7 September 2021

EFFECTIVE FARMER COMMUNICATION:
A critical component of achieving IPM

Part 3: Pesticide Behaviour, Decision-making & Communication

Australian Government
Department of Foreign Affairs and Trade

asean

GrowAsia

ASEAN FAW ACTION PLAN
Supporting IPM Across Southeast Asia

Time	Agenda Item
10:00	Introduction
10:05	**Dr Aditi Mankad,** CSIRO Land & Water Australia **Understanding farmers' decision-making and behaviour around pesticides and crop protection**
10:15	Q & A Session
10:25	**Dr Srinivasan Ramasamy, World Vegetable Center** **Farmers' knowledge, attitudes, and practices on synthetic pesticide use in Thailand, Cambodia, Vietnam and Laos**
10:40	Q & A Session
10:50	**Dr Joseph Goeb, Michigan State University** **Experience in developing pesticide education and training programmes: Zambia, Myanmar**
11:00	Q & A Session
11:10	**Dr Yunita Triwardani Winarto, Universitas Indonesia** **Understanding farmer pesticide behaviour in Java, Indonesia**
11:25	Q & A Session
11:35	**Dr Seng Kim Hian, iDE Cambodia** **Pesticide education and training programmes: Cambodia**
11:45	Q & A Session
11:55	**Summary**
12:00	Close

Photo by G. Goergen, IITA.

A recording of the webinar will be made and be distributed 1 week after this session

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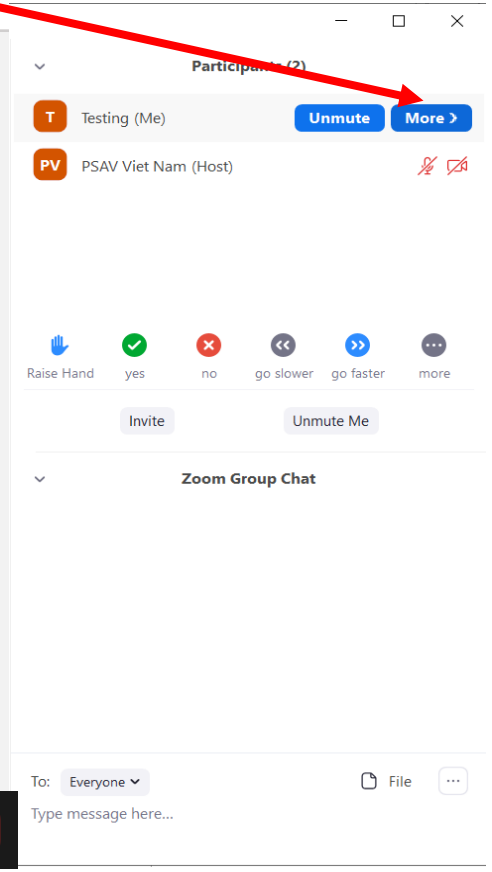

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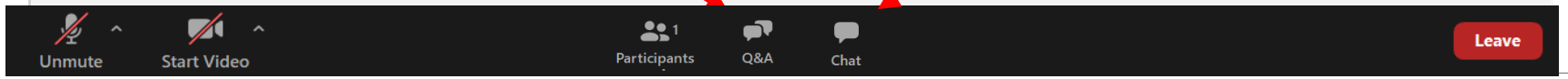


ASEAN Action Plan on FAW Farmer Communication Workshop Series

A four-part series to catalyse action on the development and design of more effective farmer communications on IPM and FAW control

- **Session 1:** Behaviour
- **Session 2:** Communication Channels
- **Session 3:** Pesticide Use & Behaviour
- **Session 4:** Best Practice

Register at: https://www.aseanfawaction.org/events

Case-Studies: We want your case-studies and examples – contact us at faw@growasia.org

Interactive

Give us your feedback and questions in the farmer communication forum at:

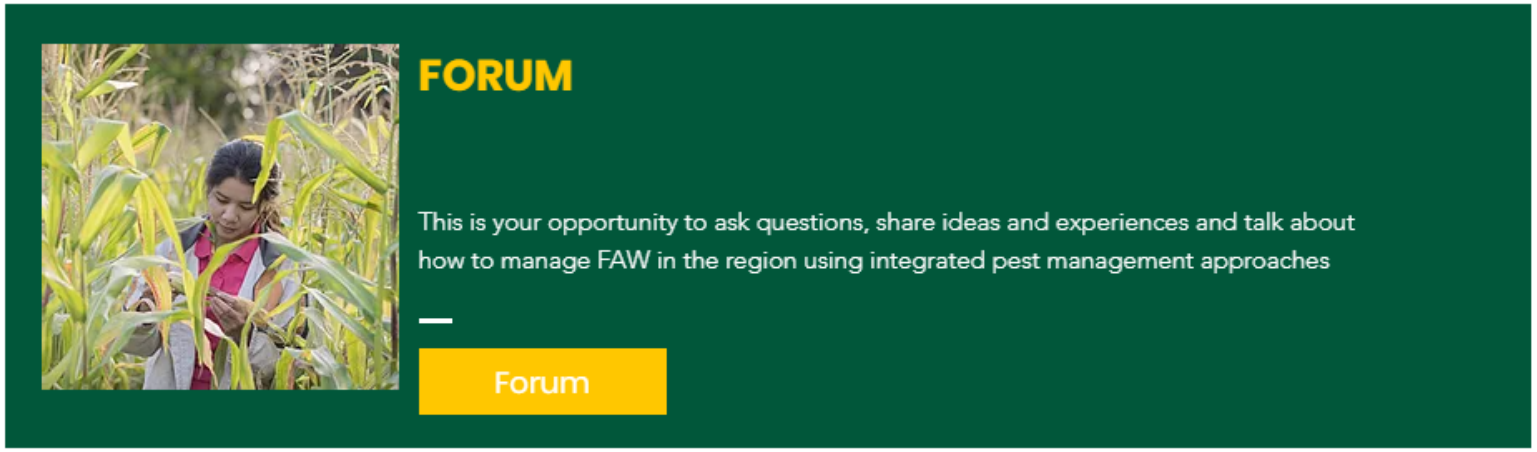
https://www.aseanfawaction.org/forum/farmer-communication

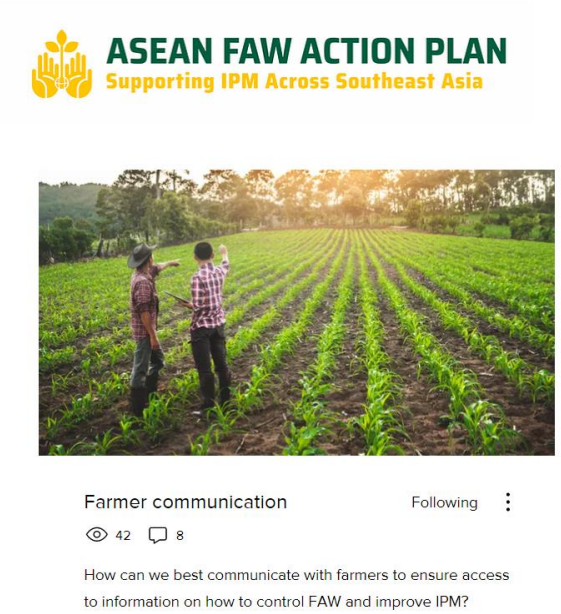
(if you wish to have a certificate of participation you must subscribe to the farmer communication forum and either ask a question, share something interesting about farmer communication like an example of something you noticed that worked well, or note something you found useful in the workshop)

1. www.aseanfawaction.org

2.

3.





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Poll

Studies

faw@growasia.org

Science of The Total Environment
Volume 747, 10 December 2020, 141160

Farmer's behavior in pesticide use: Insights study from smallholder and intensive agricultural farms in Bangladesh

Md. Panna Ali [a], Mir Md. Moniruzzaman Kabir [a], Sheikh Shamiul Haque [a], Xinghu Qin [b], Sultana Nasrin [d], Douglas Landis [c], Björn Holmquist [d], Nur Ahmed [a, d]

Farmers' attitudes towards pesticide labels: implications for personal and environmental safety

Christos A. Damalas & Muhammad Khan
Pages 319-325 | Received 15 Sep 2015, Accepted 23 May 2016, Published online: 14 Jun 2016
Download citation https://doi.org/10.1080/09670874.2016.1195027 Check for updates

Report

A Comparison of Pesticide Risk Beliefs between Farmers and Farmworkers: Implications for Risk Communication and Education

AnnMarie L. Walton, Catherine E. LePrevost, Daniel J. Hatch & Sonja Y. Grisle
Published online: 25 Feb 2021
Download citation https://doi.org/10.1080/1059924X.2021.1879698 Check for updates

INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 6, ISSUE 02, FEBRUARY 2017 ISSN 2277-8616

Effectiveness Of Pesticide Labels As A ication Tool For Smallholder Farmers On Pesticides Handling

Jones Kapeleka, Dismas L. Mwaseba

Saudi Journal of Biological Sciences
Volume 26, Issue 7, November 2019, Pages 1903-1910

Original article

Assessment of farmers on their knowledge regarding pesticide usage and biosafety

Muhammad Mubushar, Fahad O. Aldosari, Mirza B. Baig, Bader M. Alotaibi, Abdul Qader Khan

Do farmers perceive risks of fra from Saudi Arabia

Hazem S. Kassem, Bader Alhafi Alotaibi
Published: September 28, 2020 • https://doi.org/10.1371/journal.p

Science of The Total Environment
Volumes 593–594, 1 September 2017, Pages 470-477

Too much to handle? Pesticide dependence of smallholder vegetable farmers in Southeast Asia

Pepijn Schreinemachers [a], Hsiao-pu Chen [b], Thi Tan Loc Nguyen [c], Borarin Buntong [d], Lilao Bouapao [e], Shriniwas Gautam [a], Nhu Thinh Le [c], Thira Pinn [d], Phimchai Vilaysone [f], Ramasamy Srinivasan [b]

Current Opinion in Envir & Healt
Volume 4, August 2018,

Factors affecting farmers' behaviour in pesticide use: Insights from a field stu

Sci Total Environ. 2015 Dec 15;537:360-8. doi: 10.1016/j.scitotenv.2015.07.150. Epub 2015 Aug 15.

Liangxin Fan [1], Haipeng Niu [2], Xiaomei Yang
Violette Geissen [4]

Farmers' behaviour in pesticide use: A key concept for improving environmental safety

Christos A. Damalas, Spyridon D. Koutroubas

Food Control
Volume 122, April 2021, 107788

Review

Factors influencing Chinese farmers' proper pesticide application in agricultural products – A review

Yingxuan Pan [a, 1], Yingxue Ren [b, 1], Pieternel A. Luning [a]

MALAYSIAN JOURNAL OF CONSUMER AND FAMILY ECONOMICS Vol 25 (S1), 2020

Factors Influencing Group Farmers' Behaviour Towards Safe Pesticide Use in Malaysia

Nyak Nur Hamida Nyak Hashim[1], Roslina Mat Salleh[1], Syuhaily Osman[1], Zuroni Md. Jusoh[1]

artment of Resource Management and Consumer Studies, lty of Human Ecology, Universiti Putra Malaysia, Malaysia

ARTICLE

Which Factors Influence Farmers' Use of Protectiv Measures During Pesticides Exposure?

Maryam Afshari, PhD[1], Jalal Poorolajal, PhD[1], Forouzan Rezapur-Shahkolai, PhD[1], Mohammad Javad Assari, PhD[1], and Akram Karimi-Shahanjarini, PhD[1]

Science of The Total Environment
Volume 550, 15 April 2016, Pages 1001-1009

Pesticide knowledge and practice among horticultural workers in the Lâm Đồng region, Vietnam: A case study of chrysanthemum and strawberries

Michael Houbraken [a], Ingvar Bauweraerts [b], Davina Fevery [a], Marie-Christine Van Labeke [c], Pieter Spanoghe [a]
Show more

Research Article | Published: 05 January 2021

Assessment of farmers' understanding of the pictograms displayed on pesticide labels

Asghar Bagheri, Sahar Pirmoazen & Mohammad Sadegh Allahyari
Environmental Science and Pollution Research 28, 17812–17825 (2021) | Cite this article
192 Accesses | 1 Altmetric | Metrics

The importance of understanding farmer decision-making

Behavioural drivers of agripest control are key for sustainable agriculture

Dr Aditi Mankad

Senior Research Scientist

Team Leader, Biosecurity & Biotechnology

I acknowledge the input of my CSIRO colleagues in developing this work

Ann Seitzinger

Emilie Roy-Dufresne

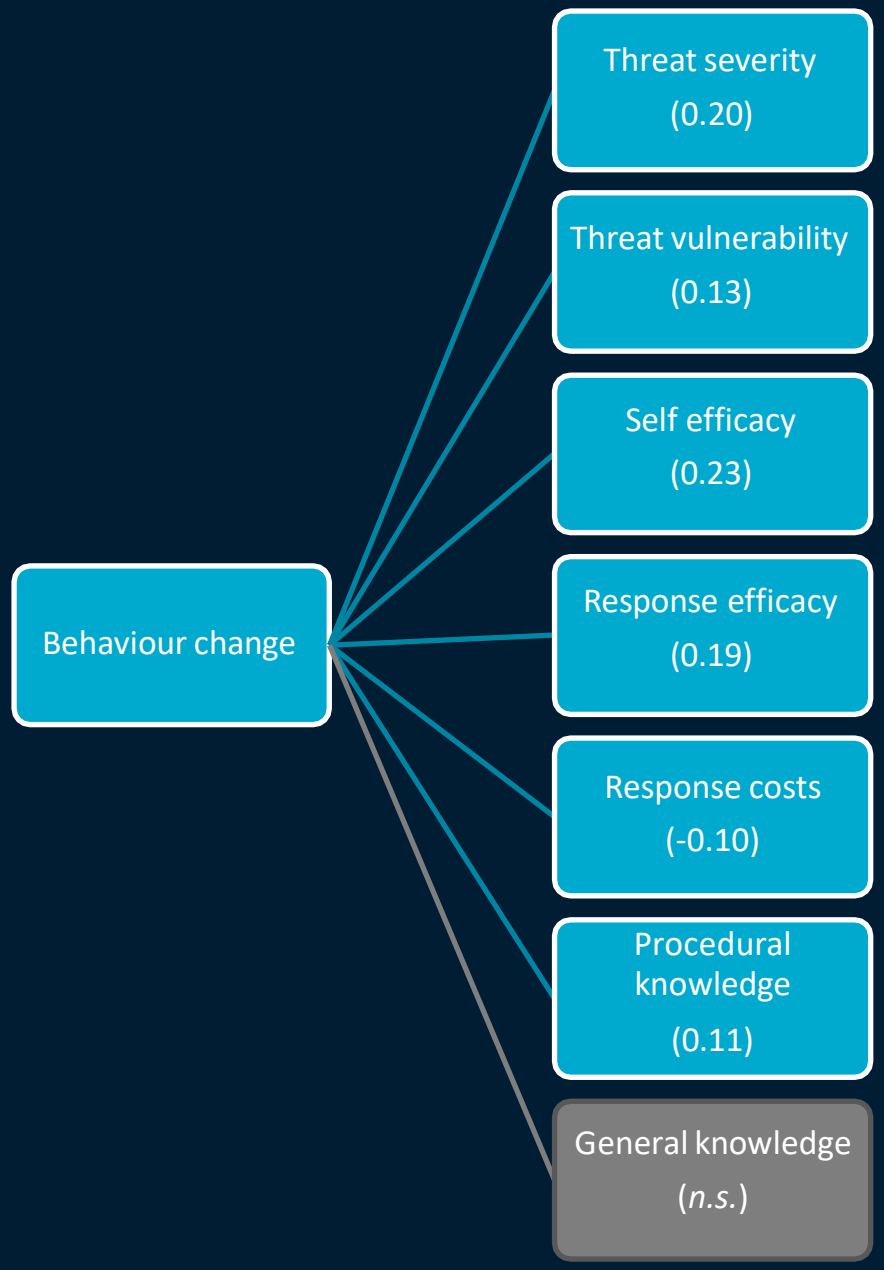
Anu Kumar

Barton Loechel

What will the future look like?

- Agri systems will have to produce sufficient and nutritious food & fibre
- Fewer available chemical inputs = less reliance on chemicals
- Need to build a longer-term vision of profitability at the farm level

Factors predicting behaviour change



Other factors

Barriers	Cost	*"The biggest [barrier] is the cost and their own situation…growers are struggling with their backs to the wall and would do as little as they can and try not spend any money… they're reluctant to do anything at all. And it hurts everyone else but that's the reality of it"*
	Lack of knowledge	
	Apathy	*"You know what growers are like, they don't want to admit that there is anything wrong, and to have a shared approach you have to admit there is a problem."*
	Incompatibility	*"Changing custom of practice can be a very difficult process."*
	Lack of cooperation	
Facilitators	Market access	*"I think if you look at the benefits associated with market access, that is a key motivator in itself"*
	Increased awareness	
	Leadership	*"I think if you got the big growers on-board, a lot of the small recalcitrant ones will look at the big fellows and say, 'they're doing it so I probably should be'…"* *"There are always innovators, leaders, then followers and anchors in every community"*
	Supply chain actors	*"They [packers] are just a really effective conduit to growers"* *"...maybe those packing sheds, particularly the buyers of the fruit, maybe they can influence the growers"*
	Credibility	*"If they see damage then they really get on board pretty quick. Then it just comes down to the cost of [change]. As long as it's not outrageous then they will get on board"*

Economic & Policy mechanisms

- Nationally coordinated policy measures are pivotal to changing farmer behaviours
- Use Denmark from late 1980s to present as an example (Pedersen, et al. 2015)
- Nationally coordinated policy measures are pivotal to changing farmer behaviours
- Producers' decision-making would be more effectively influenced with a mix of policies such as differentiated taxes, subsidies, targeted insurance, and independent and reliable extension information

Pedersen A.B., Nielsen H.Ø., Andersen M.S. (2015) The Danish Pesticide Tax. In: Lago M., Mysiak J., Gómez C., Delacámara G., Maziotis A. (eds) Use of Economic Instruments in Water Policy. Global Issues in Water Policy, vol 14. Springer, Cham. https://doi.org/10.1007/978-3-319-18287-2_6

The role of the consumer

- Central to driving market change through purchasing habits
- Investment in sustainable agriculture is driven by consumers
- Important to target market and consumer values around reduced pesticide impact

Convening a national conversation…

- Distinct farming cultures mean that different communities of practice will have differing rationales for using certain control practices
- Change will rely on the cooperation of a wide range of actors across the supply chain
- Evidence-based options, farmer-to-farmer learning, and opportunities for gaining procedural knowledge are critical elements

Thank you

Dr Aditi Mankad

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@dr_deets

Questions and Answers

Dr Aditi Mankad, CSIRO
Land & Water Australia

Understanding farmers' decision-making and behaviour around pesticides and crop protection

Please use the Q & A Box to ask questions to our speakers

World Vegetable Center

Farmers' knowledge, attitudes, and practices on synthetic pesticide use in Thailand, Cambodia, Vietnam and Laos

Srinivasan Ramasamy

Flagship Program Leader – Safe & Sustainable Value Chains &

Lead Entomologist

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World Vegetable Center

Acknowledgment

Dr. Pepijn Schreinemachers

Flagship Program Leader for Enabling Impact & Healthy Diets

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Economic importance of Vegetables

The average value of
Tomato US$ 3,800
Yardlong bean US$ 581
Pepper US$ 981
Per ha per cropping cycle
(Genova *et al.*, 2006)

World Vegetable Center

- **Misuse of pesticides is an enormous problem globally, especially in vegetable production**
- **Countries in SE Asia are experiencing rapid growth in pesticide quantities**
- **Incorrect use of pesticides leads to environmental risks and health risks to consumers, but especially to farm workers**
- **Comprehensive interventions—from the farm to the policy level—are needed to address these risks**

I. Study on Farmers' pest management

To gain a better understanding of farmers' knowledge, attitudes, and practices regarding vegetable pest management and synthetic pesticide use in Cambodia, Laos & Vietnam

(Schreinemachers et al., 2017)

Science of the Total Environment 598–599 (2017) 470–477

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Too much to handle? Pesticide dependence of smallholder vegetable farmers in Southeast Asia

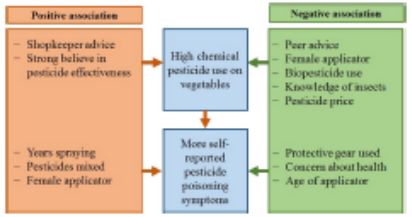
Pepijn Schreinemachers [a,*], Hsiao-pu Chen [b], Thi Tan Loc Nguyen [c], Borarin Buntong [d], Lilao Bouapao [e], Shriniwas Gautam [a], Nhu Thinh Le [c], Thira Pinn [d], Phimchai Vilaysone [f], Ramasamy Srinivasan [b]

[a] World Vegetable Center, P.O. Box 1010 (Kasetsart University), Bangkok 10903, Thailand
[b] World Vegetable Center, P.O. Box 42, Shanhua, Tainan 74199, Taiwan
[c] Fruit and Vegetable Research Institute (FAVRI), Tranquy, Gialam, Hanoi, Viet Nam
[d] Royal University of Agriculture, Chamkardaung, Dangkor District, P.O. Box 2696, Phnom Penh, Cambodia
[e] Mekong Development Center, Unit 48, Nong Niew Village, Sikhottabong District, Vientiane Capital 01000, Lao Democratic People's Republic
[f] Clean Agriculture Development Center (CADC), Ministry of Agriculture, Vientiane Capital, Lao Democratic People's Republic

HIGHLIGHTS

- Vegetable farmers' pest management was studied in Cambodia, Laos, and Vietnam.
- Farmers were aware of health risks from pesticides, but considered pesticides indispensable.
- Low knowledge of beneficial and harmful insects was associated with more pesticide use.
- Farmers who sought advice from pesticide shopkeepers tended to use more pesticides.

GRAPHICAL ABSTRACT



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Laos
Vietnam

ABSTRACT

This study aimed to understand farmers' knowledge, attitudes, and practices regarding agricultural pest management and synthetic pesticide use in Southeast Asia. Data were used from 900 farm households producing leaf mustard (*Brassica juncea* (L.) Czern. et Coss.) and yard-long bean (*Vigna unguiculata subsp. sesquipedalis* (L.) Verdc.) in Cambodia, Laos and Vietnam. Farmers heavily depended on synthetic pesticides as their main method of pest control. Most farmers were aware of the adverse health effects associated with pesticide use and covered body parts while spraying, but also considered pesticides to be highly effective and indispensable farm inputs. Farmers were largely unable to distinguish between common beneficial and harmful arthropods. Greater knowledge about this was associated with less pesticide use while greater awareness of pesticide health risks was associated with fewer observed poisoning symptoms. For the average farm and while controlling for other factors, farmers who sought advice from friends and neighbors used 45% less pesticide, but those who sought advice from pesticide shopkeepers used 251% more pesticide. Pesticide use was 42% less when a woman was in charge of pest management and 31% less when farmers had adopted biopesticides. These findings suggest relevant entry points for interventions aimed at reducing pesticide dependence.

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E-mail address: pepijn.schreinemachers@worldveg.org (P. Schreinemachers).

http://dx.doi.org/10.1016/j.scitotenv.2017.03.181
0048-9697/

World Vegetable Center

Agricultural pesticide dependence in Southeast Asia

Knowledge

Knowledge of beneficial insects, insect pests, lifecycles and pesticide safety

Perceptions

Perceived effectiveness and health effects of pesticides

- [x] Headache
- [x] Fatigue
- [ ] Dizziness
- [ ] …
- [ ] Unconsciousness

Practices

Pesticide use, alternatives used, safety precautions

- Focused on yard-long bean and leafy brassicas in Cambodia, Laos, and Vietnam
- Focus group discussions
- Questionnaire-based survey of a stratified random sample of 900 producers (150 x 2 crops x 3 countries)
  - Pest management methods used
  - Knowledge about insects
  - Perceptions about synthetic pesticides
  - Poisoning symptoms observed

(Schreinemachers et al., 2017)

II. Study on Farmers' pest management

To gain a better understanding of farmers' knowledge, attitudes, and practices regarding pest management and synthetic pesticide use on yard-long bean in Thailand & Vietnam

(Schreinemachers et al., 2014)

International Journal of Tropical Insect Science Vol. 34, No. 2, pp. 88–97, 2014 doi:10.1017/S174275841400023X

Safe and sustainable management of legume pests and diseases in Thailand and Vietnam: a situational analysis

Pepijn Schreinemachers[1]*, Ramasamy Srinivasan[1], Mei-Huey Wu[1], Madhusudan Bhattarai[2], Ricardo Patricio[3], Sopana Yule[4], Vu Hong Quang[5] and Bui Thi Huy Hop[5]

[1]AVRDC – The World Vegetable Center, PO Box 42, Shanhua, Tainan 74199, Taiwan; [2]International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru 502324, Andhra Pradesh, India; [3]Goducate (Go & Educate) International Ltd, One Commonwealth, Singapore 149544, Singapore; [4]AVRDC – The World Vegetable Center, East and Southeast Asia, Research and Training Station, Kasetsart University, Kamphaeng Saen Campus, Kamphaeng Saen, Nakhon Pathom 73140, Thailand; [5]Department of Science and International Cooperation, Vietnam Academy of Agricultural Sciences, Thanh Tri District, Ha Noi, Vietnam

(Accepted 12 February 2014)

Abstract. Vegetable legumes are important crops in tropical agriculture, but they are susceptible to a substantial number of arthropod pests and diseases. Using farm-level survey data for 240 farm households growing yard-long bean (*Vigna unguiculata* subsp. *sesquipedalis*) in Thailand and Vietnam, this study shows that the farmers' main problem is the legume pod borer (*Maruca vitrata*). Farmers rely exclusively on the use of synthetic pesticides to manage this pest, and no other control methods are generally applied. Small cultivated areas for growing yard-long bean (particularly in Vietnam), a high level of satisfaction with the use of pesticides and a lack of market demand for pesticide-free produce are formidable challenges to the introduction of integrated pest management (IPM). It is important to ensure that IPM methods, if adopted, do not reduce profits and that farmers are allowed to experiment with these methods while raising awareness in the general population about the risk resulting from pesticide exposure.

Key words: agriculture, *Maruca vitrata*, IPM, pesticide misuse, crop protection policy

Introduction

Legumes are important crops in Southeast Asia. Crops such as yard-long bean (*Vigna unguiculata* subsp. *sesquipedalis*), cowpea (*Vigna unguiculata*) and green bean (*Phaseolus vulgaris*) account for a significant share of the total area for the cultivation of vegetables, and are important sources of plant proteins and micronutrients in the human diet. Since they are capable of fixing atmospheric nitrogen, these leguminous crops also play an important role in managing soil fertility. Legumes, in particular vegetable legumes, are highly susceptible to a wide range of arthropod pests and diseases. Among the documented pests, the legume pod borer (*Maruca vitrata*) is considered one of the most serious pests in tropical Asia and sub-Saharan Africa (Sharma, 1998). Yield losses up to 80%

*E-mail: pepijn.schreinemachers@worldveg.org

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Crop cultivation practices of leaf mustard and yard-long bean in Laos, Cambodia and Vietnam, average per farm

	Leaf mustard			Yard-long bean		
	LAO	KHM	VNM	LAO	KHM	VNM
Planted area (ha)	0.21	0.12	0.04	0.31	0.14	0.05
Length of growing period (weeks)	6.6	8.7	7.7	18.2	12.7	15.5
Fertilizer applications (times/growing cycle)	0.9	2.7	3.1	1.9	3.6	5.0
Marketable yield (t/ha)*	5.6	15.0	12.4	3.0	12.5	21.8
Farmgate selling price (USD/kg)*	0.50	0.35	0.34	0.62	0.37	0.33
Gross margin (1,000 USD/ha)*	0.36	1.51	2.47	0.49	2.09	5.08

(Schreinemachers et al., 2017)

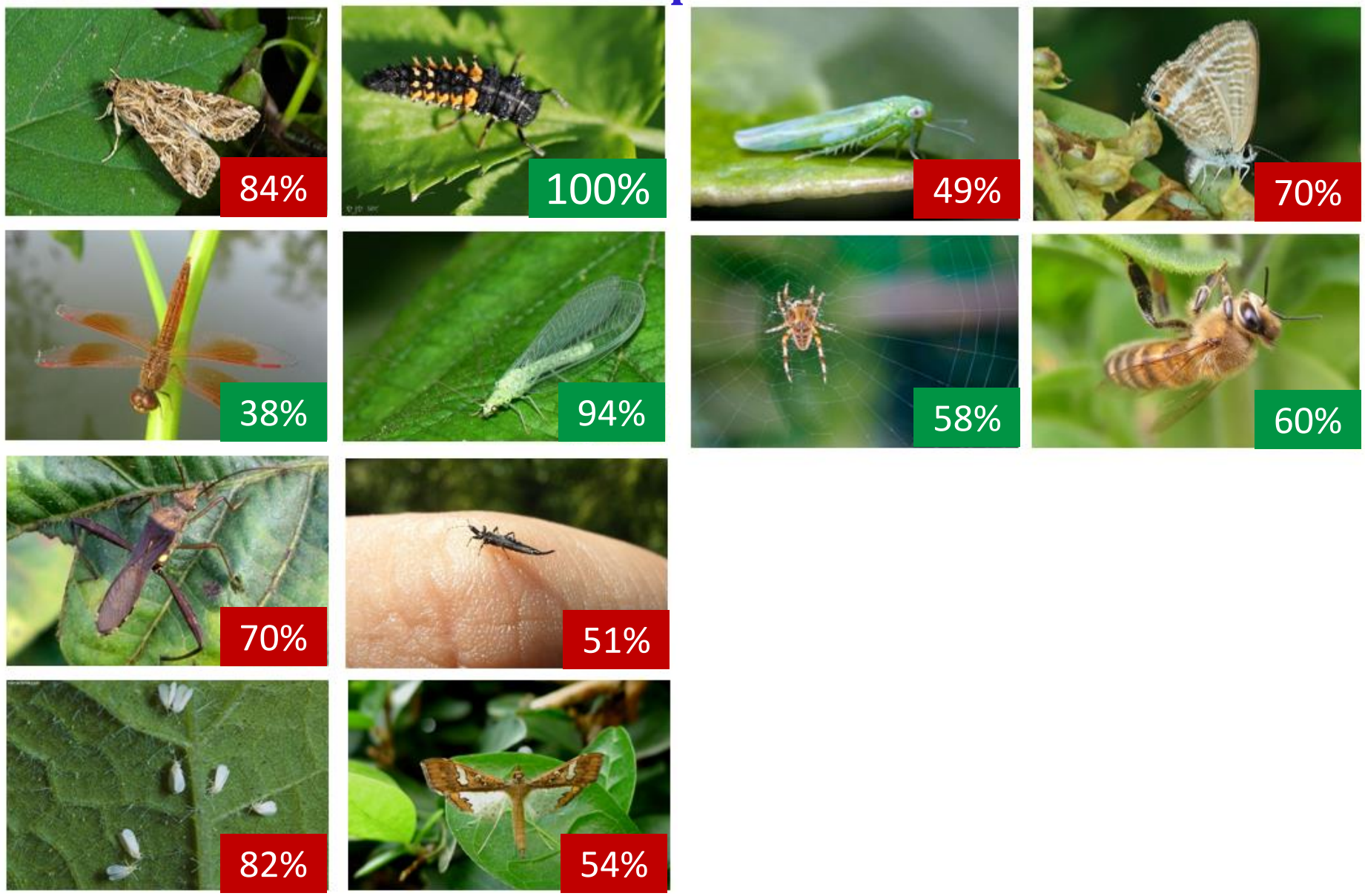
World Vegetable Center

General characteristics of yard-long bean production

	Thailand	Vietnam
Family size (people/household)	4.3	4.6
Farm size, owned (ha)	1.54	0.19
Planted area yardlong bean (ha)	1.25	0.08
Cropping cycles per year	2.21	1.43
Yardlong bean yield (tons/ha/cycle)	5.90	23.23
Farm gate selling price (USD/kg)	0.57	0.37

(Schreinemachers et al., 2014)

Which of these insects can do damage to your yard-long bean crop?



(Schreinemachers et al., 2017)

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Farmers' perceptions about the effectiveness of pesticides (proportion of farmers)

Beliefs about pesticide effectiveness	Laos (n=300)	Cambodia (n=300)	Vietnam (n=300)	Average (n=900)
Mixing different pesticides makes the spraying more effective than using a single pesticide	0.85	0.76	0.75	0.79
Using pesticides increases farm profits	0.88	0.83	0.93	0.88
Bio-pesticides are not as effective as chemical pesticides	0.79	0.88	0.43	0.70
Good pesticides are those that kill all insects immediately	0.48	0.77	0.73	0.66

(Schreinemachers et al., 2017)

World Vegetable Center

Farmers' use of pest control methods in leaf mustard and yard-long bean in Laos, Cambodia and Vietnam, average per farm

	Laos (n=300)	Cambodia (n=300)	Vietnam (n=300)	Average (n=900)
Using synthetic pesticides	0.83	0.94	1.00	0.92
Using bio-pesticides	0.00	0.01	0.74	0.25
Pick and destroy insects by hand	0.81	0.61	0.17	0.50
Rotate with non-host crop	0.02	0.43	0.10	0.18
Grow crop under insect nets	0.00	0.21	0.22	0.15
Trap or barrier crop	0.04	0.09	0.00	0.04
Blue/yellow sticky traps	0.01	0.00	0.04	0.02
Pheromone traps	0.00	0.00	0.01	0.01

(Schreinemachers et al., 2017)

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Farmers' pest management practices in leaf mustard and yard-long bean in Laos, Cambodia and Vietnam, average per farm

	Laos (n=300)	Cambodia (n=300)	Vietnam (n=300)	Average (n=900)
Pesticide use:				
– Spraying frequency (sprays/week)	1.21	0.77	0.52	0.83
– Quantity of synthetic pesticides (kg/ha/week)	0.68	0.80	1.08	0.90
Spraying practices:				
– Applicator is female (proportion)	0.24	0.24	0.49	0.33
– Mixing different pesticides (proportion)	0.63	0.71	0.88	0.75

(Schreinemachers et al., 2017)

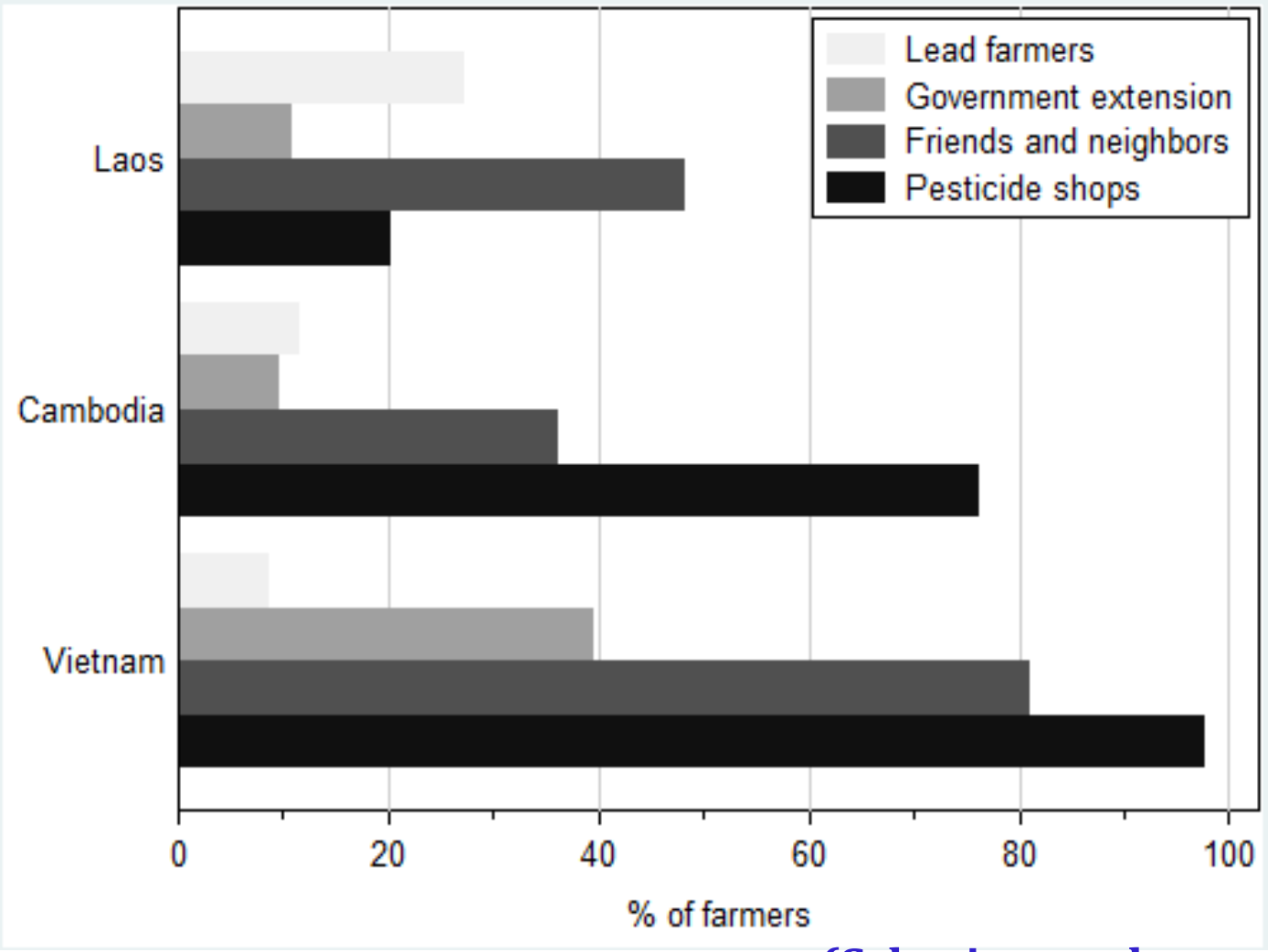
World Vegetable Center

Aspects of pesticide use, in % of farmers using pesticides on yard-long bean in Thailand

	Thailand	Vietnam
Spraying frequency		
• Twice a week	23	1
• Weekly	64	80
• Less frequent	13	19
Mix different pesticides in one spray	90	100
Satisfaction with pesticides		
• Very satisfied	2	97
• Satisfied	96	3
• Not satisfied	2	0

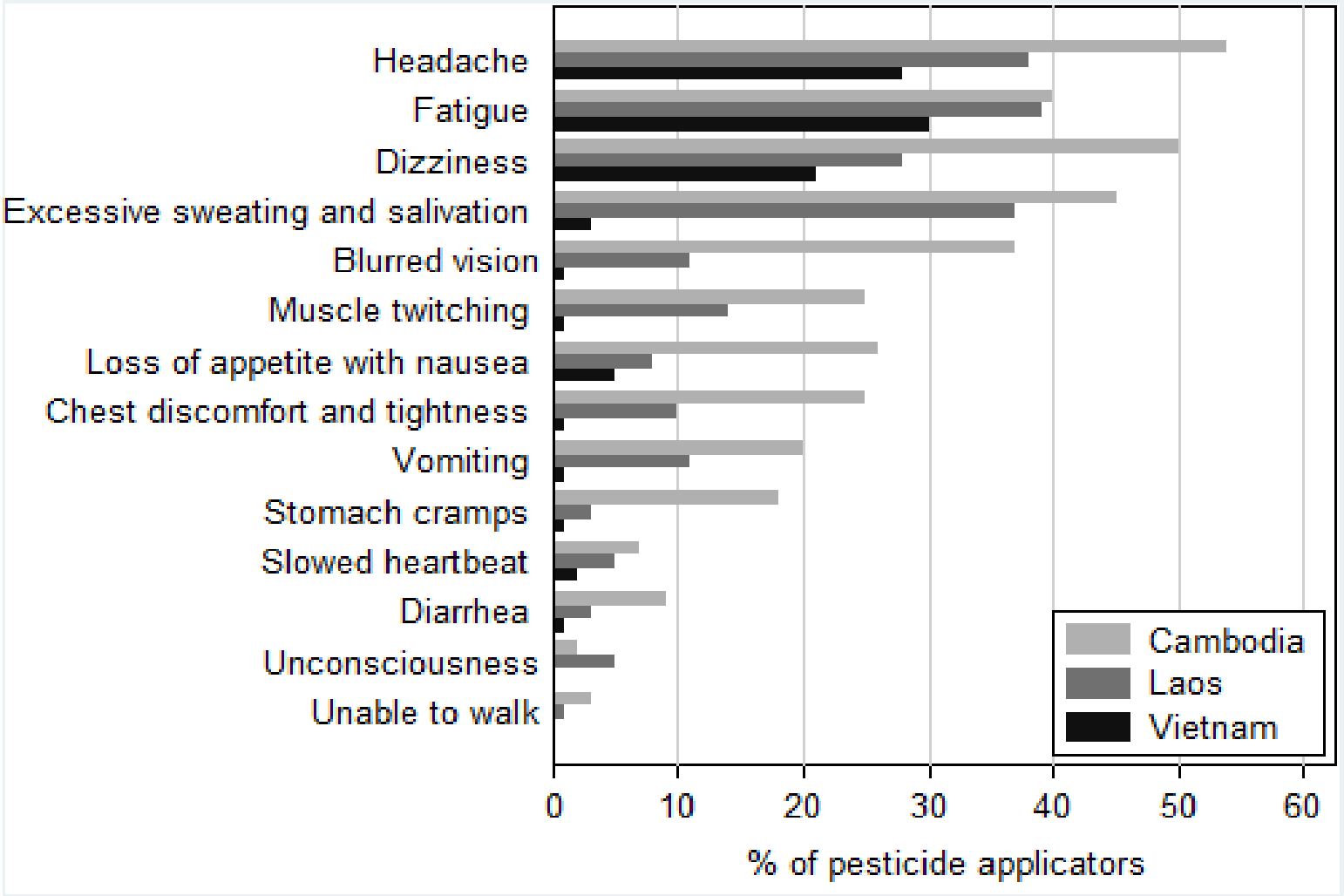
(Schreinemachers et al., 2014)

Sources of advice on pest management in Laos, Cambodia and Vietnam, in % of vegetable farmers



(Schreinemachers et al., 2017)

Perceived health effects of pesticide use among vegetable farmers in Laos, Cambodia and Vietnam



(Schreinemachers et al., 2017)

World Vegetable Center

Farmers' use of protective gear during pesticide spraying

Protective gear	Laos (n=300)	Cambodia (n=300)	Vietnam (n=300)	Average (n=900)
Long-sleeved shirt	0.99	0.93	0.99	0.97
Long trousers	0.99	0.92	0.99	0.97
Mouth cap	0.51	0.85	0.96	0.79
Hat	0.69	0.59	0.93	0.74
Rubber boots	0.97	0.41	0.86	0.74
Gloves	0.94	0.41	0.66	0.66
Raincoat or coverall	0.23	0.23	0.18	0.21
Eye cover	0.35	0.11	0.18	0.20
Respirator	0.01	0.00	0.00	0.00

(Schreinemachers et al., 2017)

World Vegetable Center

Determinants of pesticide use by leaf mustard and yard-long bean farmers in Laos, Cambodia and Vietnam

Determinants (units)	Elasticity	Significance
Plot size (ln hectare)	-0.2	**
Woman in charge of pest management (0/1)	-42.0	***
Sought advice from neighbors and friends (0/1)	-45.4	***
Sought advice from extension officer (0/1)	-9.3	
Sought advice from pesticide shopkeeper (0/1)	251.4	***
Belief that pesticides are effective (index)	0.7	**
Concern about adverse health effects (index)	-0.6	
Knowledge about arthropods (index)	-0.5	**
Pesticide price (USD/kg)	-1.1	***
Used biopesticides (0/1)	-30.9	**
Adjusted R^2	0.30	

Significance levels ***p<0.01, **p<0.05, * p<0.10.

World Vegetable Center

Determinants of the number of pesticide poisoning symptoms experienced by leaf mustard and yard-long bean farmers in Laos, Cambodia and Vietnam

Determinants (units)	Coefficient	Significance
Quantity sprayed (kg/ha/week, ln)	1.256	***
Number of pesticides mixed	1.154	**
Years of using pesticides	0.190	***
Woman applicator	3.227	**
Number of protective gears used	-1.154	**
Concern about adverse health effects (index)	-0.142	***
Knowledge about arthropods (index)	0.200	***
Constant term	4.707	
Adjusted R^2	0.29	

Conclusions

- Farmers are aware of health risk, but perceive pesticides as indispensable
- Better knowledge about beneficial insects and pests and the use of bio-pesticides helps to reduce synthetic pesticide use
- Interventions are needed to increase the availability of bio-pesticides while reducing access to synthetic pesticides (through limiting retail points, increasing prices for the most risky products, better training of retailers)

Questions and Answers

Dr Srinivasan Ramasamy, World Vegetable Center

Farmers' knowledge, attitudes, and practices on synthetic pesticide use in Thailand, Cambodia, Vietnam and Laos

Please use the Q & A Box to ask questions to our speakers

PESTICIDE DEMAND AND INFORMATION: EVIDENCE FROM ZAMBIA AND MYANMAR

JOSEPH GOEB

MYANMAR AGRICULTURAL POLICY SUPPORT ACTIVITY (MAPSA)

SEPTEMBER 7, 2021

MICHIGAN STATE UNIVERSITY

CGIAR | RESEARCH PROGRAM ON Policies, Institutions, and Markets

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Outline

- Pesticide background
  - Risks and Behaviors
  - Supply chains
  - Information and Extension
- Research overview
  - Zambia
  - Myanmar
- Results
  - Sources of information
  - Pesticide knowledge
  - Effects of information
- Summary

Pesticide Risks & Behaviors

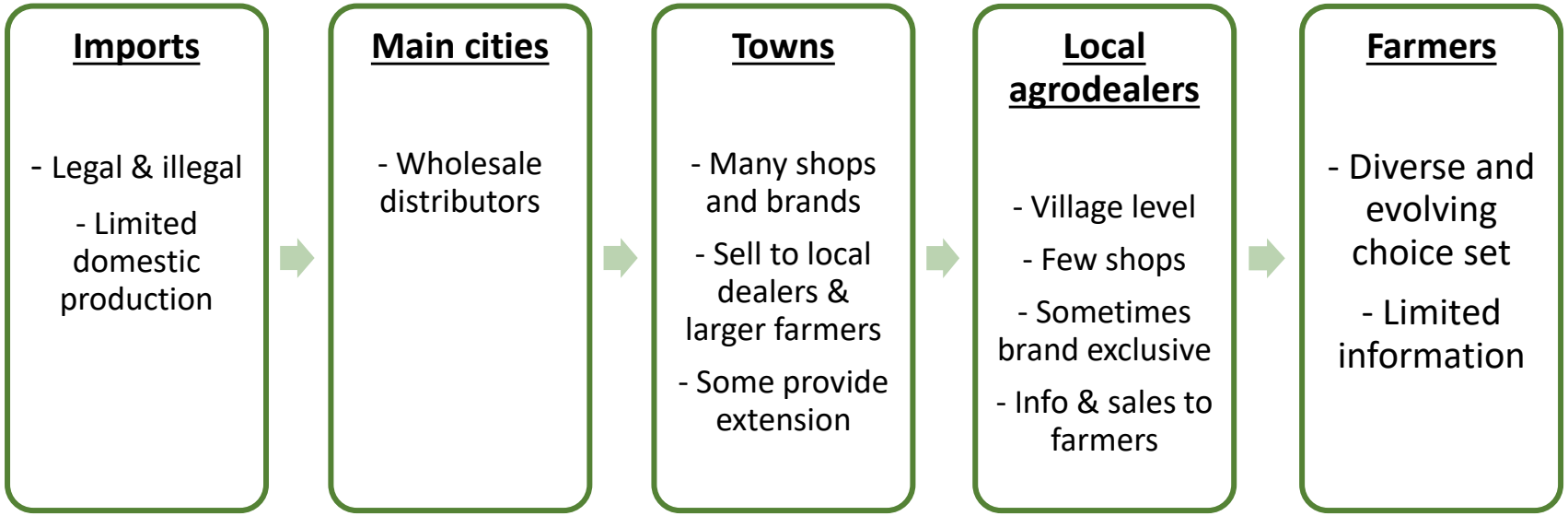
- Two primary risk components:
  - *Toxicity* - Hazard/potential harm of each pesticide
  - *Exposure* - Contact with pesticide (probability of harm)

- Developing country farmers:
  - Highly toxic pesticides + low personal protective equipment (PPE) use = acute illnesses
    →lower productivity + lost work + treatment costs

- Two possibilities for risky pesticide behaviors (Antle and Capalbo, 1994)
  - 1) Farmers may know about the risks, but lack attractive alternatives
  - 2) Farmers may not know about the risks and may unintentionally incur them

Pesticide Supply Chains

- Pesticide use is increasing in most developing countries
- Supply chains expanding and evolving
- Information flows often follow the supply chain



Pesticide Information & Extension

- Limited extension services on pesticides
  - Low budgets + low priority
- Complicated technologies + a lot of pesticide products + changing availability
  - → A LOT TO LEARN
- Some information is relatively simple → Easier to learn/transfer
  - Pesticides have negative health effects through direct exposure
  - PPE reduces exposure
  - Toxicity labels
- Other information is complex/nuanced → Harder to learn/transfer
  - IPM
  - Pesticide controls & use

Research Overview

- *Zambia (2015)*
  - 512 tomato farmers
  - Context
    - Highly toxic pesticide use among horticulture producers, especially tomatoes
    - Very limited extension → learning by doing
  - Information intervention: Lead farmer training + letter
    - (i) toxicity, (ii) PPE, (iii) pesticide controls
- *Myanmar (2021)*
  - ~1,500 maize farmers
  - Context
    - Very little known about pesticide use and behaviors at farm level
    - Fall armyworm severe threat to maize production, pesticides main control mechanism
    - Mobile network restrictions + decline in extension services during political instability & COVID
  - Information intervention: (i) SMS directly to farmers, (ii) SMS to lead farmers

Sources of Pesticide Information

Pesticide information sources and trust

	Myanmar			Zambia		
		Trust level			Trust level	
Source	Received	High	Low	Received	High	Low
Other farmers	69%	80%	20%	45%	94%	6%
Agro-dealer	18%	68%	32%	19%	80%	20%
Gov't extension	8%	63%	37%	5%	89%	11%
Radio	1%	47%	53%	23%	98%	2%

- Other farmers are most common and most trusted source of information
- Agrodealers also common, but much lower trust
- Government extension services uncommon

Pesticide Knowledge

- High prior knowledge of exposure and PPE
  - Documented in many developing countries

- Low knowledge of pesticide products in the market
  - Low share of farmers could name products to control specific pests
    - Often rely on agrodealers at point of sale
  - Led to a perception that higher prices → higher efficacy/quality (Zambia)

- Low knowledge of toxicity
  - Overperceive health risks of many pesticides
  - 'Poison is poison'

Toxicity Identification

- Farmers have a hard time identifying pesticide toxicity by color labels on packaging
  - Red label correct: >80%
  - Green label correct: <30%

- Flat risk perceptions are a problem

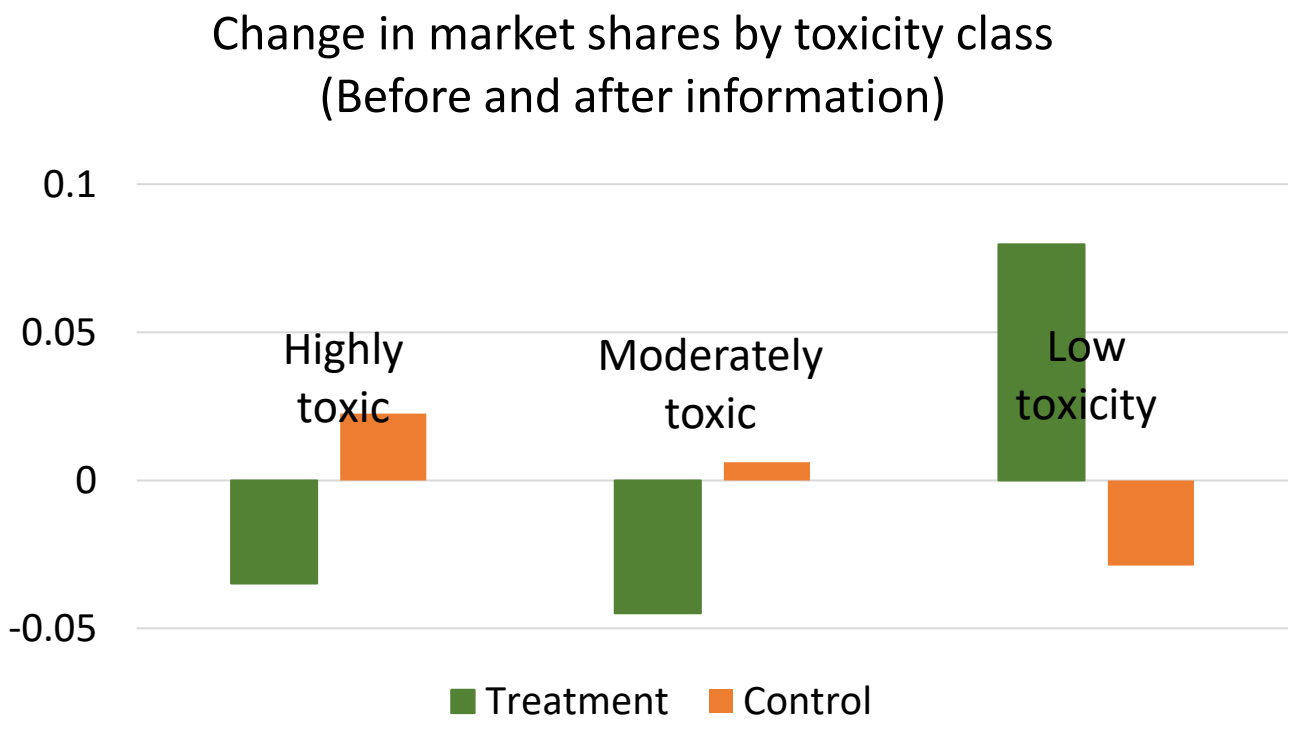
  →No health benefits from lower toxicity pesticides

Relative toxicity risk perceptions - green and red labels

	Myanmar	Zambia
Don't know	33%	31%
Flat risk perceptions	48%	41%
Incorrect relative risk perception	3%	1%
Correct relative risk perception	15%	26%

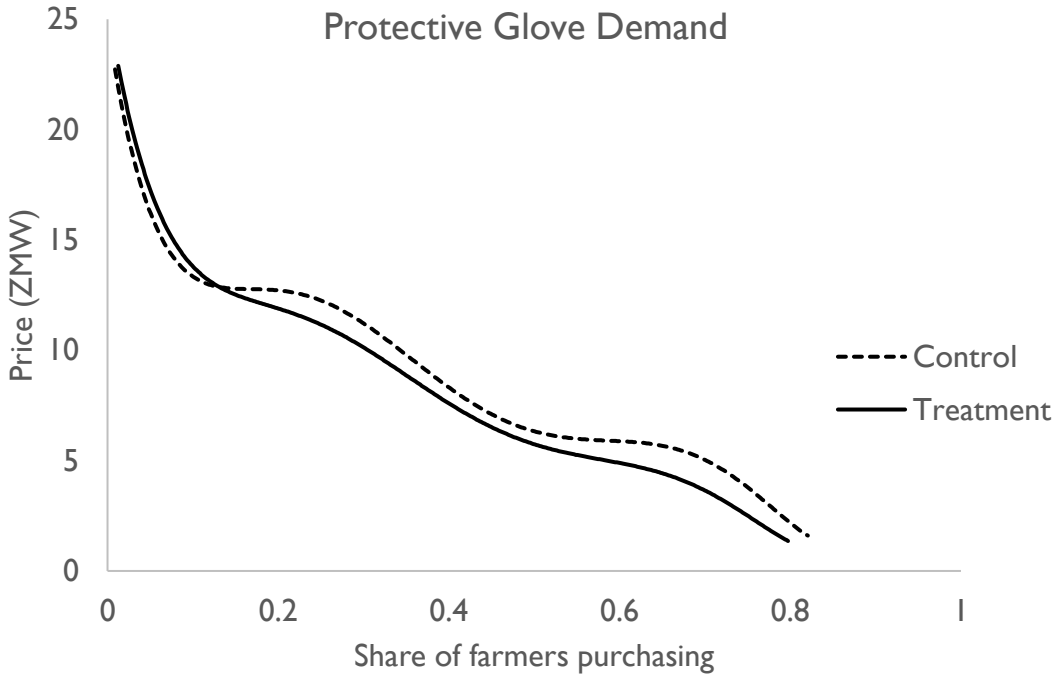
Effects of Information (Zambia – 1 of 2)

- Broke the price-efficacy perception
- Better knowledge of pest-control properties
- Increased demand for less toxic pesticides
  - Substitution from high to low toxicity



Effects of Information (Zambia – 2 of 2)

- No effect on PPE demand
- High prior knowledge, limited opportunity for information to change demand or behaviors



Summary

- Pesticides are an important part of IPM
- Limited information reaching farmers on pesticides
  - Other farmers are most common and most trusted
  - Agrodealers also a common source, but less trusted
- Evolving supply chains add to complexity in learning
- Farmers generally undervalue health benefits of less toxic pesticides
  - Flat health risk perceptions prevalent (i.e., all pesticides highly toxic)
- Information can change knowledge and behaviors, but important to identify knowledge gaps and design information appropriately
  - Toxicity information increased demand for less toxic products
  - PPE information did not change PPE demand

Thank you

Goeb, J., Dillon, A., Lupi, F., & Tschirley, D. (2020). Pesticides: what you don't know can hurt you. *Journal of the association of environmental and resource economists, 7(5)*, 801-836. https://www.journals.uchicago.edu/doi/abs/10.1086/709782

Goeb, J., & Lupi, F. (2021). Showing pesticides' true colors: The effects of a farmer-to-farmer training program on pesticide knowledge. *Journal of Environmental Management, 279*, 111821. https://doi.org/10.1016/j.jenvman.2020.111821

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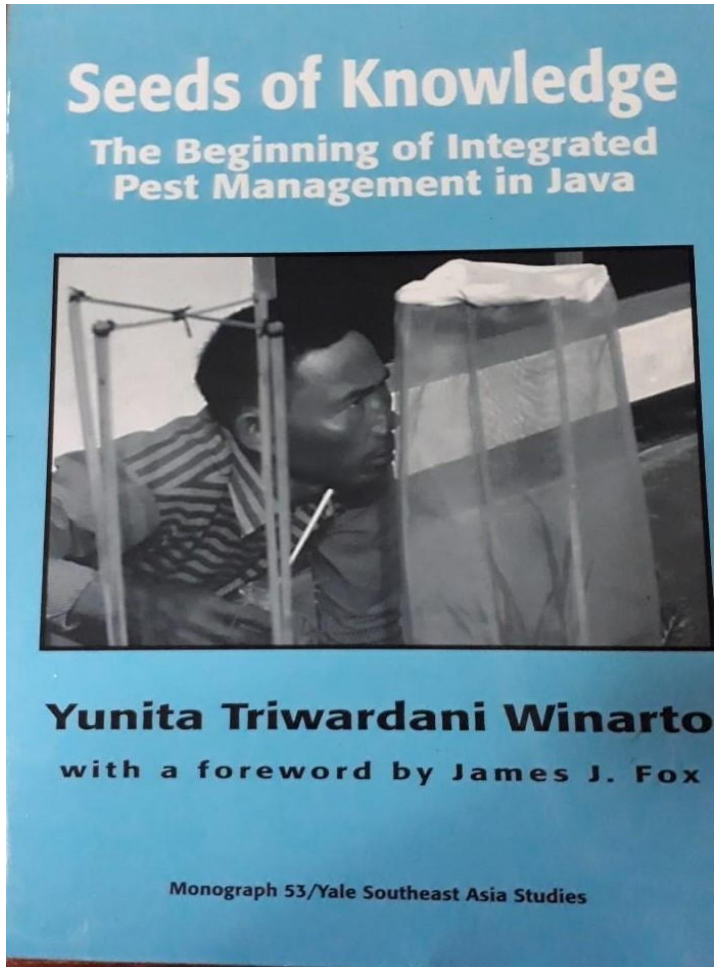
Questions and Answers

Dr Joseph Goeb, Michigan State University

Experience in developing pesticide education and training programmes: Zambia, Myanmar

Please use the Q & A Box to ask questions to our speakers



The "Trap of Pesticide Use" & the Struggle to Get Out of the "Trap"

Yunita T. Winarto
Anthropologist - Universitas Indonesia & the Academy of Indonesian Sciences

"The Behaviour of Pesticide Purchasing and Use"
Workshop Series on ASEAN Action Plan on Fall Army Worm Control

ASEAN FAW Action Plan 7th of September 2021

"We are like plants. The government sowed the seeds, but they did not watering the plants"
2004

Mixing a cocktail of ‘medicines’ by also boiling the very poisonous granule insecticides to control yellow rice stemborer.

Spraying ‘medicines’ to control leaf folder

“My plants are sick, infested by brown plant hopper, what is the most powerful ‘medicines’?”

“Why the more numerous *obat* (‘medicines’) we have, the more numerous ‘illnesses’ infesting my plants?”

Farmers were ignorance of the work and the effects of *obat* they used to ‘kill’ the cause of ‘illnesses’ and to restore their plants onto their fields’ ecosystem & their own body

Yet, they kept using it as a protection and an insurance to secure their harvests

Photos by Y.T. Winarto, Subang, 1991

Why were the Farmers being Trapped in the Ill-wise Use of Pesticides?

- **The persisting schema of controlling "illnesses" since the introduction of the Green Revolution in early 1970s:**

A combination of a prophylactic way of spraying *obat* & observation of the plant's healthiness

Mix the 'expensive' (strong) & the 'cheap' ones, & with herbicides &/or fungicides to save time & energy

- **The inclusion of pesticides in the "package" of rice intensification programme – part of the credit scheme.**
- **The absence of any explanation or knowledge transmission of the 'nitty-gritty' of the work and effect of pesticides.**
- **The introduced term of *obat* (*medicine*) by the agricultural officials: the incorrect use of metaphor, but was internalized by farmers as part of their vocabulary and new practice.**
- **The intensive advertisement of various brands of pesticides**

The role of salesmen, extension staff & shop owners as the main knowledge providers

The Introduction of Integrated Pest Management Farmer Field School

The Brown Planthopper:
Nilaparvata lugens Stal.
"Si Wereng Batang Cokelat"

The NEW education method: The Novel paradigm of learning:

"What is this?"

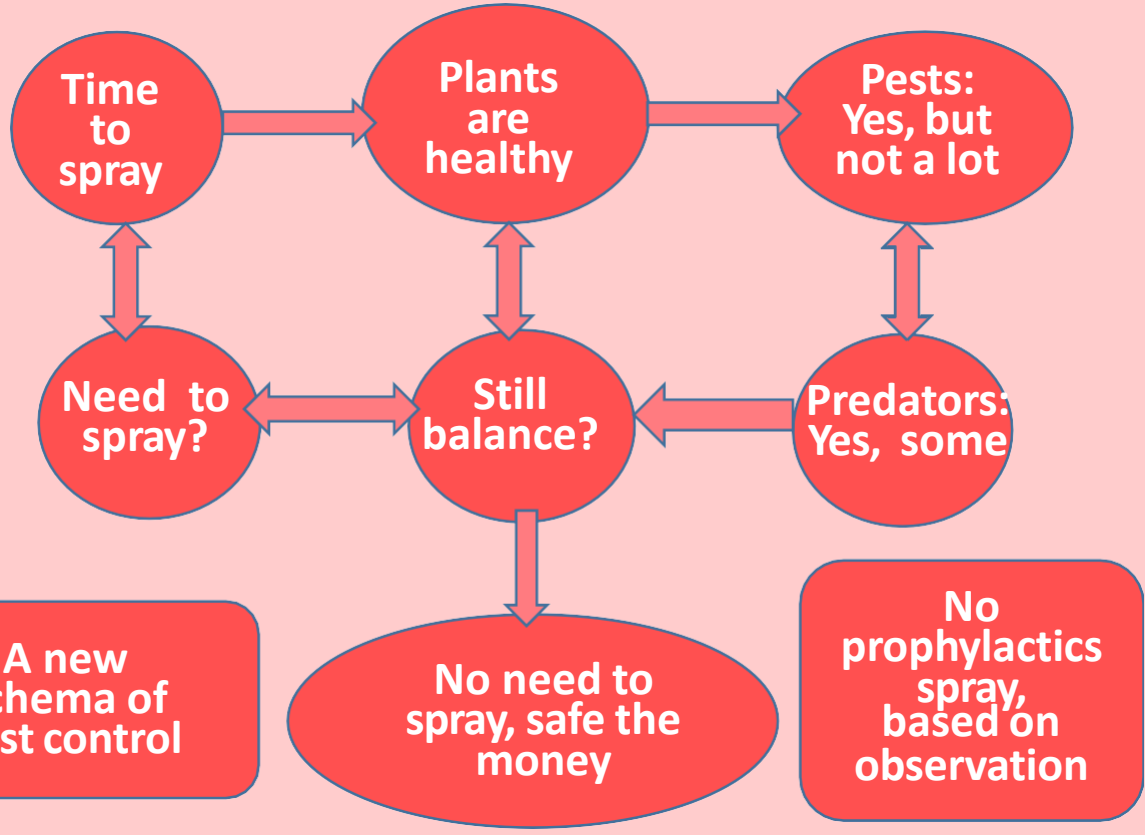
Farmers' own discovery learning

CARA BELAJAR PHT MANA YANG BENAR ?

Source: The National IPM Program n.d.

Indonesian:	English:
Cara Belajar PHT mana yang benar	Which ways of IPM learning is the correct one?
Apa ini? Ya...itu jenis serangga yang makan hama.	What is this? Yes...that is a type of insect which feeds on pest.
Ditemukan di mana, Pak?	Where do you find it, Sir?
Jumlahnya berapa? Apakah sering terlihat ?	How many? Do you often see it?

Detailed observation of field's ecosystem, understanding the presence & role of "natural enemy", evaluating the "economic threshold" & making decisions accordingly.



The Resurgence of Brown Planthopper & Viruses over the Period of 2011-2017

La Niňa 2010: Outbreaks of BPH in various places in Java in 2011

Photo by Winarto in Klaten, 2011

BPH & viruses in one rice hill

Photo by Winarto, Klaten, 2011

La Niňa 2016-17:

BPH outbreaks in Indramayu – 2017
Photo by G. Acciaioli, 2017

Viruses damaged rice fields in Indramayu – 2017
Photo by R. Ariefiansyah, 2017

Yet, Farmers were still “Bathing” the Plants with Pesticides

Mixing *obat* was still going on

Photo by Winarto, Indramayu, 2018

Pesticides advertisement went on

Obat were sold not only in special insecticide shop, but also at home in one room with milks, breads, medicines etc.

Photos by Winarto, 2011, 2015

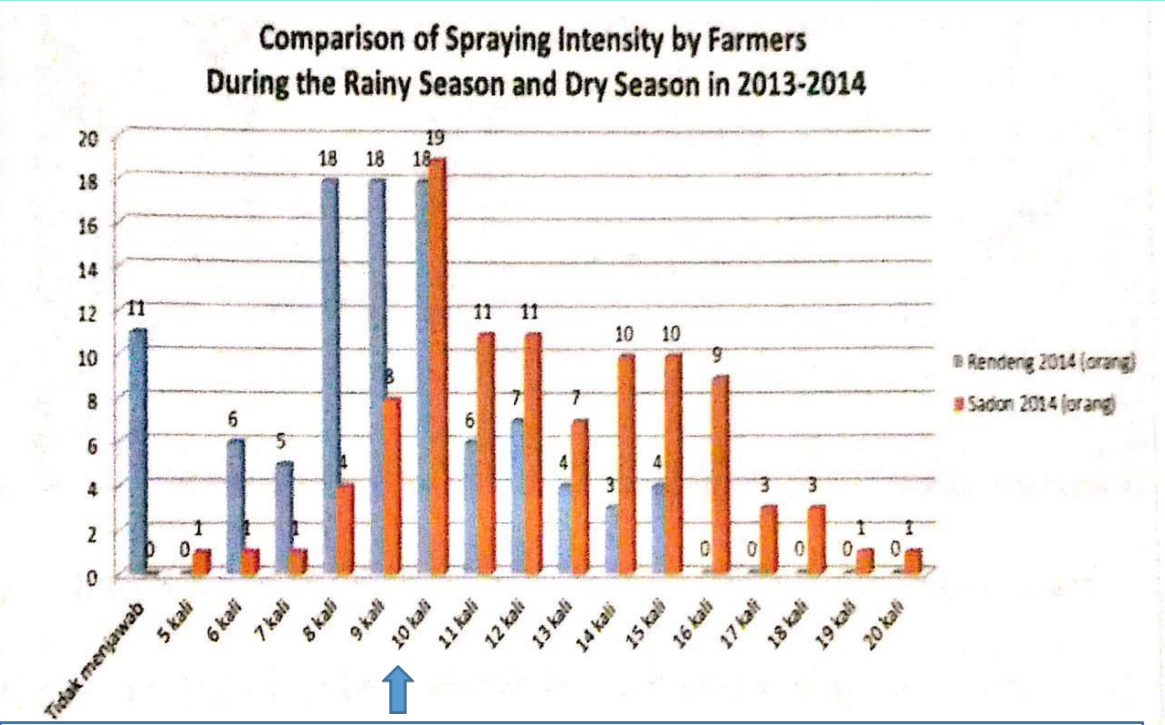
Book cover:

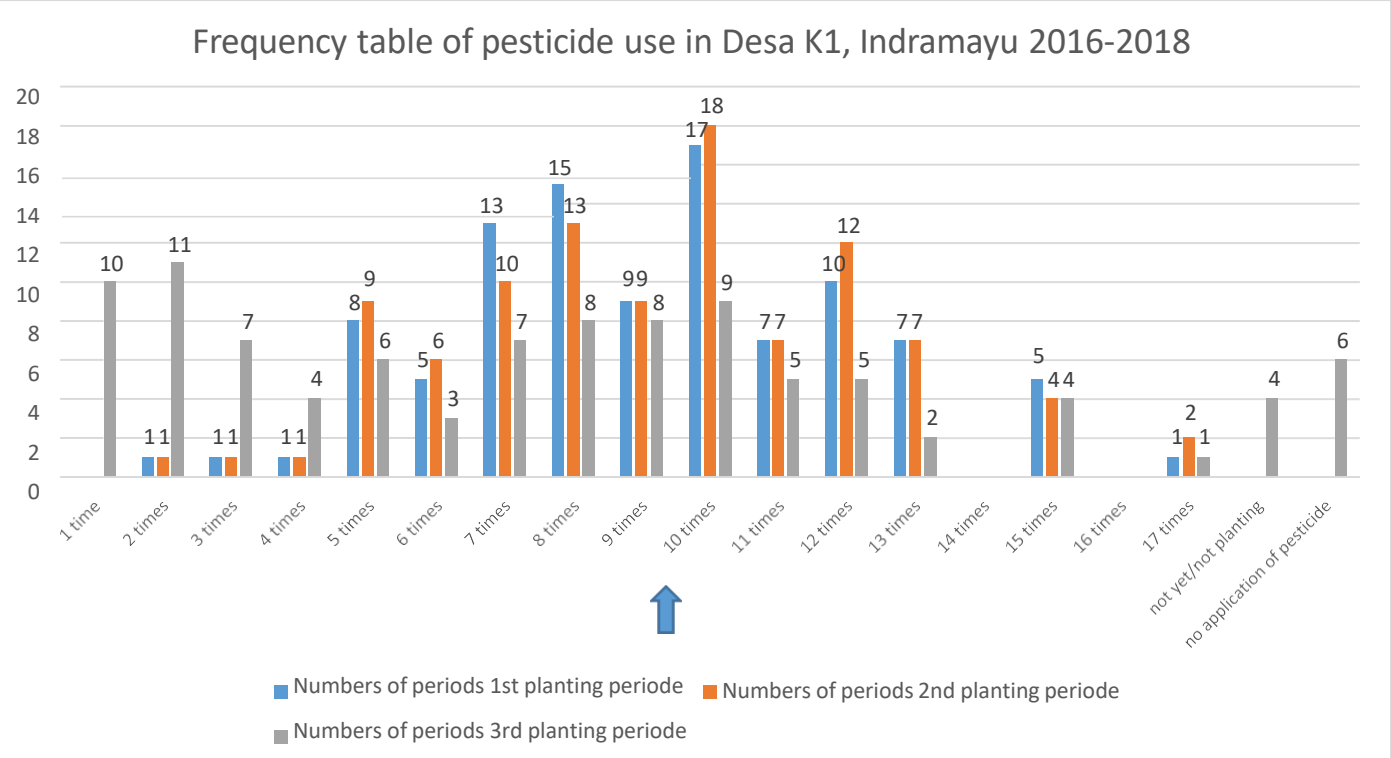
Food Crisis & “False Mind”: Why is it still going on?

Ed. by Winarto, 2016

Photo of harvest failure in Indramayu infested by BPH – by R. Ariefiansyah, 2016

Pesticides Use in Indramayu (2013-2014; 2016—2018)





Examples of Pesticides 'Cocktails' & Costs (2013-2014)

100 farmers 2 seasons: 243 different mixed combinations: 2—7 products; only 11 farmers ever used 1 product.

2 cases – 'cocktails' & costs:

- 4.5 ha: 8 times diverse 'cocktails' (1-7 products) – total $US 833; 1 ha: $US 185.
- 0.4 ha: 10 times using the same 'cocktail' (3 products) – total $US 172.83; 1 ha: $US 432.

Fox & Winarto, 2016

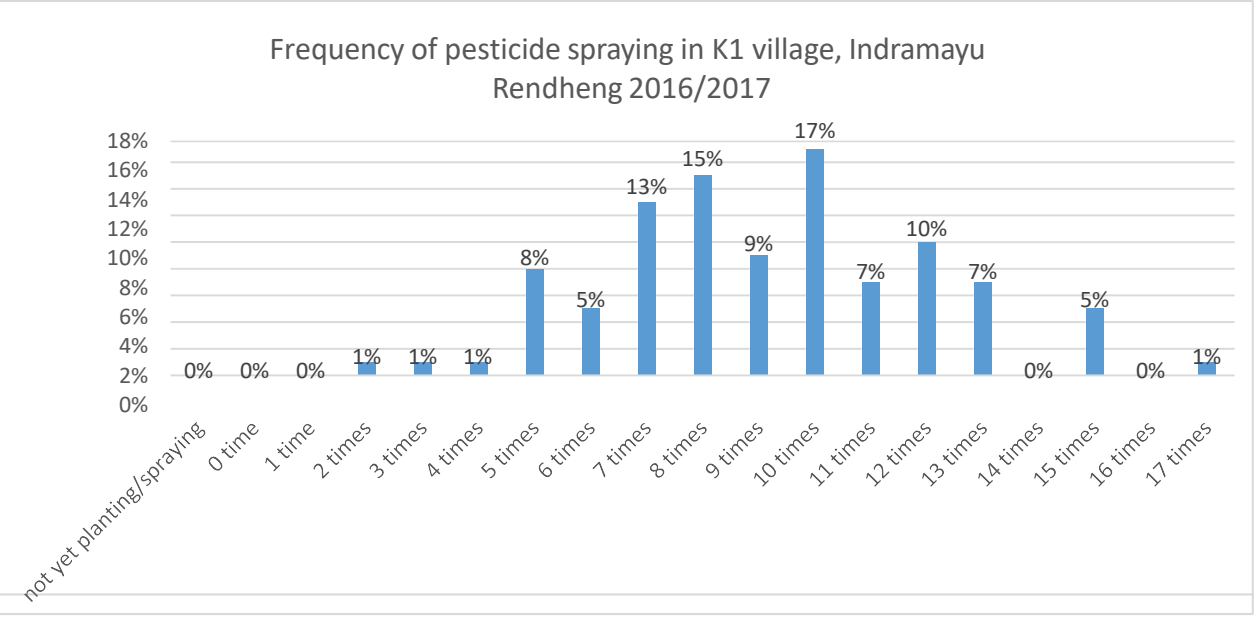
Pesticides 'Cocktails' in Indramayu (2016-2018)

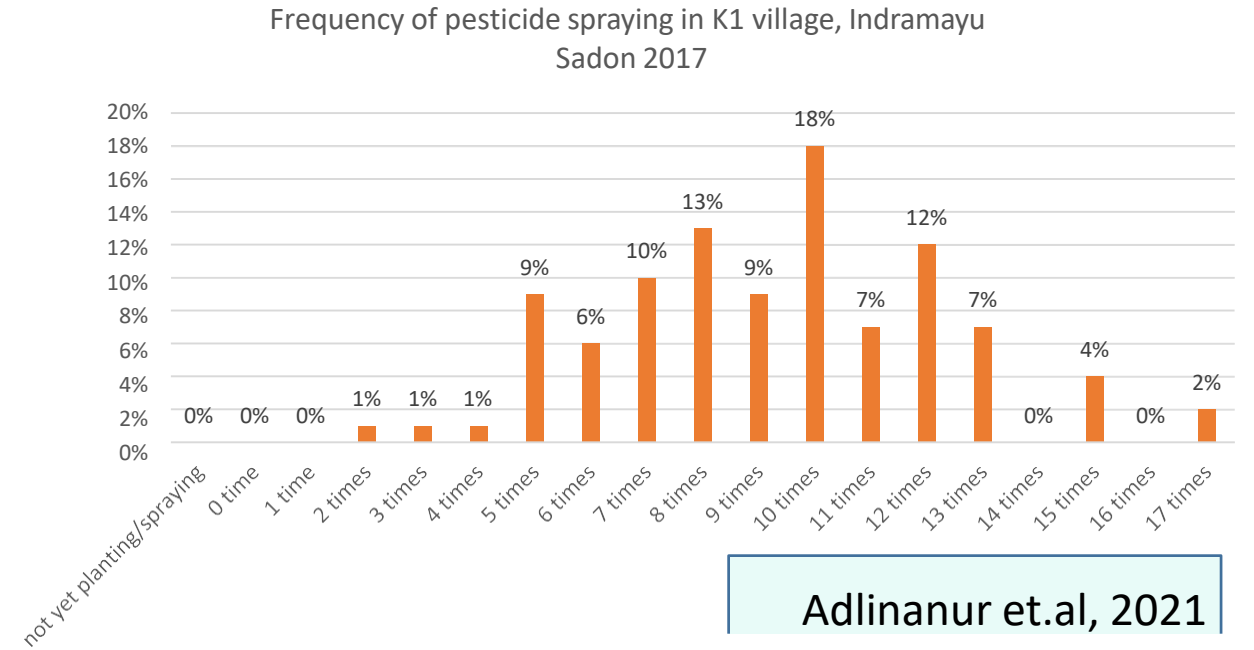
- **Indramayu:** 100 farmers of 158 ha – 3 seasons: 161 cocktail varieties: 38% - 3 products; 21% - 4—5 products.

Total costs of 3 seasons of 100 farmers: **$US 133,944.**

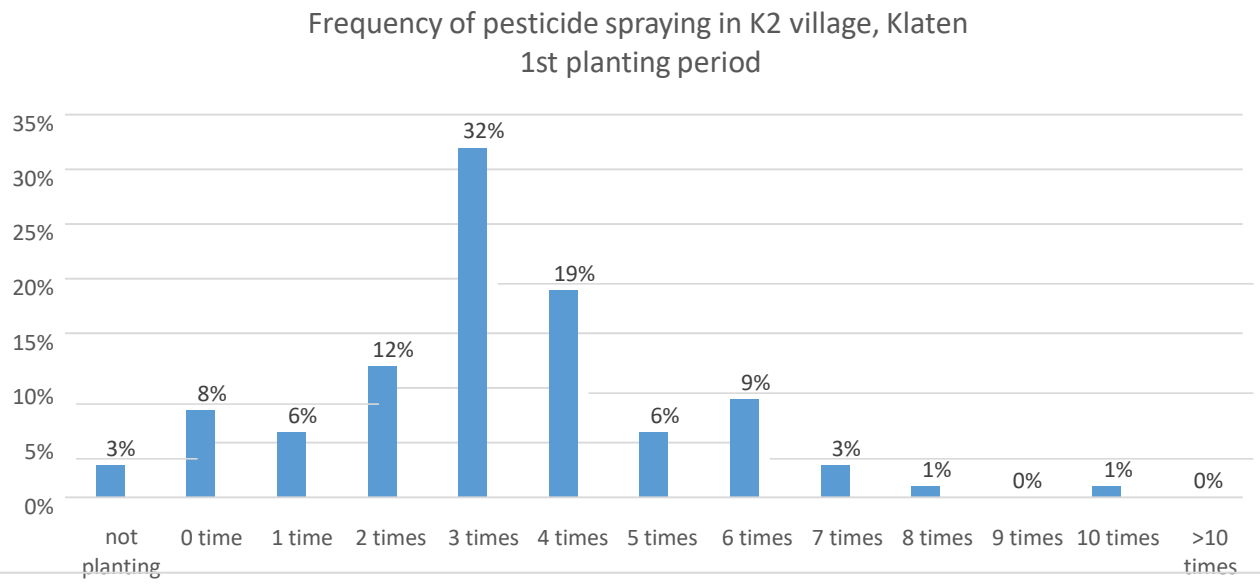
Adlinanur et al., 2021.

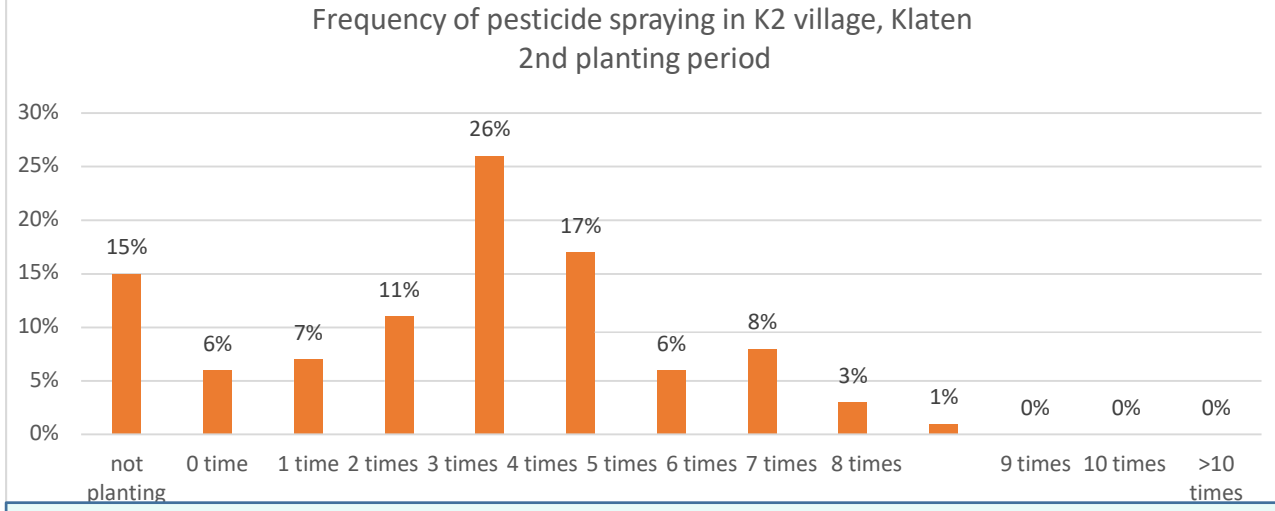
Frequency of pesticides spraying in Indramayu & Klaten: 2016-17





Adlinanur et.al, 2021





Klaten: 100 farmers of 51 ha – 48 cocktail varieties: 46% - 1 single product; only 1 farmer – 4 products.
Total costs: **$US 2004.**

The Intra-personal Structure & The Extra-personal Structure: Do not support one another?

❖ Factors affecting farmers' decisions:

The Intra-personal structure

- **Schema: connection of several knowledge elements – situational**
- **Emotion & motivation**
- **Belief, strengthened by evidences (subjective and/or objective interpretation)**
- **Trust**
- **Access to resources**

Sources of knowledge/services: Extension/PD observers, Shop owners, Salesmen, Fellows, Others through:

- ➢ Extension meeting, state programmes,
- ➢ IPM FFS & various other FFSs
- ➢ Ecological engineering etc.
- ➢ Science Field Shops/agrometeorology

Behaviour

- ❖ Persisting ill-wise use of pesticides
- ❖ No spraying if unnecessary
- ❖ Moving away from chemical pesticides

The Extra-personal structure

- **State policies & regulations**
- **Government subsidies of inputs**
- **Pesticides promotions**
- **Vulnerable (continuous pest/disease infestation) or sustainable environment?**
- **Absence/presence of long-term educational commitment**
- **The waning of IPM as a National Strategy**

- ➢ Registered brands of pesticides increased 2002: **813** – 2014: **3005** – 2016: **3207**
- ➢ Pesticides have become "consumer goods" (?) – can be purchased freely.
- ➢ Where is the code of conduct in distributing pesticides?


Measuring rainfall

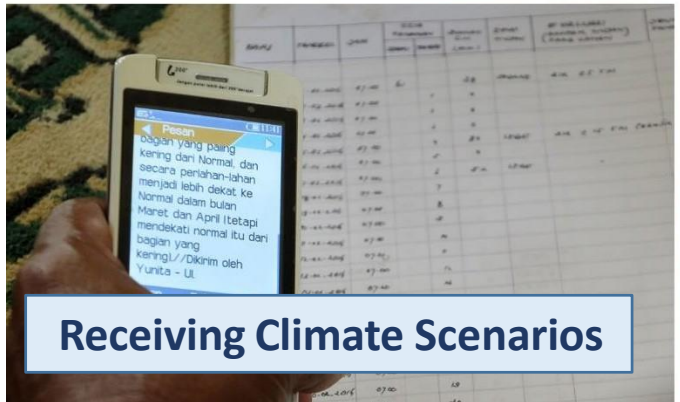

Observing agroecosystem


Discussing vulnerability


Presenting & Analyzing data


Evaluating yields

Organizing SFSs


Receiving Climate Scenarios


Providing new knowledge


Carrying out experiment

The long-live educational commitment for farmers to cope better to climate change:
SCIENCE FIELD SHOPS with 8 climate services

Learning agrometorology in two ways communication with farmers as researchers in their own fields

Enrich the schema of cultivating crops by incorporating the element of meteorology in their agroecosystem analyses & decisions

Climate scenario at the end of 2015 – El Niňo:

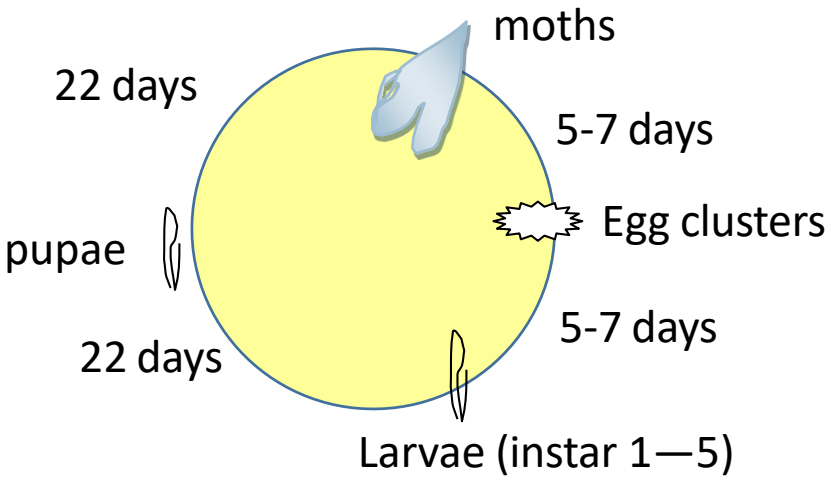
Rainfall Below Normal up to March 2016 & Rainfall data of Nov. & Dec. 2015.

Water condition.

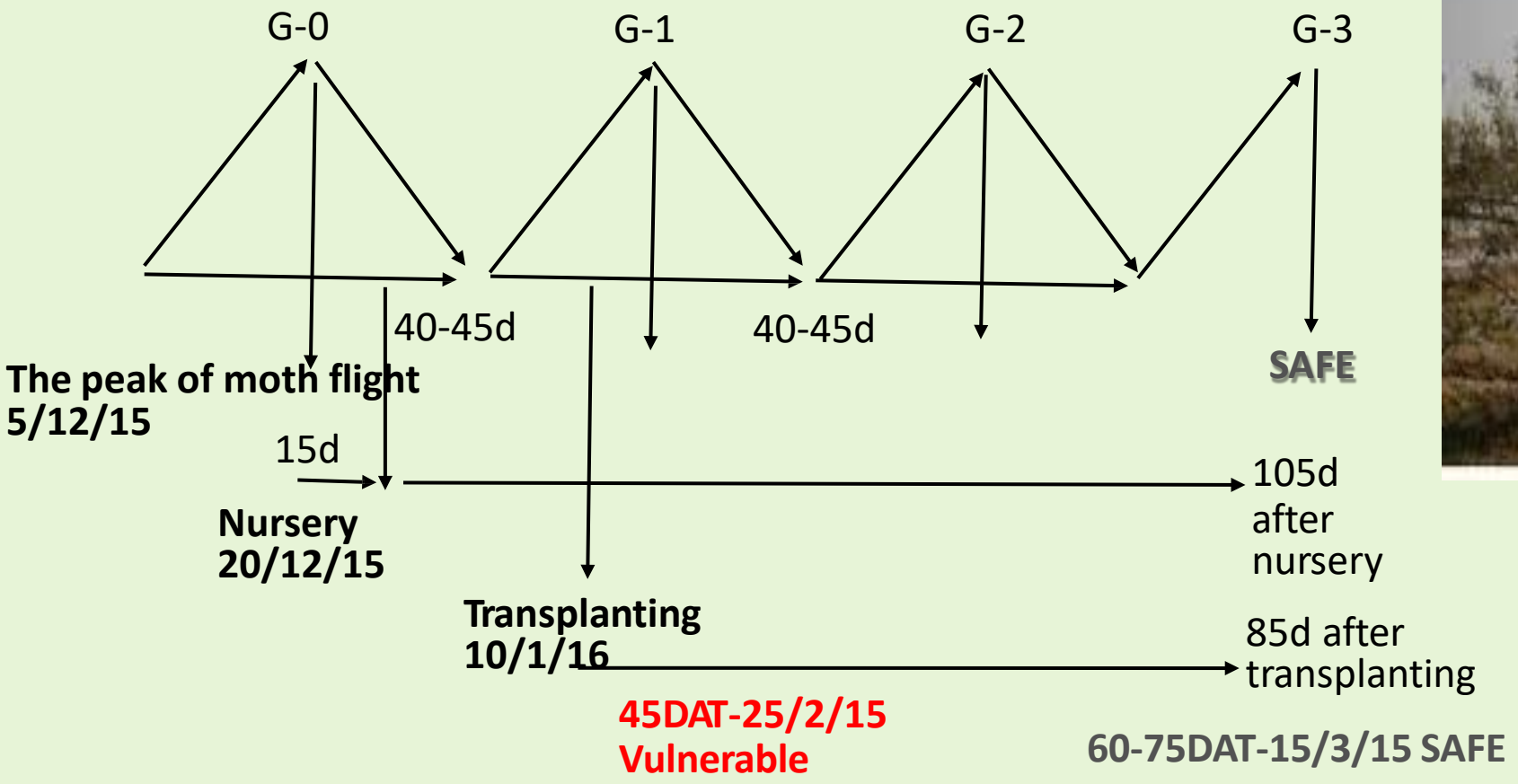
Observation of White/Yellow rice stem borer's flights.

Defined the planting schedule & rice varieties of short maturing age.

Discuss it in the village meeting.

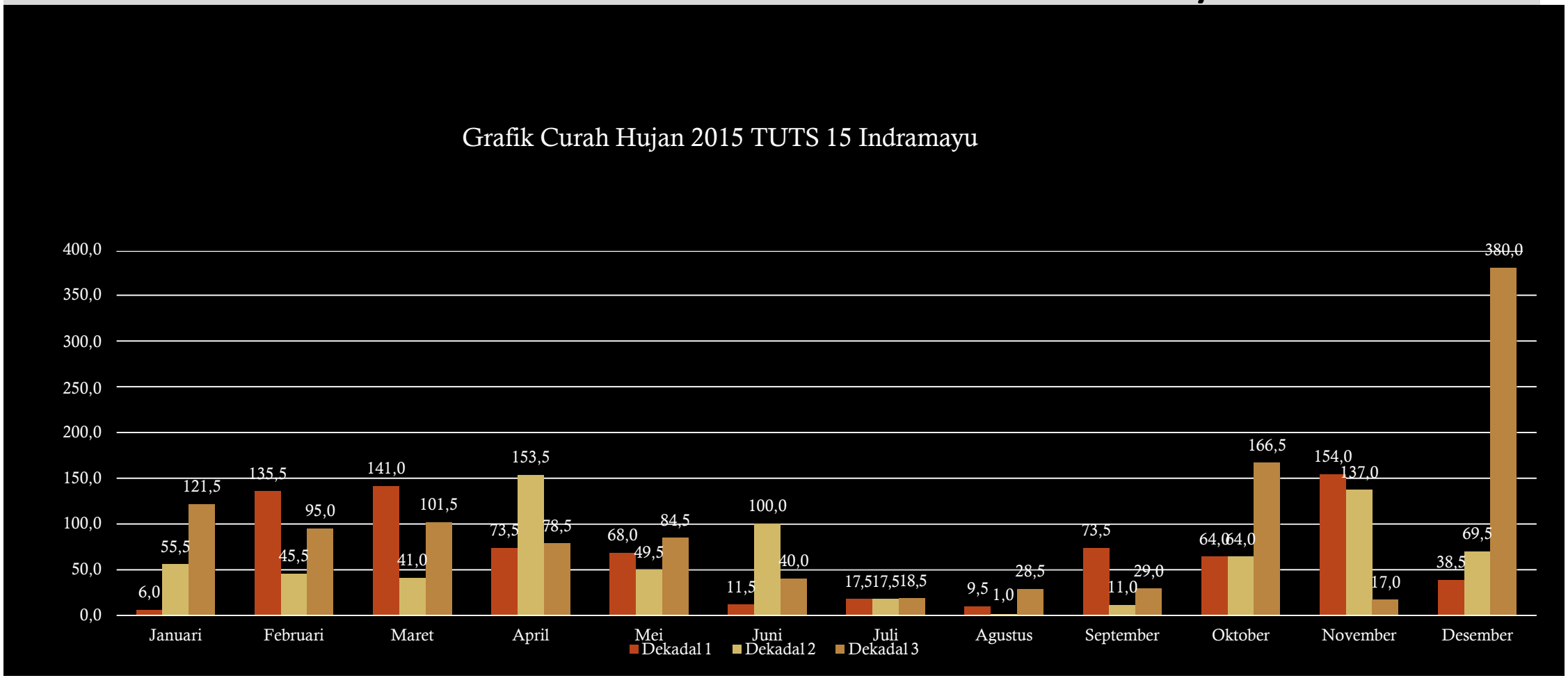


The life cycle of White/ Yellow Rice Stem borer



Yields: 8.1 t/ha: (+2.5 t/ha)

Example of an Annual Rainfall Graph by one Rainfall Observer in Indramayu



Thank You

Questions and Answers

Dr Yunita Triwardani Winarto, Universitas Indonesia

Understanding farmer pesticide behaviour in Java, Indonesia

Please use the Q & A Box to ask questions to our speakers

iDE
Powering entrepreneurs to end poverty.

Pesticide education and training programmes: Cambodia

Dr. Seng Kim Hian
Agronomy Director, iDE Cambodia
skimhian@ideglobal.org
https://www.ideglobal.org

Outline of the presentation

1. Introduction
2. Problems with pesticide use
3. Training programmes
4. Photos of change gallery

1. Introduction of pesticide use in Cambodia

- Pesticides have been widely used in the agriculture sector and are almost unavoidable for the current production scale and economic situation in Cambodia.
- However, there are several challenges as a consequence of pesticide use particularly in health issues of growers, retailers and consumers, pesticide resistance and the local environment.
- Cambodia's agriculture is poised to capitalize on increasing demand for "safe" and locally-grown produce (GAP, Organic, PGS etc.).
- Need to assess and address the problems with pesticide use. For USAID funded projects, Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP) is required.

2. What are the problems with pesticide use in Cambodia?

- Farmers use highly toxic pesticides
- Lack of availability and use of PPE
- Farmers do not maintain application equipment
- Farmers are unaware of safe use practices
- Farmers use pesticide in a way that may have adverse effects on ecosystems
- Weak pesticide regulation capacity
- Pesticide labels are often in foreign languages
- Pesticide sellers and extension officers do no have sufficient training
- Empty pesticide containers

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BUREAUS FOR ASIA AND FOOD SECURITY

PESTICIDE EVALUATION REPORT AND SAFE USE ACTION PLAN (PERSUAP) AMENDMENT 2

IEE AMENDMENT: §216.3(B) PESTICIDE PROCEDURES

PROJECT/ACTIVITY DATA

Project/Activity Name:	Feed the Future Cambodia Harvest II ("Harvest II")
Amendment #:	2
Geographic Location:	South East Asia (Cambodia)
Implementation Start/End:	1/1/2017 to 12/31/2022
Implementing Partner(s):	Abt Associates, International Development Enterprises (iDE), Emerging Markets Consulting (EMC)
Tracking ID/link:	
Tracking ID/link of Related IEE:	Asia 16-042 https://ecd.usaid.gov/repository/pdf/46486.pdf
Tracking ID/link of Other Related Analyses:	

ORGANIZATIONAL/ADMINISTRATIVE DATA

Implementing Operating Unit:	Cambodia
Funding Operating Unit:	Bureau for Asia
Initial Funding Account(s):	$ 22.5 M
Total Funding Amount:	
Amendment Funding Date / Amount:	January 10, 2019
Other Affected Units:	Bureau for Food Security
Lead BEO Bureau:	Asia
Prepared by:	Alan Schroeder, PhD, MBA; Kim Hian Seng, PhD, Carl Bannon, with support from Abt Associates and iDE
Date Prepared:	08/14/2020

ENVIRONMENTAL COMPLIANCE REVIEW DATA

Analysis Type:	§216.3(B) Pesticide Procedures - PERSUAP
Environmental Determination:	Negative Determination with Conditions
PERSUAP Procedures Expiration Date:	12/31/2022
Climate Risks Considerations / Conditions	

2018 Feed the Future Cambodia Harvest II PERSUAP 1

Empty pesticide containers are commonly find in the field and sometime even nearby or in the waterbody

3. Pesticide training programme

- Two types of training programme: training of trainer and SUP awareness raising

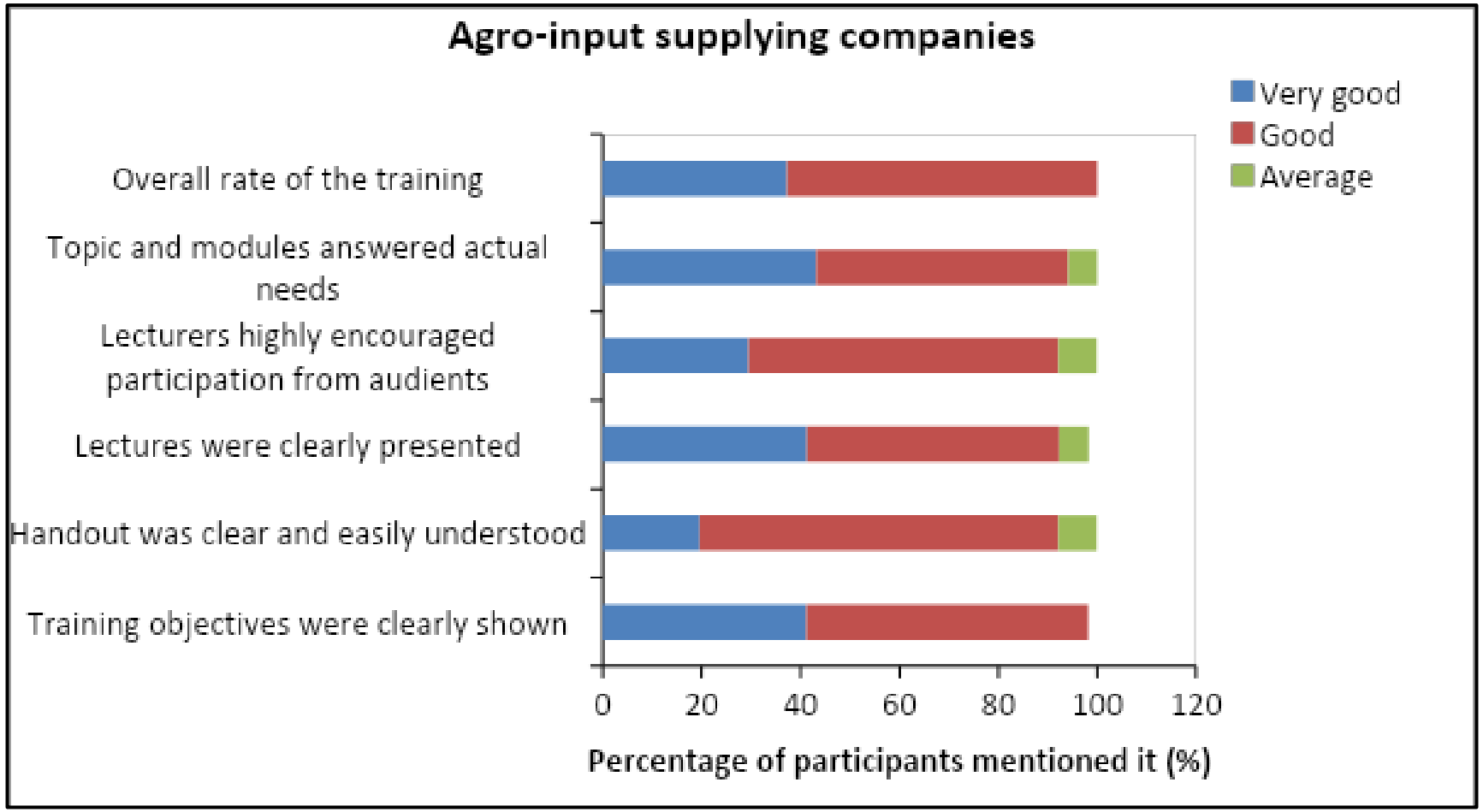
Photo A: ToT for PS and extension

Photo B: SUP awareness training for farmers

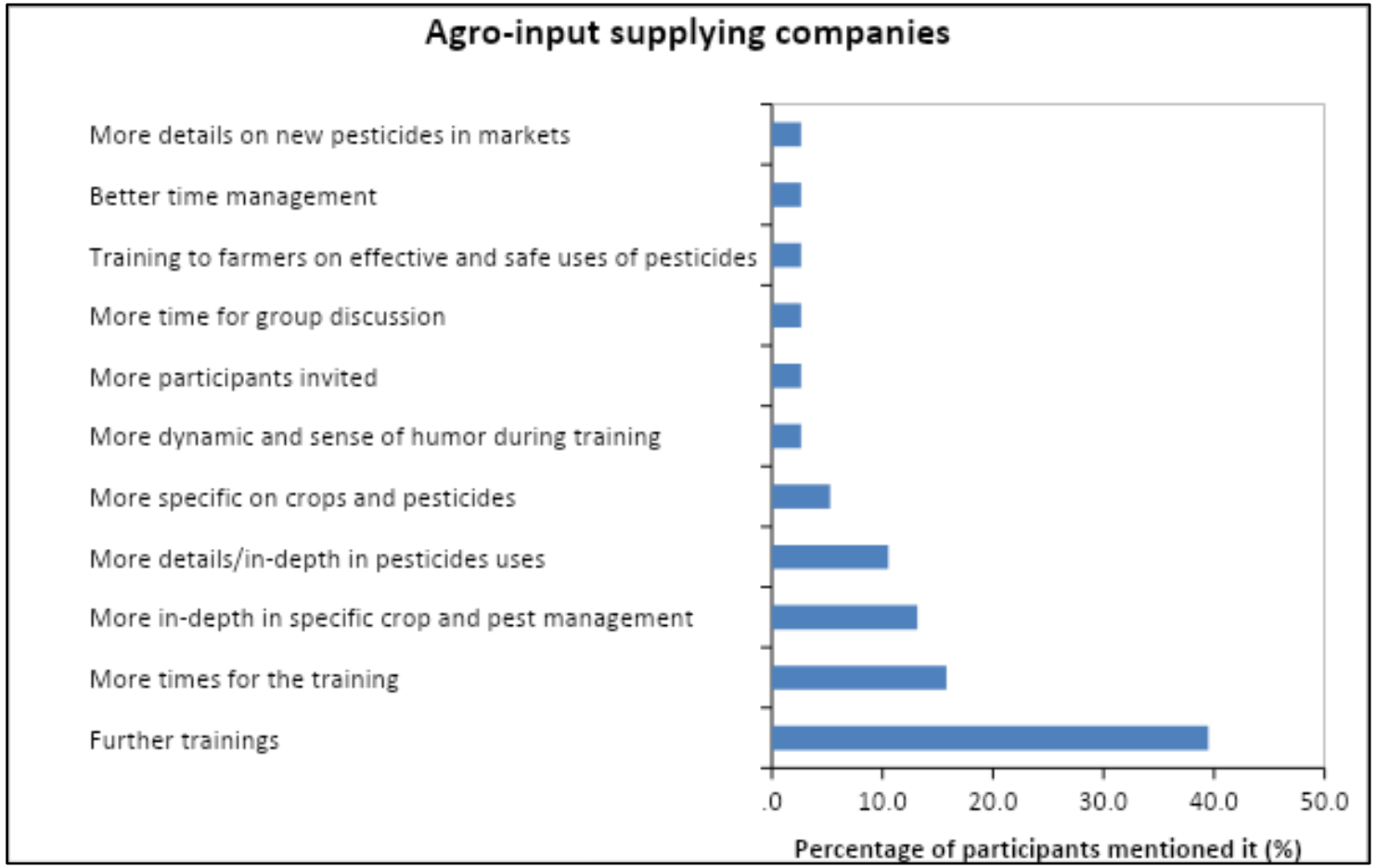
3. 1 Training of Trainer programme

- Participants: Private Sector partners and extension officers
- Purpose: often it is a compliance to strengthen the implementation of the USAID 216 regulation and enforce USAID environmental stewardship. Promote safe use practice of pesticide and IPM.
- Expectation: the trainers will train their retailed networks and farmers.
- Content of the training: fundamentals of pest identification; common available pesticides in the markets and pesticides approved PERSUAP/ pesticide laws and regulations, and suspended pesticides in Cambodia; practical tips for safe handling and storage of pesticides for retailers and farmers; basic pesticide resistance mechanisms and their prevention.

Feedbacks for ToT training



Feedbacks for ToT training



3.2 SUP awareness training programme

- Participants: market actors (input retailers and village collectors) and farmers.
- Purpose: to awareness about safe use of pesticide and promote use of PPE.
- Expectation: market actors can transfer key messages to farmers, and increase adoption of safe pesticide handling practice and use of PPE.
- Content of the training: PPE, safe storage and disposal, withholding period, and why do they need to use locally registered pesticides?

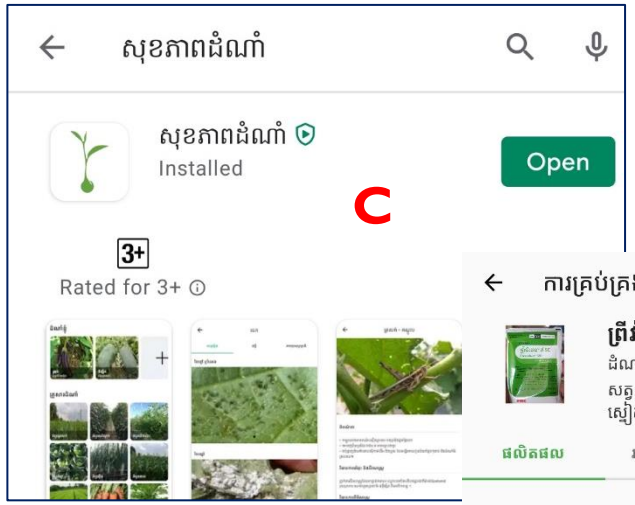
Photos from SUP awareness training for farmers

Photo A: demonstration of the pesticide spillage using white paper clothe and water with dye color for better visibility.
Photo B: demonstration of using proper PPE introduced by the project

4. Photos of change gallery

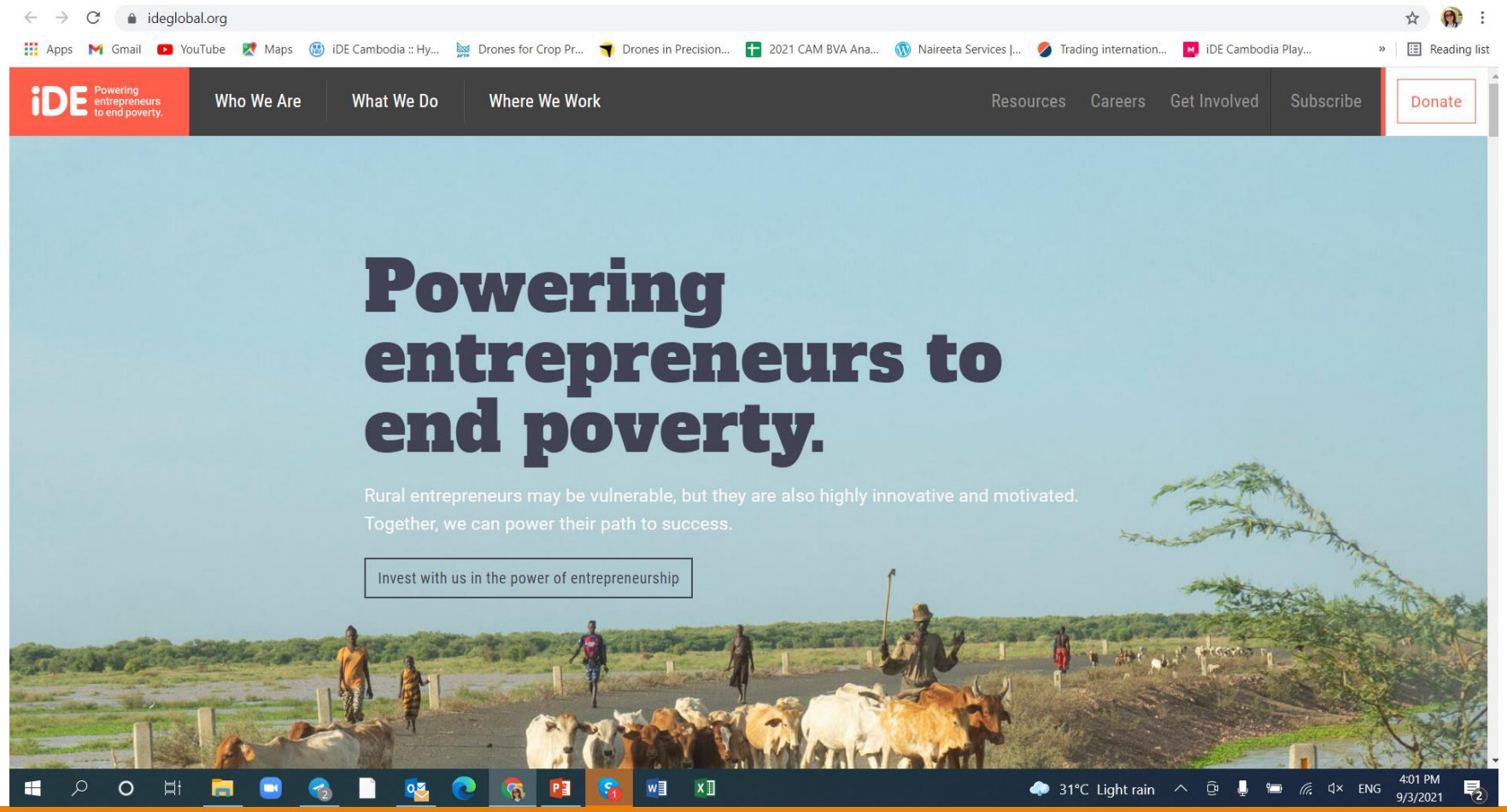
Photo A: it was quite common that farmers apply pesticide with minimal PPE
Photo B: farmers start using some PPE for pesticide application

Farmers started building a pesticide storage house under the shade with door lock and away from the house, kitchen and animal house (Photo B and C), whereas previously they keep pesticide under trees, in the kitchen or at the animal house (Photo A).



Safe Use of Pesticide awareness raising: SUP educational materials are printed and distributed to farmers, market actors, public and private extension agents (Photo A & B), or through smartphone App called Sokhapheapdamnam or Plant Health (Photo C & D).

Thank you for your attention!



Questions and Answers

Dr Seng Kim Hian, iDE Cambodia

Pesticide education and training programmes: Cambodia

Please use the Q & A Box to ask questions to our speakers

Summary:

ASEAN Action Plan on FAW Farmer Communication Workshop Series

A four-part series to catalyse action on the development and design of more effective farmer communications on IPM and FAW control.

Session 1: Behaviour

Completed

Session 2: Case studies of Farmer Communication

Completed

Session 3: The Behaviour of Pesticide Purchasing and Use

Tuesday 7 September 2021

Session 4: Guidance for Communication – Top Tips for Effective Farmer Outreach

Tuesday 23 November 2021

Register at: https://www.aseanfawaction.org/events

Case-Studies: We want your case-studies and examples – contact us at faw@growasia.org

EFFECTIVE FARMER COMMUNICATION:
A critical component of achieving IPM

7 September 2021

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Part 3: Pesticide Behaviour, Decision-making & Communication

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