Workshop:
Pesticide, Agiculture and Food: Multiple and Growing Concerns in Cambodia

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IPM Program in Cambodia

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Content

Part I: Background of National IPM Program and Pesticide Application

Part II. Research of Application of Biological Control Agents

Part I

Background of the National IPM Program and Pesticide Application

Background and Rationale IPM

- IPM Program was initiated in 1993 by MAFF after a National Workshop on "Environment and IPM“
- The overall goal is to improve **food security and safety** through the promotion of Integrated Pest and Crop Management skills at the farm level
- IPM enables farmers to grow healthy crops considering production sustainability and socio-economic effectiveness, while safeguarding human health and protecting the natural environment.

Institutional arrangement

The Program is structured under MAFF and General Directorate of Agriculture is responsible for the implementation. The main tasks are to:

- reduce the dependence of farmers on agricultural chemicals, especially pesticides in agriculture,
- develop the capacity of agricultural trainers and extension workers in conducting training and experiments and providing appropriate services,
- educate farmers on agricultural technologies by enhancing their knowledge on field ecology and by developing skills in managing crops effectively.

Approach and Principles

- Employing participatory, discovery-based and experiential education approach “learner learning rather than teacher teaching”,
- Key principles are:

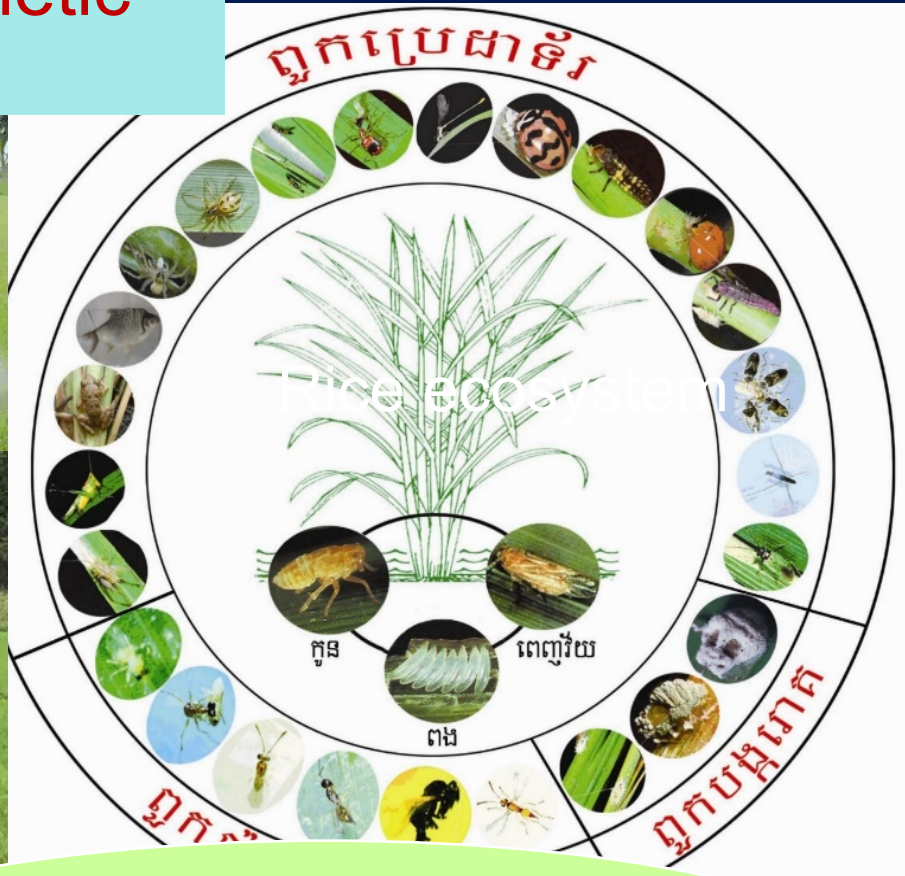
1. grow a healthy crop by taking into account all production aspects,
2. conserve natural enemies by rationalizing the use of chemical pesticides,
3. observe fields regularly to identify problems and take action based on ecologically friendly approach, and
4. farmers become experts in their own fields and beyond.

Concern on Chemical Pesticide Use

It affects:

- Agricultural production (higher costs, induce more pest problems),
- Rural livelihoods (less income, occupational health problems due to acute or chronic poisoning)
- Environmental health (water and soil contamination, reduced biodiversity)
- Public health (pesticide residues in food)
- Trade in agricultural produce (pesticide residue).

Farmer perception on Synthetic Pesticides intervention



Resistant varieties, IPM, Biological control, Biodiversity, Ecological Engineering

Farmers sprayed pesticides in BTB

Pesticides storage in farmer hut and Praying in Siem Reap Province

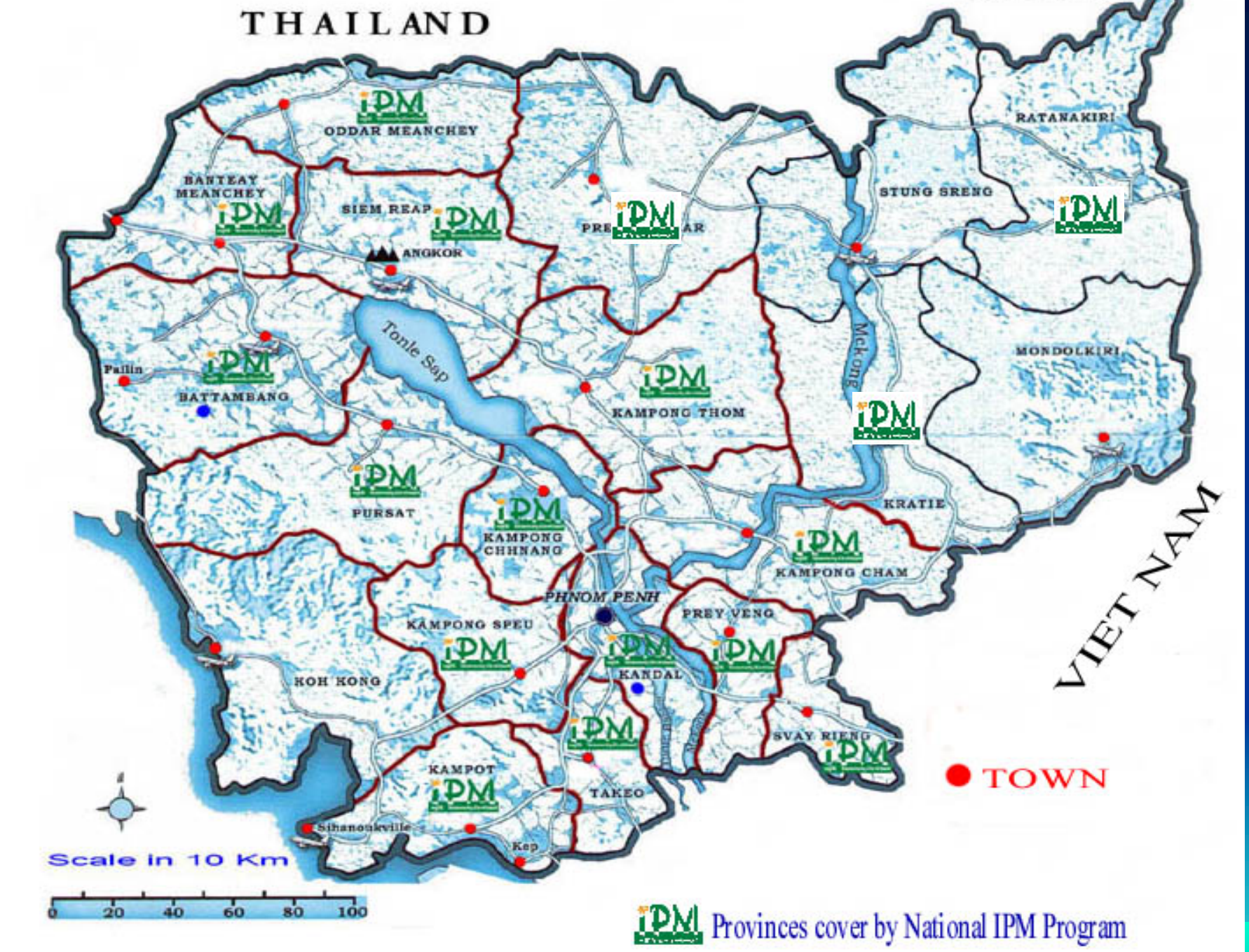
Key Activities

- Season-long farmer field schools for whole season on environmentally friendly production and protection
- Researches for finding out new effective alternative option to pesticide,
- Regular refresher trainings, Field Day, Technical Congress,
- Training on mass rearing and utilization of biological control agent,
- Training on negative impact of pesticides on health and environment,
- Pesticide campaigns to raise awareness on the negative impacts of pesticide on health and environment, and
- IPM Farmer Clubs,

Some Field Activities

Pesticide and Health Exercises

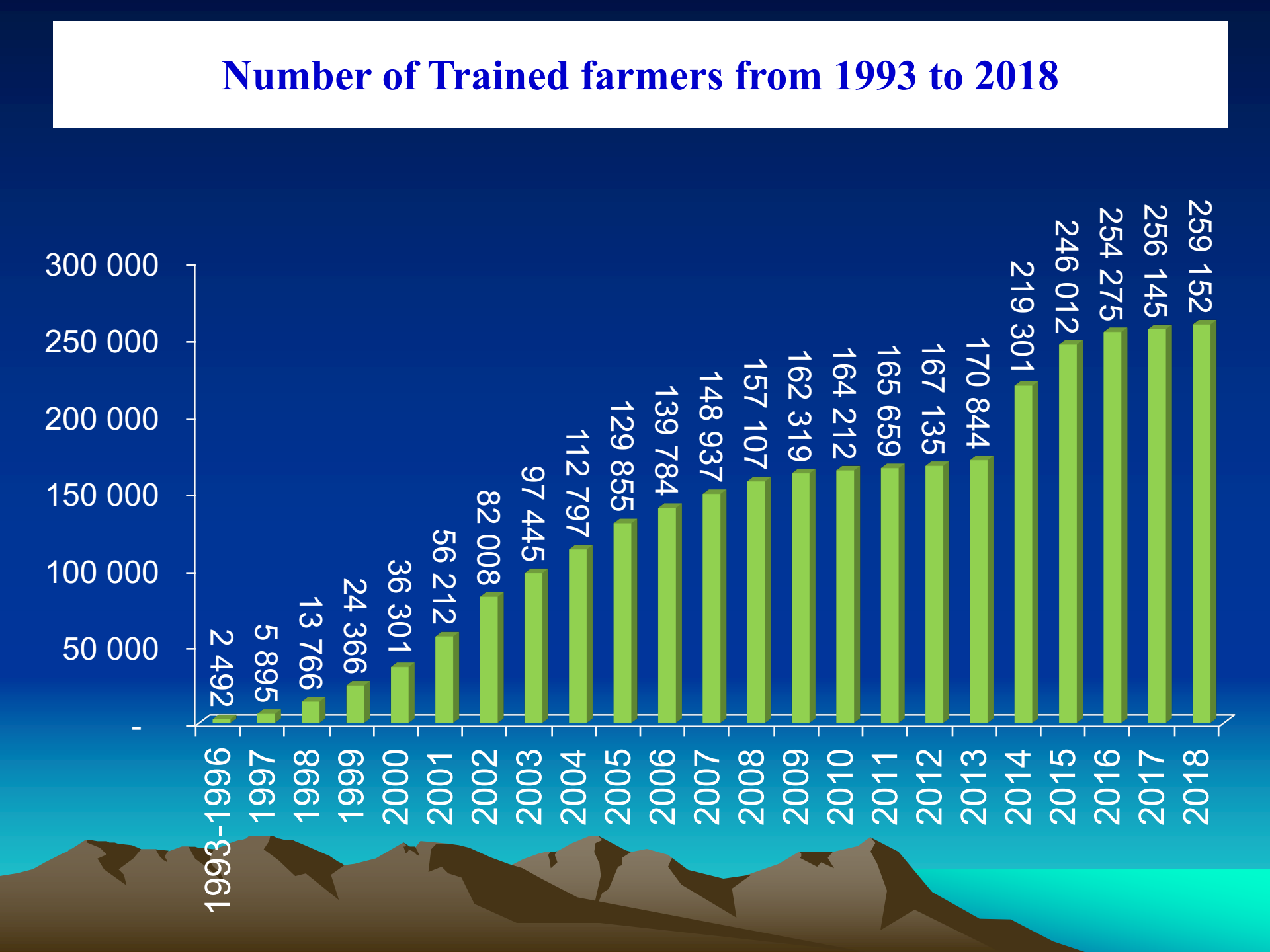
Pesticide Risk Reduction Campaign


THAILAND
ODDAR MEANCHEY
BANTEAY MEANCHEY
SIEM REAP
ANGKOR
Pailin
BATTAMBANG
Tonle Sap
PURSAT
KAMPONG CHHNANG
KAMPONG THOM
RATANAKIRI
STUNG SRENG
Mekong
MONDOLKIRI
KRATIE
KAMPONG CHAM
VIET NAM
PHNOM PENH
PREY VENG
KAMPONG SPEU
KANDAL
KOH KONG
SVAY RIENG
KAMPOT
TAKEO
Sihanoukville
Kep
TOWN
Scale in 10 Km
0 20 40 60 80 100
Provinces cover by National IPM Program

Donors and Development Partners support the Nationa IPM Programme:

FAO, IRRI, EU, **DANIDA, WB, ADB, IFAD,** PRASAC, UNICEF, HI, REDDBANA, CWS, CRS, NPA, OXFAM, PADEK, ANS, APHESA, CAAEP, CARE, CARITAS, CASD, CIDSE, CONCERN, GRET, HEKS, JVC, MCC, NAPA, READ PROJECT, SAMAKEE, WVC, ADDA, ZOA, CIDA and ChildFund.....

Number of Trained farmers from 1993 to 2018



Part II

Researches on the Biological Control Agent Applications

Study

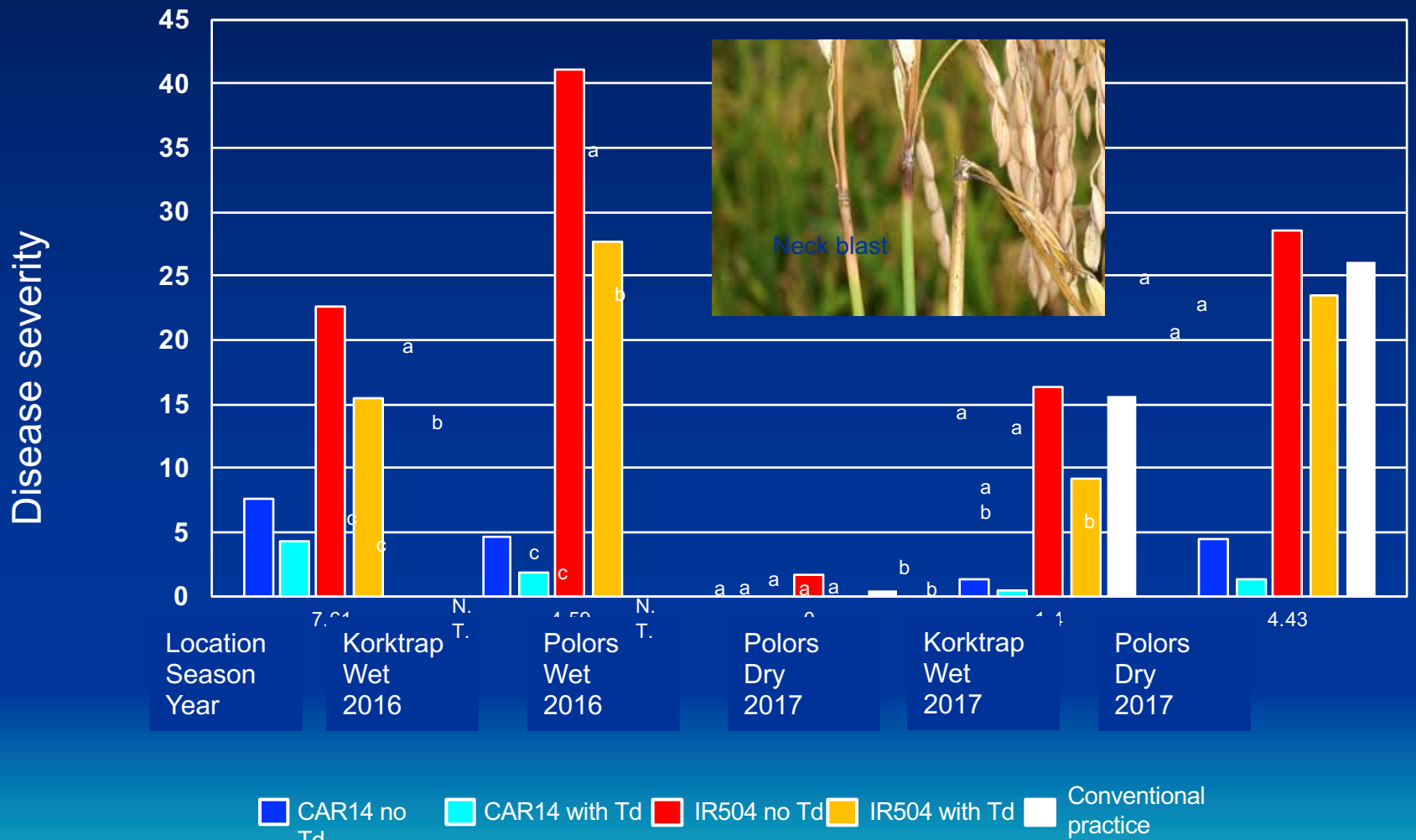
Rice blast management in Cambodian rice fields using *Trichoderma harzianum* and a resistant variety

To investigate the effectiveness of resistant variety CAR14 and *Trichoderma harzianum* as a BCA to suppress rice blast incidence in the fields condition during wet and dry seasons in Cambodia.

Trichoderma harzianum:

- Applied at 250g/20Kg seeds
- Sprayed four times at the rate of *20g/20 liter water:* 20 days after sowing (DAS) and 30 DAS, booting and dough stages.

Incidence of neck blast

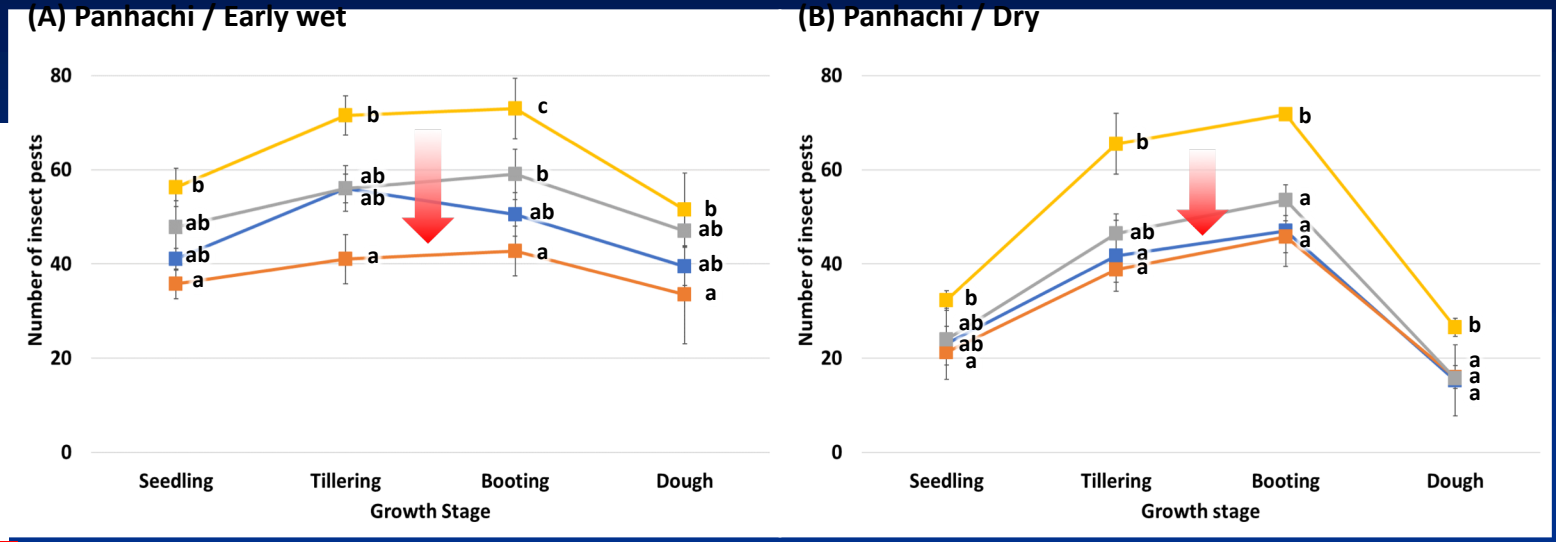


Study

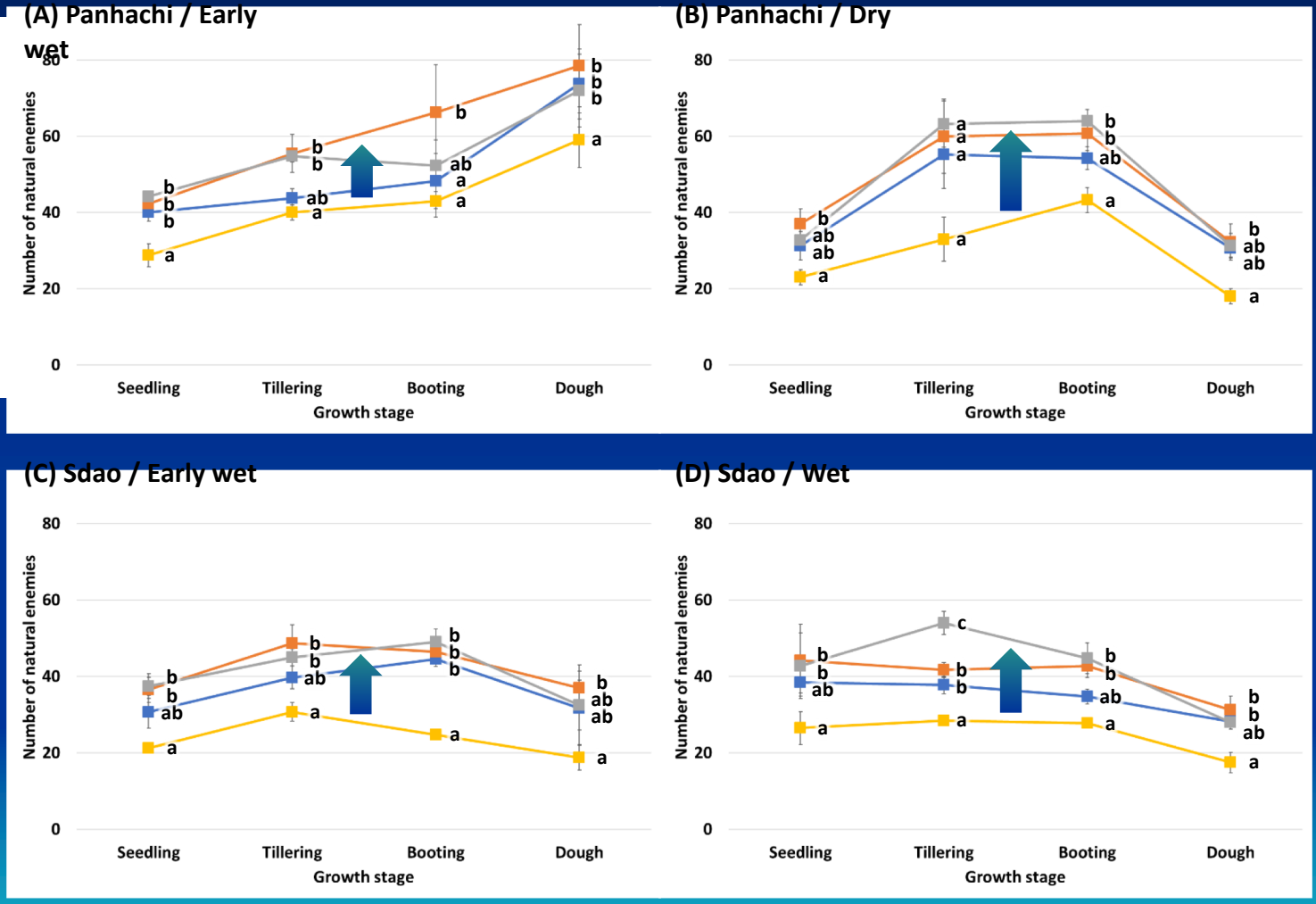
Suppression of rice insect pests by application of an entomophagous fungus and an orange oil

To investigate the effects of *B. bassiana* and an orange oil extract on insect pests and natural enemies in rice fields of Cambodia.

Reduction in Insect Pests by BIPM + Orange oil & B. bassiana



Increase in Natural Enemies by BIPM + Orange oil & B. bassiana



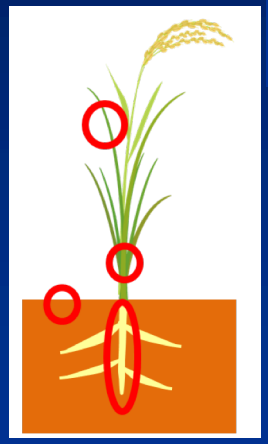
Study

Screening and characterization of 2'-deoxyuridine-degrading bacteria for biological control against rice blast disease

To identify 2DU-degrading microorganisms that may serve as a source of BCA against the rice blast fungus in Cambodia.

The 2'-deoxyuridine (2DU) has been identified as an infection promoting factor produced by the rice blast pathogen (Ando *et al* 2011).

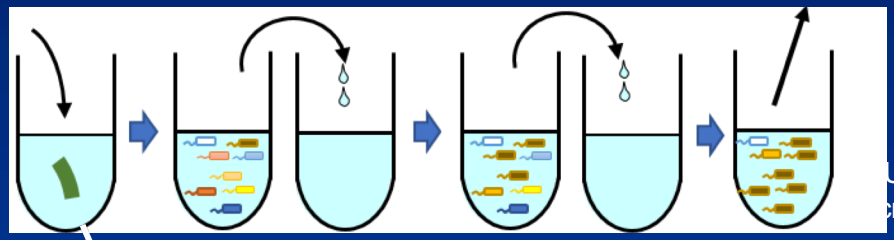
Enrichment culture, isolation and classification of 2DUDB



Leaf, Leaf sheath, root or soil

Repeating subculture every week

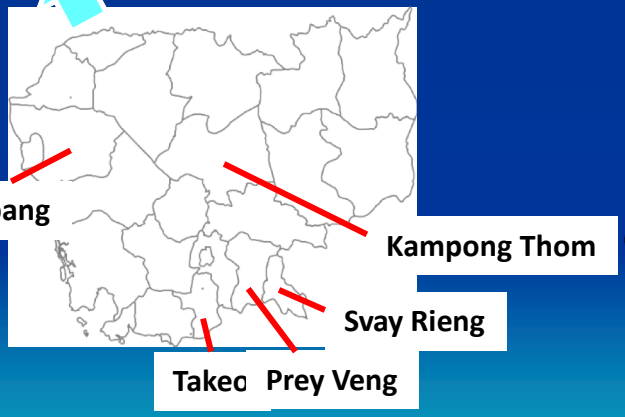
Determination of 2DU reduction with absorbance at 267 nm



U-degrading
crobial complex

Mineral salts medium containing 2DU as a sole carbon source (DUMM)

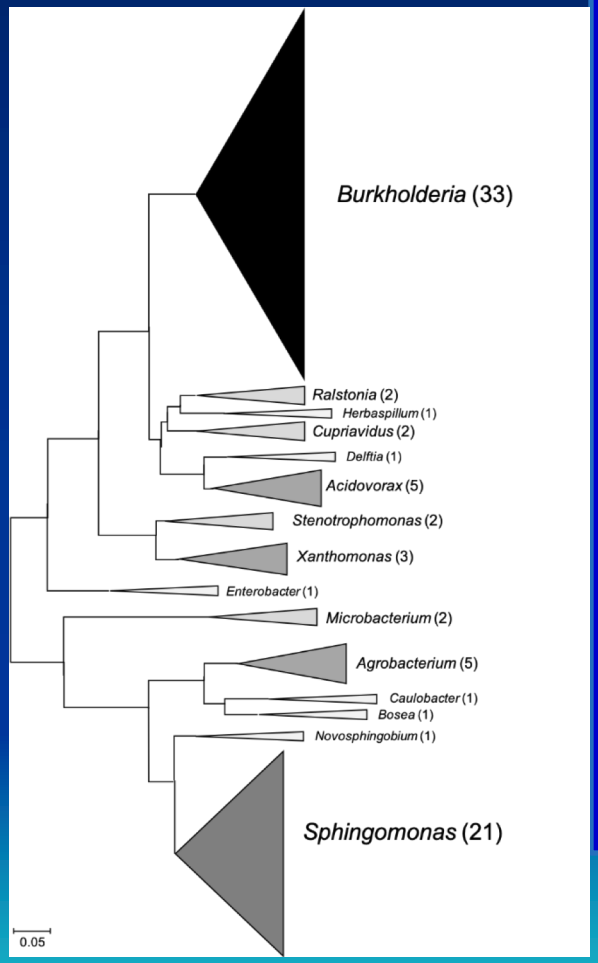
Positive culture of 2DU-degradation were plated on to R2A agar.



Isolated colonies were checked for 2DU-degrading activity in DUMM.

Isolates were classified using 16S rDNA sequences

Phylogenetic classification of 2DUDB



	No. of isolates
Burkholderia	(33)
Sphingomonas	(21)
Acidovorax	(5)
Agrobacterium	(5)
Xanthomonas	(3)
Cupriavidus	(2)
Microbacterium	(2)
Ralstonia	(2)
Stenotrophomonas	(2)
Bosea	(1)
Caulobacter	(1)
Delftia	(1)
Enterobacter	(1)
Herbaspillum	(1)
Novosphingobium	(1)

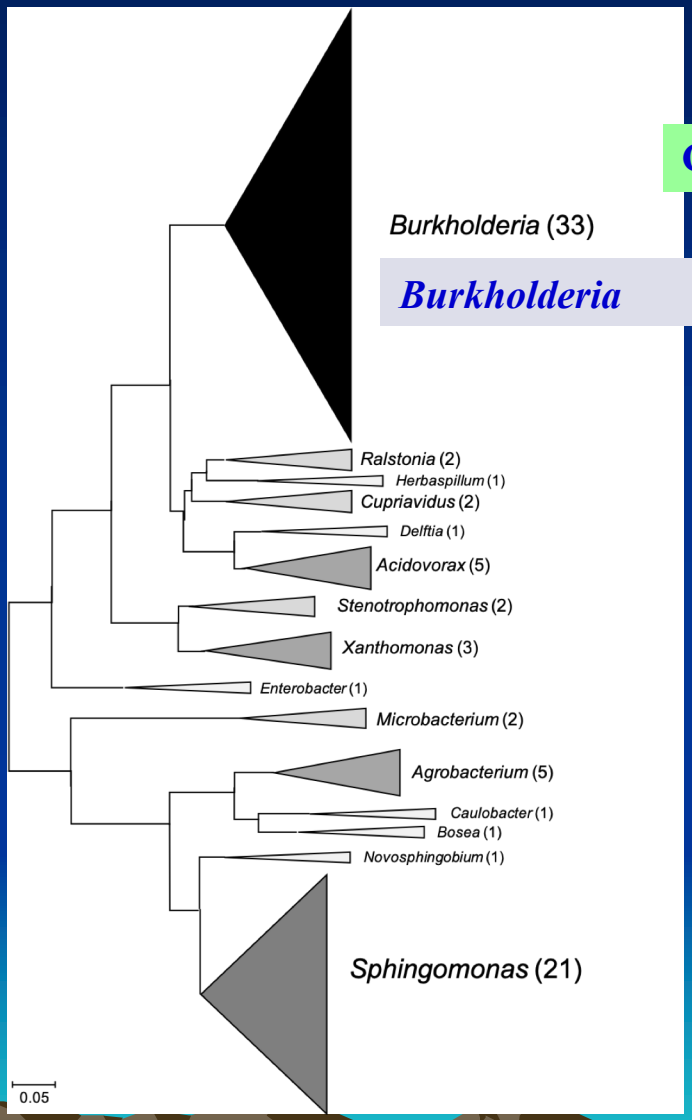
Japan

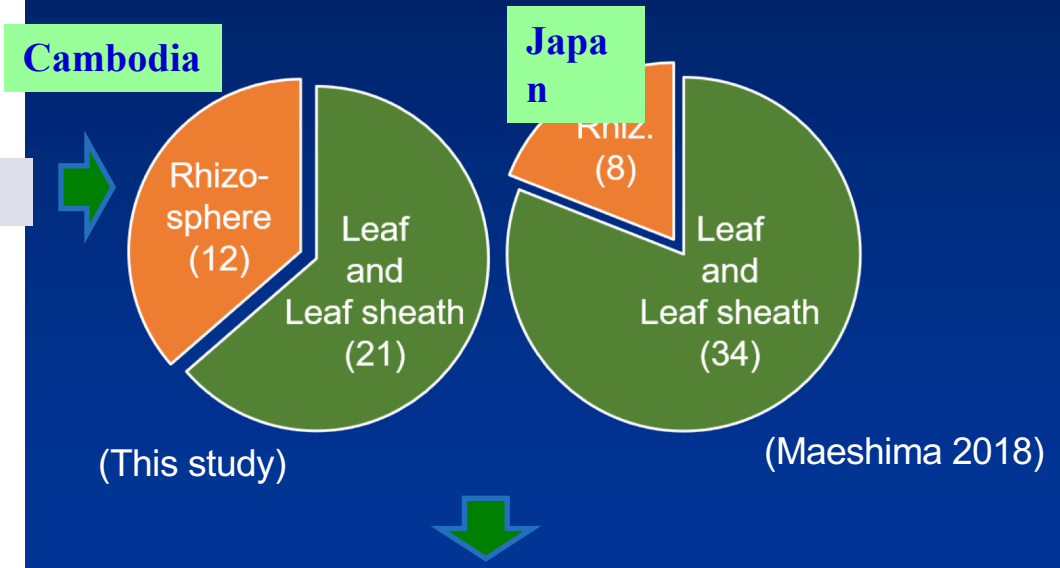
Study 3

	No. of isolates
Burkholderia	(42)
Azospirillum	(13)
Acidovorax	(10)
Comamonas	(5)
Kinneretia	(5)
Undibacterium	(3)
Delftia	(3)
Mesorhizobium	(2)
Rhizobium	(1)
Leclercia	(1)
Herbaspillum	(1)
Enterobacter	(1)
Duganella	(1)
Curvibacter	(1)
Bacillus	(1)
Ensifer	(1)

Maeshima 2018

Isolated DUDB *Burkholderia* spp. in Cambodia and Japan





***Burkholderia* spp. isolated from plant tissues**

In Japan, out of 34 strains isolated from plant tissues, 12 strains exhibited suppression activities against the rice blast, expecting that the Cambodian strains have the same ability.

Conclusion on Rice Searches

- Resistant variety CAR14 is very effective in reducing leaf and neck blast incidence without assist of *Trichoderma*.
- *T. harzianum* application suppress leaf and neck blast incident on susceptible variety, and increase rice yield.
- Application of *B. bassiana* or orange oil as a BCA can depress insect pests population without adverse effects on rice ecosystem balance.
- IPM combined with applications of *B. bassiana* and orange oil promoted natural enemies in rice fields.
- 2DUDB are existing broadly in rice fields in Cambodia. The bacteria genus *Burkholderia* is the most abundant 2DUDB in Cambodia and Japan.
- The *Burkholderia* spp. in Japan can suppress the blast pathogen, expecting that *Burkholderia* spp. in Cambodia have the same ability.

Thank you very much!!!

For your participation