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International Center for Tropical Agriculture
Since 1967 Science to cultivate change

Objective 3:

Surveillance & Diagnostics

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Project Mid-term Review

February 2022

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Bioversity International and the International Center for Tropical Agriculture (CIAT) are CGIAR Research Centers.
CGIAR is a global research partnership for a food-secure future.

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

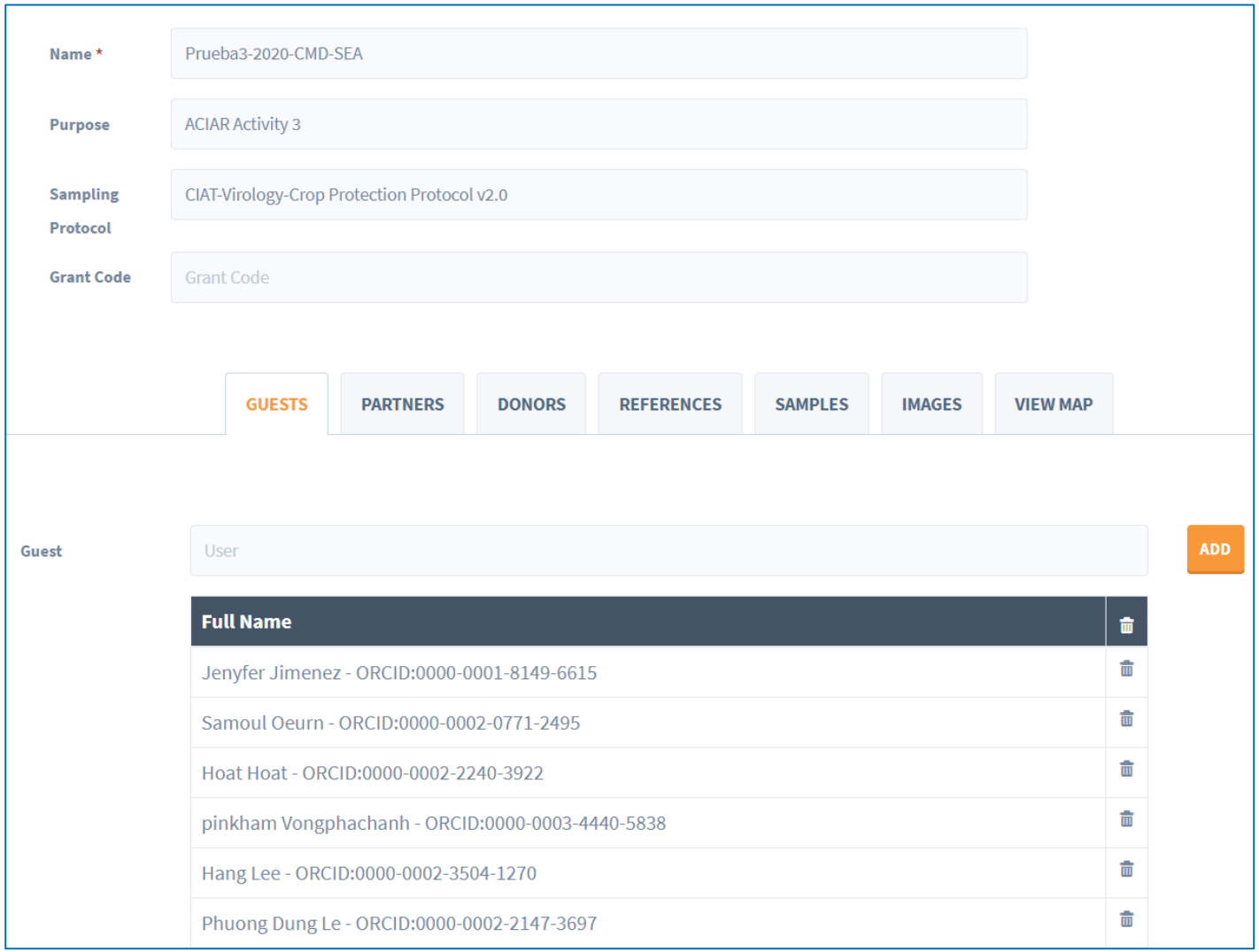
Targtes: CMD and CWBD

Leaf mosaic and deformation

Leaf yellowing, short petioles, phyllody

Information platform: data integration and communication

https://pestdisplace.org



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Information platform: data integration and communication

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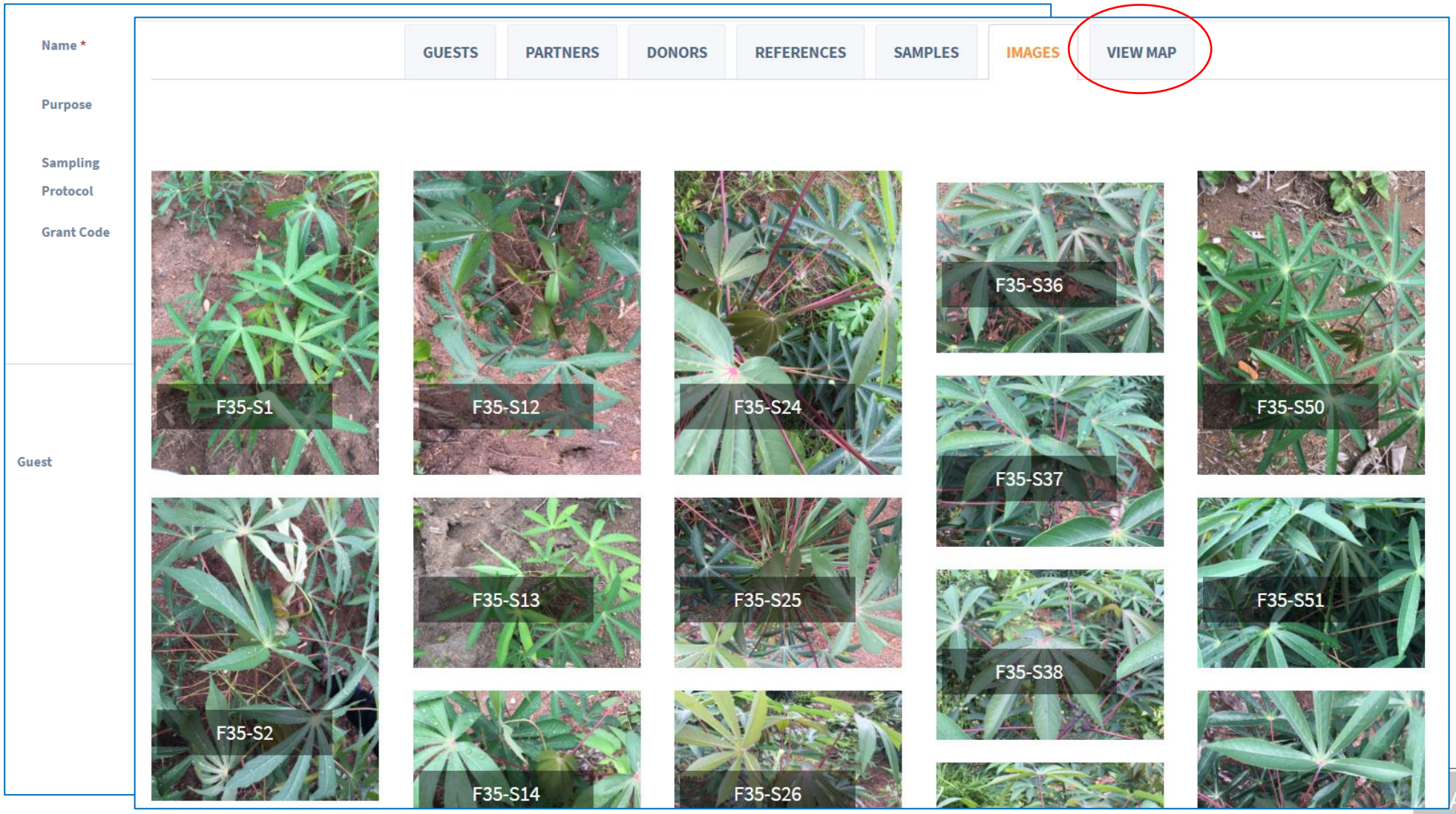

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Information platform: data integration and communication

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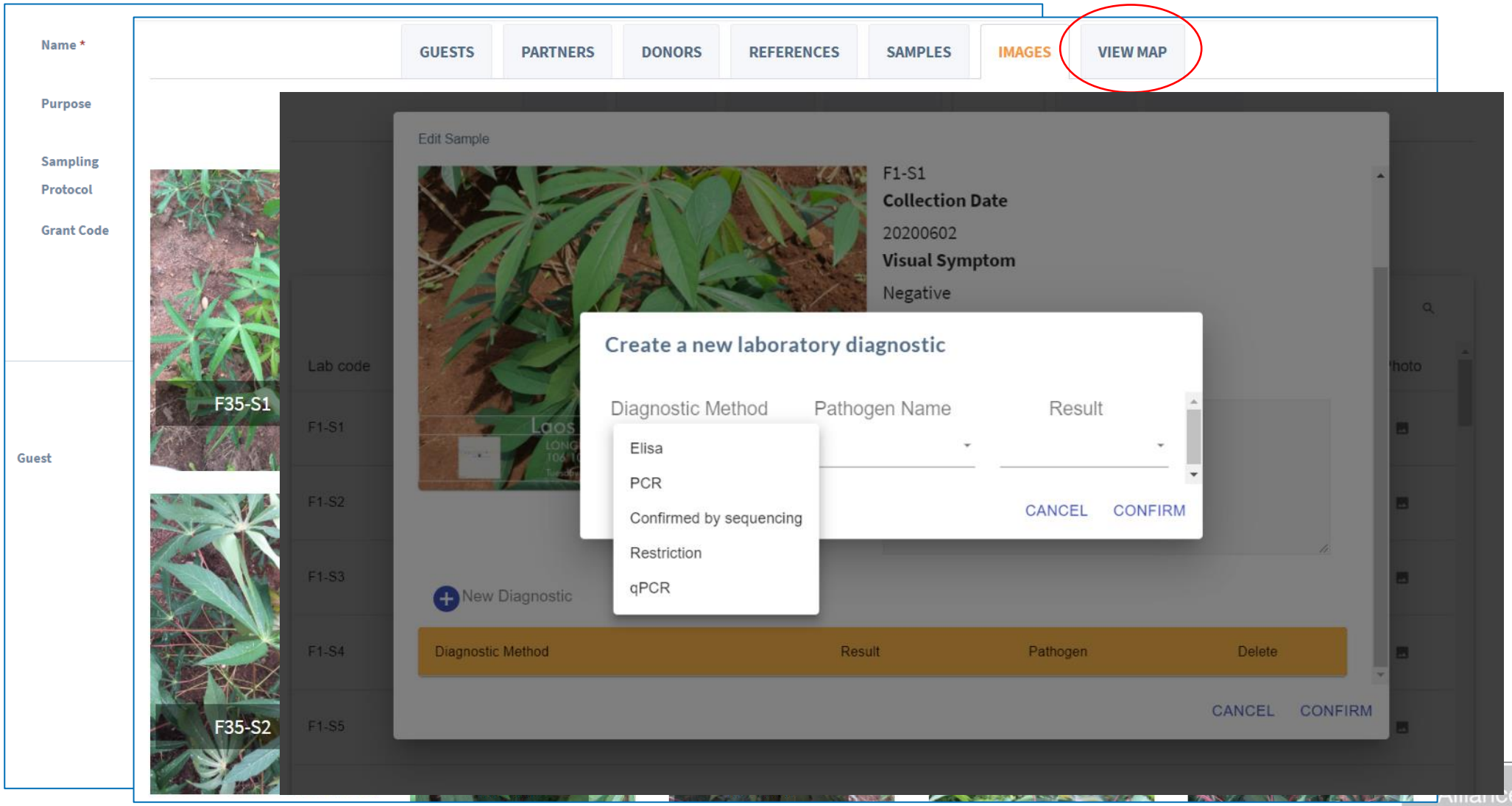

Information platform: data integration and communication

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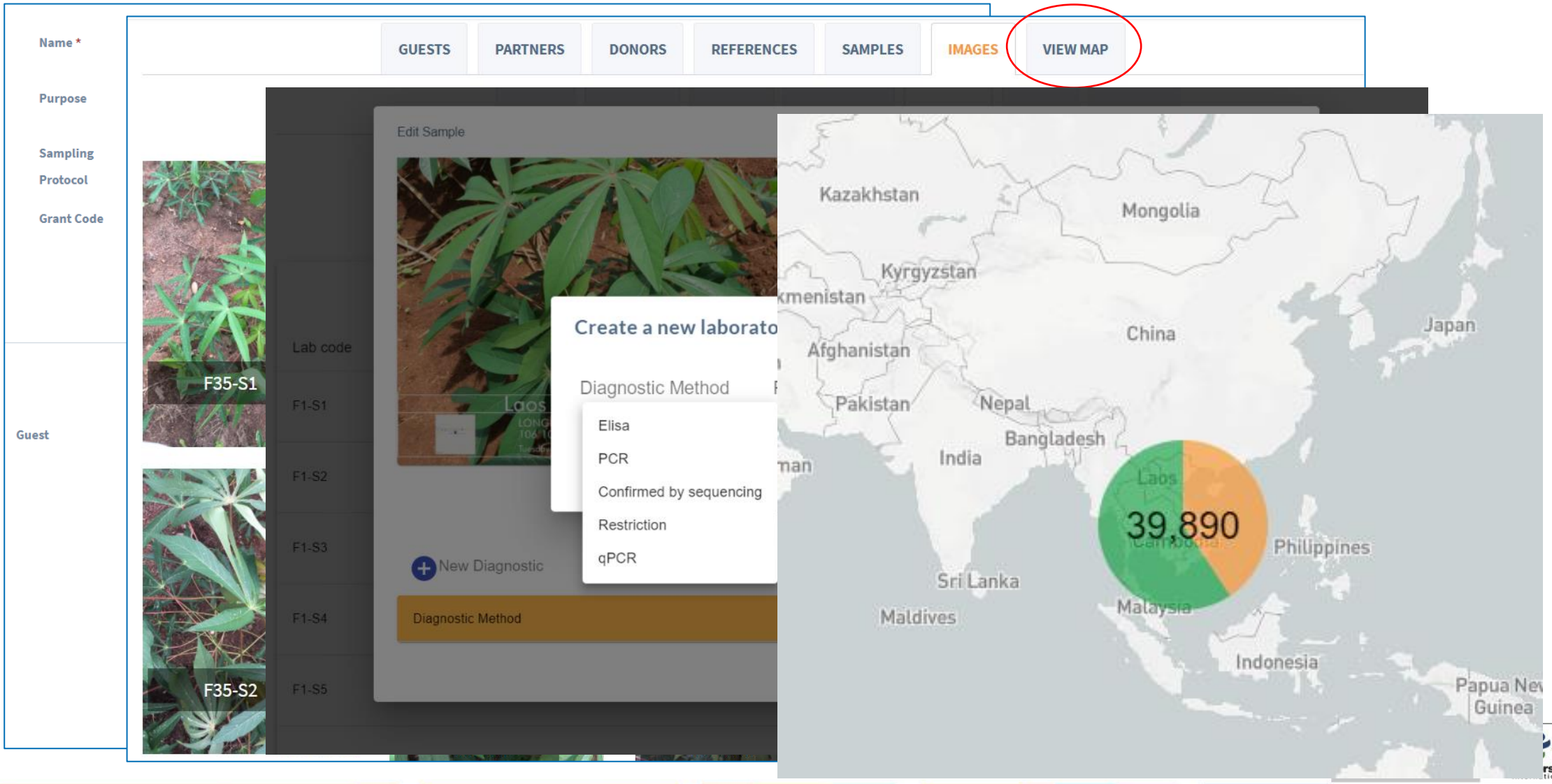
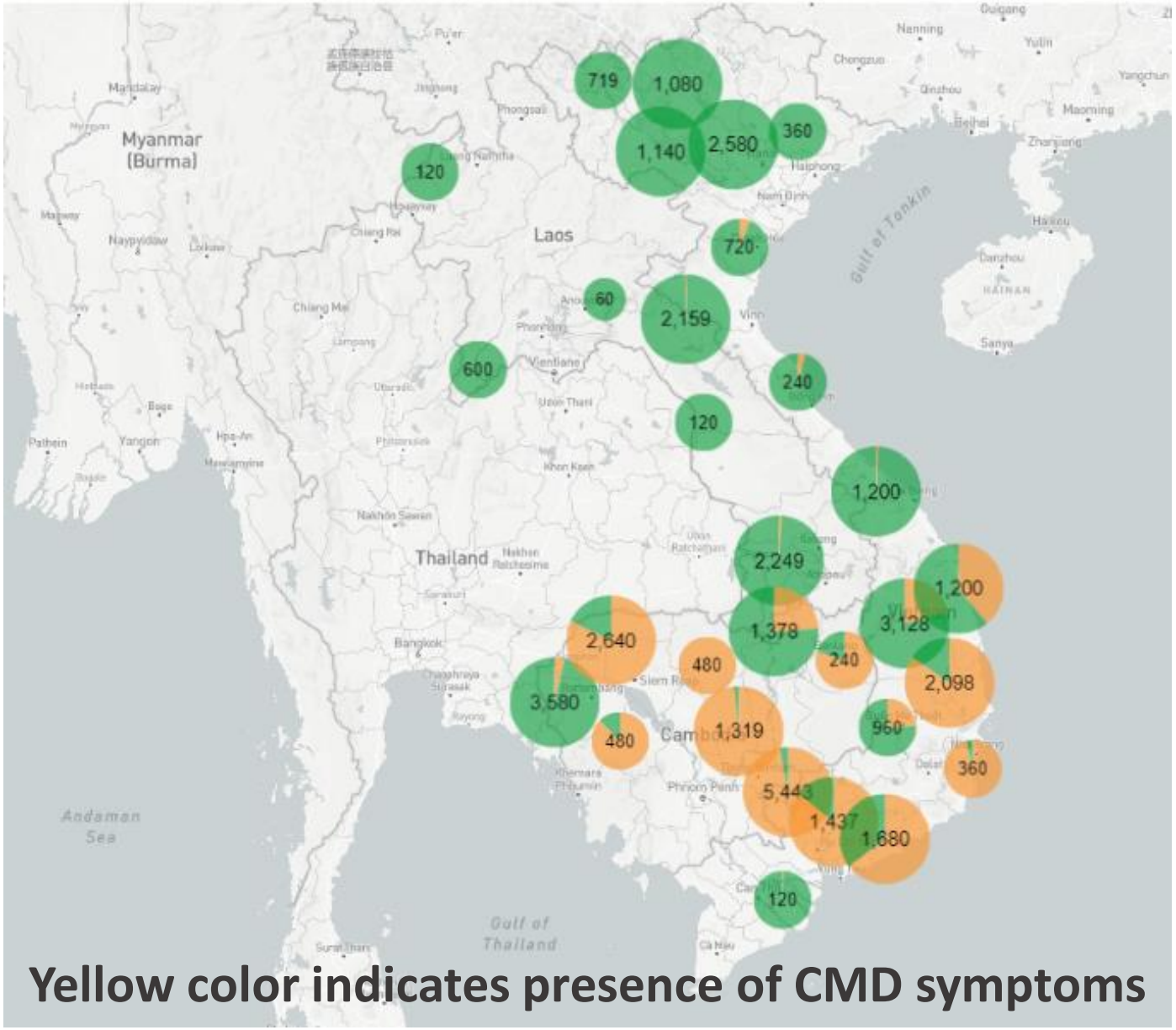


Surveillance

- 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.



Yellow color indicates presence of CMD symptoms

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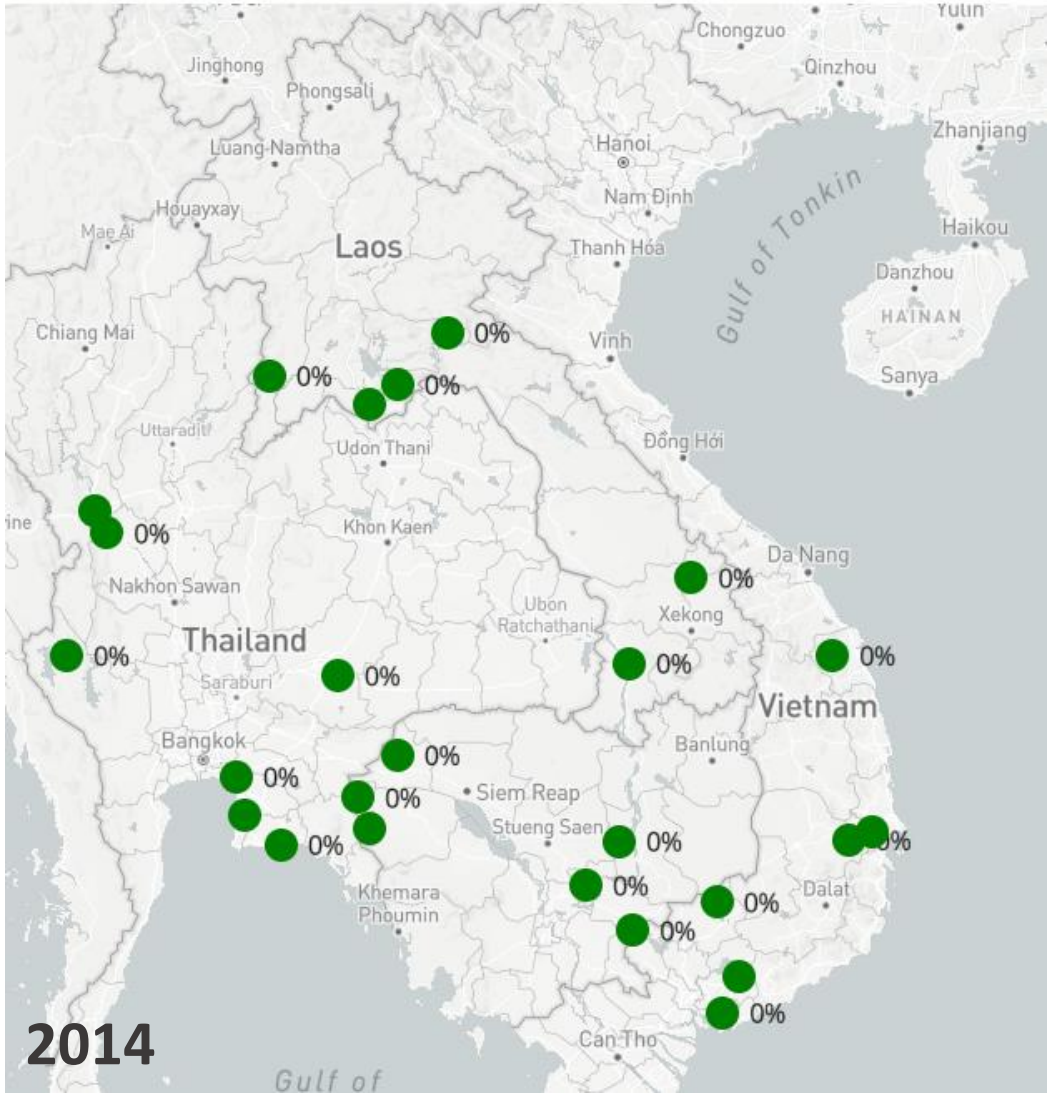
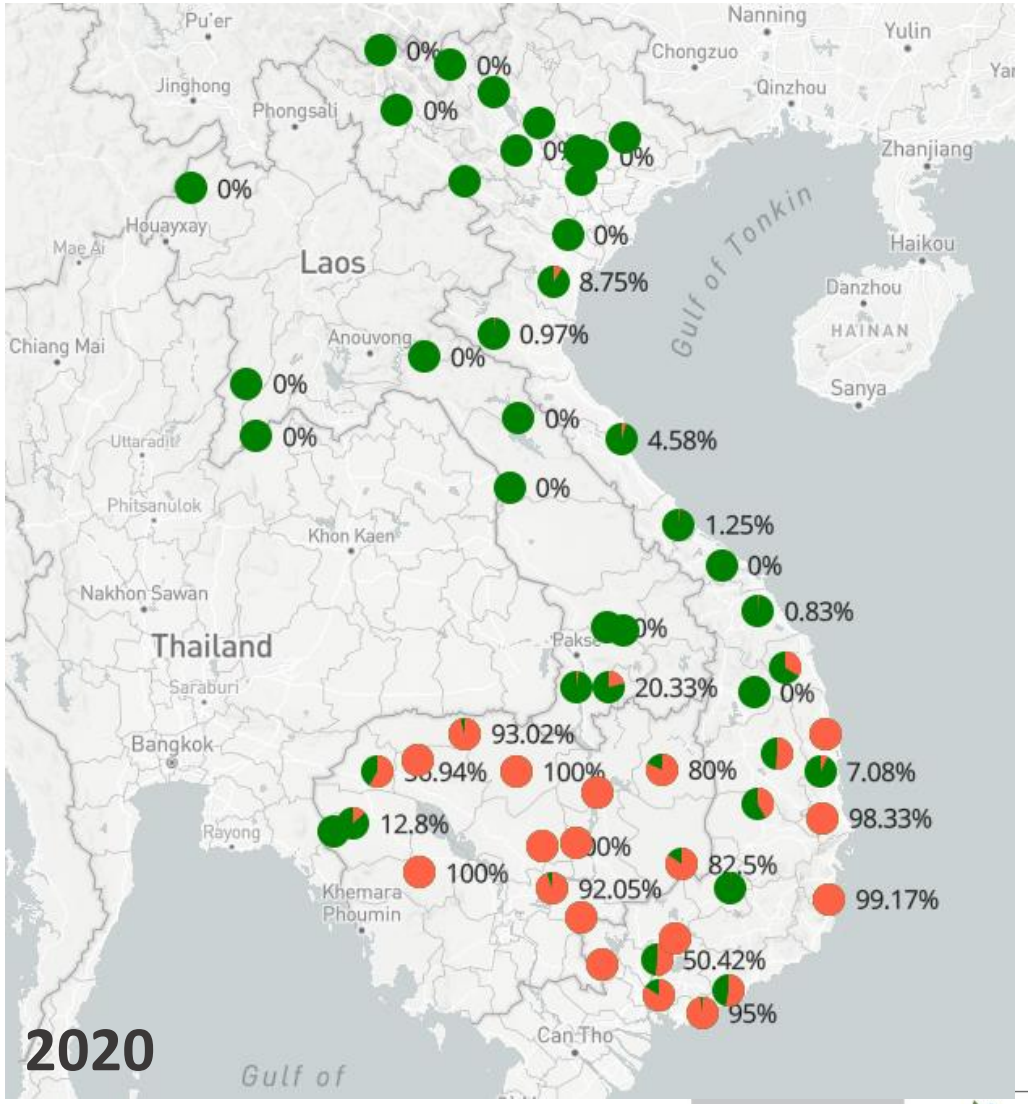
https://pestdisplace.org/projects/PDP_00063/provinces/map#3.44/18.47/103.34

Incidence maps (Province level): CMD



Transect sampling, 50 observations per field; 3-5 months plants

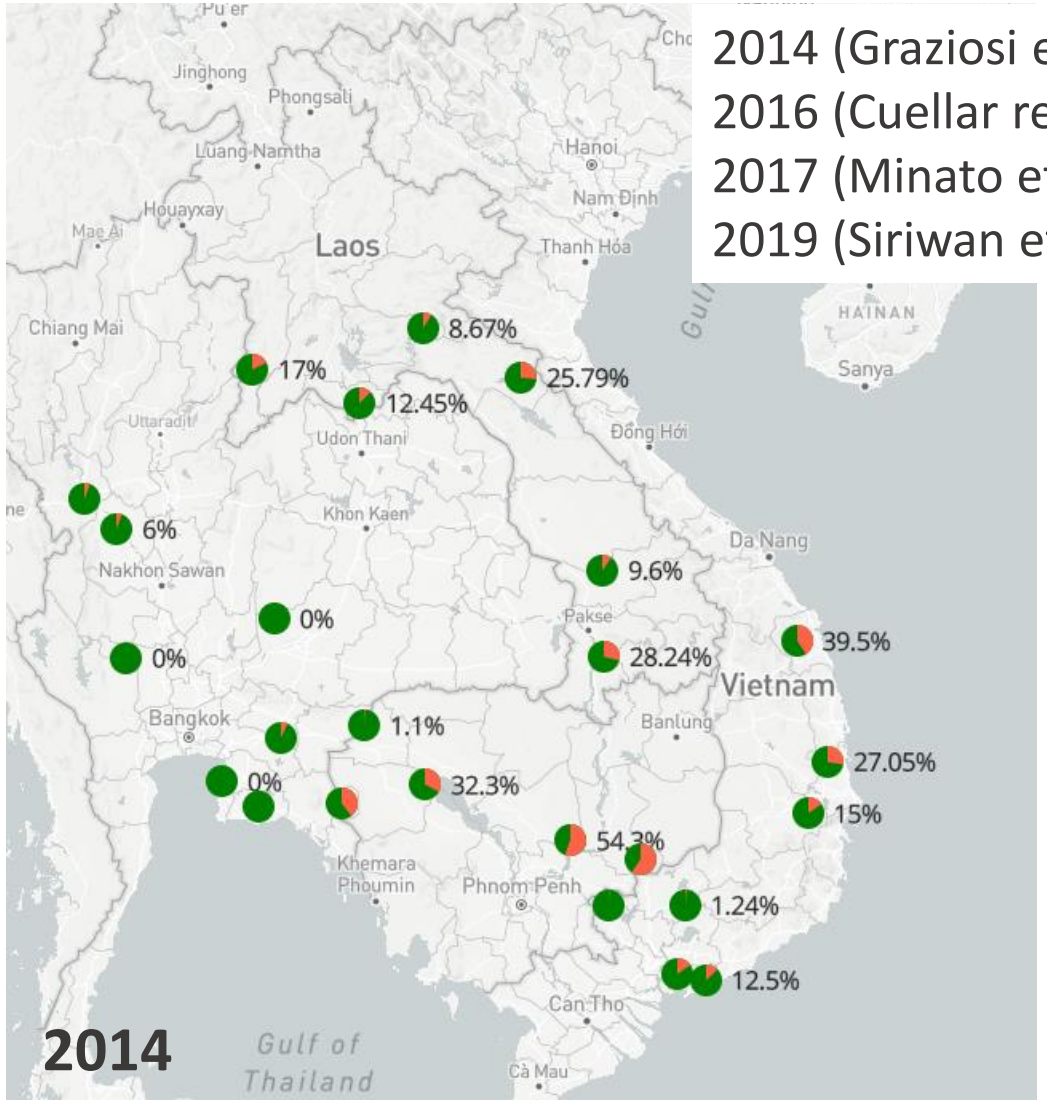


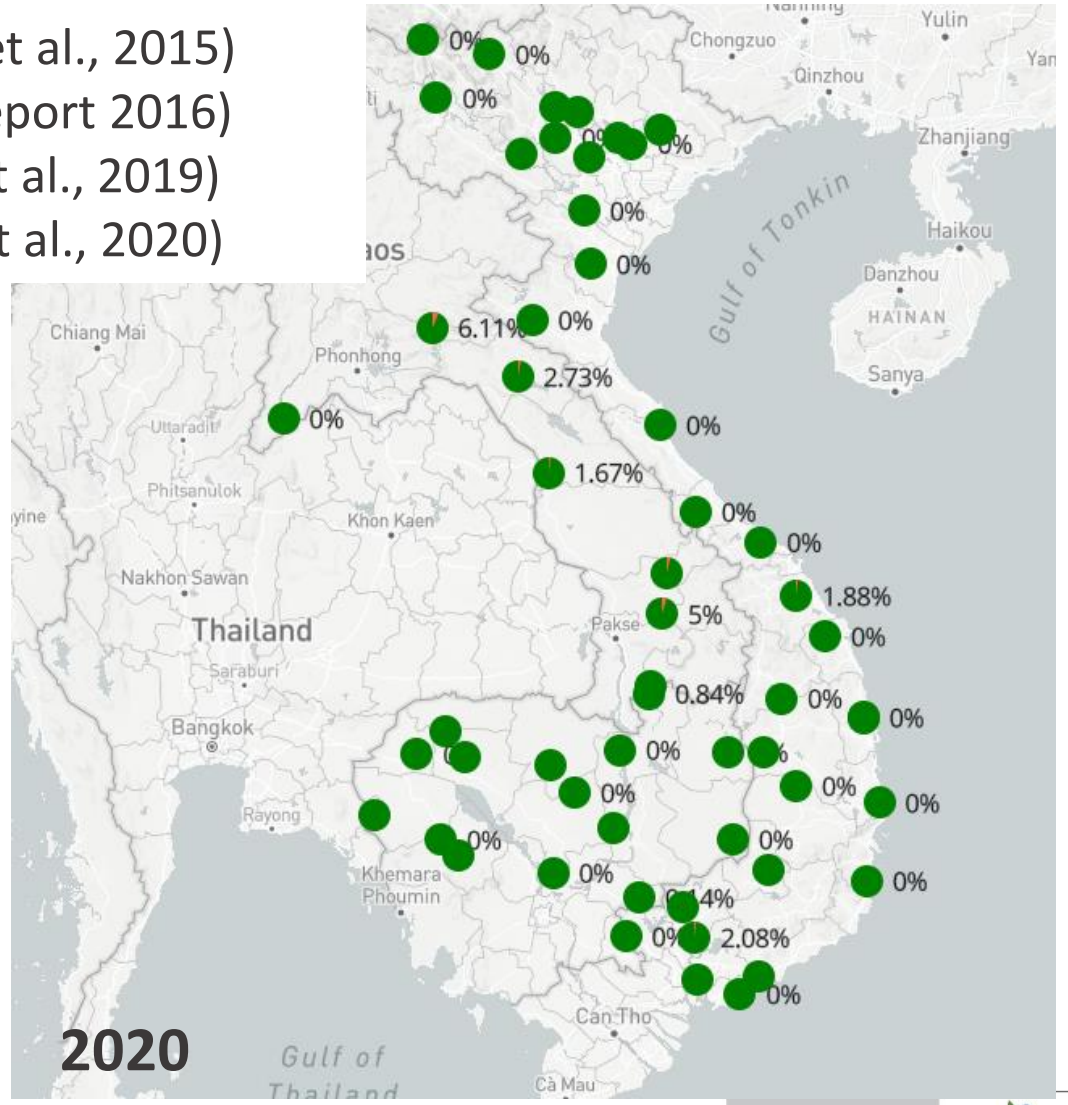
Transect sampling, 60 observations per field; 4-6 months plants

Incidence maps (Province level): CWBD

https://pestdisplace.org/projects/PDP_00062/provinces/map#5.5/14.447/104.163

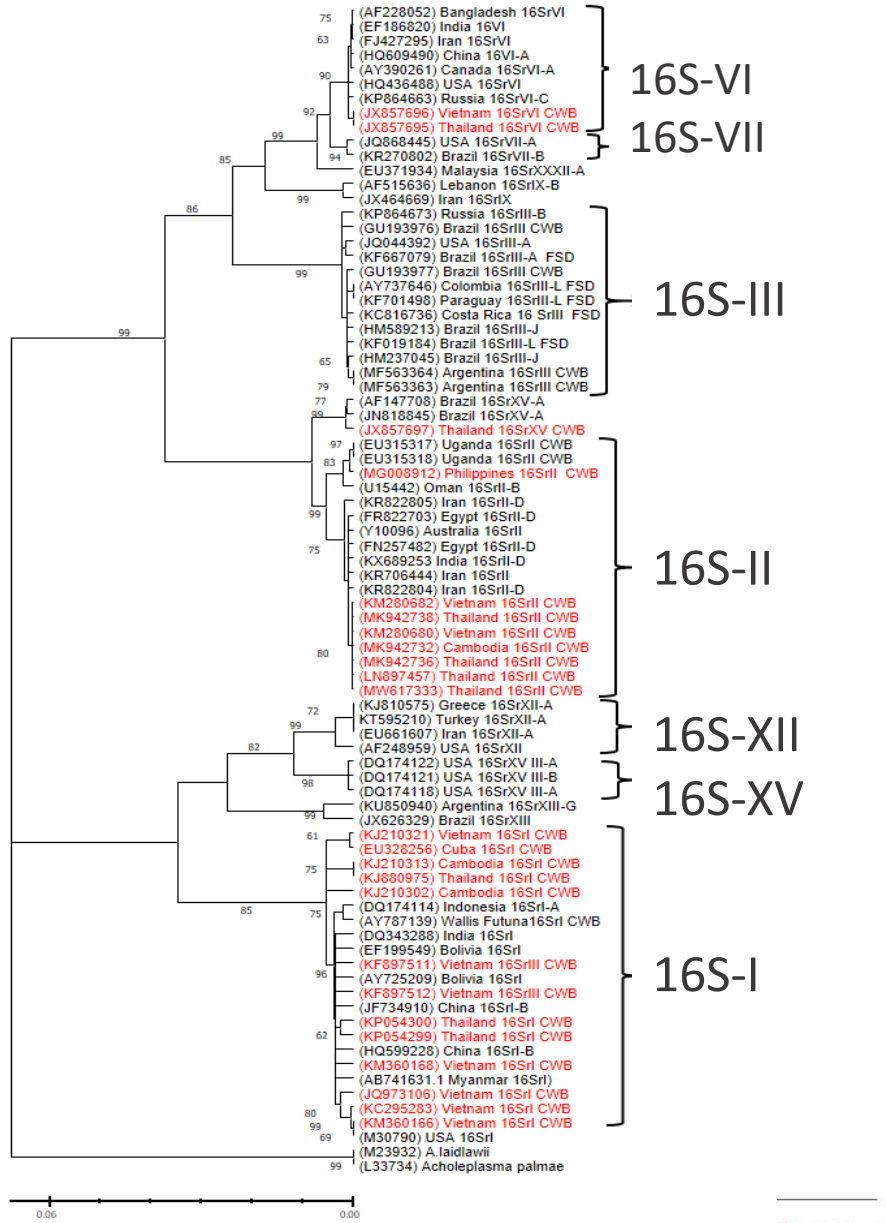
2014 (Graziosi et al., 2015)
2016 (Cuellar report 2016)
2017 (Minato et al., 2019)
2019 (Siriwan et al., 2020)





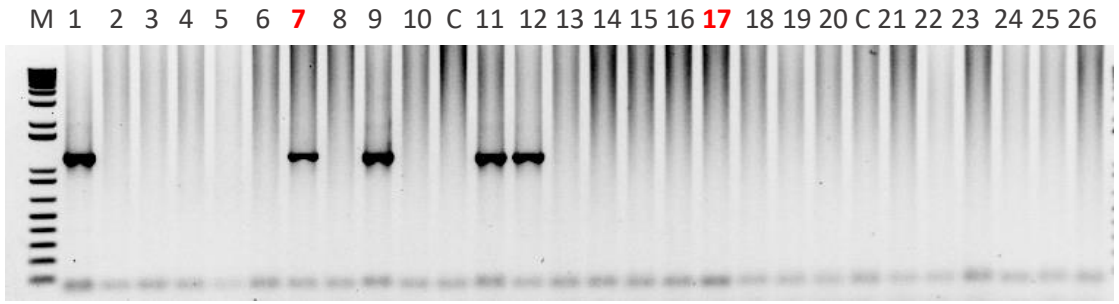
Diversity of phytoplasmas sequences in SEA

- 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 protocolos for detection of CWBD-associated phytoplasma

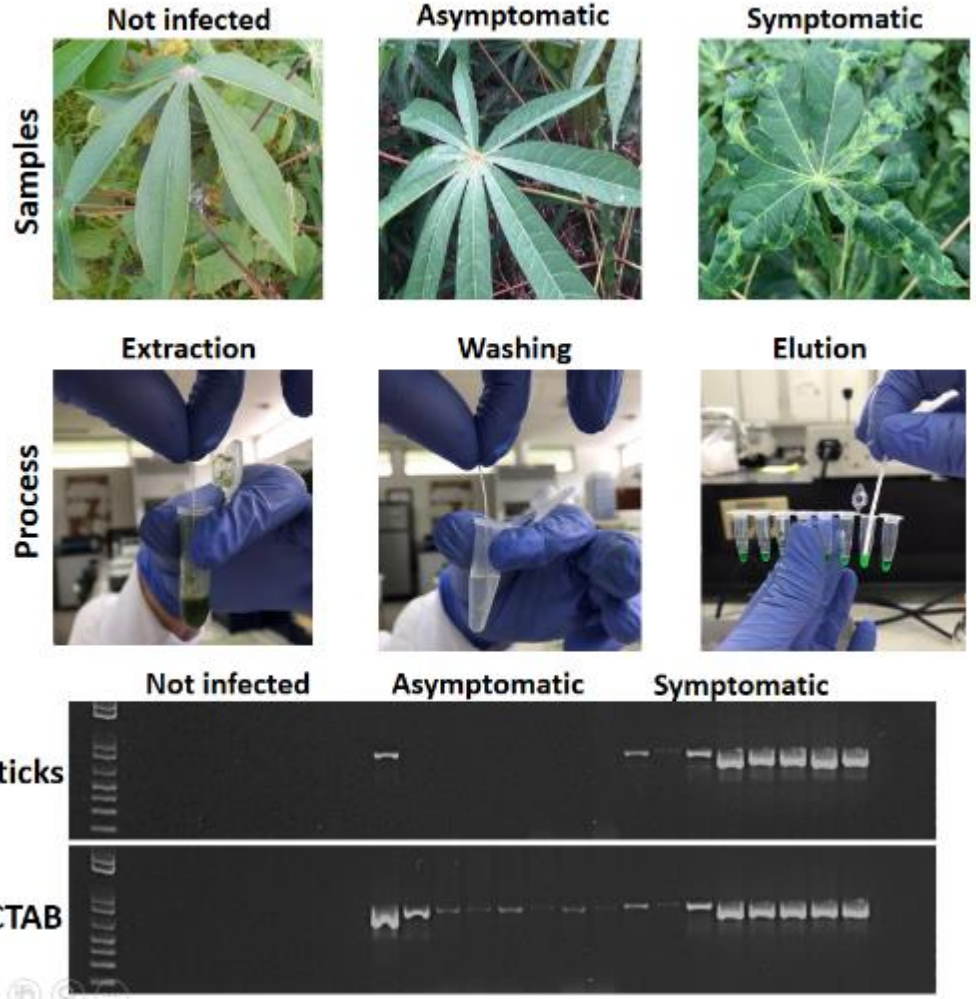


N=120	CWBD symptoms	No CWBD symptoms
PCR(+)	4	23
PCR (-)	13	80

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

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

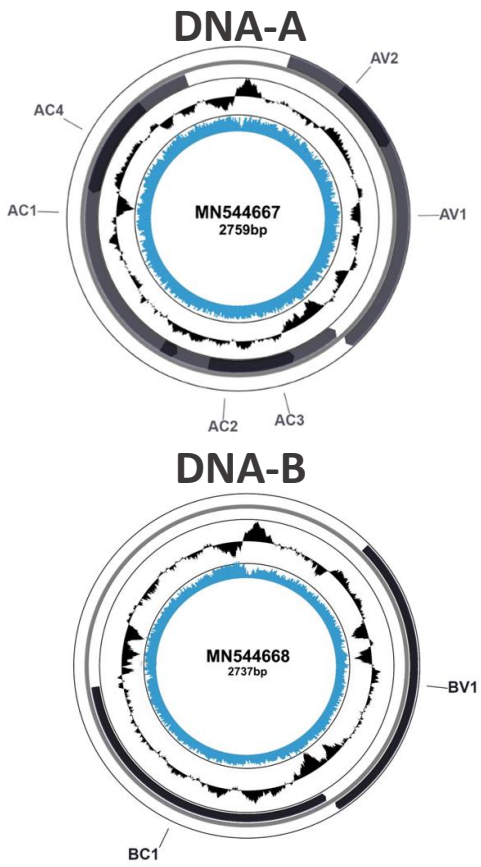


Coffee cup droid

UQueensland

Nanopore

Genome analysis



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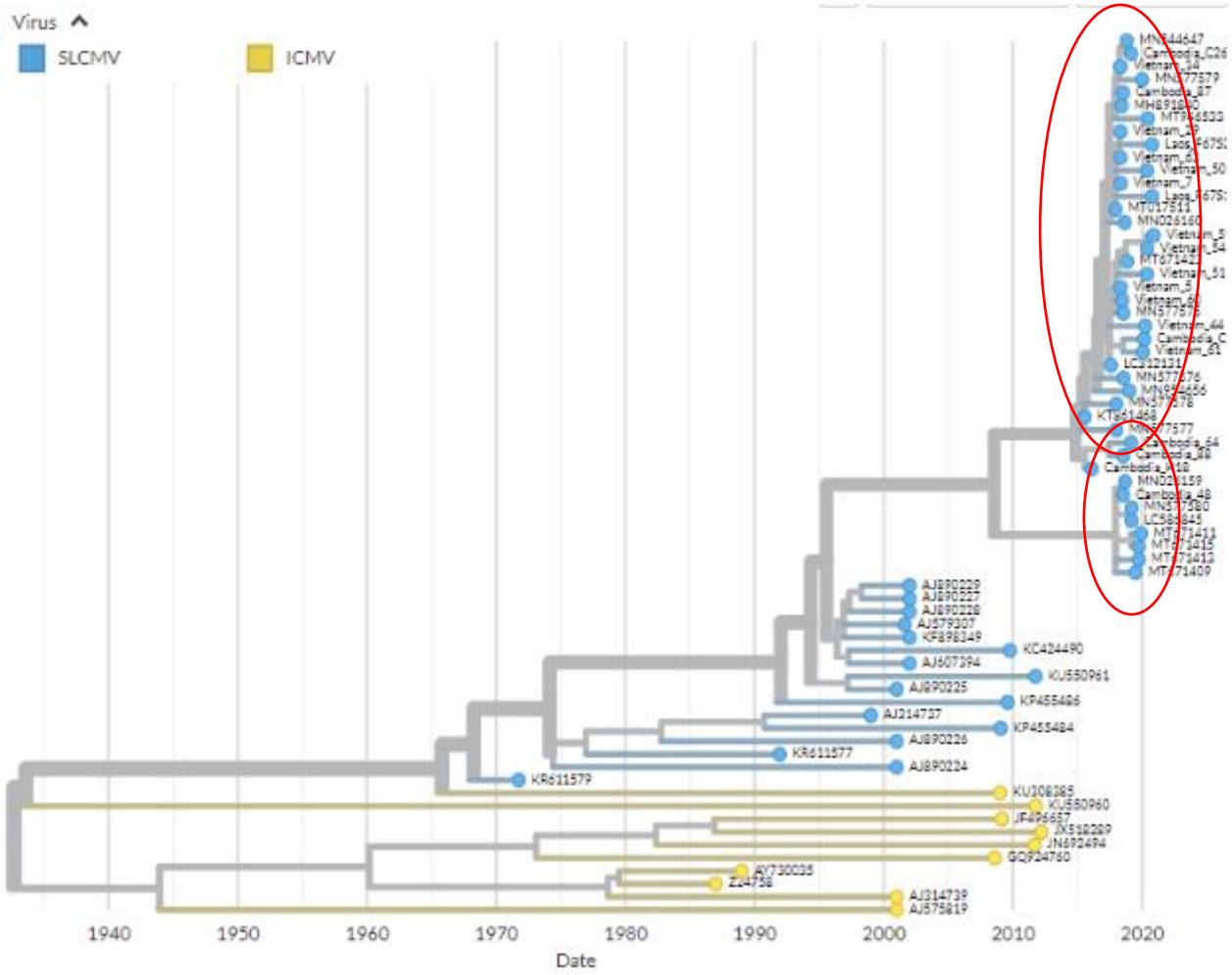
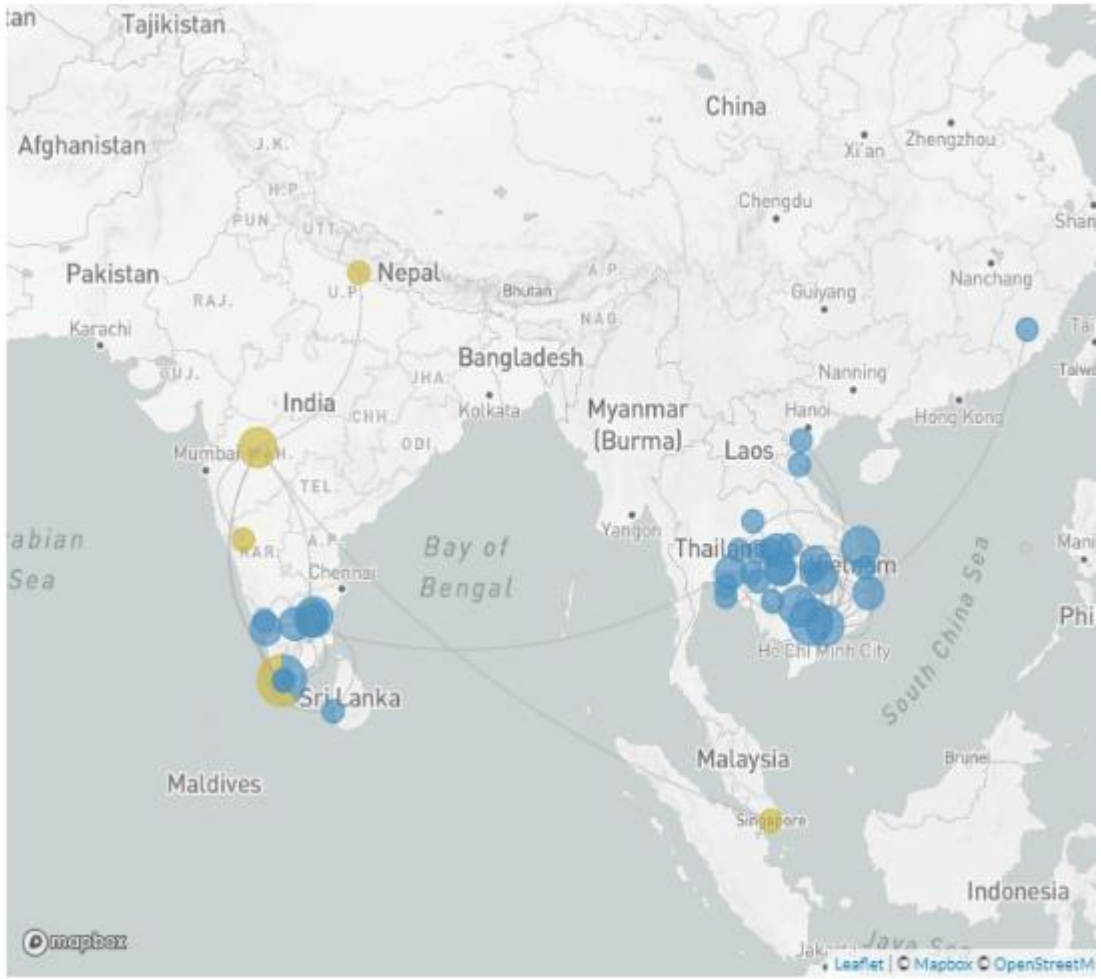
Genome analysis of SLCMV

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





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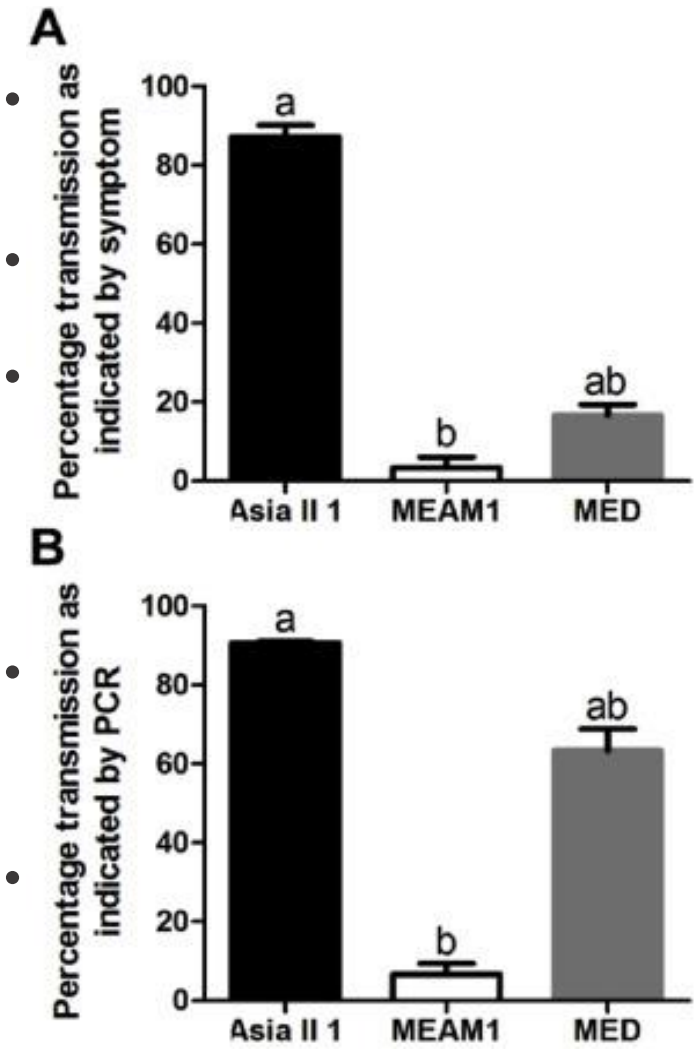
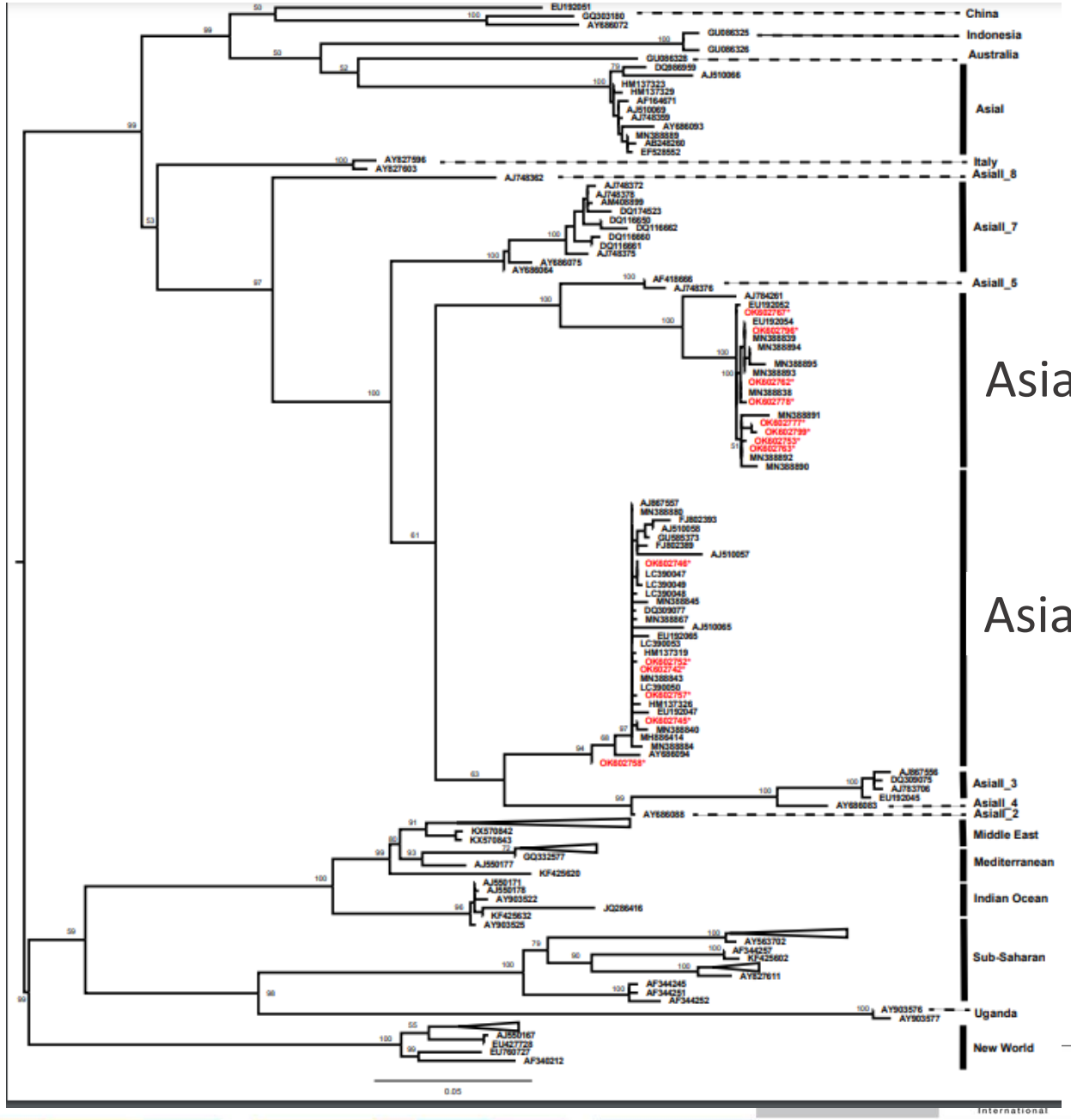
Whiteflies (WF)



Chi et al., 2020

WF Surveys in Laos and Vietnam



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

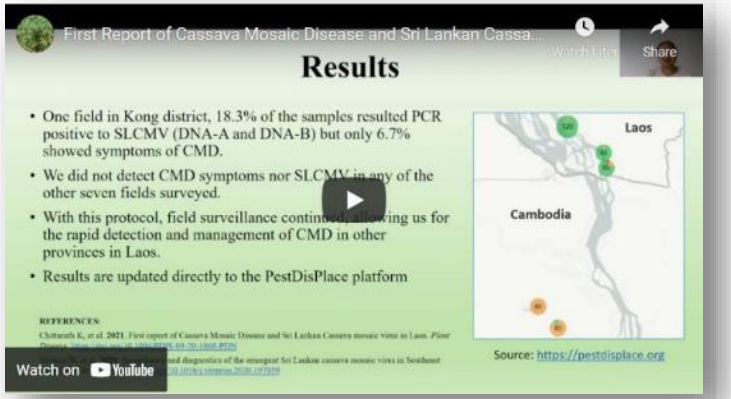
- **Khonesavanne Chittarath and Pinkham Vongphachanh**

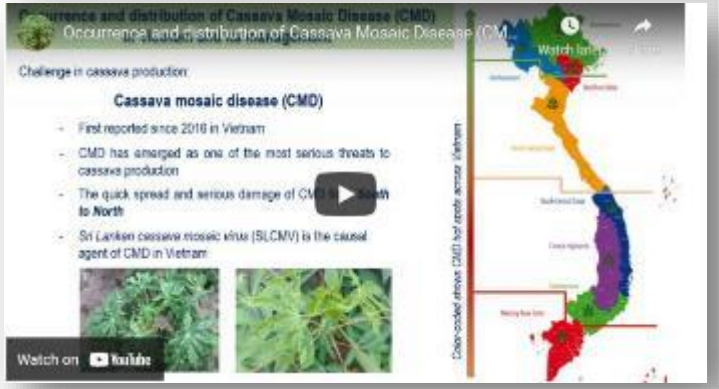
  PPC – Lao PDR

- **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





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/ -

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