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Objective 3: Surveillance & Diagnostics

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Project Mid-term Review

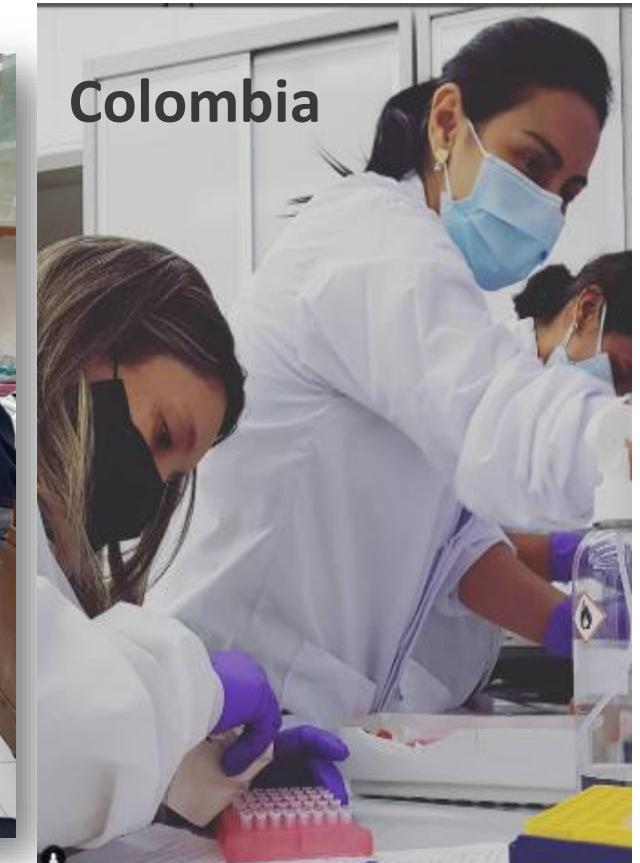
February 2022



Objective 3



- **Objective 3:** Develop, test and deploy diagnostic protocols, tools, and information platforms fit for purpose in monitoring, surveillance, and certification applications



Close collaboration & communication network

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Targets: CMD and CWBD

Leaf mosaic and deformation



Leaf yellowing, short petioles, phyllody



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Information platform: data integration and communication

<https://pestdisplace.org>

Name * Prueba3-2020-CMD-SEA

Purpose ACIAR Activity 3

Sampling Protocol CIAT-Virology-Crop Protection Protocol v2.0

Grant Code Grant Code

GUESTS **PARTNERS** **DONORS** **REFERENCES** **SAMPLES** **IMAGES** **VIEW MAP**

Guest User **ADD**

Full Name	Delete
Jenyfer Jimenez - ORCID:0000-0001-8149-6615	Delete
Samoul Oeurn - ORCID:0000-0002-0771-2495	Delete
Hoat Hoat - ORCID:0000-0002-2240-3922	Delete
pinkham Vongphachanh - ORCID:0000-0003-4440-5838	Delete
Hang Lee - ORCID:0000-0002-3504-1270	Delete
Phuong Dung Le - ORCID:0000-0002-2147-3697	Delete

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Information platform: data integration and communication

<https://pestdisplace.org>

Information platform: data integration and communication

<https://pestdisplace.org>

Guest

Name *

Purpose

Sampling Protocol

Grant Code

GUESTS PARTNERS DONORS REFERENCES SAMPLES IMAGES **VIEW MAP**

	F35-S1	F35-S12	F35-S24	F35-S36	F35-S50
Guest					
					
					

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Bioversity International

CIAT

Information platform: data integration and communication

<https://pestdisplace.org>

The screenshot displays a web-based information platform for pest displacement. On the left, a sidebar lists fields: Name*, Purpose, Sampling Protocol, Grant Code, and Guest. The Guest section shows a list of samples with images: F35-S1, F1-S1, F1-S2, F1-S3, F1-S4, and F1-S5. F1-S1 is selected, and a modal dialog titled 'Edit Sample' is open, showing details: F1-S1, Collection Date (20200602), Visual Symptom (Negative), and a photo of a cassava plant. A sub-modal dialog titled 'Create a new laboratory diagnostic' is open, prompting for Diagnostic Method (Elisa, PCR, Confirmed by sequencing, Restriction, qPCR) and Pathogen Name. The 'CONFIRM' button is highlighted. At the top, a navigation bar includes links for GUESTS, PARTNERS, DONORS, REFERENCES, SAMPLES, IMAGES (highlighted with a red circle), and VIEW MAP.

Information platform: data integration and communication

<https://pestdisplace.org>

Name *

Purpose

Sampling Protocol

Grant Code

Guest

F35-S1

F1-S1

F1-S2

F1-S3

F1-S4

F1-S5

F35-S2

GUESTS PARTNERS DONORS REFERENCES SAMPLES IMAGES **VIEW MAP**

Edit Sample

Lab code

Laos

LONG 106 106 106

Create a new laboratory

Diagnostic Method

- Elisa
- PCR
- Confirmed by sequencing
- Restriction
- qPCR

+ New Diagnostic

Diagnostic Method

Kazakhstan

Mongolia

Kyrgyzstan

Uzbekistan

Afghanistan

Pakistan

Nepal

China

Japan

Vietnam

Bangladesh

India

Sri Lanka

Maldives

Malaysia

Cambodia

Philippines

Indonesia

Papua New Guinea

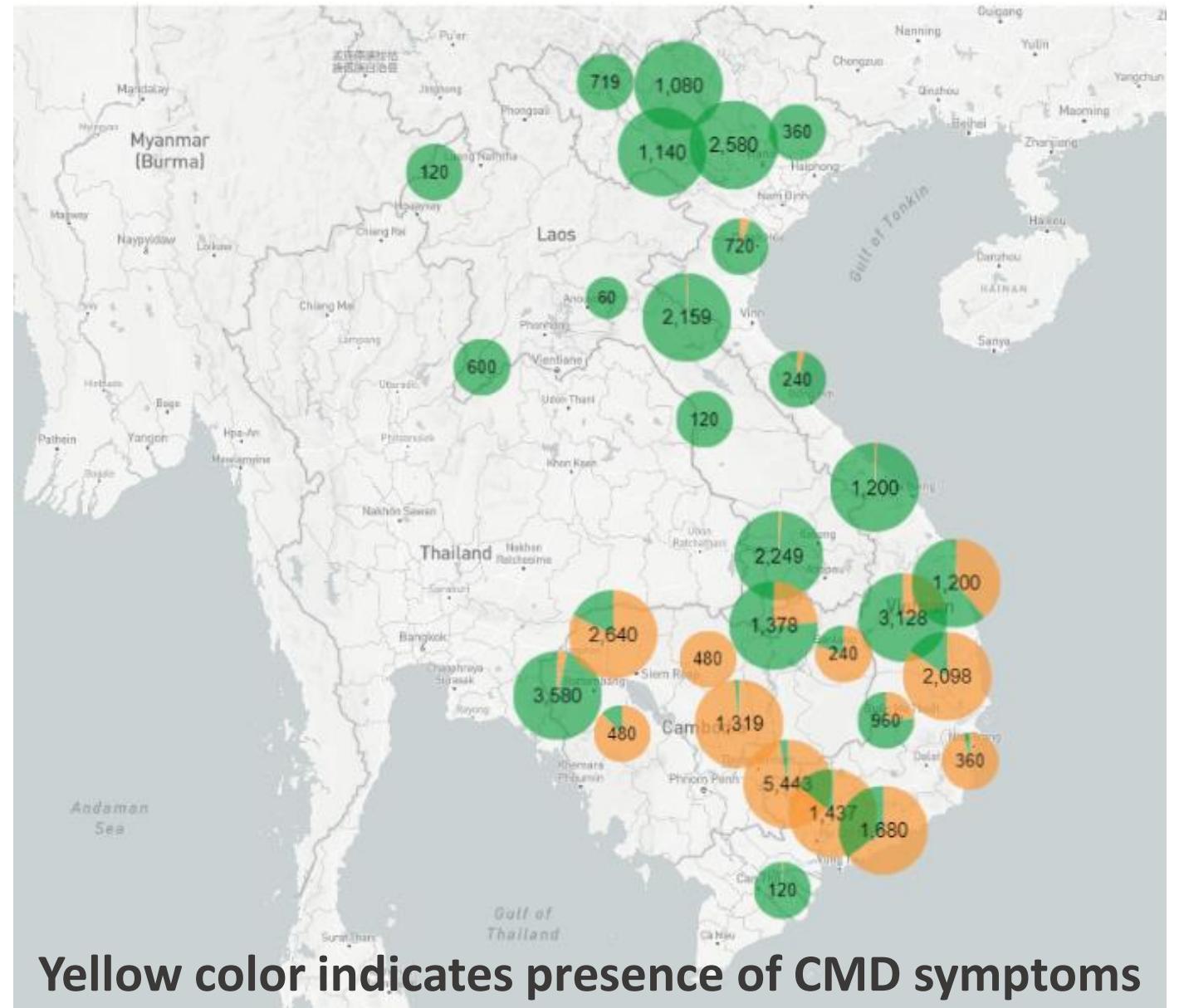
Labs 39,890

CIAT

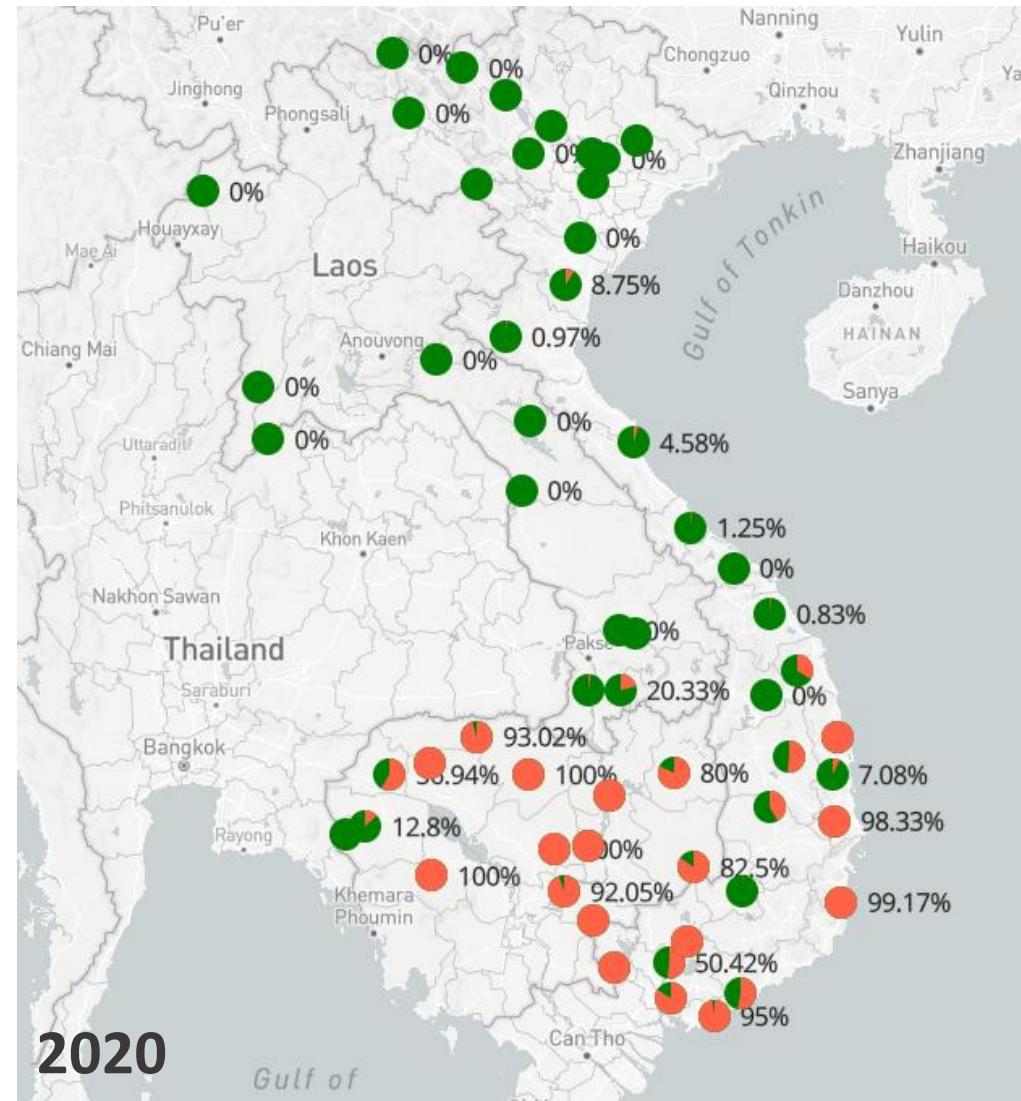
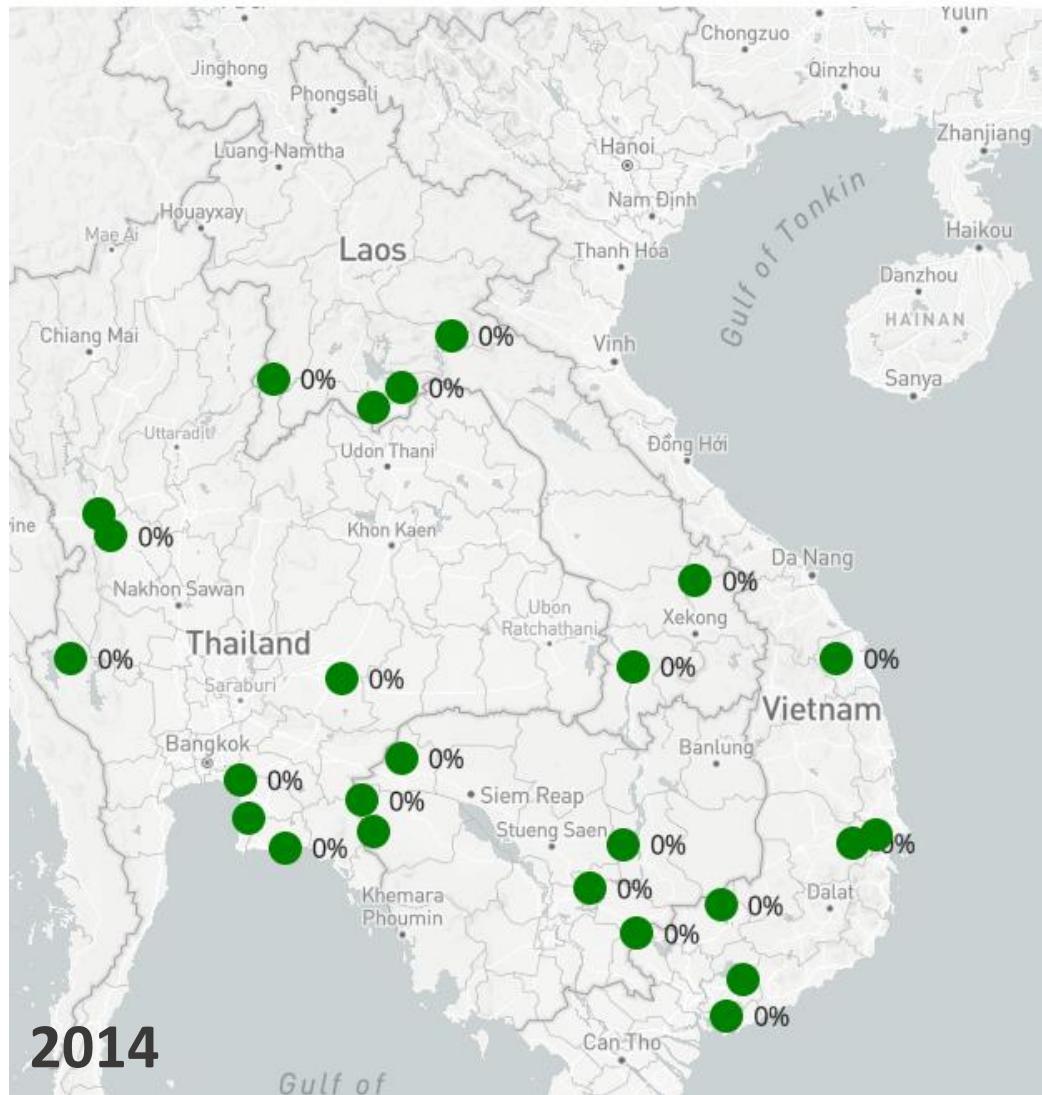
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

Surveillance

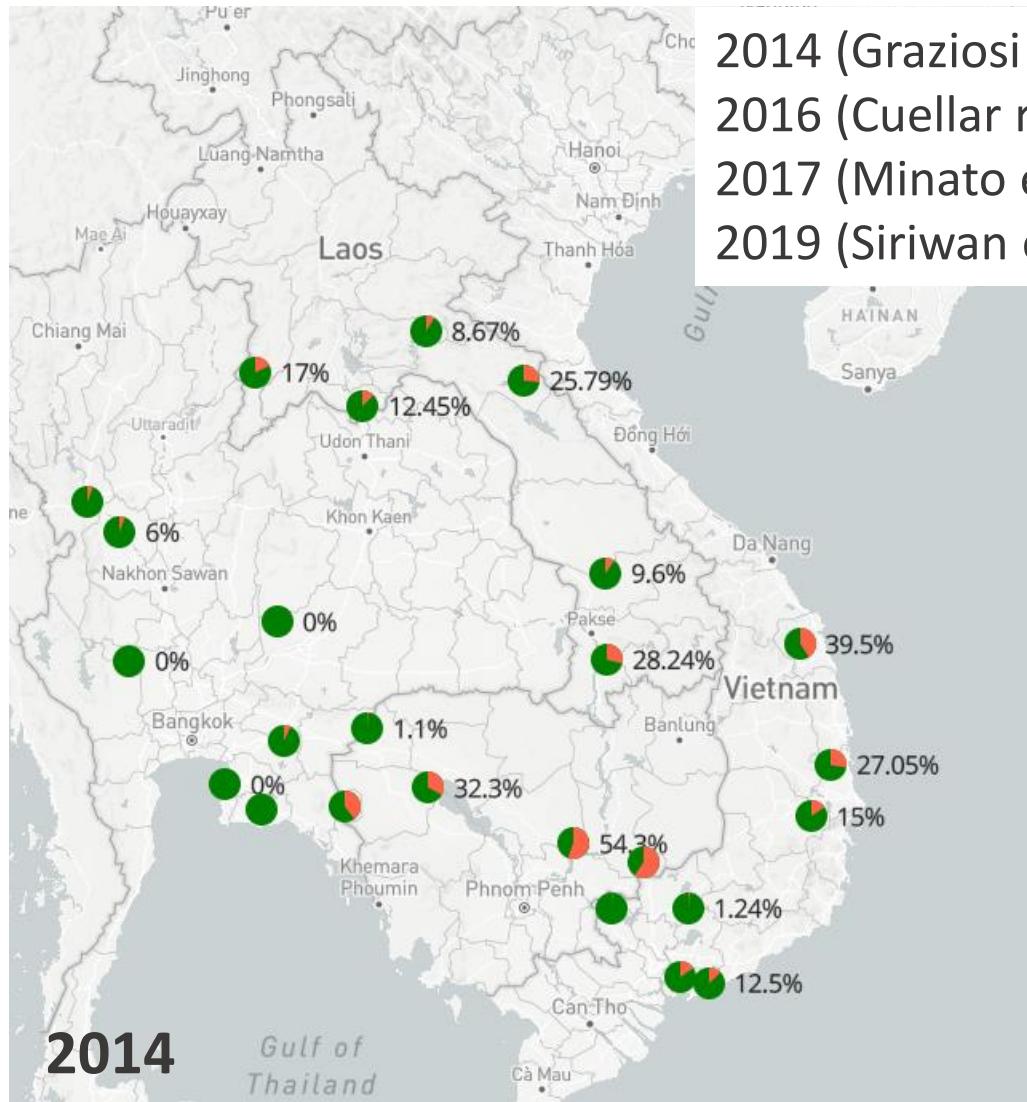
- Two consecutive years. Using a standard protocol in 3 countries (5% symptoms, 95% prob/Ha).
- 28,920 'observations' in 2020 and 10,970 'observations' in 2021 (COVID impact)
- Raw data maps updated in 'real-time'. Analysis>curation. All data is shared through the platform.
- Photo records 'observations' allow the identification of CMD, CWBD and other symptoms.



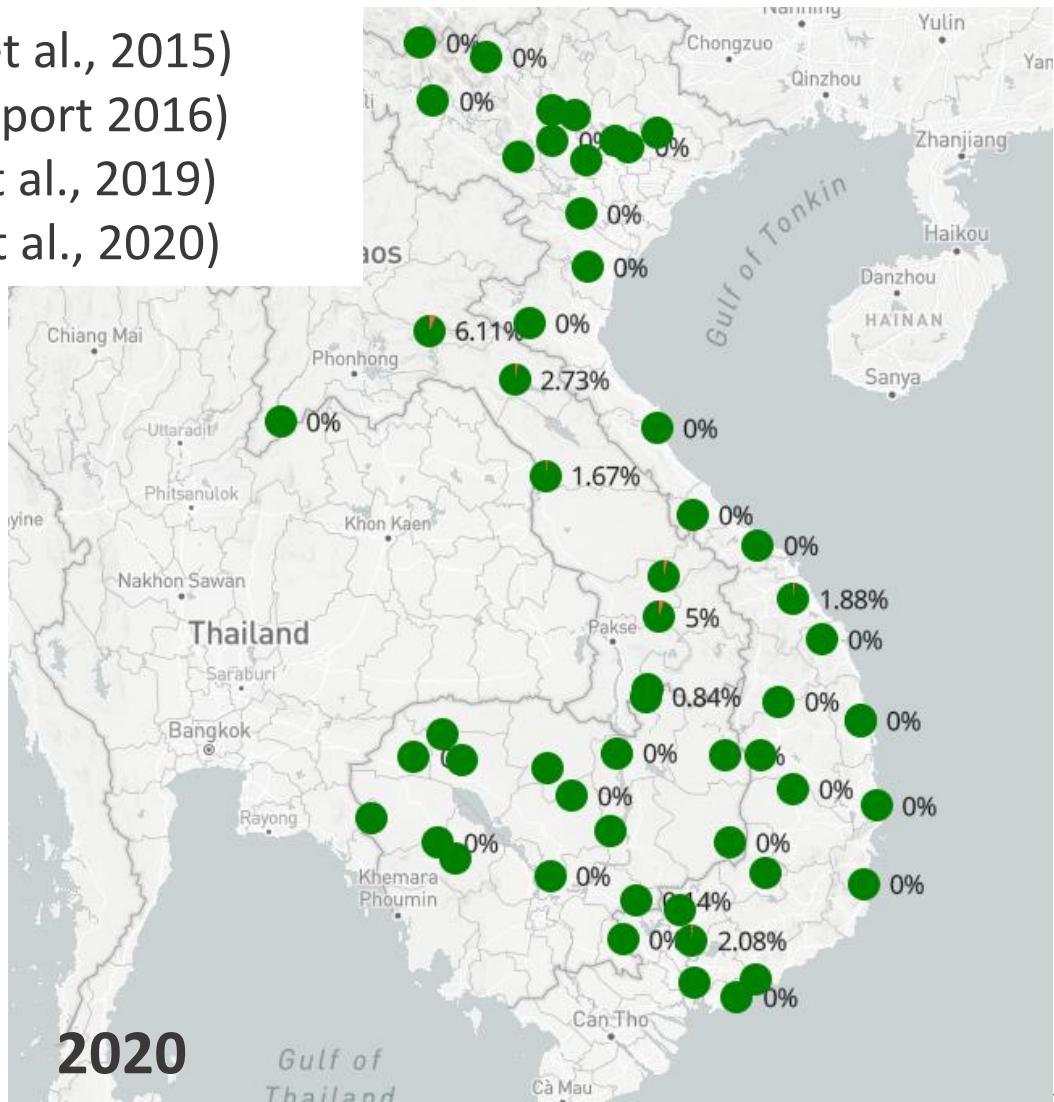
Incidence maps (Province level): CMD



Incidence maps (Province level): CWBD



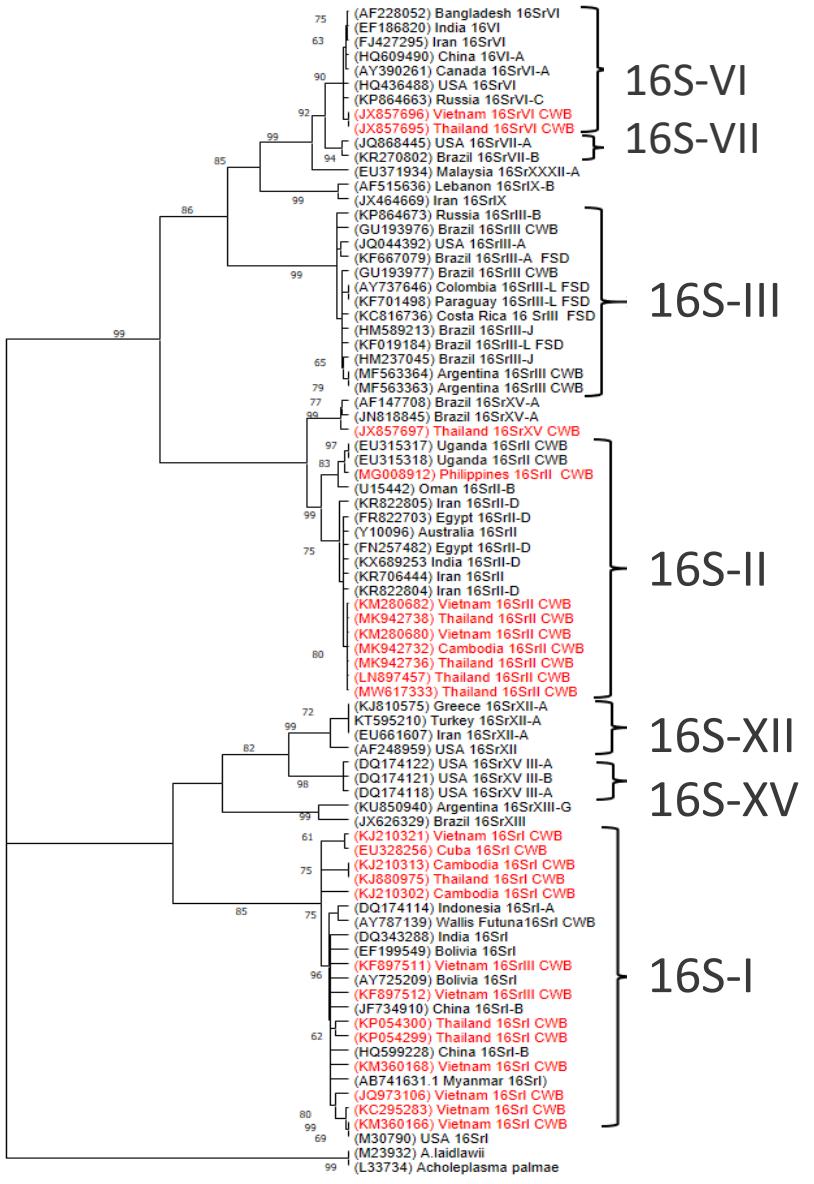
- 2014 (Graziosi et al., 2015)
- 2016 (Cuellar report 2016)
- 2017 (Minato et al., 2019)
- 2019 (Siriwan et al., 2020)



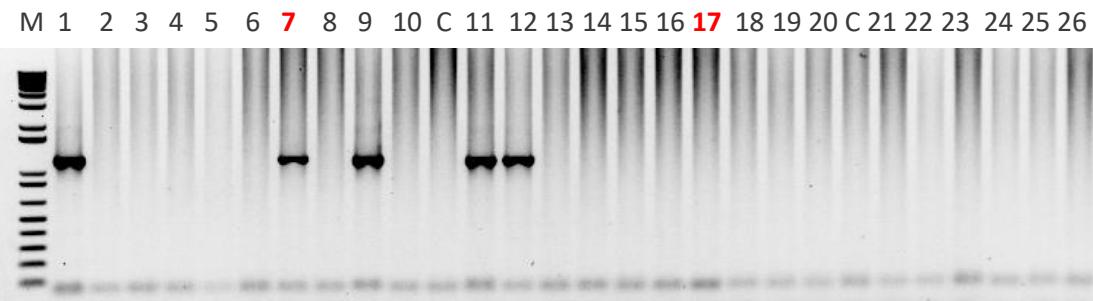
2020

Diversity of phytoplasmas sequences in SEA

- Phytoplasma can be classified based on the analysis of their 16S rRNA into ribosomal groups and subgroups
- Sequences of CWBD-associated phytoplasmas belong to groups I, II, and VI (in red).
- Phytoplasmas infecting cassava in LAC belong to a separate group (III).
- Current detection methods target the 16S sequences but are not efficient



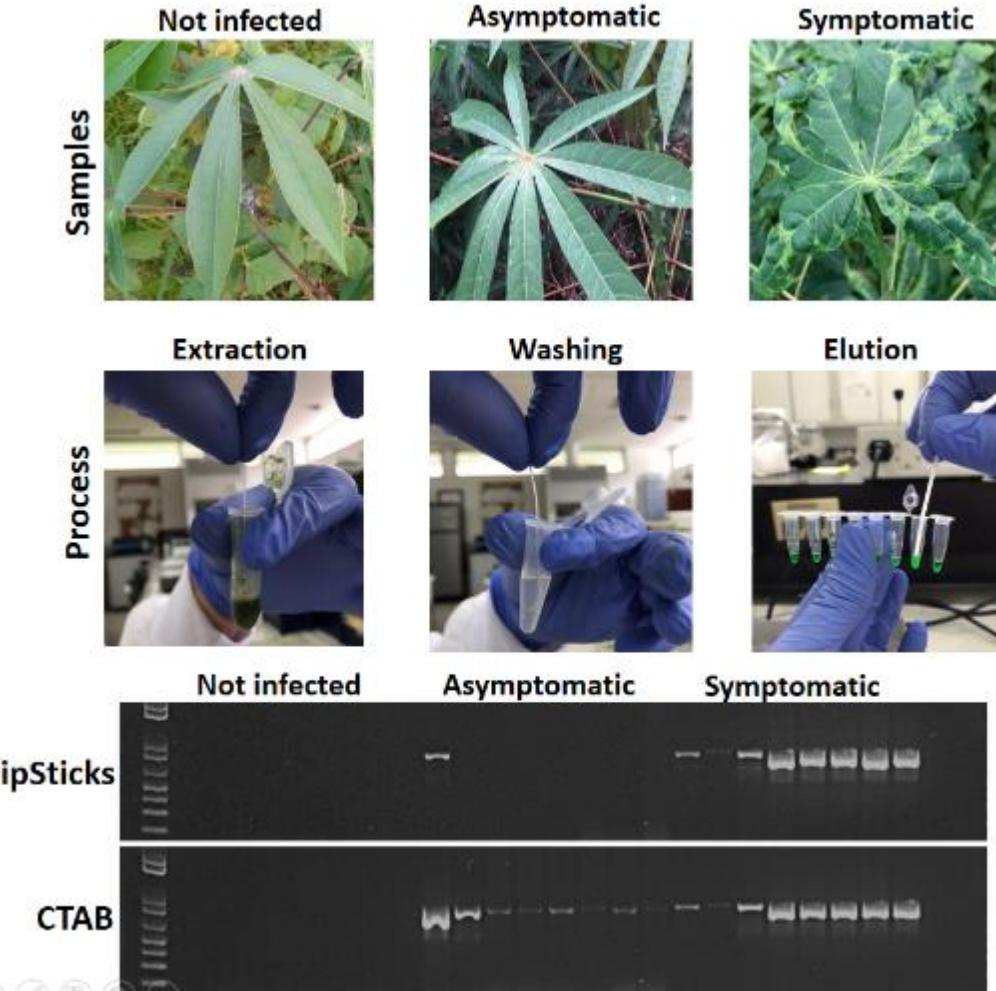
Testing current nested PCR protocols for detection of CWBD-associated phytoplasma



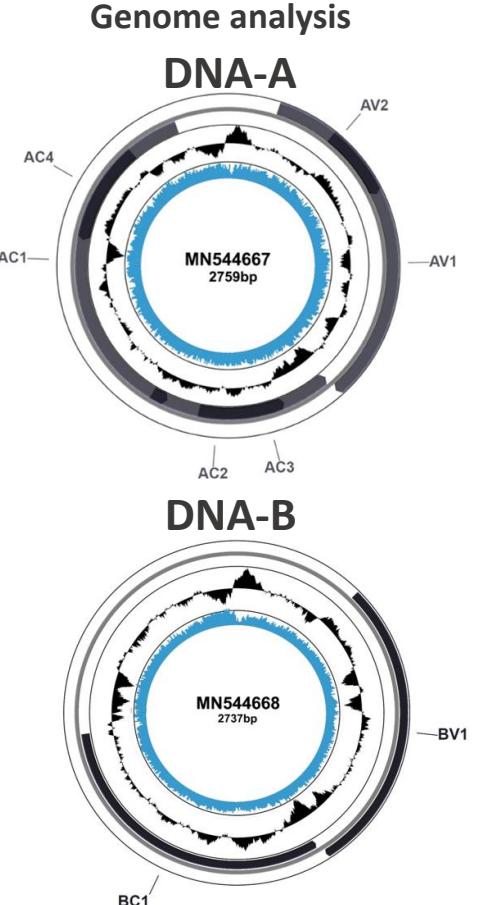
N=120	CWBD symptoms	No CWBD symptoms
PCR(+)	4	23
PCR (-)	13	80

Less than 50% of the PCR bands correspond to phytoplasma sequences

Diagnostics CMD: PCR, LAMP (droid), genome sequencing

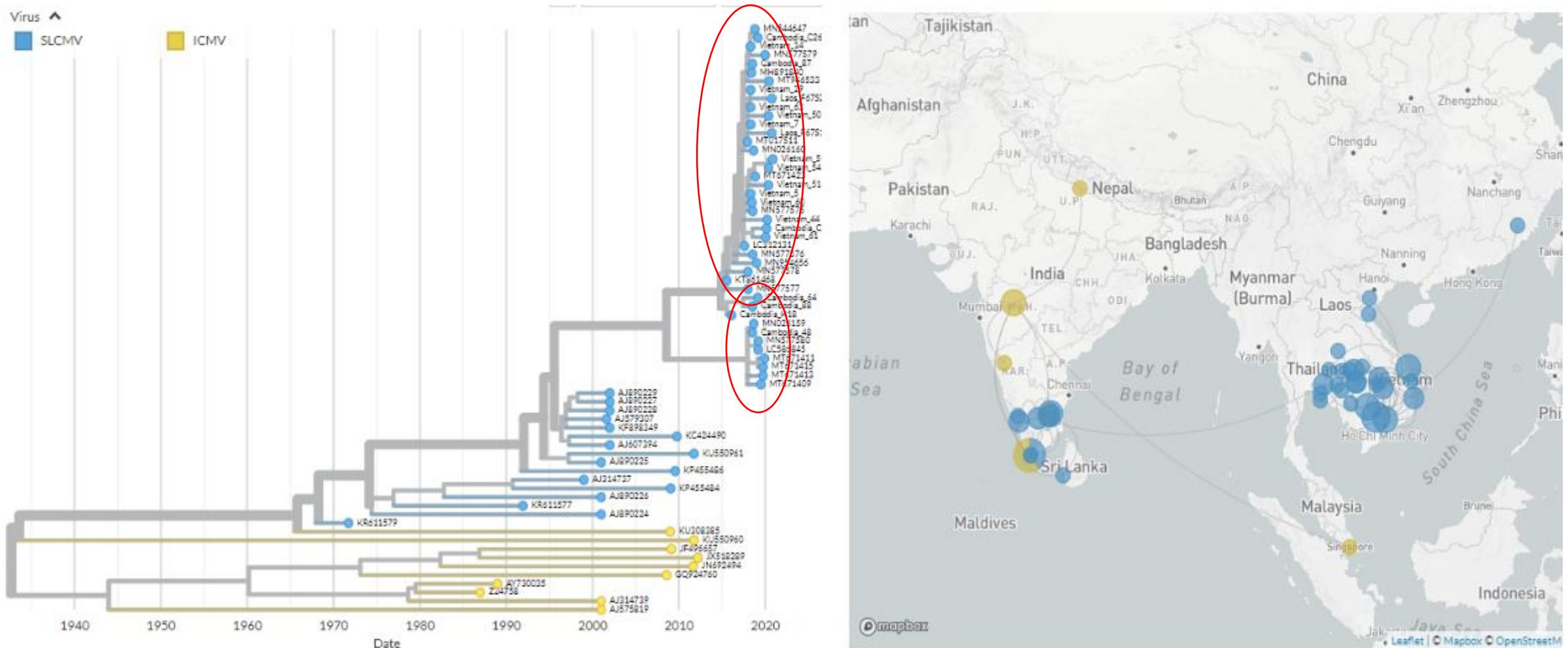


UQueensland



Genome analysis of SLCMV

<https://nextstrain.org/community/pestdisplace/CMDASIA1?c=virus&r=location>



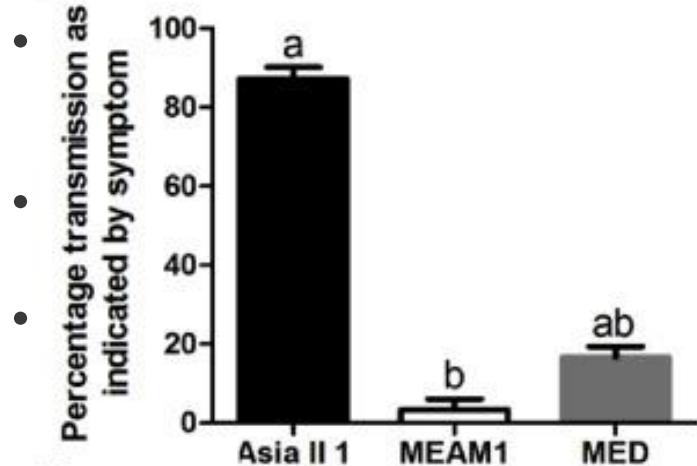
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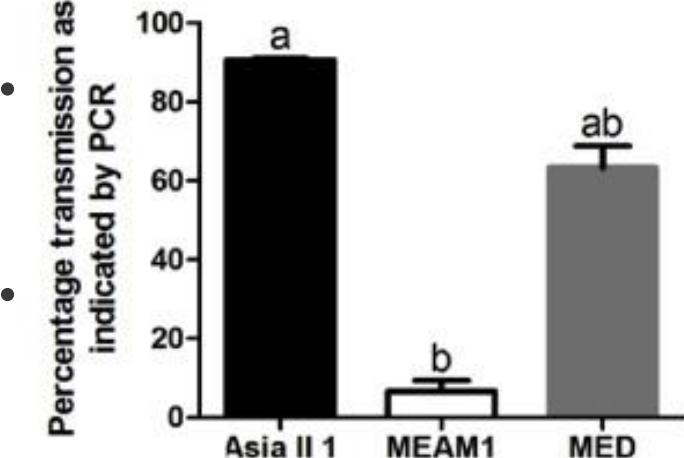
Whiteflies (WF)

WF Surveys in Laos and Vietnam

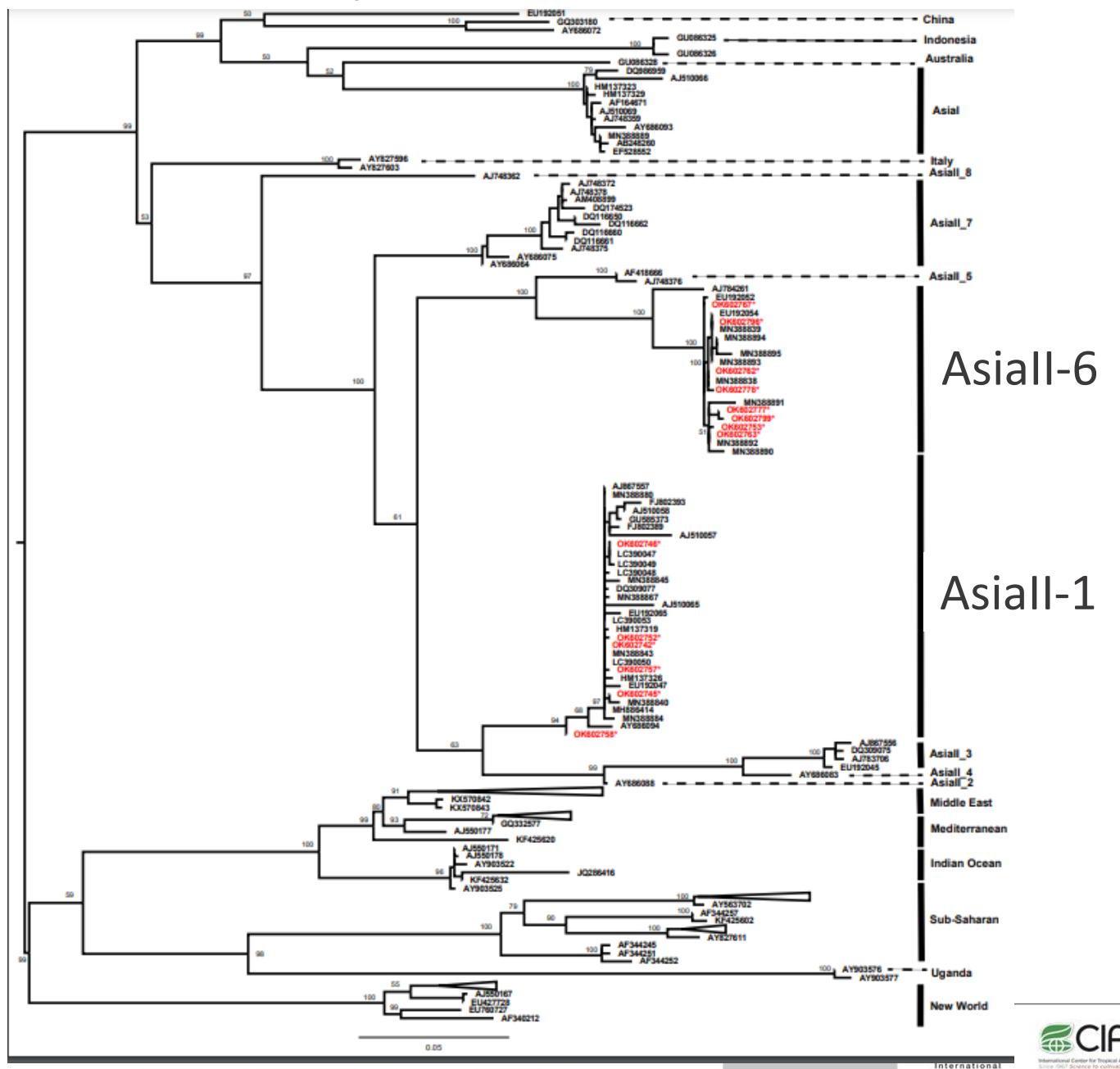
A



B



Chi et al., 2020



Awareness raising leads to early detection and rapid response



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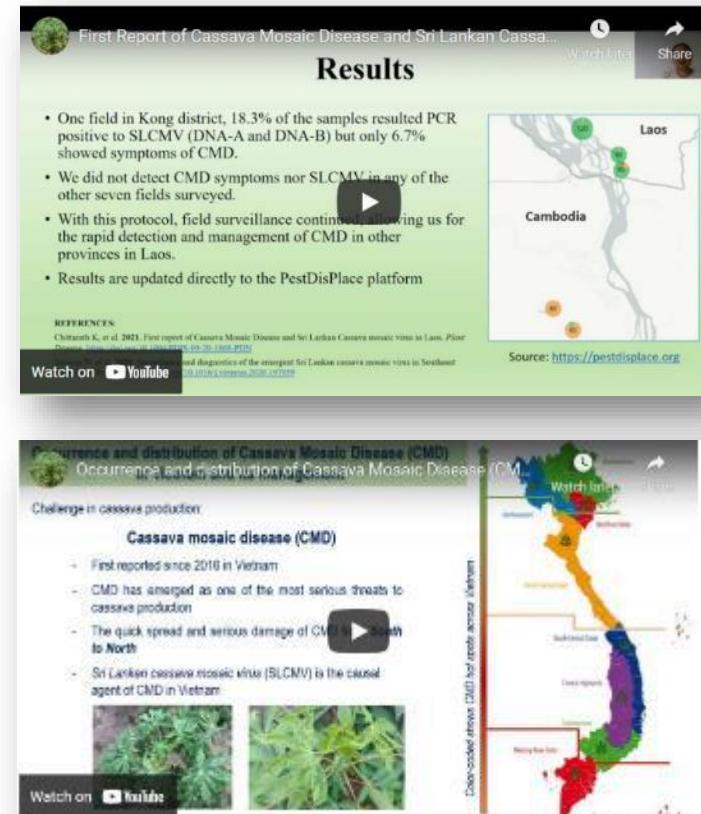
Capacity building: participation in Intln. conferences and scientific publications

Australasian Plant Pathology Society Conference - 2021

- Khonesavanne Chittarath and Pinkham Vongphachanh
PPC – Lao PDR
- Le Thi Hang: PPRI - Vietnam

PUBLICATIONS

- Siriwan W, Jimenez J, et al. **2020**. Surveillance and diagnostics of the emergent Sri Lankan cassava mosaic virus in Southeast Asia. *Virus Research*. <https://doi.org/10.1016/j.virusres.2020.197959>
- Leiva AM; Siriwan W, et al. **2020**. Nanopore-based complete genome sequence of a Sri Lankan cassava mosaic virus strain from Thailand. *Microbiology Resource Announcements*. <https://doi.org/10.1128/MRA.01274-19>
- Chittarath K, Jimenez J, et al. **2021**. First report of Cassava Mosaic Disease and Sri Lankan Cassava mosaic virus in Laos. *Plant Disease*. <https://doi.org/10.1094/PDIS-09-20-1868-PDN>
- Jimenez et al., **2021**. An optimized nucleic acid isolation protocol for virus detection in cassava (*Manihot esculenta* Crantz.). *MethodsX*. <https://doi.org/10.1016/j.mex.2021.101496>



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DEVELOPING COUNTRY SUPPORTER



In summary

- Diagnostic protocols for CMD have been validated >> implement portable LAMP and sequencing in the region (COVID permitting).
- Surveillance for CMD has mapped regions of high and low disease incidence in each country >> clean seed propagation, resistance trials, variety identification
- Validate CWBD decreased incidence >> consider cassava genotyping data
- Improve molecular identification of CWBD >> genome sequencing
- Two biotypes of WF >> Contribution to transmission & dissemination of CMD



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Thank you!

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<https://cassavadiseasesolutionsasia.net/> -

