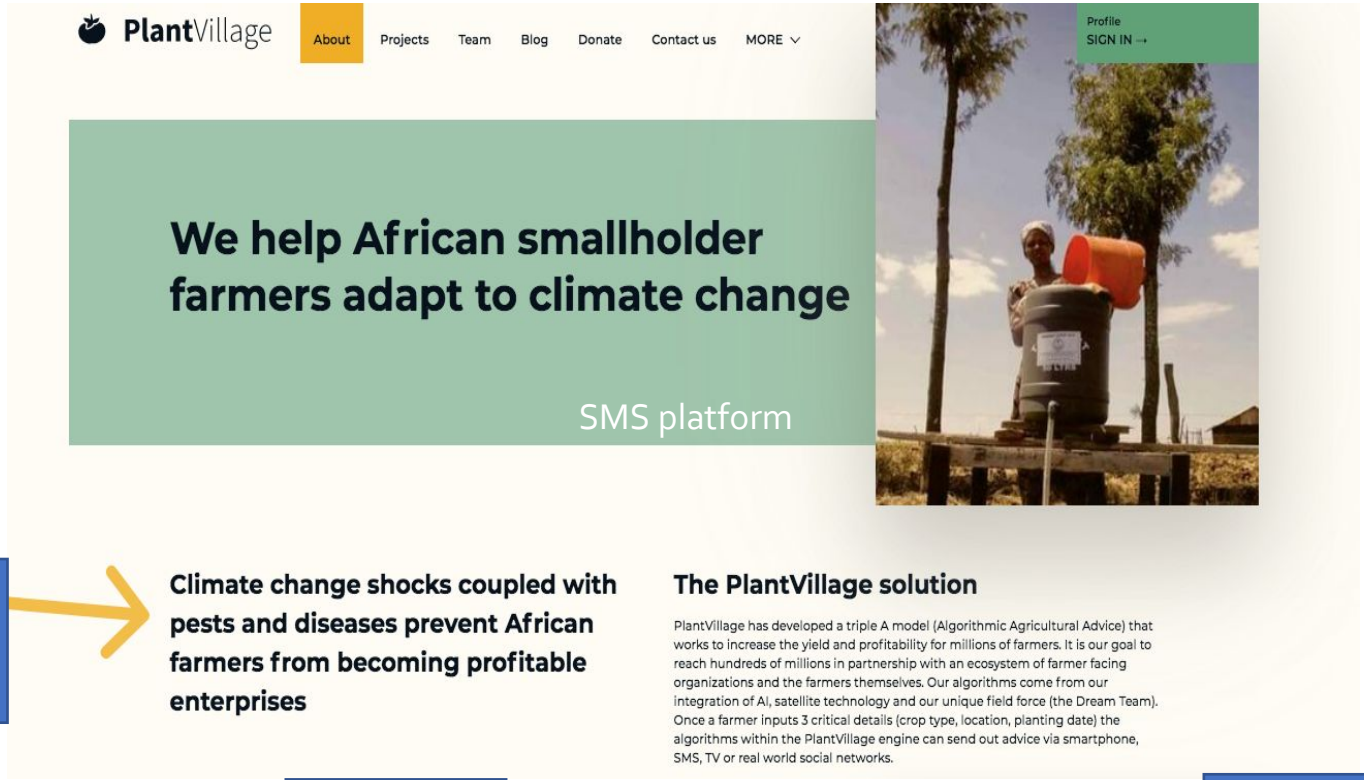
AI assistant in cloud (satellite vision)

Weather information (ECMWF & VPIM) Norway

Connecting farmers to experts (global village)

Delivery of content to TV, SMS

SMS platform

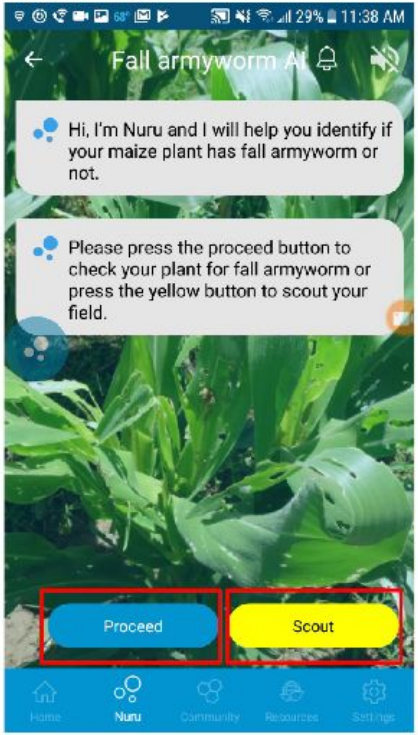


PlantVillage NURU

PlantVillage

Main Menu

Diagnose your field with *Nuru*



Get Advice on how to help your plants

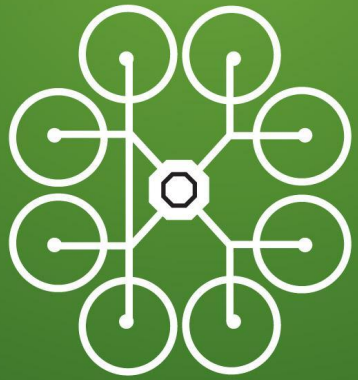
Learn in your language (English, Swahili, French, Twi)

Dream Team upscaling Digital IPM in Kenya. The team consist of 54 Youths and >80% women farmers.

Thank you!

For more information reach out to:

winnieatieno50@gmail.com



NEW HOPE

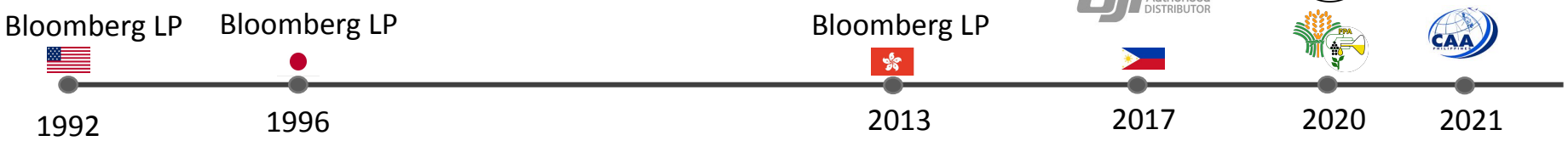
CORPORATION

PRECISION AGRICULTURE

MISSION: TO ADVANCE PHILIPPINE AGRICULTURE BY LEAPS AND BOUNDS

NEW HOPE CORPORATION

My Journey: Serving Financiers to Farmers



PERSONAL CREDENTIALS

- Certified Technician, MG-1P and T16 models
- Certified Pesticide Applicator (CPA)
  Responsible Care Officer (ARCO)
  Drone Spray Controller
- RPAS Controller (RPAS-142140)

COMPANY CREDENTIALS

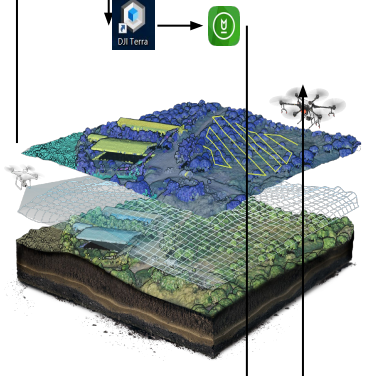
- CERTIFICATE OF PUBLIC CONVENIENCE (CPCN)
- OPERATOR CERTIFICATE (COMMERCIAL)
- DRONE SPRAY OPERATOR (COMMERCIAL)

About Us

It’s true.

The world is at the cusp of bringing tremendous change in the traditional practice we call agriculture. Precision agriculture and Agriculture 4.0 are buzzwords that conjure images of a more intelligent way of farming that will soon uplift our way of farming.

In truth, it’s a cluster of disparate technologies each evolving its own pace with varying degrees of commercial viability. Even if all of these technologies are go-to-market ready, they are hardly “plug-n-play” and subject to Philippine regulatory regimes.



New Hope Precision Agriculture Corporation is a national operator founded in 2017 that is solely focused on bringing agricultural drone technology to the Filipino farmer. As Distributor for DJI, the world’s largest drone manufacturer, we bring singular focus on agricultural drones by actualizing benefits, de-mystifying the technologies inside those boxes. We democratize the agricultural drones to ordinary farmers **commercially licensed** operators by the Fertilizer & Pesticide Authority (FPA) and Civil Aviation Authority (CAAP).

NEW HOPE CORPORATION

We get it.

Safety, Above All

New Hope has profound respect for Philippine regulations which hard-code safety procedures in the operation of agricultural drones. Onerous, perhaps. But our aviation and pesticide laws are perfectly reasonable and in line with regulations in the developed world.

Reasonable ≠ Simple. The Laws require credentials at the operator and enterprise levels. But moreover, none of the drones in the market are “plug-n-play”, nor are chemical dilutions standard—far from it.

New Hope Precision Agriculture Corporation understands the value of stewardship and our role as responsible operator, hand-holding our customers so that they can develop new competencies. We are uniquely positioned to lead not only because of our commercial credentials, but also because of our collaborative relationship with government and chemical companies.

On February 8, 2021, New Hope was granted the only exemption by the FPA to apply a subset of chemicals despite not being label-expanded for drones. This set the scene for application trials where we are now discovering the appropriate dilution rates for each chemical.

NEW HOPE CORPORATION

THE PROBLEM THAT WE SEE

TECHNOLOGY IS MOVING AT A RAPID PACE

ON MULTIPLE FRONTS, NOT JUST DRONES

BUT FARMERS & CORPORATIONS ARE SLOW TO DECIDE

MIRED IN A PERPETUAL STATE OF CATCH-UP

Poll

How would you rate this session?

Join the Smallholder AgriTech SEA LinkedIn group

GrowAsia Digital Learning Series

Powered by padang &co

For inquiries, email Grow Asia:
wei-li@growasia.org

ASEAN FAW ACTION PLAN
Supporting IPM Across Southeast Asia

Join the ASEAN FAW ACTION PLAN
www.aseanfawaction .org

Questions: **alisonwatson@growasia.org**