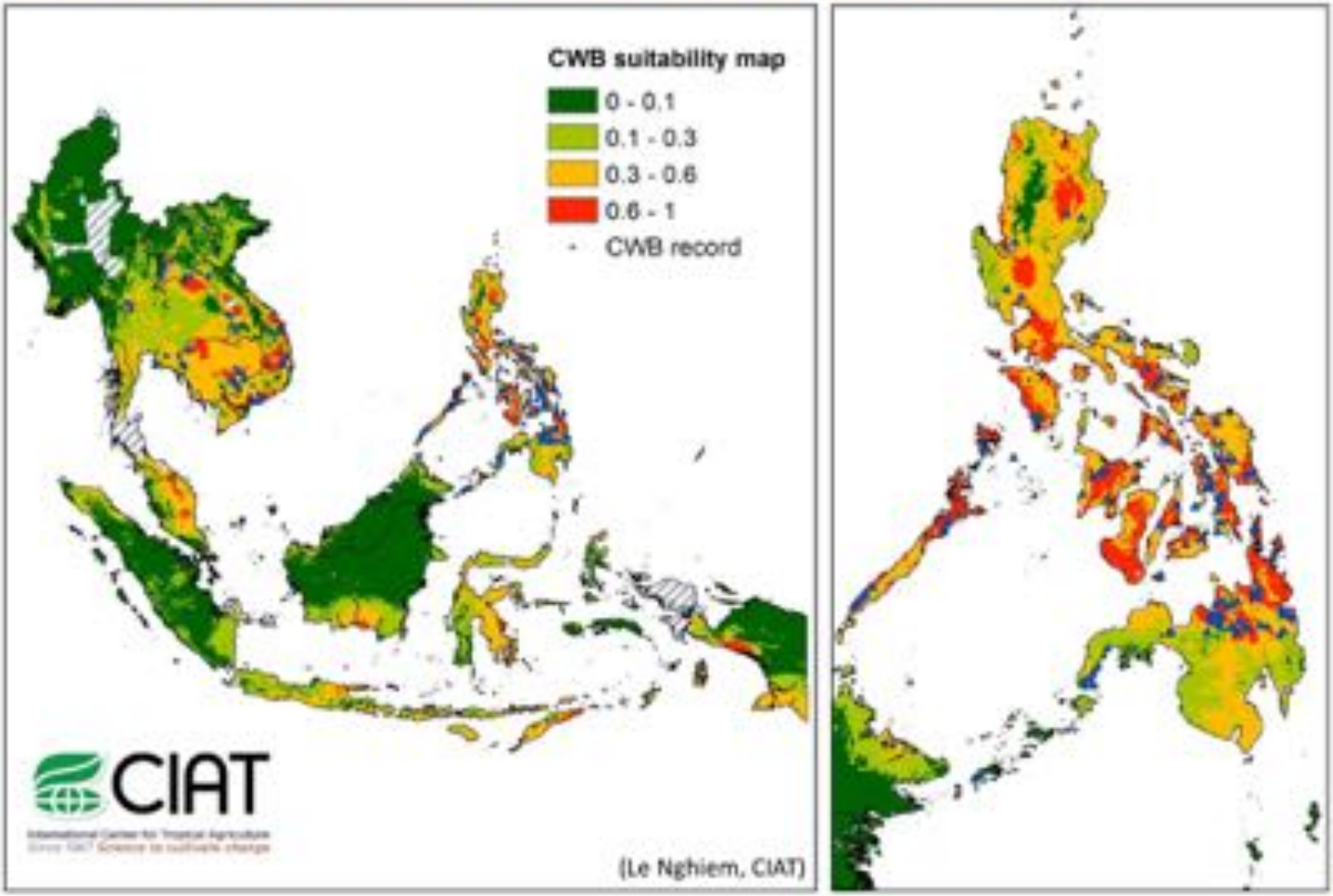

17th Jan 2018, Mid term review and Research symposium
Updates:
Research on cassava witches' broom disease and cassava mosaic disease
Nami Minato (Postdoctoral Fellow)
CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

Overview of CMD and CWBD

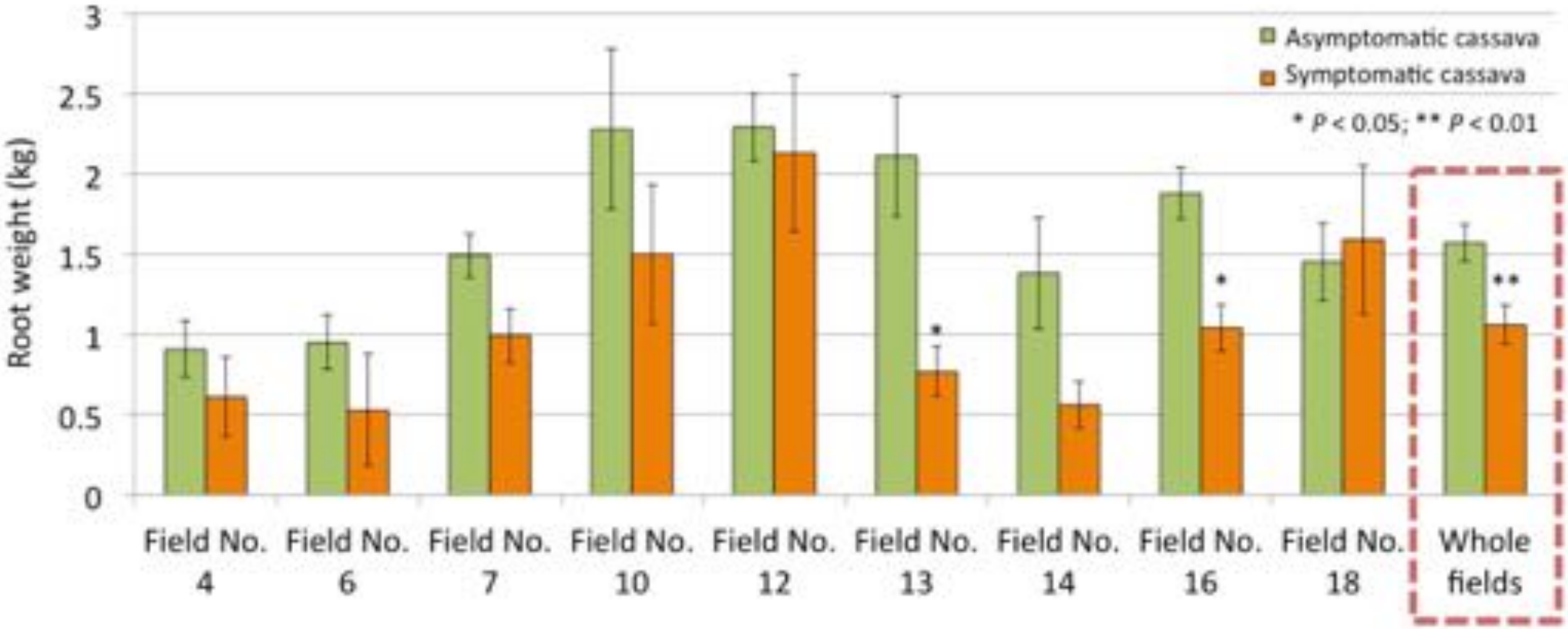
	Cassava witches' broom disease	Cassava mosaic disease
		
First Report in SEA	1990s in TH	2015 in KH
Occurrence	VN, KH, LA, TH, ID, PH,MM,…	KH and VN
Yield loss	Approx. 34%	Unknown
Causal pathogen	Bacterium (phytoplasma)	Virus
Diagnostics	Nested PCR, LAMP, SMART-DART	PCR, ELISA, LAMP

Cassava witches' broom disease

Where CWB occurred, and is exposed to risks



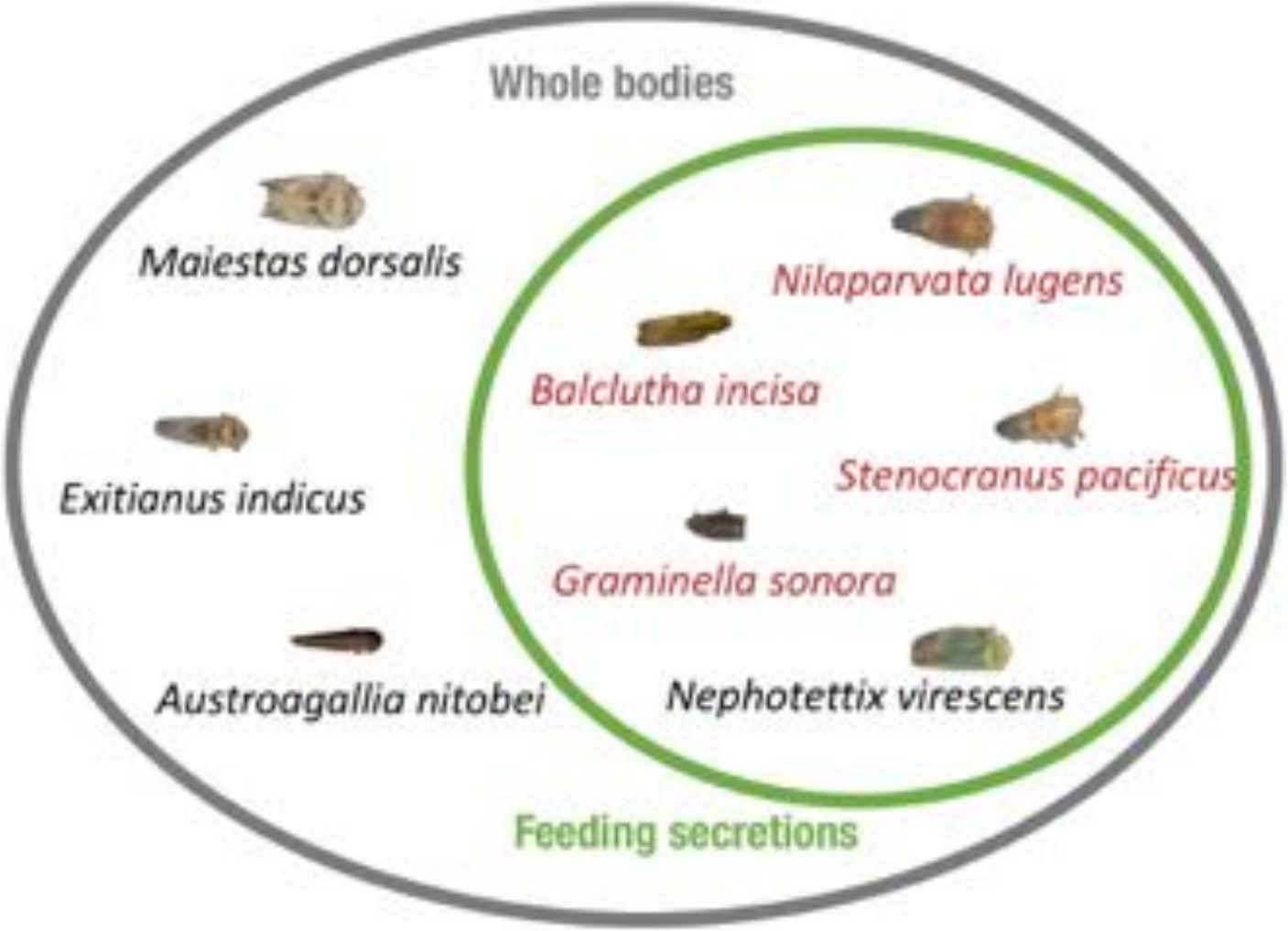
Yield Reduction



CWB causes yield reduction of approx. 34%

Research on vector insects

Species retaining phytoplasma in cassava fields



Vector candidates

For conclusive evidence, we will conduct *in planta* transmission trials

'Resistance' to phytoplasma?

- Phytoplasma is unculturable
- Resistance to phytoplasma has not commonly been found
- No curative approaches available

High potential for phytoplasma control

- ❑ Stable access to clean seeds
- ❑ Vector management

Importance and needs of P&D research

Diagnostics

Capacity development of basic diagnostics

Development of diagnostic tools for fields/ local institutions

Monitoring

Systematic sequential monitoring in broader area

Variety evaluation

No resistance (CWB), both CWB and CMD are stake-borne

→ Establishment of seed systems is important

Systematic variety evaluation (eg. yield loss) combined with fingerprinting


Thank you
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Cassava witches' broom

Cassava Witches' Broom (CWB) : An emergent disease in SE Asia

- CWB is thought to be caused by phytoplasma
- Presence in Asia and Central/ Latin Americas
- In Africa: Arocha *et al.*, 2009

Countries	Reported causal agent	References
Vietnam	group 16SrI & II	Alvarez *et al.*, 2013; Trinh *et al.*, 2015
Brazil	group 16SrIII	Flores *et al.*, 2013
Cuba	group 16SrI	Arocha *et al.*, 2009b
Uganda	group 16SrII	Arocha *et al.*, 2009a

(Photo by Georgina Smith / CIAT)

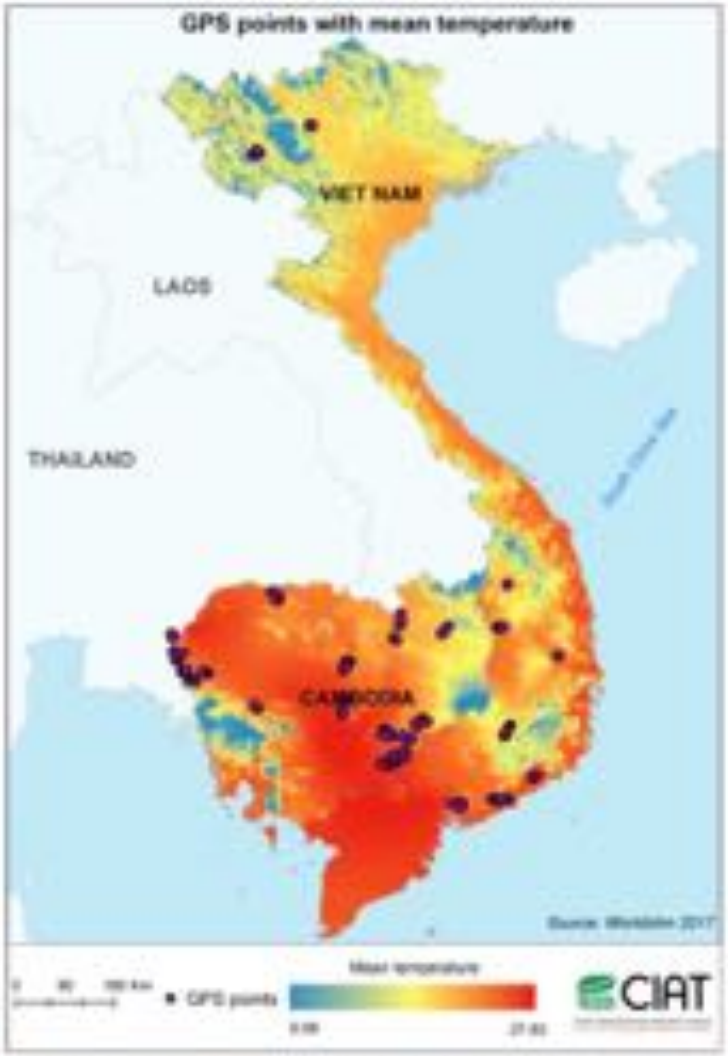
Table 1. Main arthropod taxa reported in SE Asian cassava crops, organised by year of first (regional) record (taxa reported within the past 15 years are highlighted in bold)[a]

Taxa	Common name	Origin	Record SE Asia	Maximum yield loss(%)[b]	References
A. Short-tailed mealybug					
Phenacoccus manihoti	Cassava mealybug	Neotropical	**2008**	50,* 84**	78
Paracoccus marginatus	Papaya mealybug	Nearctic	**2008**	40***	57,253
P. solenopsis	Cotton mealybug	Nearctic	**2006**	n.a.	34,42
P. madeirensis	Madeira mealybug	Neotropical	**2004**		16,34
Maconellicoccus hirsutus	Hibiscus mealybug	Neotropical	1942		43,254
B. Long-tailed mealybug					
Pseudococcus jackbeardsleyi	Jack Beardsley mealybug	Neotropical	1996	n.a.	16,34
Ferrisia virgata	Striped mealybug	Neotropical	1942		43,45
C. Green mite complex					
Mononychellus mcgregori	Green mite	Neotropical	**2009**	60*****	21,61
D. Red mite complex					
Neotetranychus lek	Red mite	n. a.	**2013**		59
Oligonychus thelytokus	Red mite	Afrotropical	1998		53,255
Tetranychus marianae	Red mite	Nearctic	1975		55,56
T. yusti	Red mite	Neotropical	1975		49,55
T. urticae	Red mite	Palearctic	1975		49,55
Eutetranychus africanus	African red mite	Afrotropical	1975		49,56
O. biharensis	Red mite	Oriental	1975		49,56
T. cinnabarinus	Red mite	Palearctic	1969	53******	49,54
T. neocaledonicus	Red mite	Australasian	1962		49,256
T. truncatus	Red mite	Palearctic	1962		49,256
T. kanzawai	Red mite	Palearctic	1962		49,256
E. orientalis	Red mite	Palearctic	1962		49,256
E. Whiteflies					
Aleurodicus dispersus	Spiralling whitefly	Nearctic	1987	n.a.	21,70
Bemisia tabaci	Silverleaf whitefly	Palearctic	1933		21,75
F. Scale insects					
Aonidomytilus albus	Cassava scale	Nearctic	1935		19,73
Parasaissetia nigra	Black scale	n. a.		n.a.	53
Saissetia miranda	Black scale	Nearctic	n. a.		53
G. Others					
Isoptera: Rhinotermitidae	Termites	Oriental	n. a.	n.a.	19,53
Coleoptera: Scarabeidae	Whitegrubs	Oriental	n. a.	n.a.	84,87

[a] n. a. = information not available.

Supplementary data

Surveyed districts



Location of 419 field sampling sites in Cambodia & Vietnam.

- Covering big production areas
  - 15 districts in each country

Country	District
Vietnam	1 Thuan Chau
	2 Van Yen
	3 Chu Prong
	4 Mad Lak
	5 Eaker
	6 Dak Glong
	7 Sa Thay
	8 Krong Pa
	9 Song Hinh
	10 Bac Binh
	11 Ham Tan
	12 Tan Bien
	13 Tan Chau
	14 Ham Thuan Nam
	15 Long Thanh

Country	District
Cambodia	1 Anlong Veaeng
	2 Malai
	3 Sala Krau
	4 Pailin
	5 Kamnieng
	6 Phnum Proek
	7 Rattanak mondul
	8 Kravanh
	9 Koun Mom
	10 Steung Treng
	11 Snoul
	12 Dambae
	13 Memot
	14 Romeas Haek
	15 Sandan
	16 Baray

What Phytoplasma is

- **Plant-pathogenic bacterium**

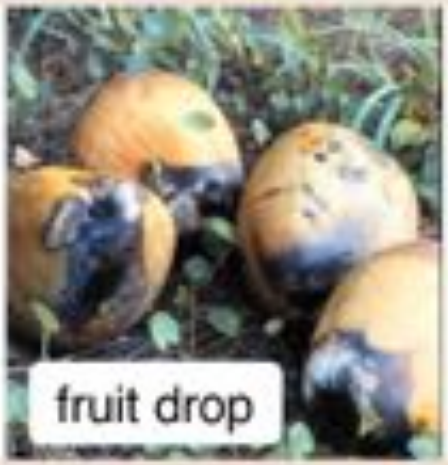
Whole plant

Witches' broom

flower

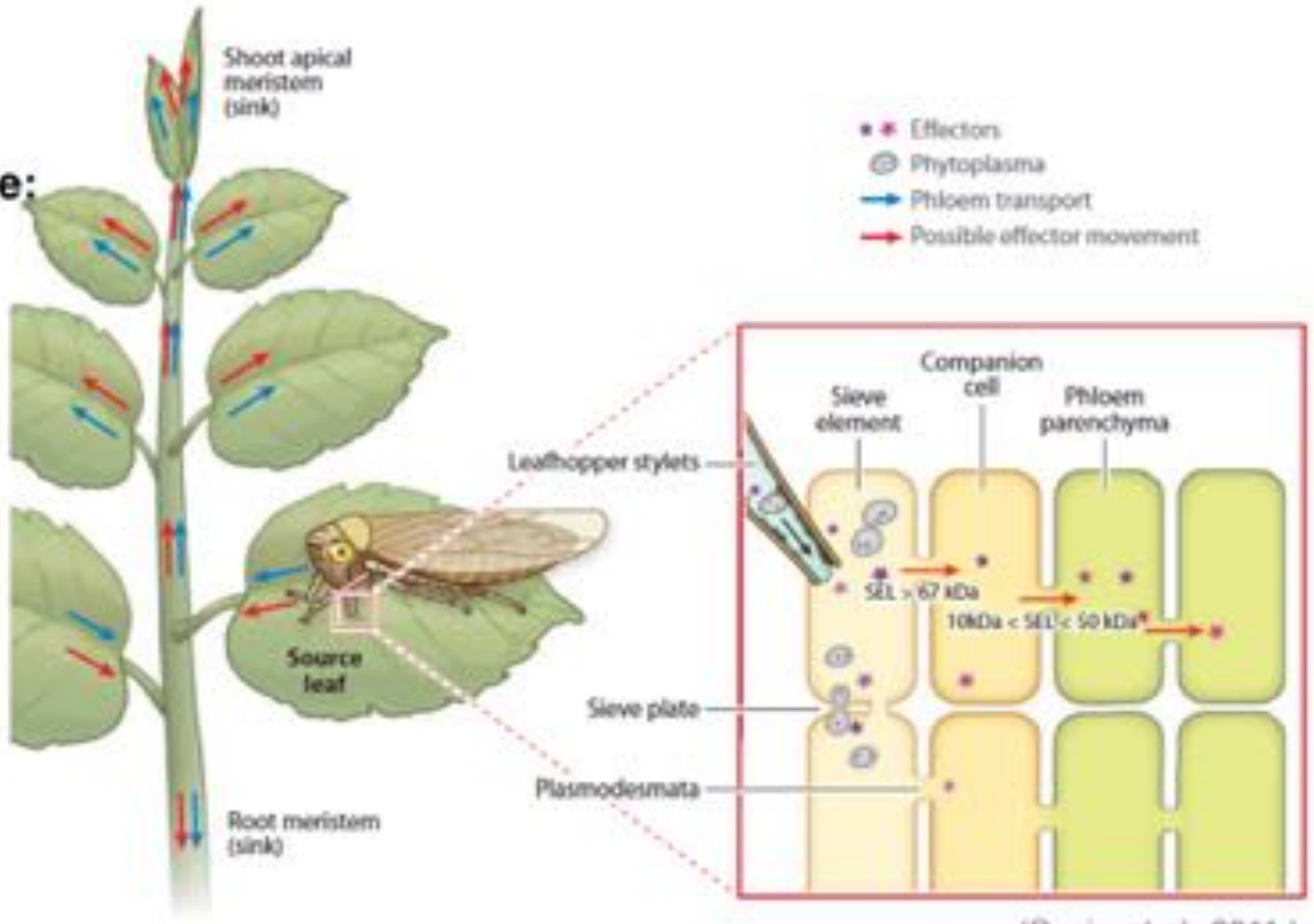
leaf

fruit



What Phytoplasma is

- Plant-pathogenic bacterium
- **Intracellular parasite: phloem-restricted**
- **Cell wall-less**
- **Until now, unable to be cultured**



(Sugio *et al.*, 2011)

What Phytoplasma is

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- **Transmitted by insects & parasitic plants**

Insects (Hemiptera)

Dodder (*Cuscuta* spp.)

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Insects (Hemiptera)

Dodder (*Cuscuta* spp.)

- Cicadellidae (Leafhoppers; 叶蝉)
- Delphacidae (Planthoppers;飞蝨)
- Psyllids

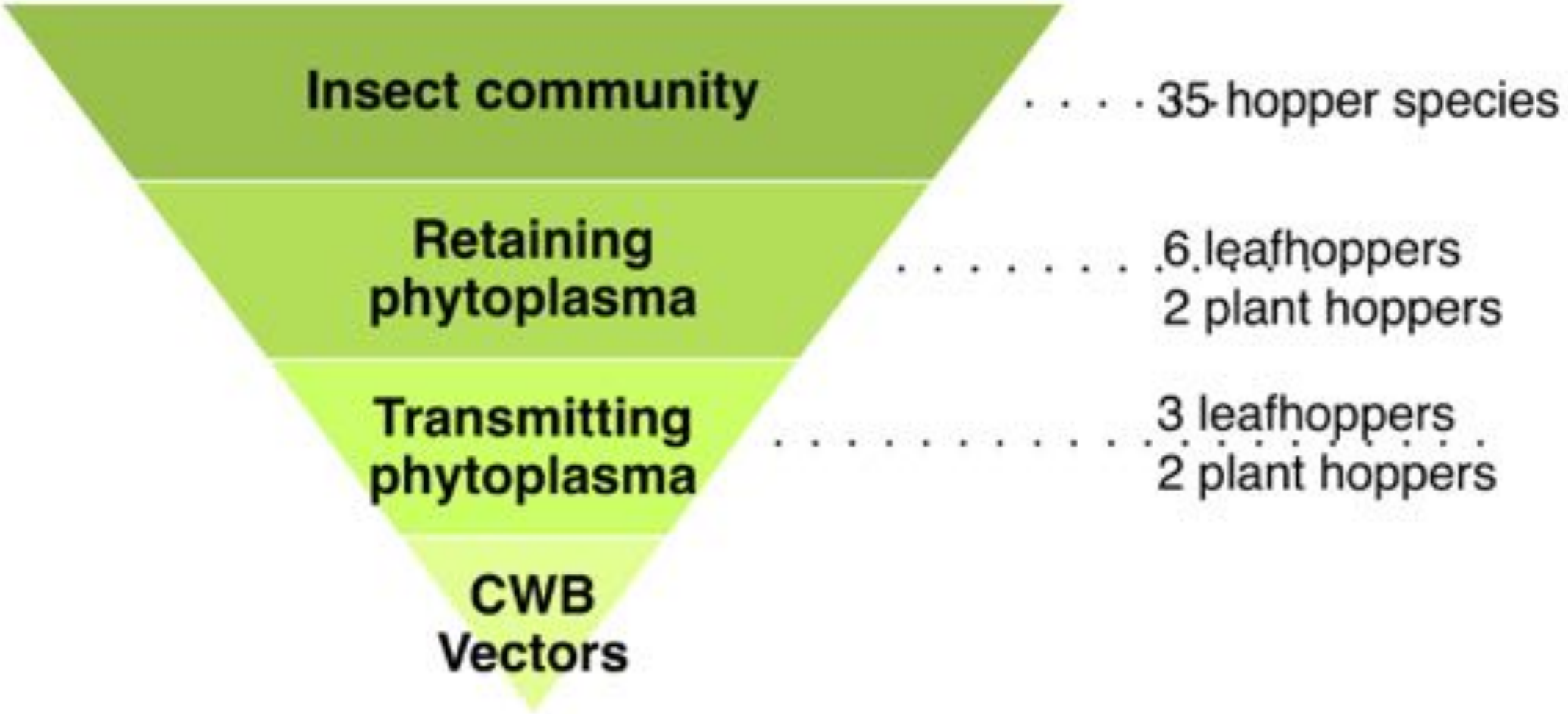
Objectives

Why identify vectors?

- Phytoplasma is unculturable
- Resistance to phytoplasma has not been found
- No curative approaches available

- **Vector management**
  = high potential for phytoplasma control
- Facilitates resistance screening
- Sheds light upon disease epidemiology
- Constitutes basis for vector management

Conclusion


Insect community
35 hopper species
Retaining phytoplasma
6 leafhoppers
2 plant hoppers
Transmitting phytoplasma
3 leafhoppers
2 plant hoppers
CWB Vectors