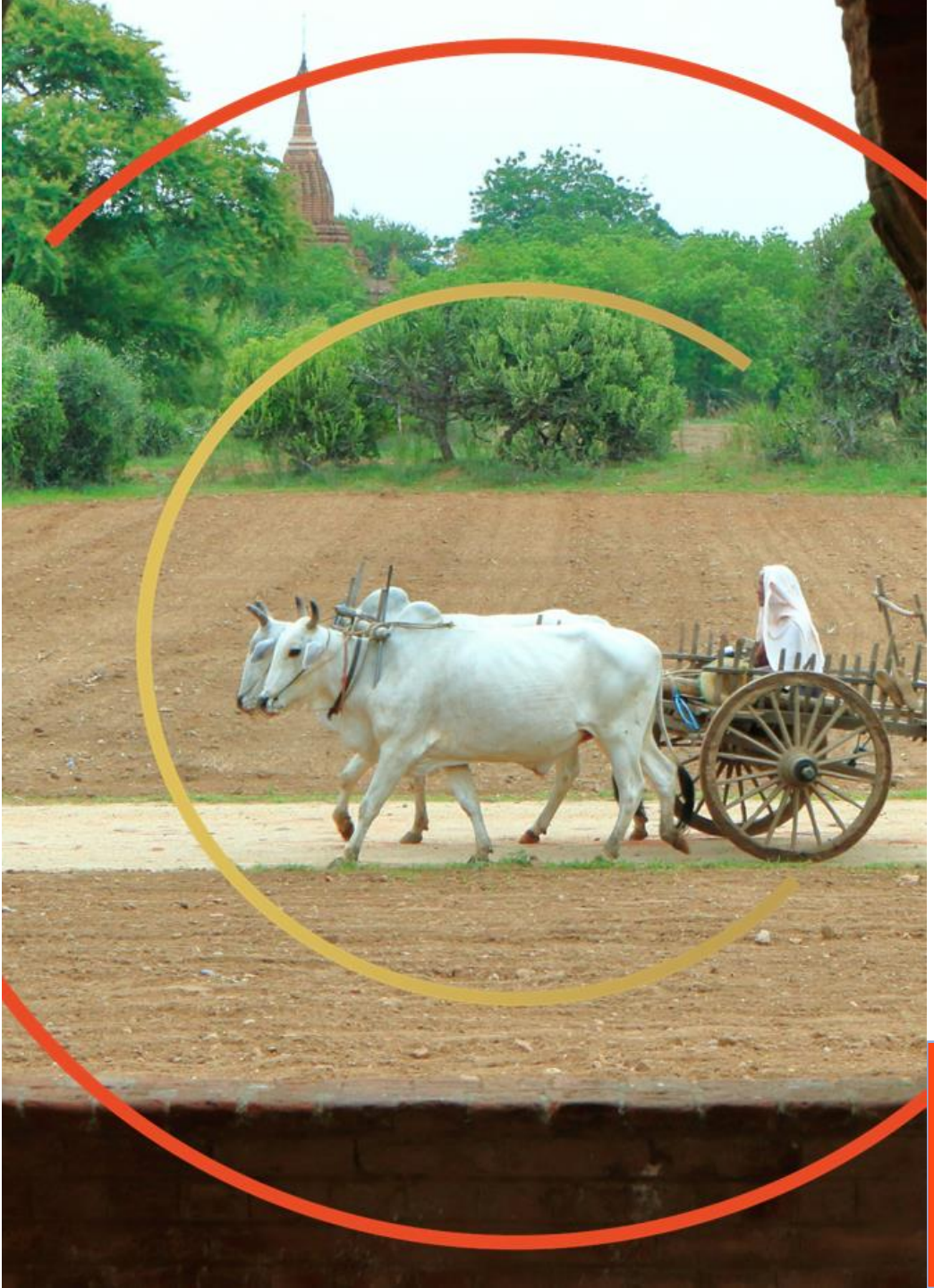


World Organisation for Animal Health

SEACFMD

# Regional FMD updates

Bolortuya Purevsuren
Animal health officer
WOAH SRRSEA

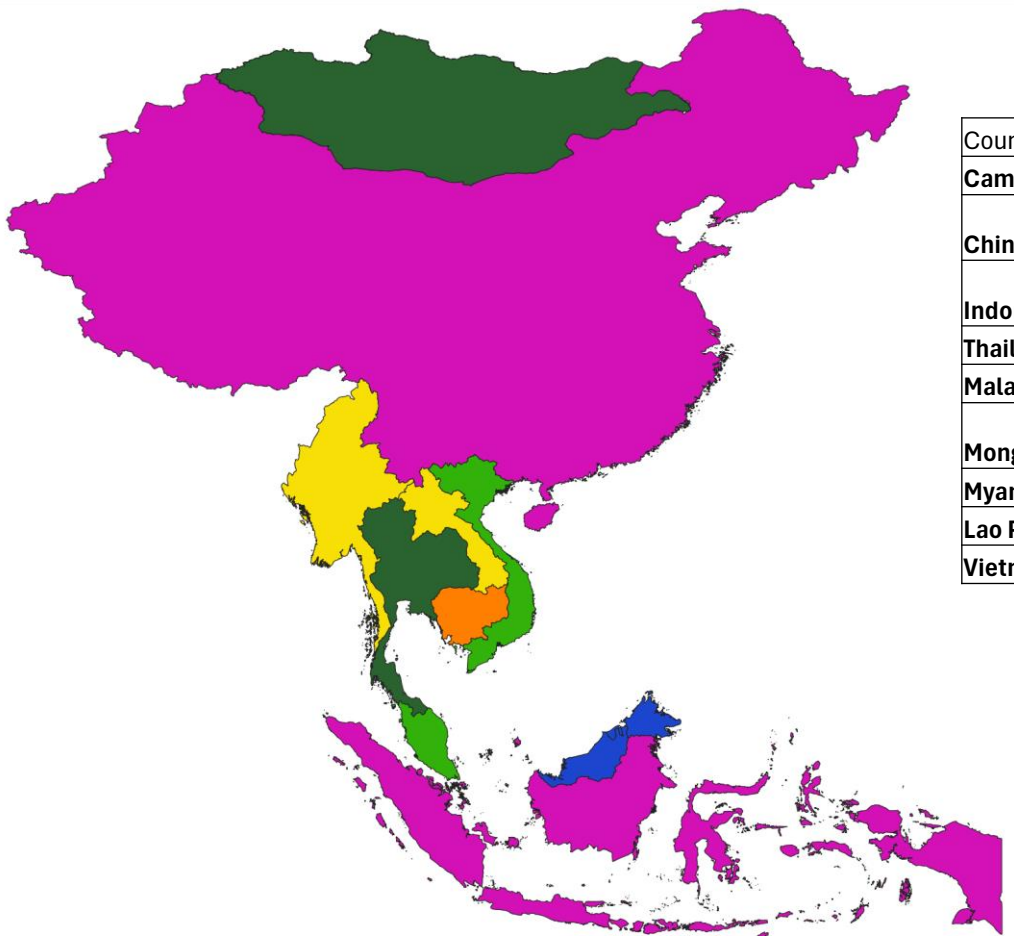
**27th SEACFMD National Coordinators Meeting**

20 – 22 August 2025, Luang Prabang, Lao PDR

# Outline

- Regional FMD situation
- Ongoing Projects and studies
- Conclusion /Discussion

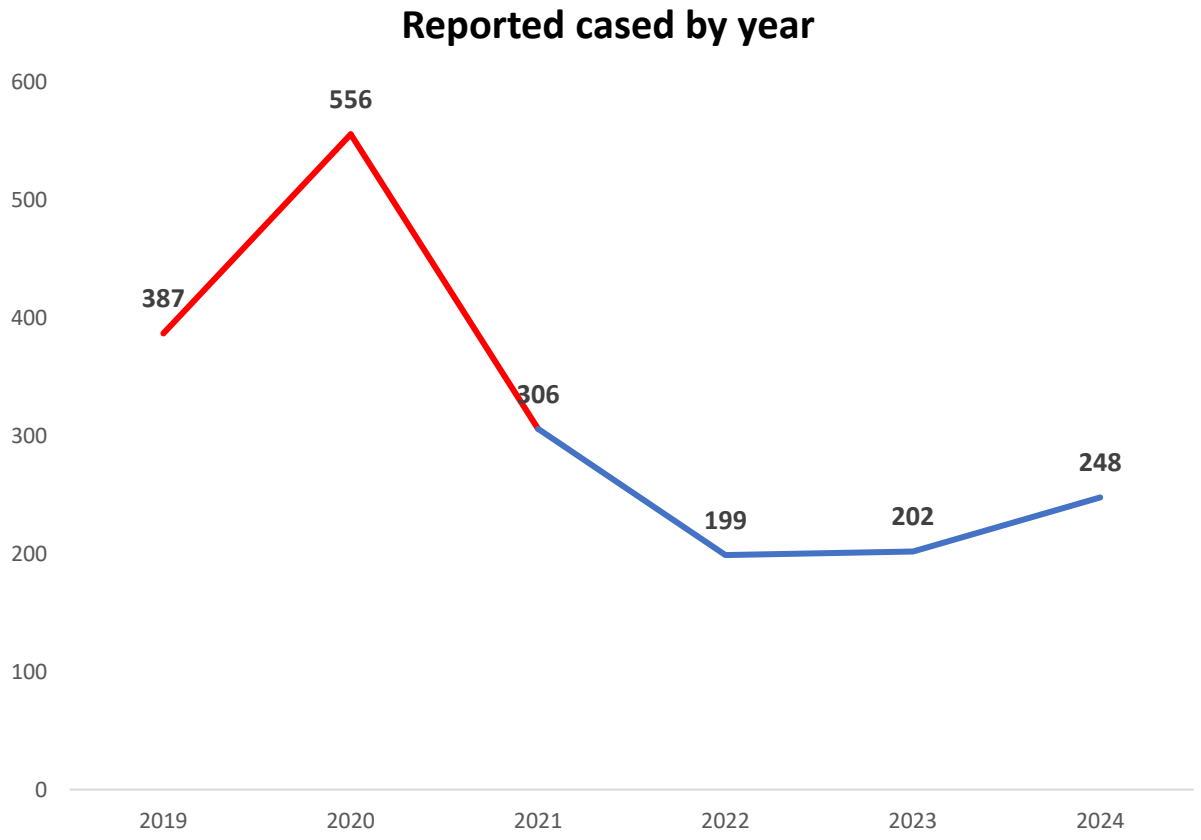
# Regional FMD situation



| Country | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cambodia** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **China** | OCP | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | No status | No status |
| **Indonesia** | free | free | free | free | free | free | free | No status | No status | No status | No status |
| **Thailand** | 3 | OCP | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| **Malaysia** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **Mongolia** | 3 | OCP | 4 | 4 | 4 | 4 | 4 | 4 | No status | No status | OCP |
| **Myanmar** | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Lao PDR** | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Vietnam** | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

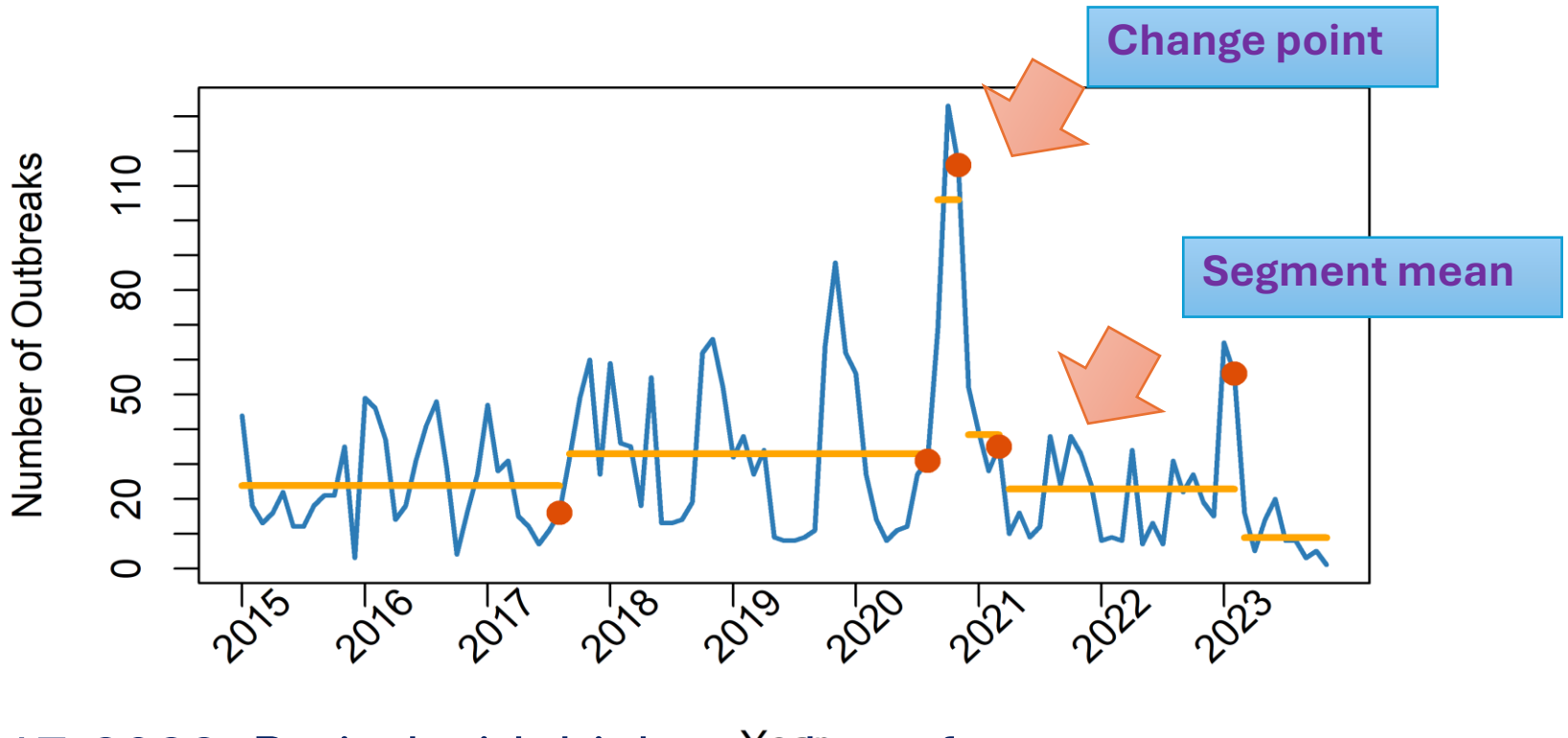
Mongolia FMD National plan has been endorsed May 2025, regained PCP stage 4

# FMD outbreak reported in 2019-2024




| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|
| Cambodia | 32 | 248 | 36 | | 37 | 46 |
| China | 6 | 4 | 3 | 1 | 4 | 3 |
| Indonesia | | | | 50 | 119 | 111 |
| LaoPDR | 63 | 55 | 0 | 0 | 0 | 0 |
| Malaysia | 39 | 52 | 26 | 13 | 8 | 15 |
| Mongolia | 0 | 0 | 101 | 3 | 0 | 0 |
| Myanmar | 28 | 3 | 4 | 0 | 0 | 5 |
| Thailand | 194 | 218 | 47 | 110 | 16 | 2 |
| Vietnam | 25 | 31 | 89 | 22 | 19 | 66 |

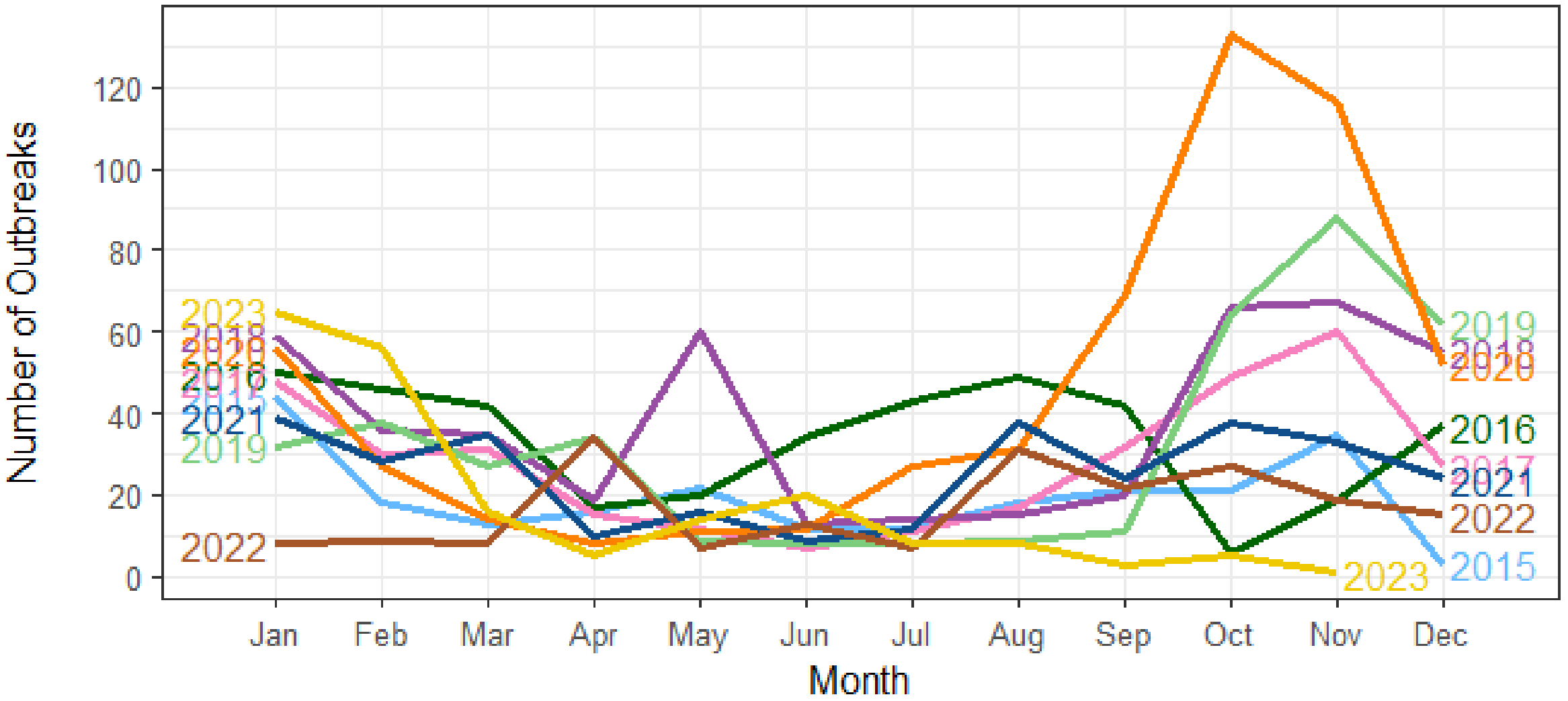
# Temporal trend and changepoints




- 2017-2022: Period with high number of reports
- 2021-2023: the number of reports was lower than 2017-2022
- Early 2023: Shift in the number of reports then the trend declined

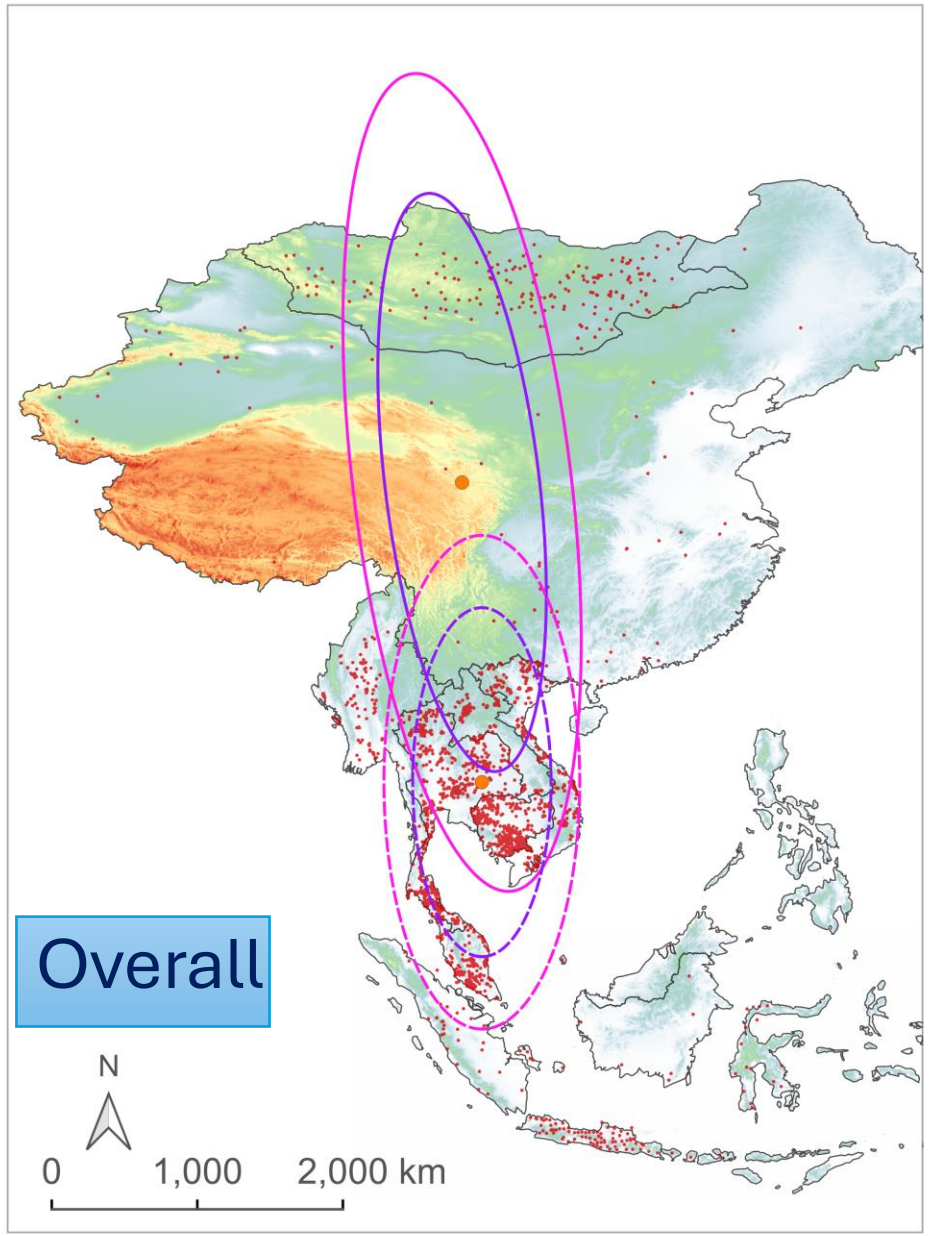
Source: Study on Epidemiological Characteristics, Temporal Change Points, and Space-Time Clusters of Foot and Mouth Disease Outbreaks in SEACFMD Region, Dr Veerasak Punyapornwithaya, Chiang Mai University

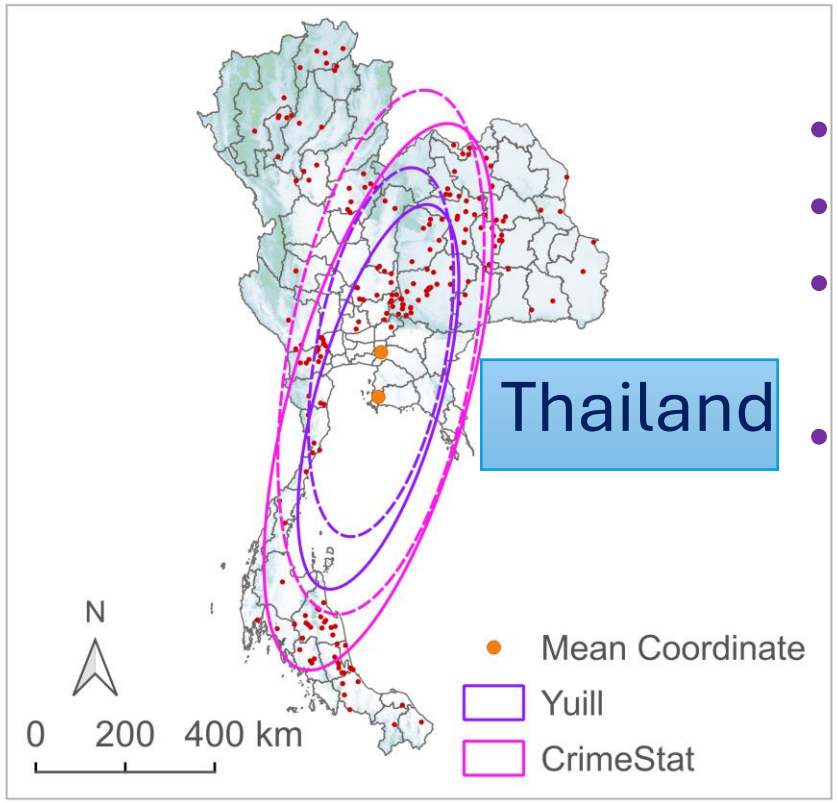
# Temporal pattern

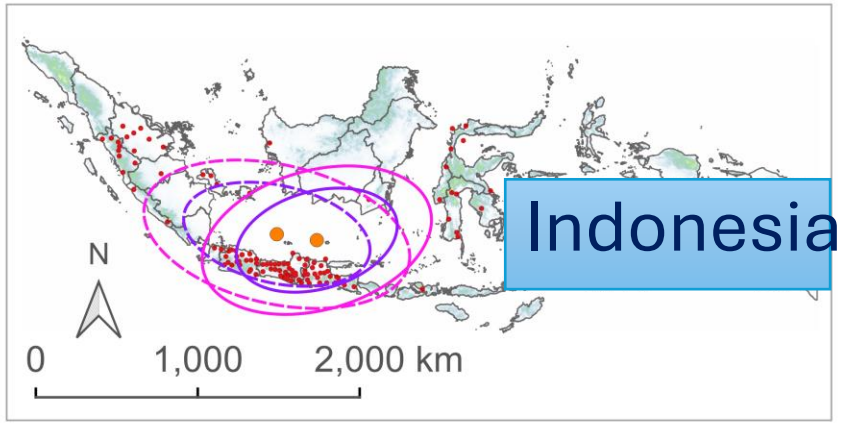



Source: Study on Epidemiological Characteristics, Temporal Change Points, and Space-Time Clusters of Foot and Mouth Disease Outbreaks in SEACFMD Region, Dr Veerasak Punyapornwithaya, Chiang Mai University

# Directional distribution of FMD outbreaks



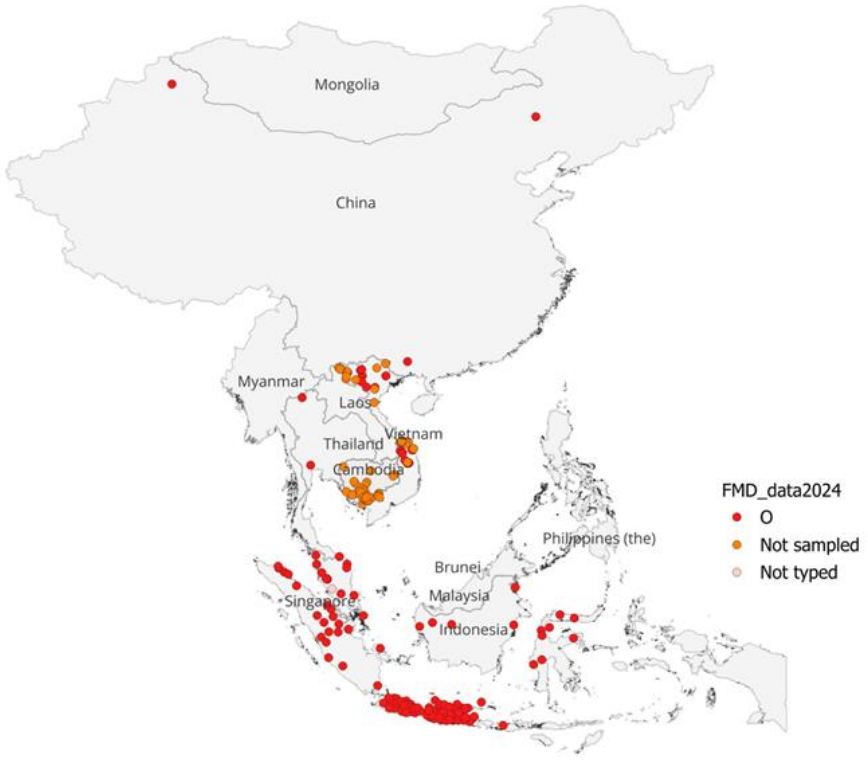



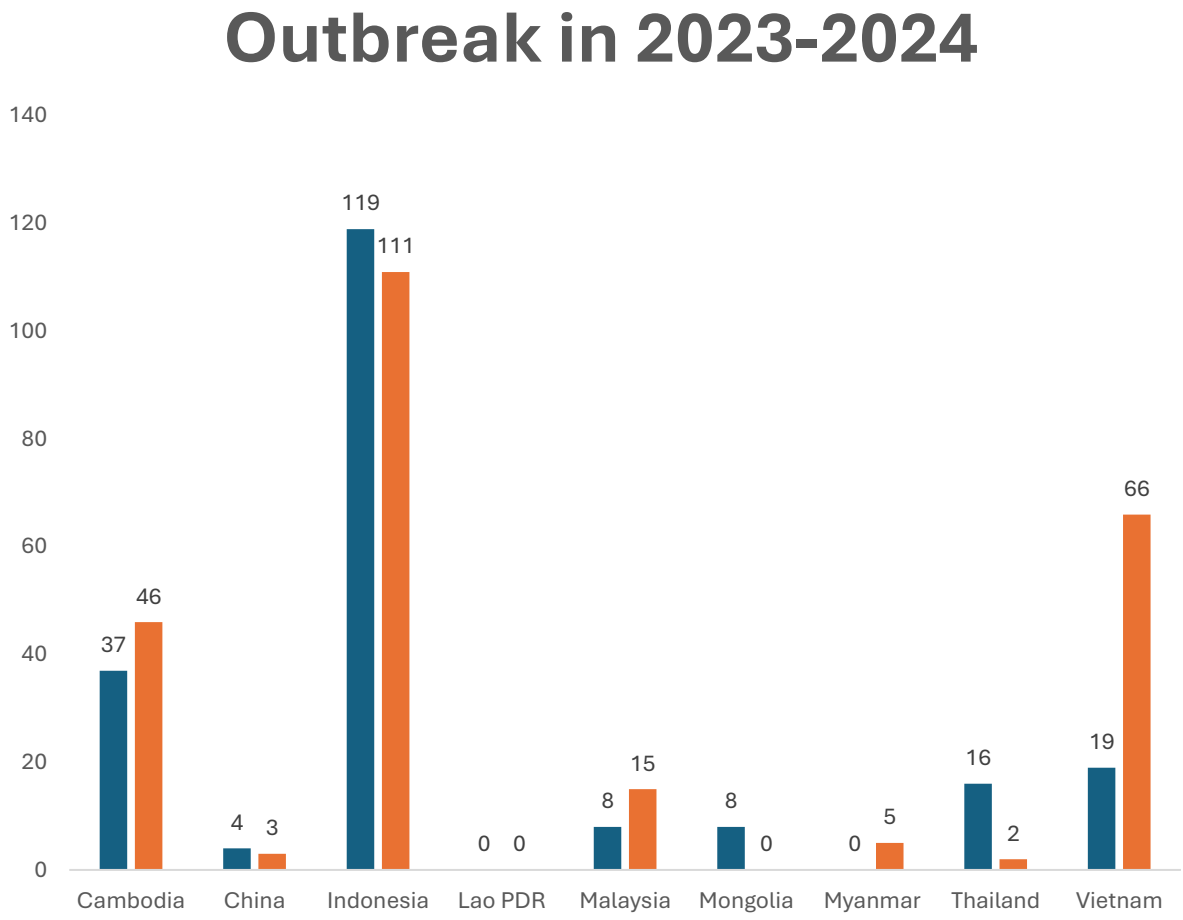




- Distribution direction
- Overall: North and south
- Thailand: North-East and South-East
- Indonesia: East and West

Source: Study on Epidemiological Characteristics, Temporal Change Points, and Space-Time Clusters of Foot and Mouth Disease Outbreaks in SEACFMD Region, Dr Veerasak Punyapornwithaya, Chiang Mai University

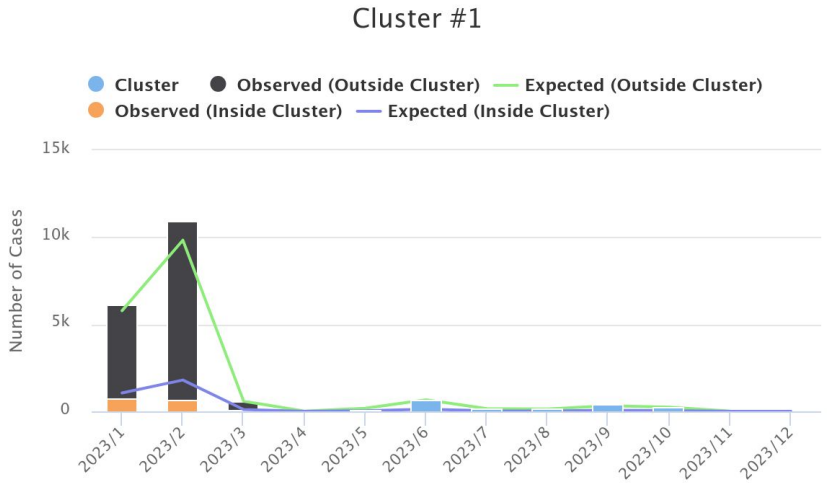
# FMD outbreak reported 2023-2024

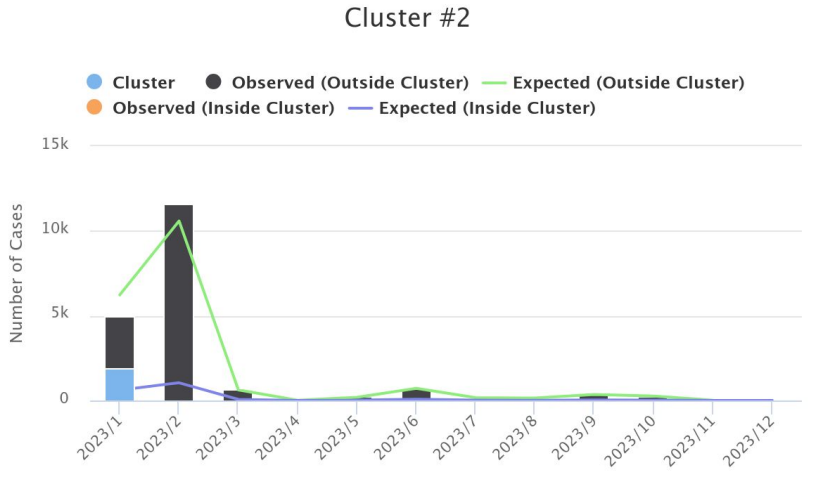


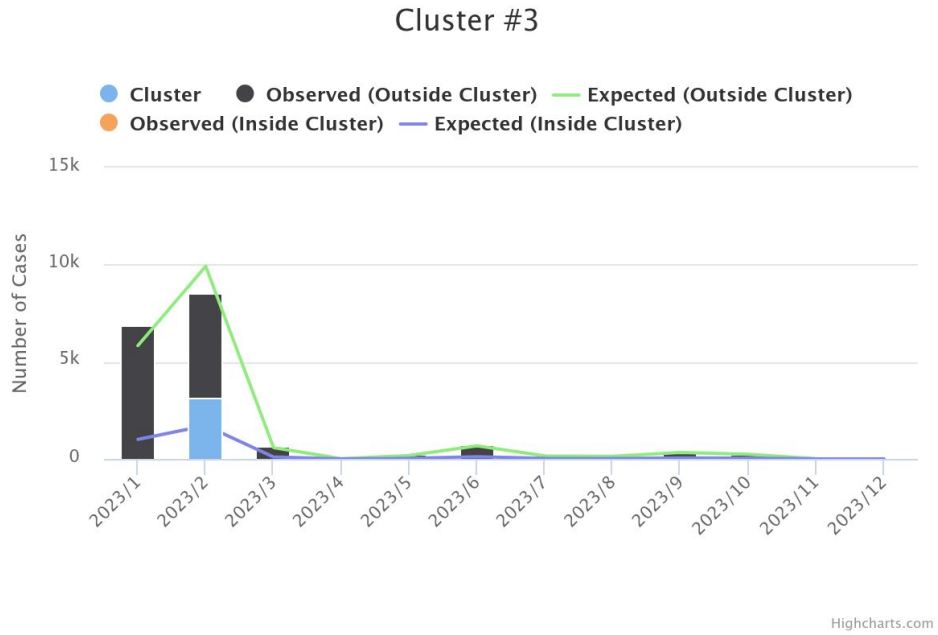



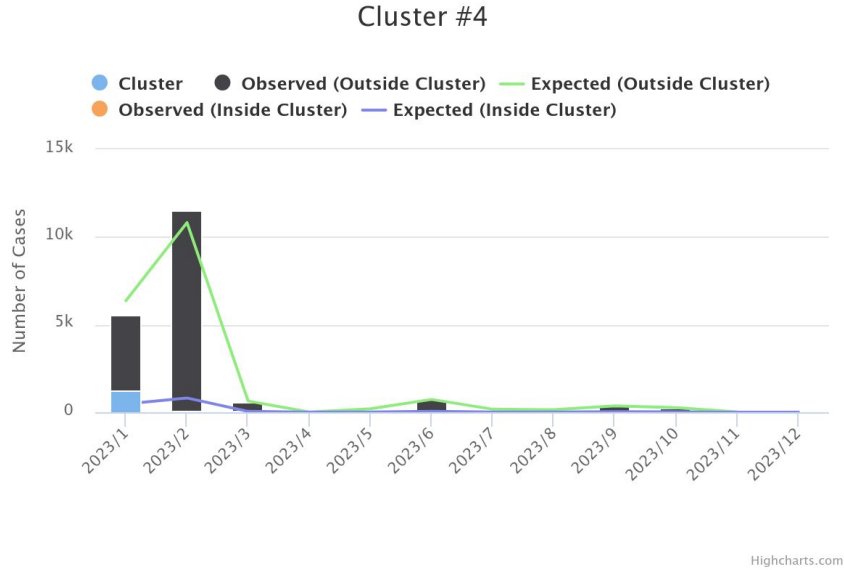
# Temporal analysis 2023

Cambodia,
Malaysia,
Thailand,
Vietnam

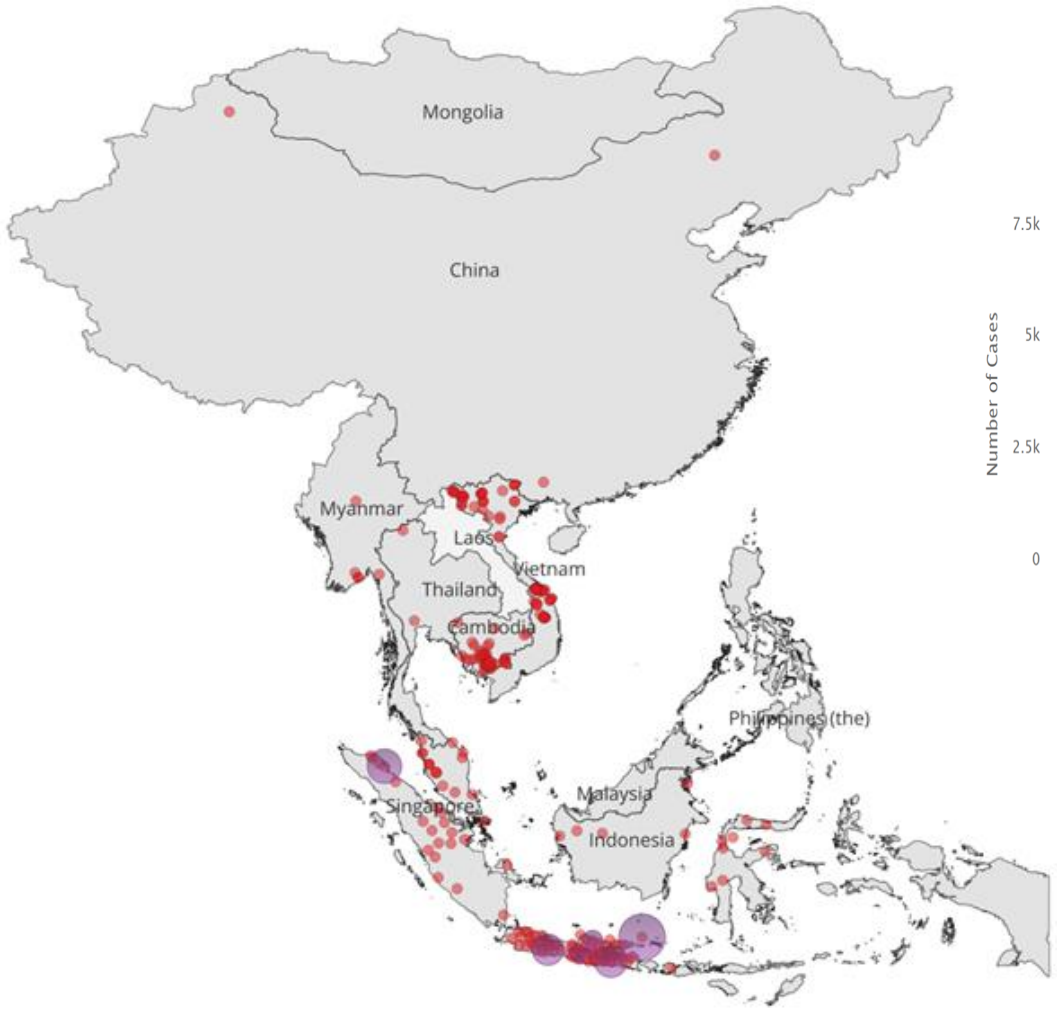


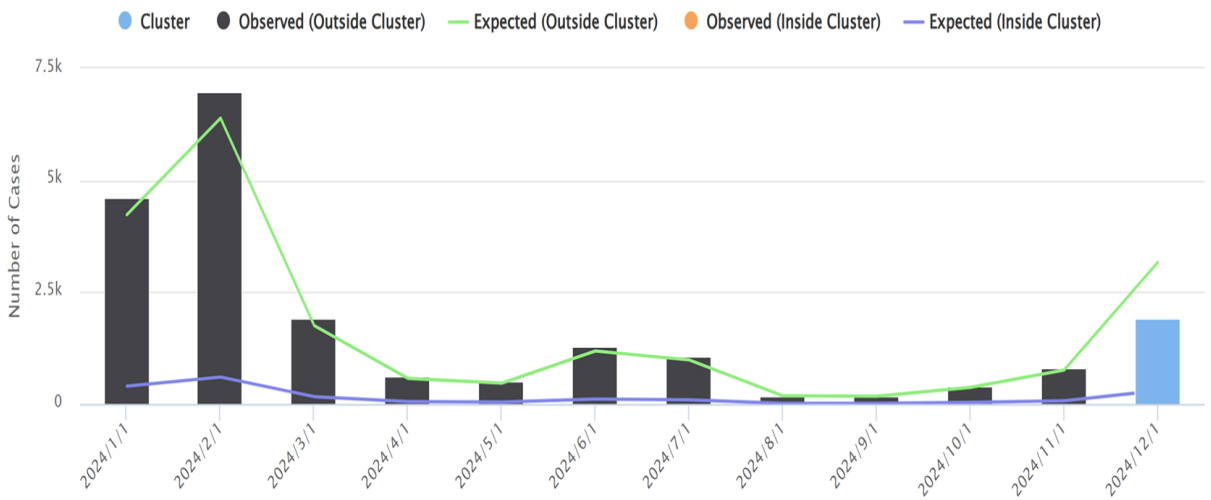



# Temporal analysis 2024



# Reported serotypes FMDV:

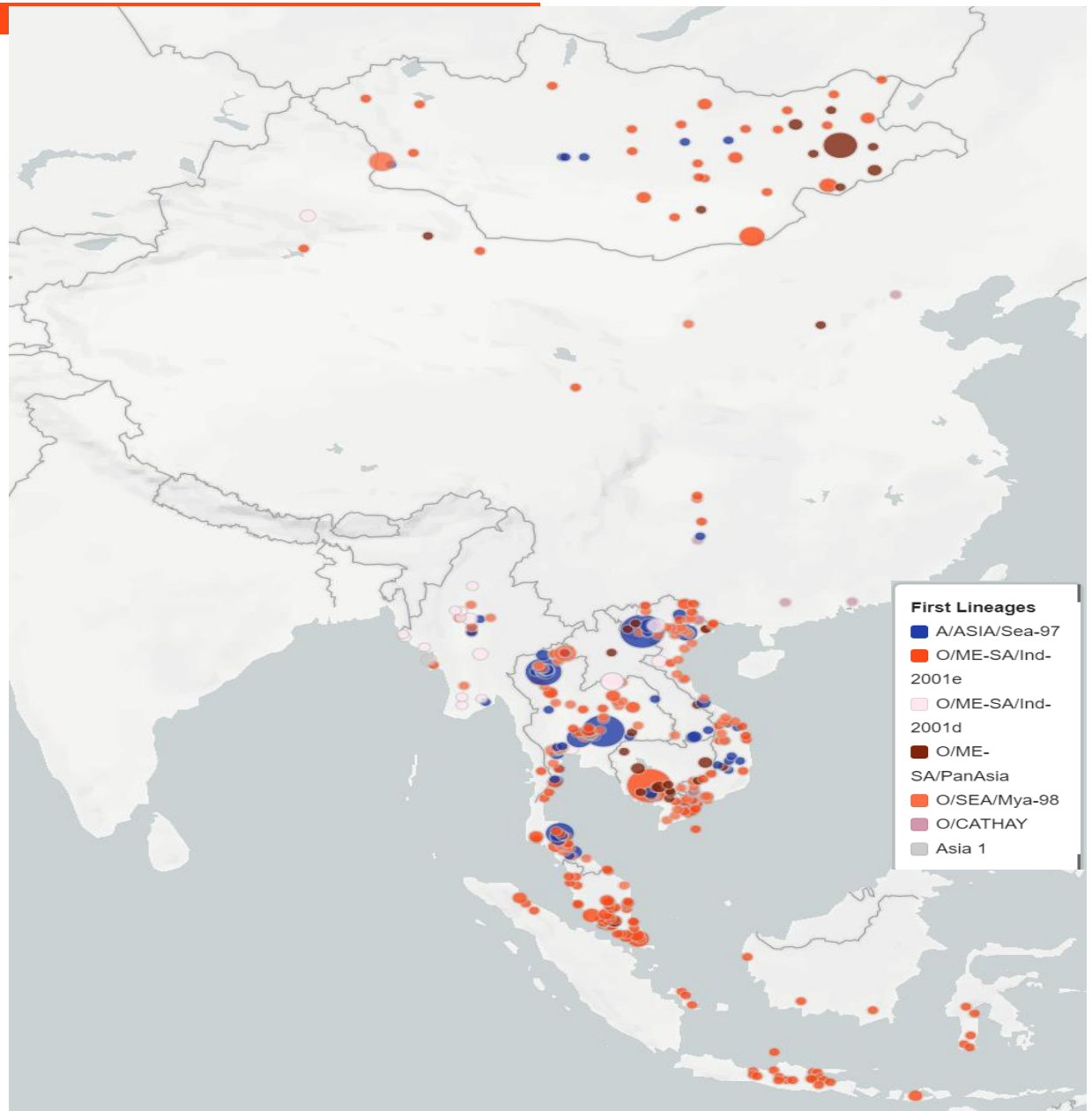
Serotype O:

- O/ME-SA/Ind2001e
- O/ME-SA/Ind2001d
- O/ME-SA/Pan Asia
- O/SEA/Mya-98

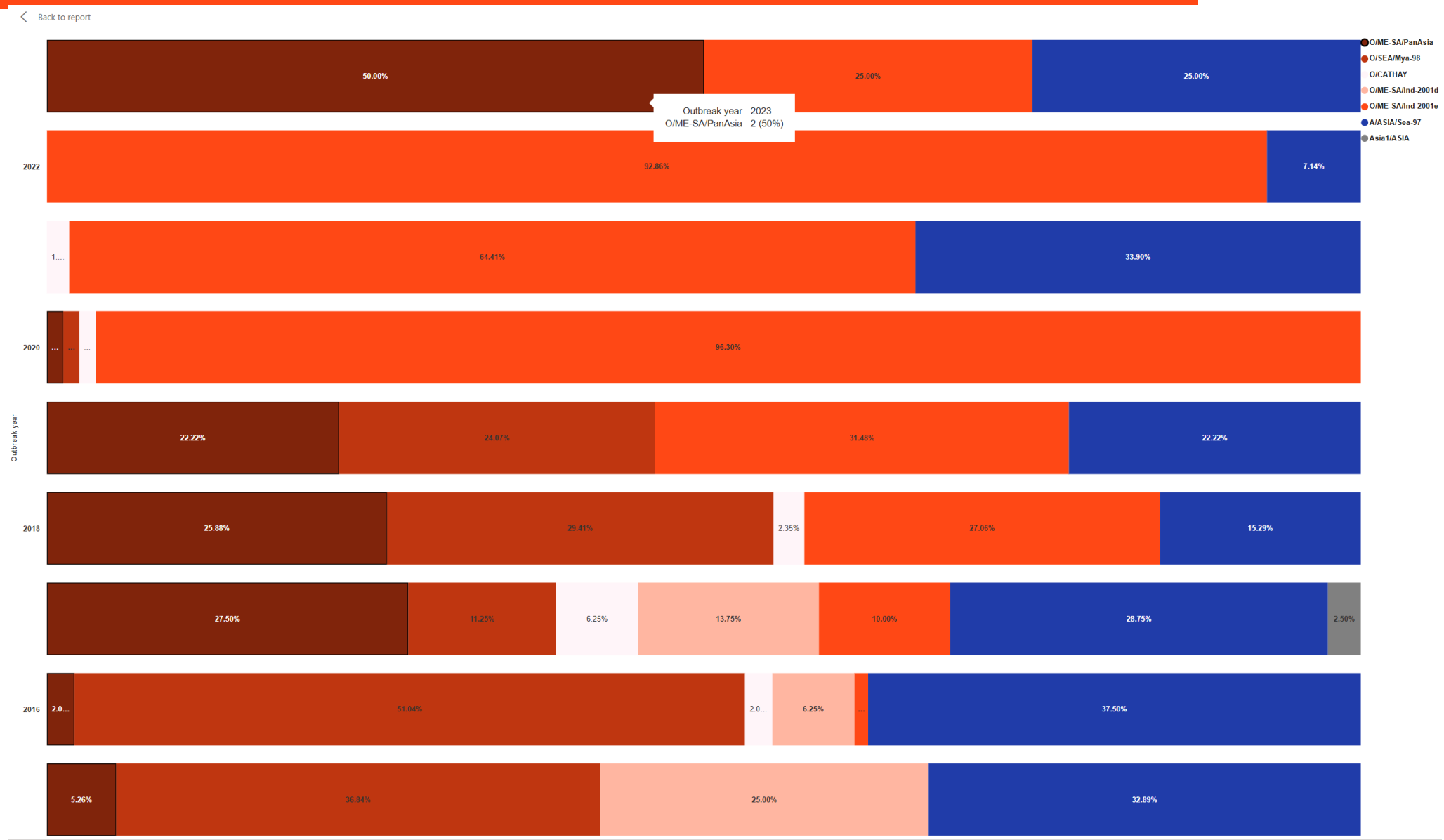
- O/Cathay (pig adapted)

Serotype A/ASIA/Sea-97

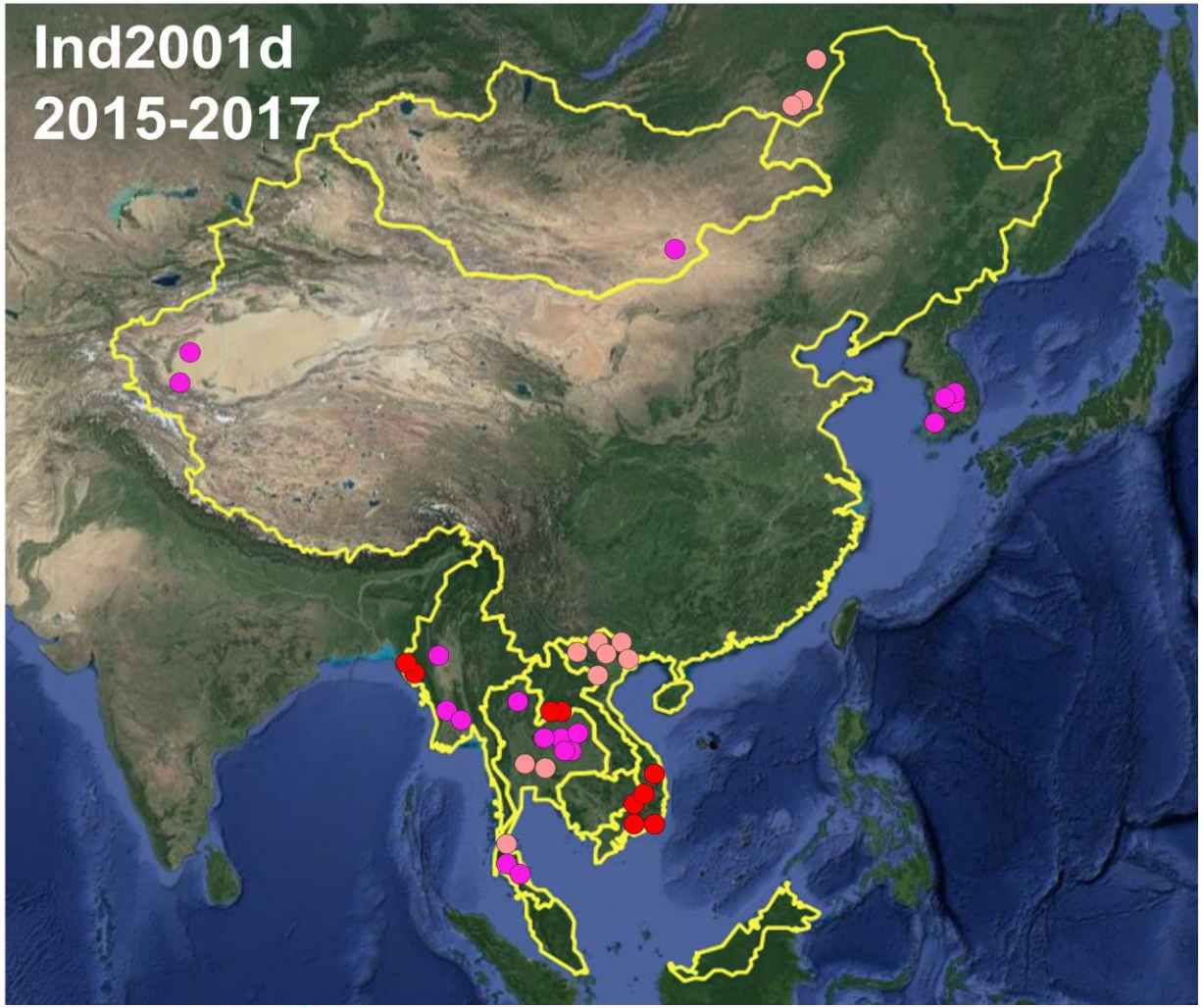
Serotype Asia 1



# Reported serotypes FMDV:



# O/ME-SA/Ind2001d




**O/ME-SA/Ind2001d**

2015- Laos, Myanmar (isolated 2016), Vietnam
2016- Thailand, Vietnam
2017-Myanmar, China, Mongolia, Korea and Russia

**Report on FMDV O in Laos in 2015**
Batch: WRLFMD/2015/00034

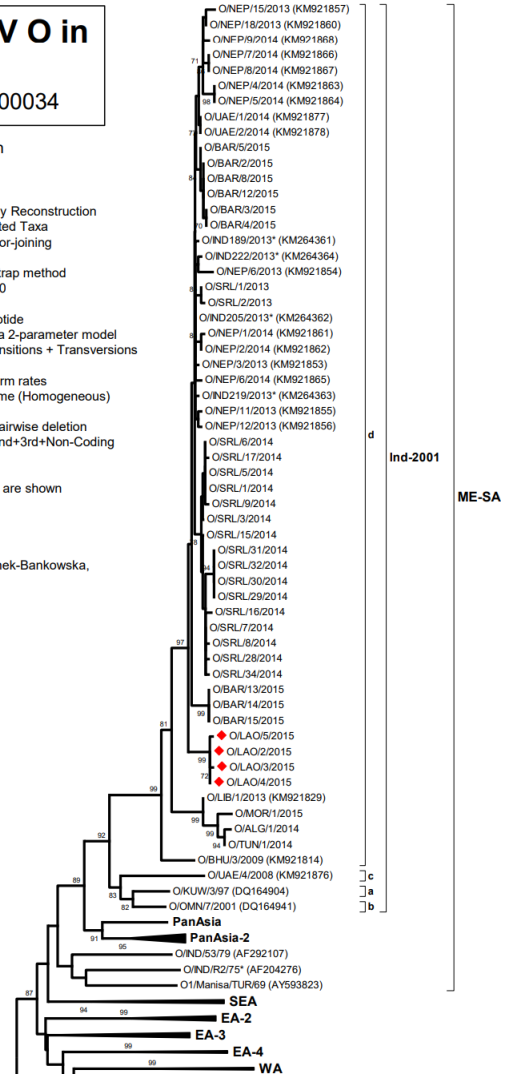
◆ indicates viruses in this batch

Software: MEGA 6.06
Analysis
Analysis ---------- Phylogeny Reconstruction
Scope ---------- All Selected Taxa
Statistical Method ---------- Neighbor-joining
Phylogeny Test
Test of Phylogeny ---------- Bootstrap method
No. of Bootstrap Replications ------- 1000
Substitution Model
Substitutions Type ---------- Nucleotide
Model/Method ---------- Kimura 2-parameter model
Substitutions to Include ---------- d: Transitions + Transversions
Rates and Patterns
Rates among Sites ---------- Uniform rates
Pattern among Lineages ---------- Same (Homogeneous)
Data Subset to Use
Gaps/Missing Data Treatment --------- Pairwise deletion
Codons Included ---------- 1st+2nd+3rd+Non-Coding
No. of Sites : 642
No Of Bootstrap Reps = 1000
Only bootstrap values of 70% and above are shown

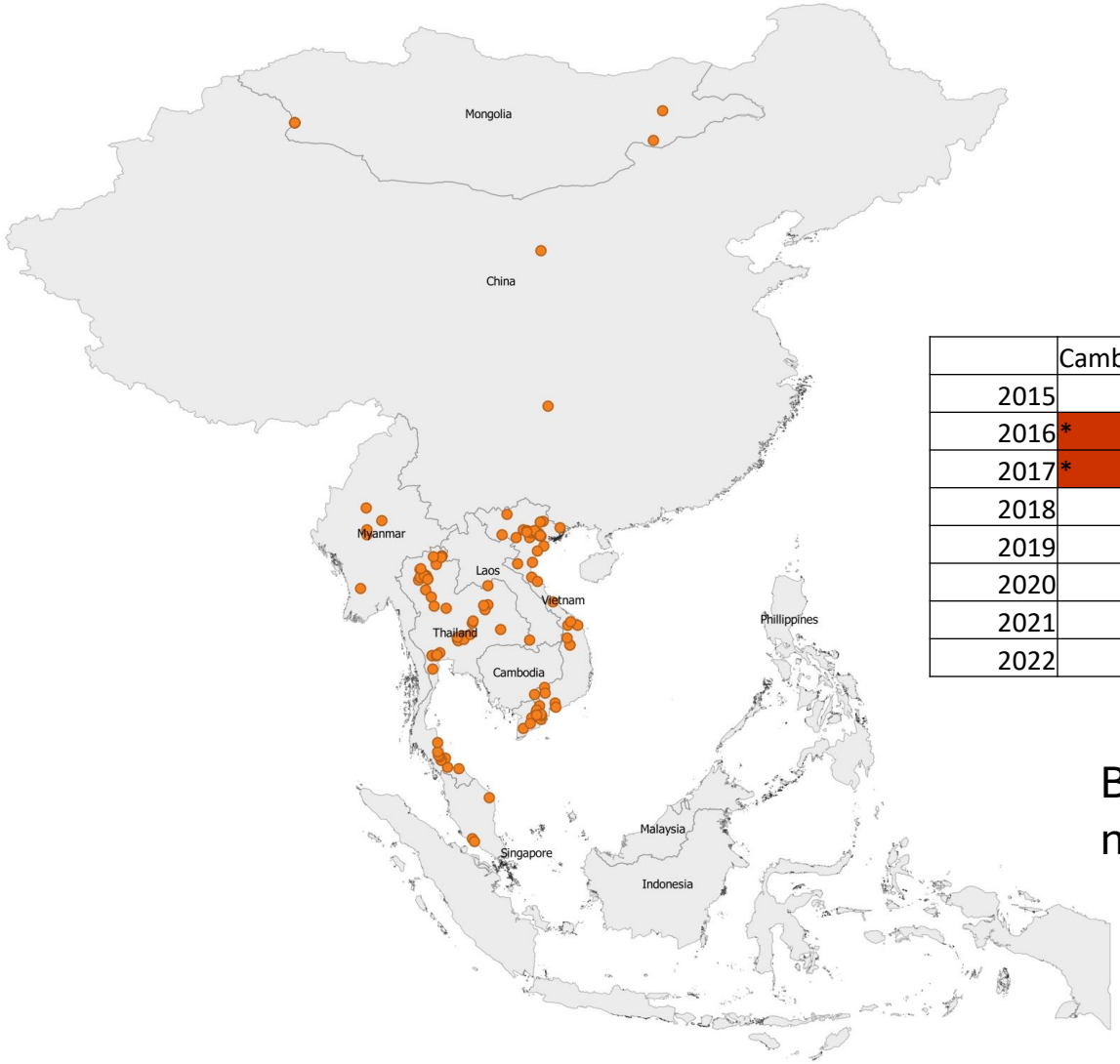
*, not a WRLFMD Ref. No.

N.J. Knowles, J. Wadsworth & K. Bachanek-Bankowska,
17 December 2015





# O/SEA/Mya-98




| | Cambodia | China | Laos | Malaysia | Mongolia | Myanmar | Thailand | Vietnam |
|---|---|---|---|---|---|---|---|---|
| 2015 | | | | | | * | | |
| 2016 | * | * | | | | * | | |
| 2017 | * | * | | | | * | | |
| 2018 | | | | | | | | |
| 2019 | | | | | | * | | * |
| 2020 | | * | | | | | | |
| 2021 | | | | | | * | | |
| 2022 | | | | | | | | |

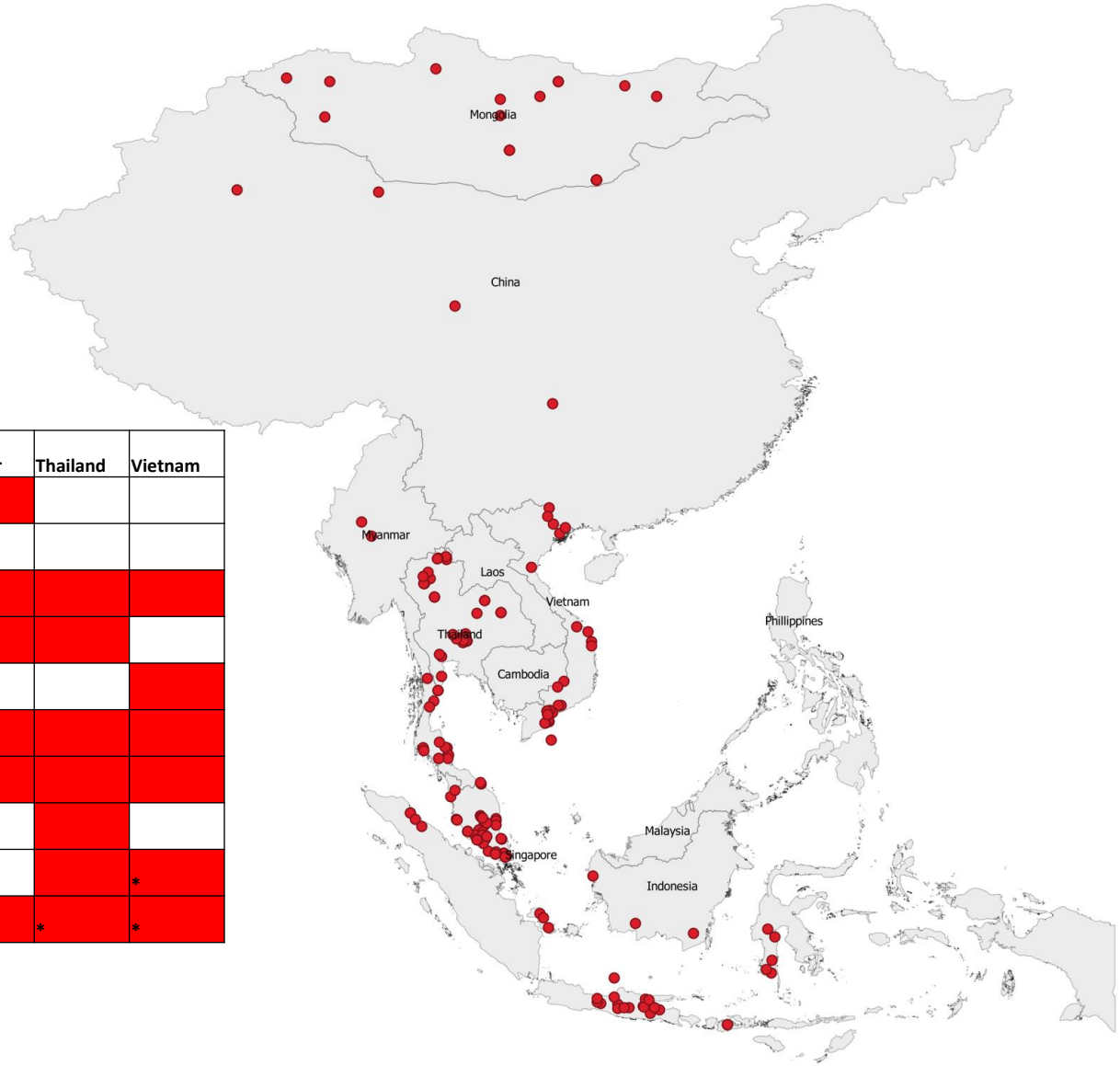
Between 2015 and 2018, Mya-98 was the most prevalent

# O/ME-SA/Pan Asia

| Year | Cambodia | China | Laos | Malaysia | Mongolia | Thailand | Vietnam |
|---|---|---|---|---|---|---|---|
| 2015 | | | | | | | |
| 2016 | | | | | | | |
| 2017 | | | | | | | |
| 2018 | | | | | | | |
| 2019 | | * | | | | * | |
| 2020 | | | | | | | |
| 2023 | | | | | | | |

# O/ME-SA/Ind2001e

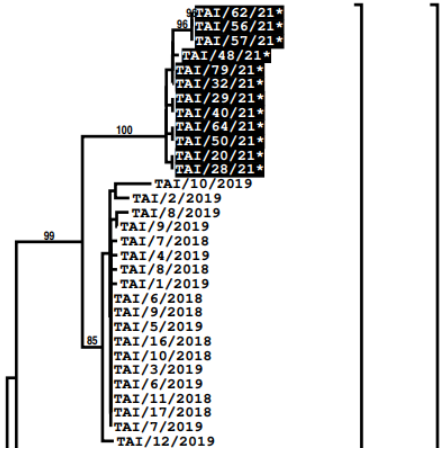
| Year | Cambodia | China | Indonesia | Lao PDR | Malaysia | Mongolia | Myanmar | Thailand | Vietnam |
|---|---|---|---|---|---|---|---|---|---|
| 2015 | | | | | | | | | |
| 2016 | | | | | | | | | |
| 2017 | | * | | | | | * | | |
| 2018 | | * | | | | | | | |
| 2019 | | * | | | | | | | |
| 2020 | | | | | | | * | | |
| 2021 | | * | | | | | * | | |
| 2022 | | | | | | | | | |
| 2023 | | * | | | | | | | * |
| 2024 | | * | | | * | | * | * | * |



# Serotype A/ASIA/Sea-97

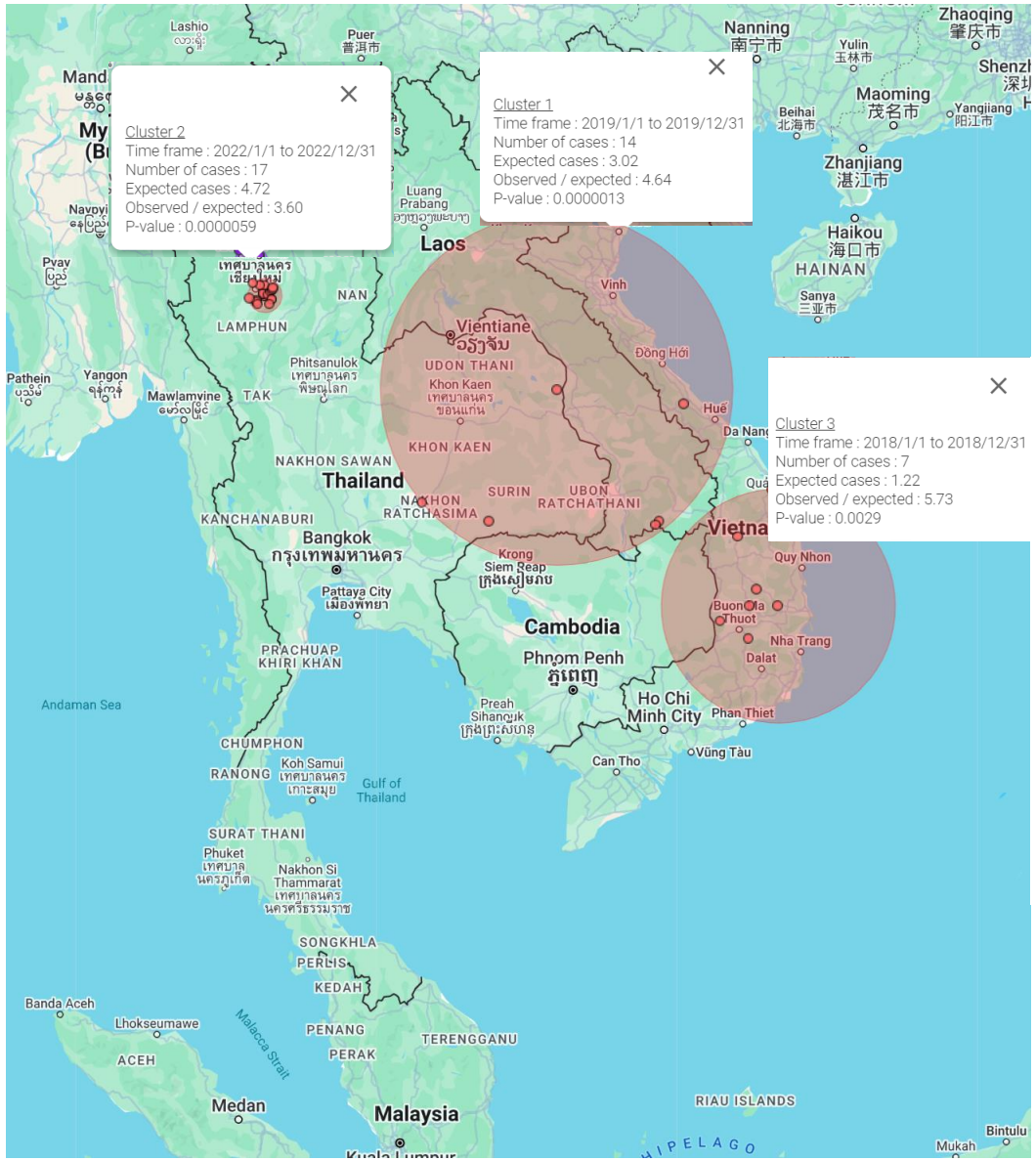

**Report on FMDV A in Thailand in 2021**

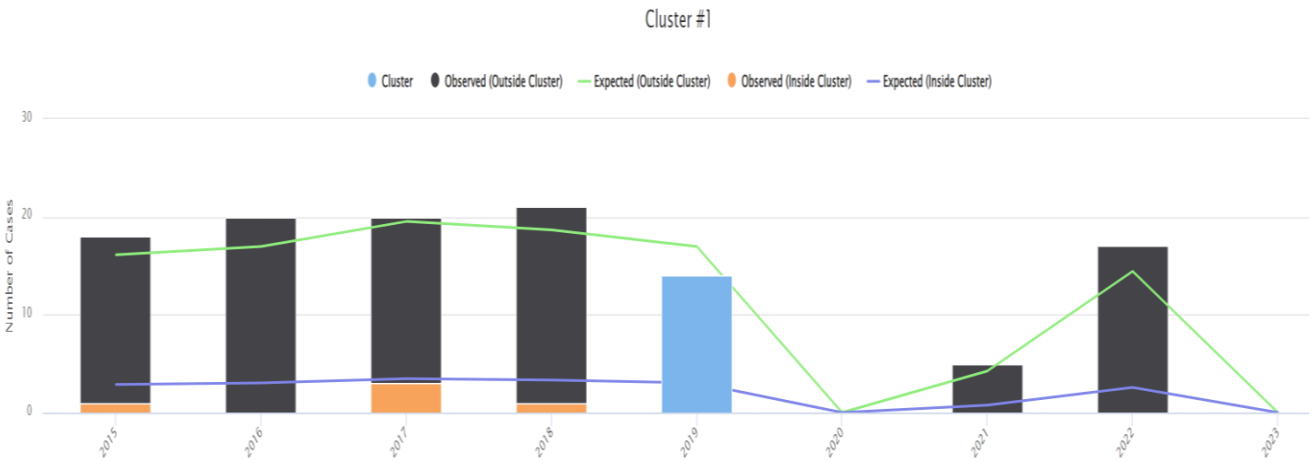
**Batch: WRLMEG/2022/00014**



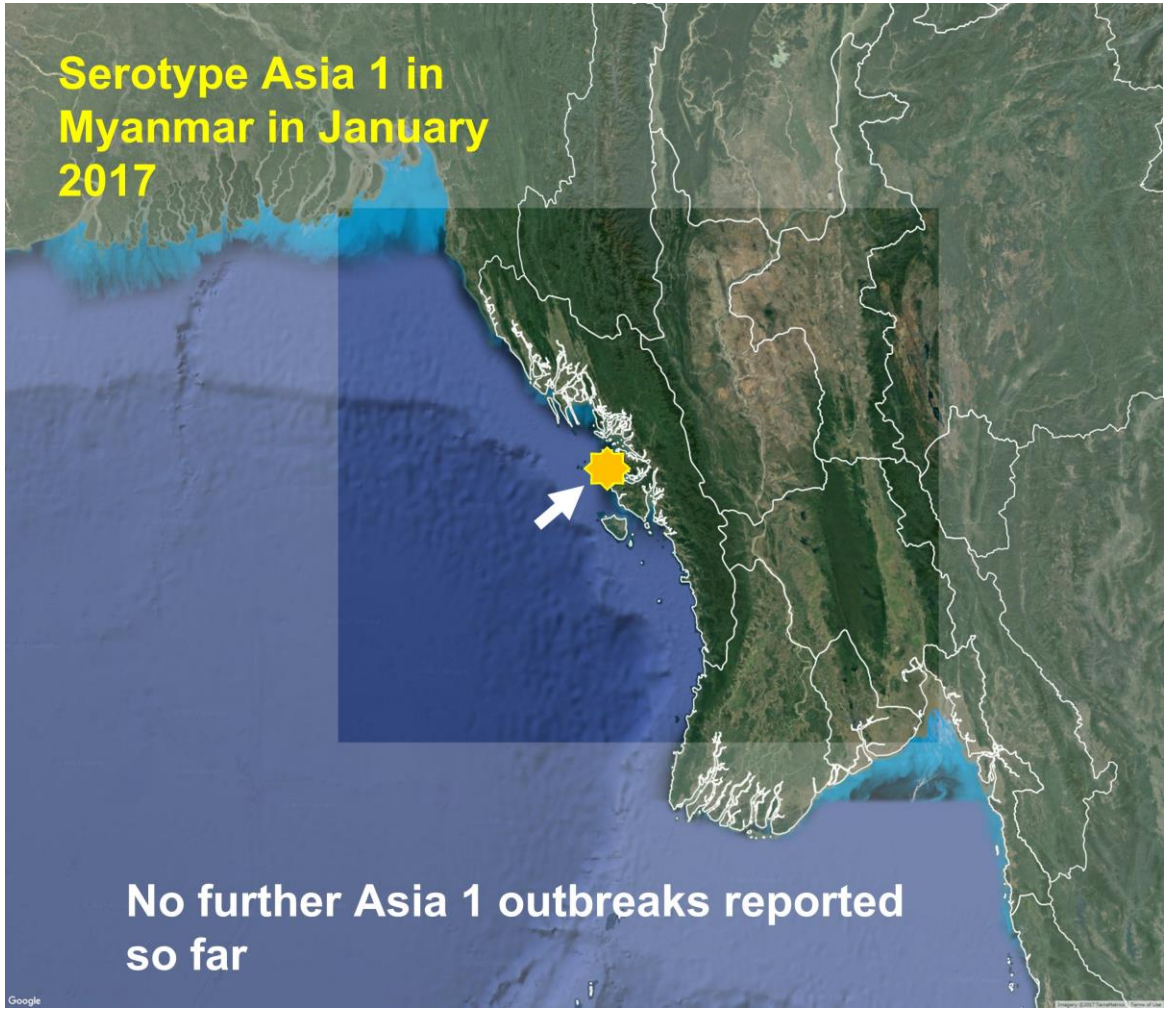

| Year | Cambodia | China | Laos | Malaysia | Mongolia | Myanmar | Thailand | Vietnam |
|---|---|---|---|---|---|---|---|---|
| 2015 | | | | | | | | |
| 2016 | | | | | | | | |
| 2017 | * | | | | | | | |
| 2018 | | * | | | | | | |
| 2019 | * | | | | | | | |
| 2020 | | | | | | | | |
| 2021 | | | | | | * | | |
| 2022 | | | | | | | | |
| 2023 | | | | | | | | |

# Serotype A/ASIA/Sea-97 (2019-2023)



# Serotype Asia 1




Received: 4 May 2018 | Revised: 22 November 2018 | Accepted: 12 December 2018
DOI: 10.1111/tbed.13112

SHORT COMMUNICATION

WILEY

## Foot-and-mouth disease outbreaks due to an exotic serotype Asia 1 virus in Myanmar in 2017

Lin Lin Bo[1,*] | Khin Sander Lwin[2,*] | Sahawatchara Ungvanijban[3] | Nick J. Knowles[4] | Jemma Wadsworth[4] | Donald P. King[4] | Ronello Abila[5] | Yu Qiu[5]

South Asia prevalent ?

# FMDV Asia 1 study

Preventive Veterinary Medicine 244 (2025) 106663

Contents lists available at ScienceDirect

Preventive Veterinary Medicine

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

## Probability of freedom from foot-and-mouth disease virus serotype Asia 1 in Southeast Asia, China and Mongolia

Masako Wada [a,*], Jun-Hee Han [a], Bolortuya Purevsuren [b], Karma Rinzin [b], Ashish Sutar [b], Ronello Abila [b], Supatsak Subharat [a]

[a] EpiCentre, School of Veterinary Science, Massey University, Palmerston North, New Zealand
[b] Sub-Regional Representation for South-East Asia, World Organisation for Animal Health, Bangkok, Thailand

ARTICLE INFO

*Keywords:*
Foot-and-mouth disease
Surveillance sensitivity
Disease freedom
Scenario tree model
Southeast Asia
Passive surveillance
Asia 1
cattle
Smallholder
Vaccination

ABSTRACT

Foot-and-mouth disease virus (FMDV) serotype Asia 1 has not been reported in Southeast Asia, China and Mongolia between 2018 and 2024, despite the endemicity of FMD in this region and the continued circulation of serotype Asia 1 in South Asia. While vaccines against Asia 1 are still occasionally used in this region, it is unknown whether the absence of reports indicates true disease freedom or surveillance gaps. This study aimed to estimate the sensitivity of existing passive surveillance systems, and the probability of regional freedom from serotype Asia 1 across eight countries using the scenario tree approach. Two stochastic scenario tree models were developed to estimate surveillance sensitivity for FMD (any serotypes) and serotype Asia 1 specifically. Country-specific input parameters were derived from a questionnaire survey of in-country experts on FMD vaccination practices, smallholders' behaviour, sampling protocols and diagnostic laboratory capacity. Additionally, 2010 – 2022 data on FMD clinical samples submitted and confirmed Asia 1 cases were obtained from the World Reference Laboratory for FMD. Under a design annual incidence rate of 10 % at the village level and 20 % at the animal level, estimated surveillance sensitivity for FMD ranged from 100.0 % in Mongolia and 95.9 % in China to 1.7 % in Cambodia and < 0.1 % in Myanmar. Using the effective design incidence rate with a median of 0.02 – 0.07 % at the village level and 20 % at the animal level, the probability of detecting Asia 1 was estimated to be 0.0 – 6.7 % per country and 14.5 % for the region. The estimated probability of regional freedom from Asia 1 was 53.9 % after the first year without reporting. Over years of no reporting, this probability would increase, only if an annual risk of introduction remained below 6 %. The results were most sensitive to parameters related to sampling intensity and smallholders' behaviour, particularly in countries with high surveillance sensitivity, such as Mongolia and China. Our findings highlight the low sensitivity of passive surveillance in the region, suggesting that serotype Asia 1 may have remained undetected under the current surveillance efforts. Strengthening data collection and continued efforts in increasing surveillance intensity are essential to improving confidence in the regional freedom from serotype Asia 1.

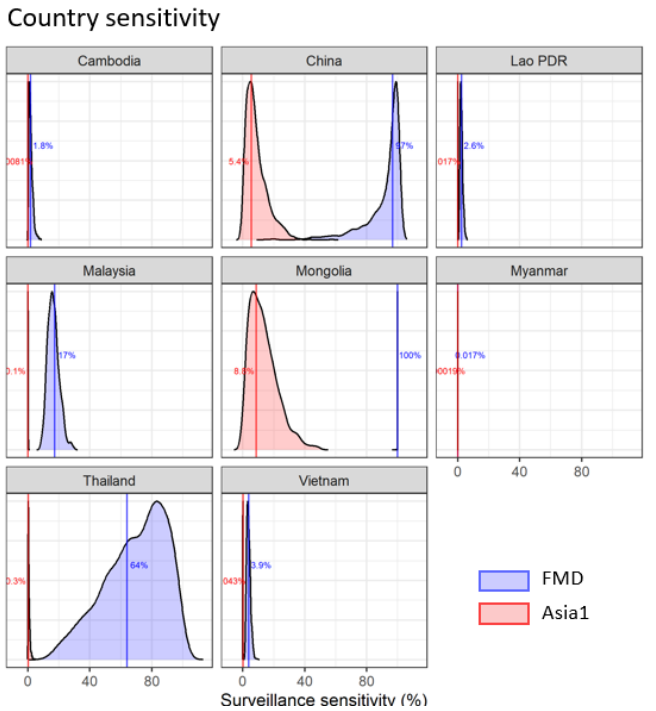
### 1. Introduction

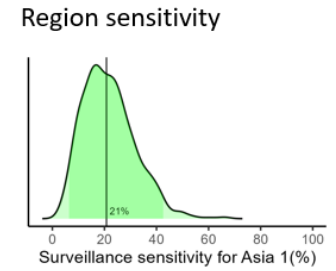
Foot-and-mouth disease (FMD) remains endemic in Southeast Asia (SEA), China and Mongolia, imposing significant socioeconomic burdens through reduced livestock productivity and restrictions on international trade. While vaccination has historically been key to eradicating FMD in other regions (Moura et al., 2024), its control in SEA is challenging, amid increasing demand for animal products, frequent unofficial livestock movements, and inadequate border control (Blacksell et al., 2019). A major obstacle is the short life of vaccine-induced immunity and poor cross immunity between or within serotypes (Kenubih, 2021; Robinson et al., 2016; Singh et al., 2019), complicating routine vaccination efforts in a landscape dominated by resource-poor smallholders. Additionally, limited diagnostic capacity

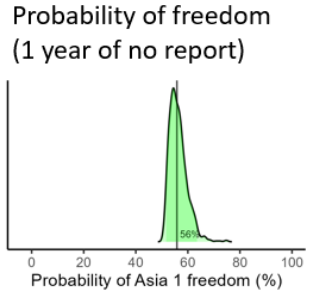
*Abbreviations:* FAO, Food and Agriculture Organization of the United Nations; FMD, Foot-and-mouth disease; FMDV, Foot-and-mouth disease virus; LHS, Latin hypercube sampling; PRCC, Partial rank correlation coefficient; SEA, Southeast Asia; SEACFMD, Southeast Asia, China and Mongolia Foot and Mouth Disease campaign; WOAH, World Organisation for Animal Health; WRLFMD, World Reference Laboratory for Foot and Mouth Disease.

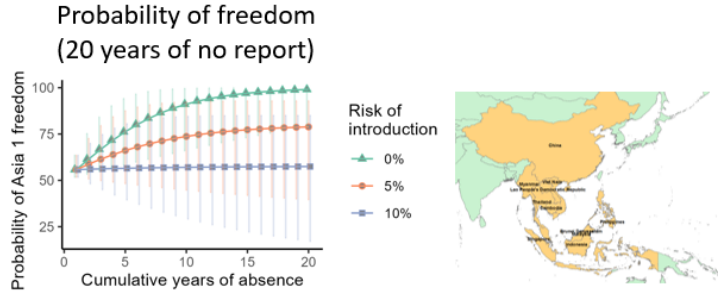
* Corresponding author.
*E-mail address:* m.wada@massey.ac.nz (M. Wada).

https://doi.org/10.1016/j.prevetmed.2025.106663
Received 25 March 2025; Received in revised form 1 August 2025; Accepted 14 August 2025
Available online 14 August 2025


[Probability of freedom from foot-and-mouth disease virus serotype Asia 1 in Southeast Asia, China and Mongolia - ScienceDirect]

# Ongoing Projects and studies

ANIMAL & VETERINARY SERVICE
A cluster of NParks

**National Parks Board**
*Animal & Veterinary Service*
Singapore Botanic Gardens
1 Cluny Road, Singapore 259569
Tel: (65) 64717808, Fax: (65) 64723033
www.ava.gov.sg
www.facebook.com/AnimalBuzzSG

Dear ASEAN Member States,

The ASEAN Regional Animal Health Information System (ARAHIS), was launched in 2016, and aims to facilitate the timely sharing of disease information among ASEAN Member States and to monitor priority animal diseases, particularly FMD, in support of the SEACFMD campaign.

While the system has been in service for many years, it is no longer feasible to upgrade or maintain ARAHIS on a sustainable basis. Therefore, Singapore, a leading country for ARAHIS, in collaboration with WOAH, is working on integrating ARAHIS functionalities into the World Animal Health Information System (WAHIS) reporting platform. This proposed alignment will ensure continued disease reporting and monitoring within the region.

As updated during the 32nd ASEAN Sectoral Working Group for Livestock Meeting held in Singapore this year, ARAHIS will be decommissioned by 31st December 2024. If you wish to download any data, please do so before the system is decommissioned. You may want to refer to the page 42 of the ARAHIS manual for instructions for exporting data from ARAHIS.

We will be conducting a session in November 2024 to demonstrate the new functionalities of the WAHIS platform. More details will be shared later. Should you have any questions, please do not hesitate to contact Dr. Bolortuya Purevsuren at b.purevsuren@woah.org.

Yours sincerely,

Dr Chang Siow Foong
Director-General
Animal & Veterinary Service
National Parks Board
Singapore

Copy to: WOAH SRR SEA
ARAHIS Focal Points
ASWGL Focal Points

## Reporting within WAHIS/ARAHIS integration framework from January 2025 onwards

Disease never reported/absent for some time or event ongoing → Early warning module – Immediate notification + **weekly** follow-up reports (exceptional event)

Stable event

Disease reported as present in the six-monthly reports after having sent a final report declaring it stable

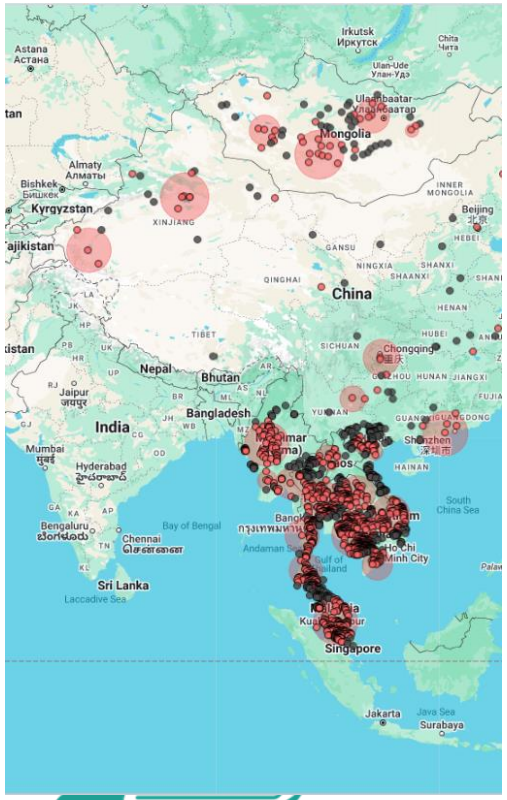
Disease historically reported as present in the six-monthly reports

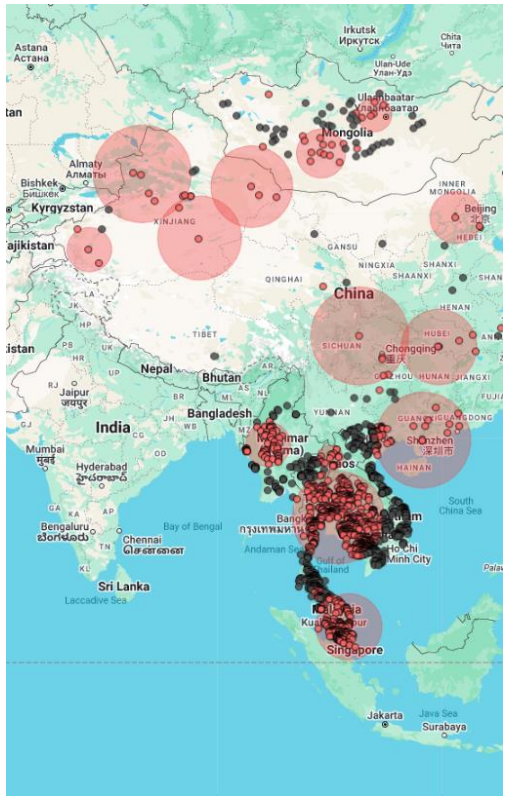
→ New ARAHIS framework
Early warning report (event) using WAHIS early warning module for endemic diseases + **monthly** follow-up reports

SEACFMD

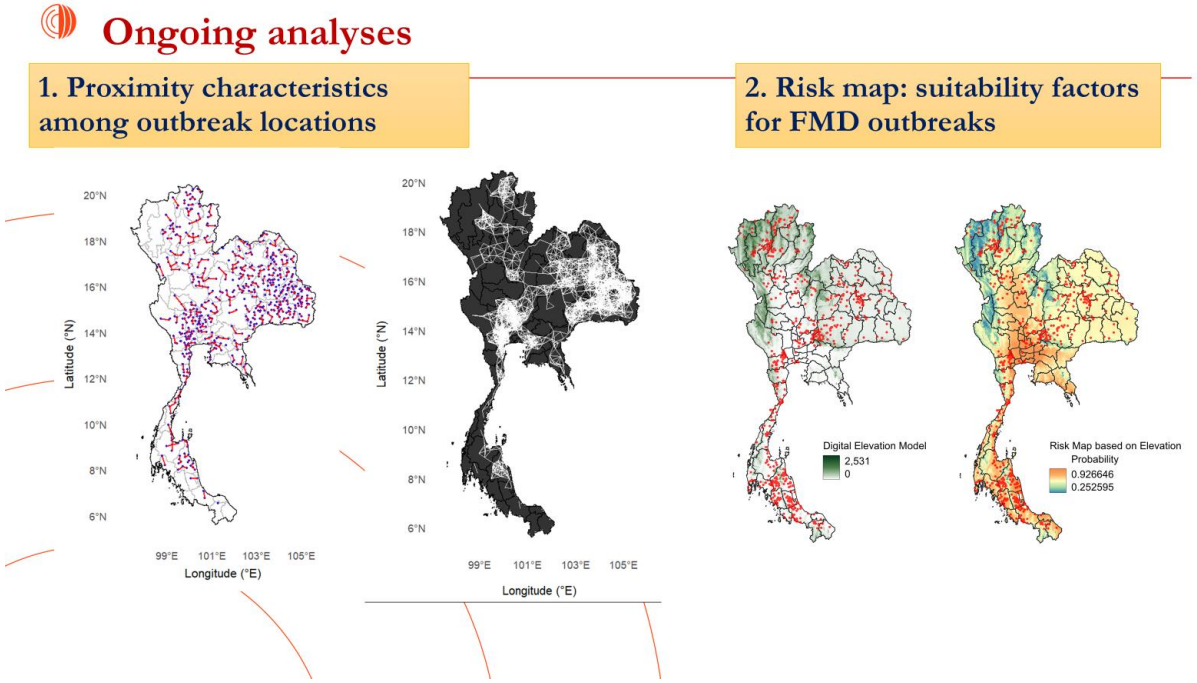
# FMD historical data analysis

Study on Epidemiological Characteristics, Temporal Change Points, and Space-Time Clusters of Foot and Mouth Disease Outbreaks in SEACFMD Region




Risk mapping based on susceptible population and other risk factors



# Animal Price monitoring –Pilot study in Thailand

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## Using online public animal price data as a signal for predicting an increase in animal disease outbreak reports: a pilot study on cross-correlation modeling in Thailand

Veerasak Punyapornwithaya[1*], Supitchaya Srisawang[1], Chalita Jainonthee[1], Wengui Li[2], Ronello Abila[3] and Bolortuya Purevsuren[3]

**Abstract**

**Background** Changes in livestock prices are often linked to disease outbreaks. An animal price monitoring system has been considered a potential tool for predicting transboundary animal diseases (TADs). The aim of this study was to examine the cross-correlation between market price dynamics and disease outbreak patterns using publicly available online data to explore the potential of market prices as early indicators of impending TAD outbreaks.

**Methods** Time series data on TAD outbreak reports, including foot and mouth disease (FMD), lumpy skin disease (LSD), and African swine fever (ASF), as well as animal price data for cattle and pigs in Thailand, were analyzed. Cross-correlation analysis was conducted to assess the relationship between animal prices and disease outbreak report patterns. Data from January 2021 to December 2023 (primary dataset) were analyzed to identify cross-correlation patterns, while data from January to September 2024 (extended dataset) were incorporated to evaluate the consistency of the observed cross-correlation over the study period.

**Results** A significant cross-correlation was identified between cattle prices and the number of outbreak reports for FMD in the primary dataset. An increase in cattle prices during the preceding one to two months (lags of -1 and – 2) was associated with a subsequent rise in FMD outbreak reports. This correlation remained consistent when the extended dataset was incrementally incorporated and analyzed on a month-by-month basis. In contrast, in the primary dataset, no significant cross-correlation was observed between cattle prices and LSD outbreak reports. For ASF, cross-correlations between farm-gate pig prices and ASF outbreak reports were detected at lag 0, lag 3, lag 4, and lag 5 in the primary dataset; however, no significant correlation was observed in the extended dataset.

**Conclusions** This study demonstrates the feasibility of using animal price trends as signal tools for anticipating an increase in TAD outbreak reports. The findings specifically support the use of cattle price data as an early signal for forecasting increases in FMD outbreak reports in Thailand. The availability and consistency of publicly accessible data

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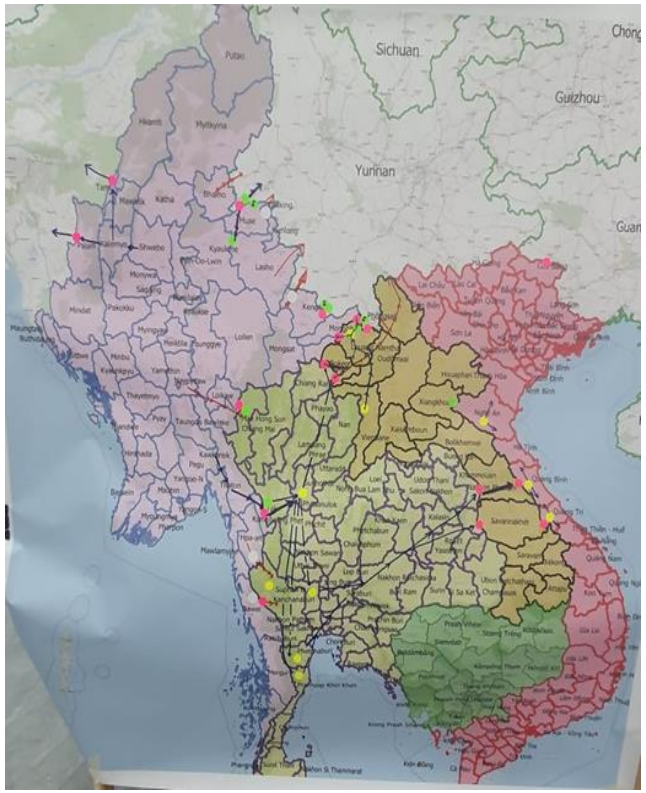
- The study found that cattle prices may serve as early warning signals for FMD outbreaks.
- A cross-correlation was observed at negative lags of one to two months, indicating that increases in cattle prices tend to precede outbreaks.
- Rising cattle prices could potentially act as early indicators for impending FMD outbreaks in Thailand.
- The reliability of this approach depends on outbreak dynamics, reporting delays, and economic behaviors.

Using online public animal price data as a signal for predicting an increase in animal disease outbreak reports: a pilot study on cross-correlation modeling in Thailand | BMC Veterinary Research | Full Text

# Animal movement study plan


Animal Movement study, 2015




Exercise mapping in 2024, UMWG

Study area that planning:

Thailand- Maesot, Chiangrai, South Thailand border Malaysia, Chiangmai

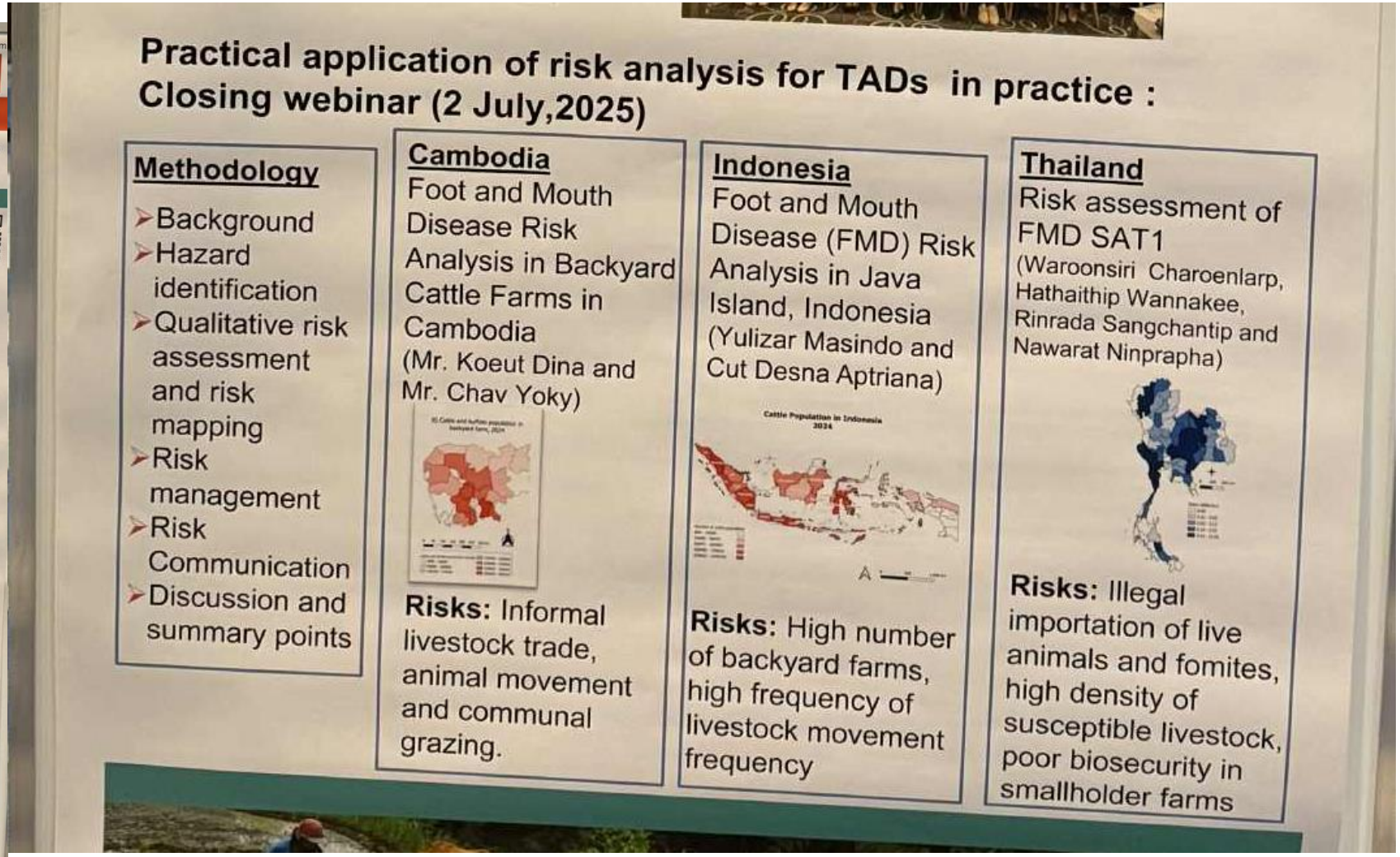
Malaysia- Kota bear, Perlis and South part of Malaysia trading with Indonesia

Myanmar –Muse and Kukai, Mandalay and Sagiang

Lao PDR- Bokeo and Luang Namtha, key area exporting cattle to China

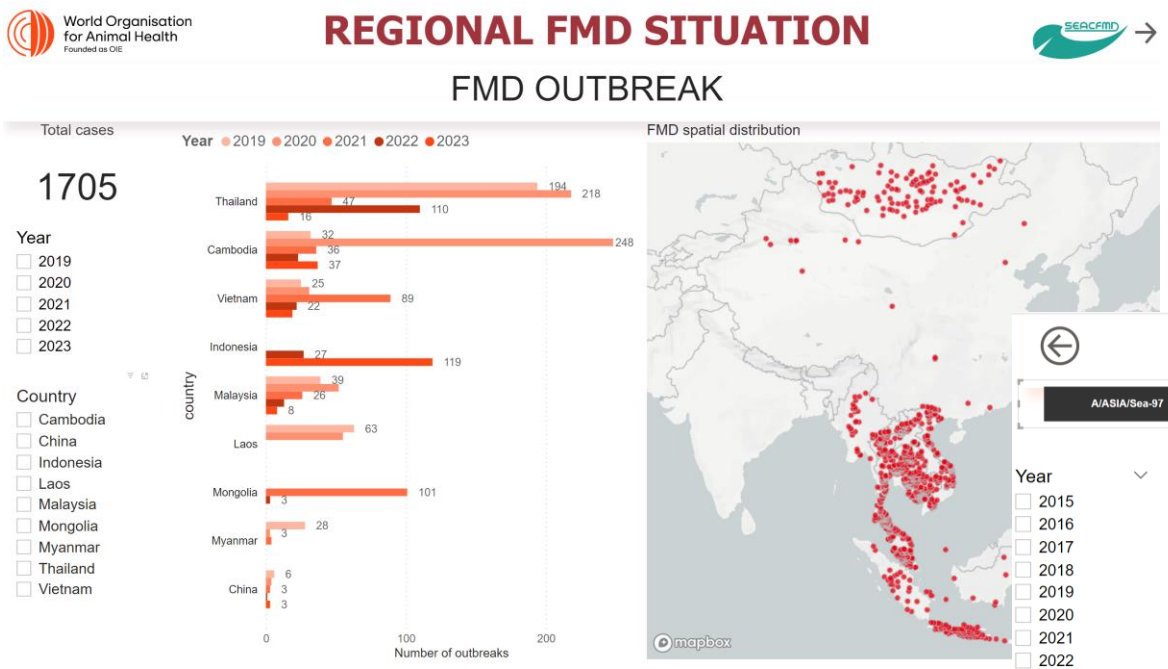
Vietnam- Cao Bang province, key area exporting cattle to China

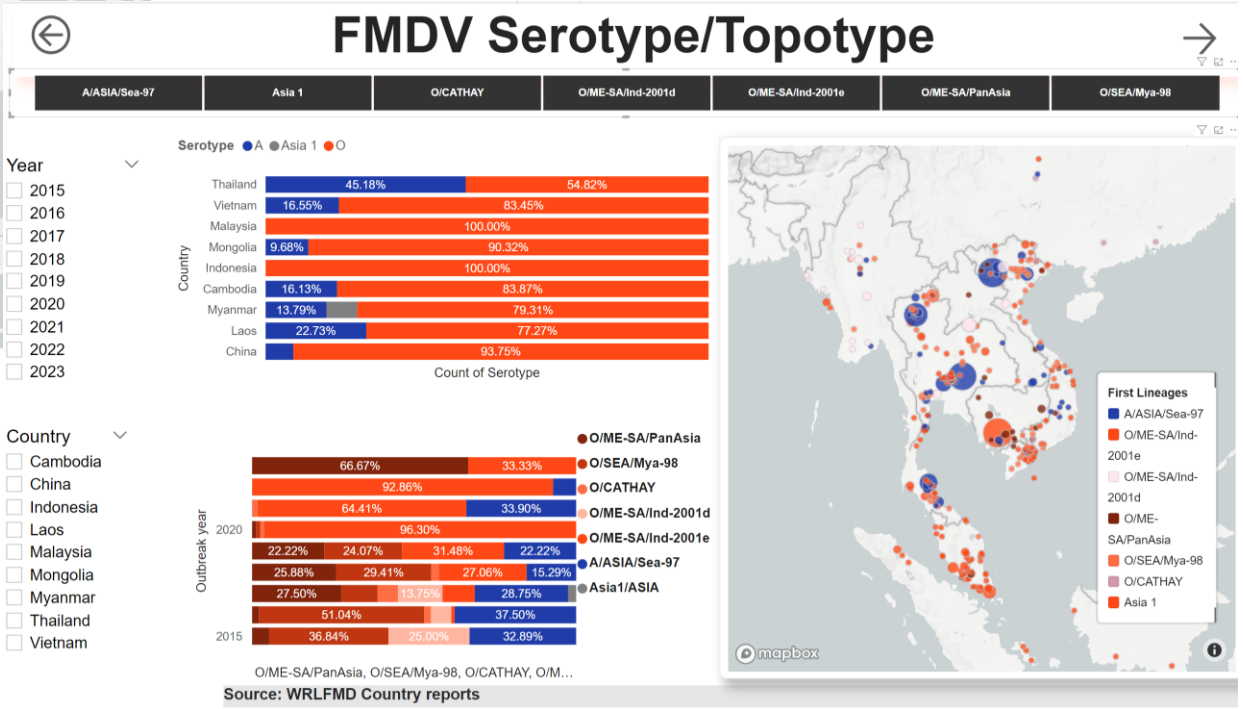
# Risk analysis training

# Conclusion/ Discussion

- Need to follow up negative reporting
- Reporting FMD through WAHIS Early morning module
- Gaps in active surveillance data collection and analysis
- Low sensitivity of passive surveillance system
- Does current surveillance accurately represent the full FMD picture in the region?
- Ongoing risk of new or emerging FMDV strains entering the region




South-East Asia, China and Mongolia Foot and Mouth Disease (SEACFMD) Campaign WOAH - Asia

# Thank You