

IDENTIFICATION OF RISK FACTORS FOR THE RECENT FOOT AND MOUTH DISEASE OUTBREAK IN SRI LANKA

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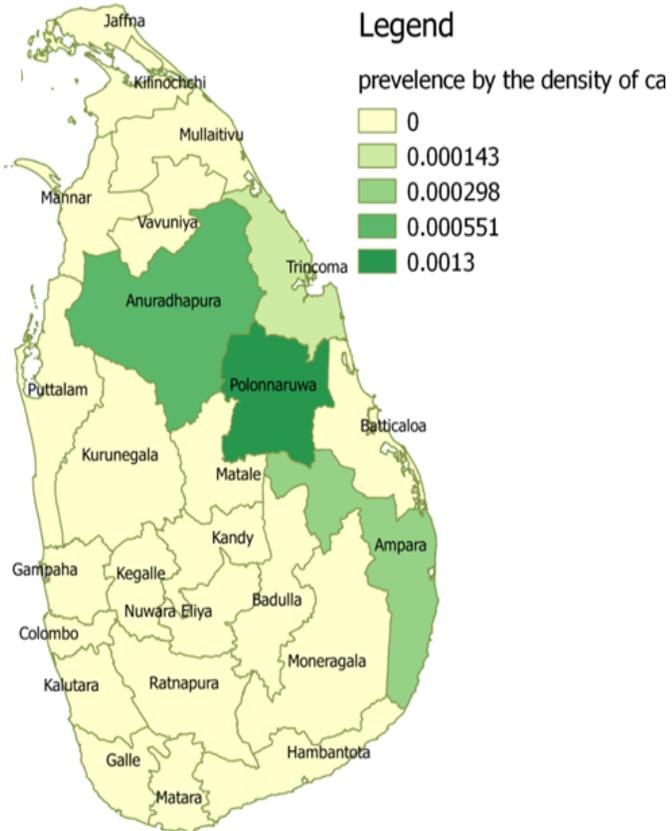
Introduction

Foot and Mouth Disease

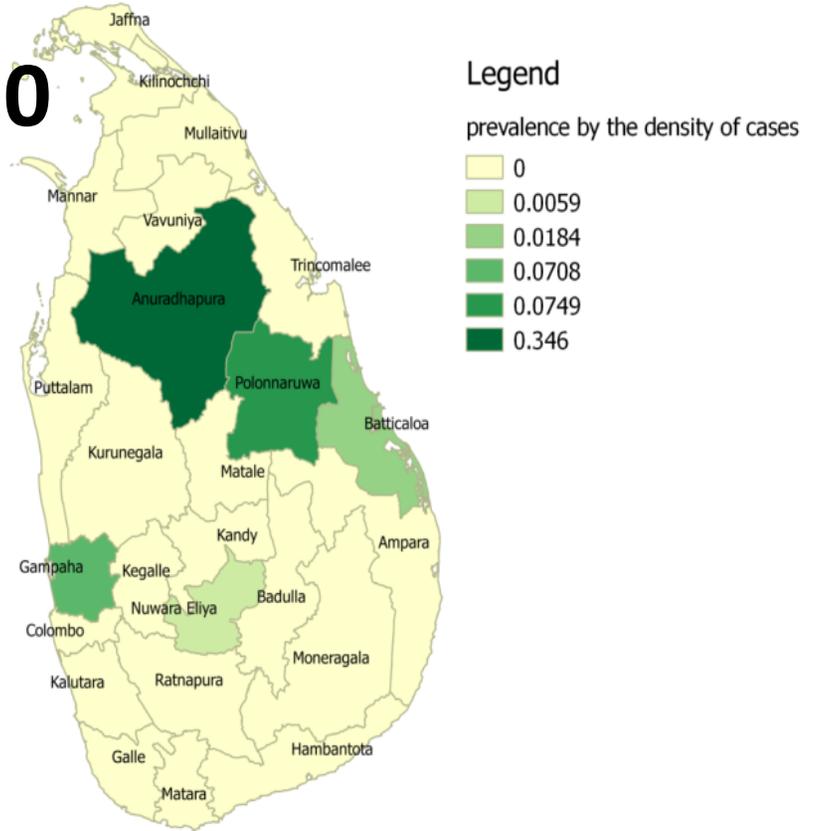
- FMD Type O is endemic in Sri Lanka. This serotype has a great genetic diversity.
- As an OIE member country Sri Lanka strategies to eradicate the disease by 2020 following the Progressive Control Pathway(PCP).

History of the disease situation

2009

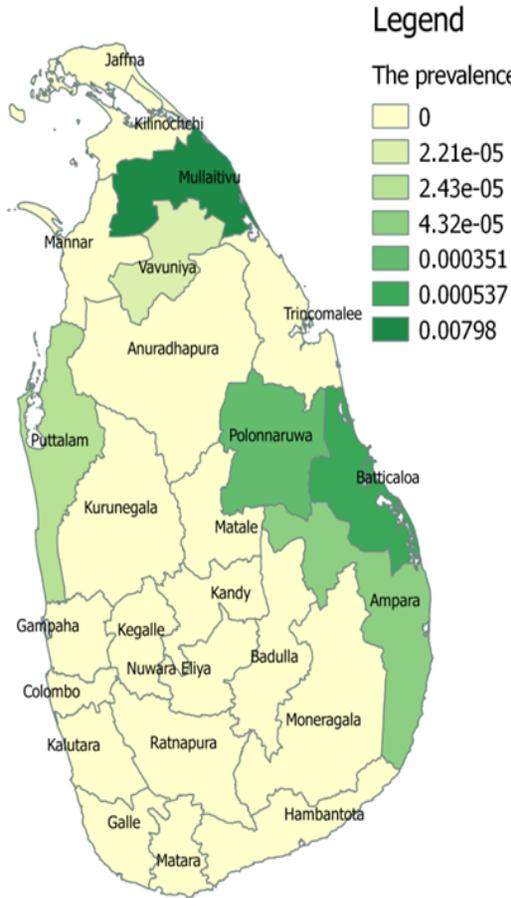


2010

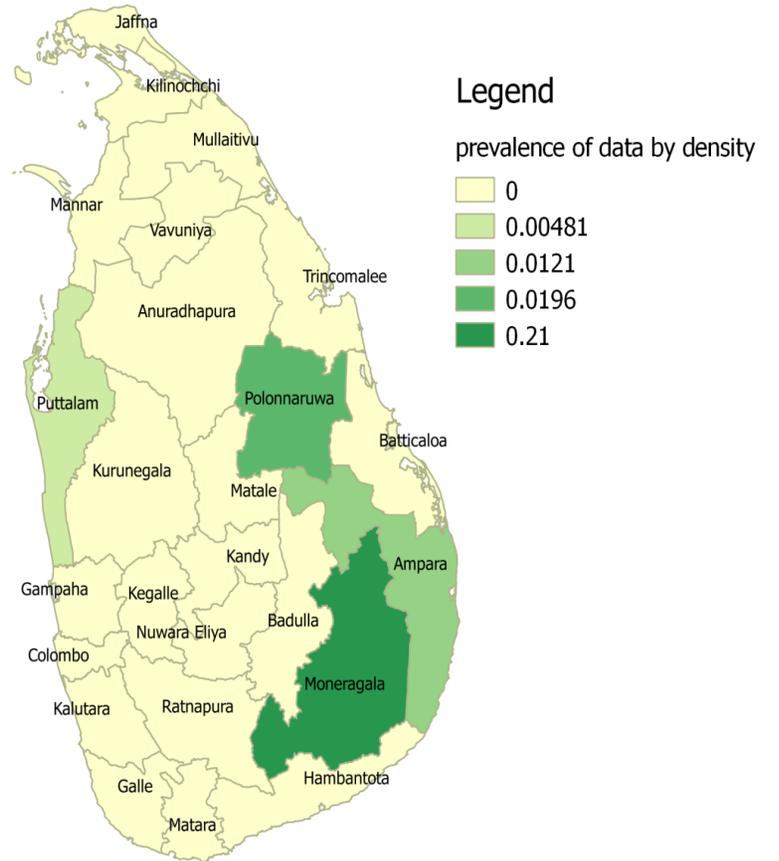


History of the disease situation

2011



2012

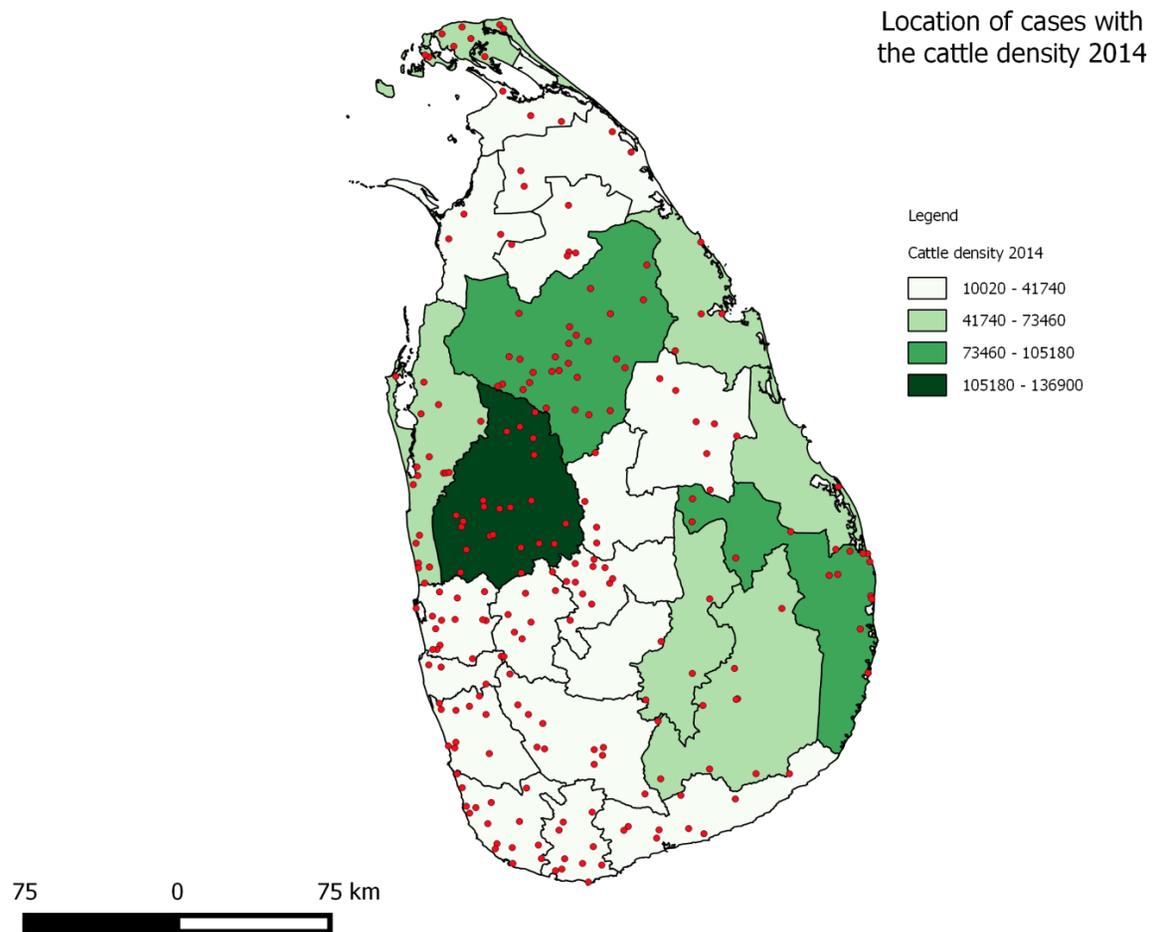


History of the disease situation

2013



2014 outbreak



Major drawbacks for the disease control in Sri Lanka

- There are no strategic documents that outline the nationwide control of FMD in all susceptible production animals.
- Currently annual vaccination, ring vaccination, passive surveillance and movement control is practiced during an outbreak but are not efficient enough to control outbreak.

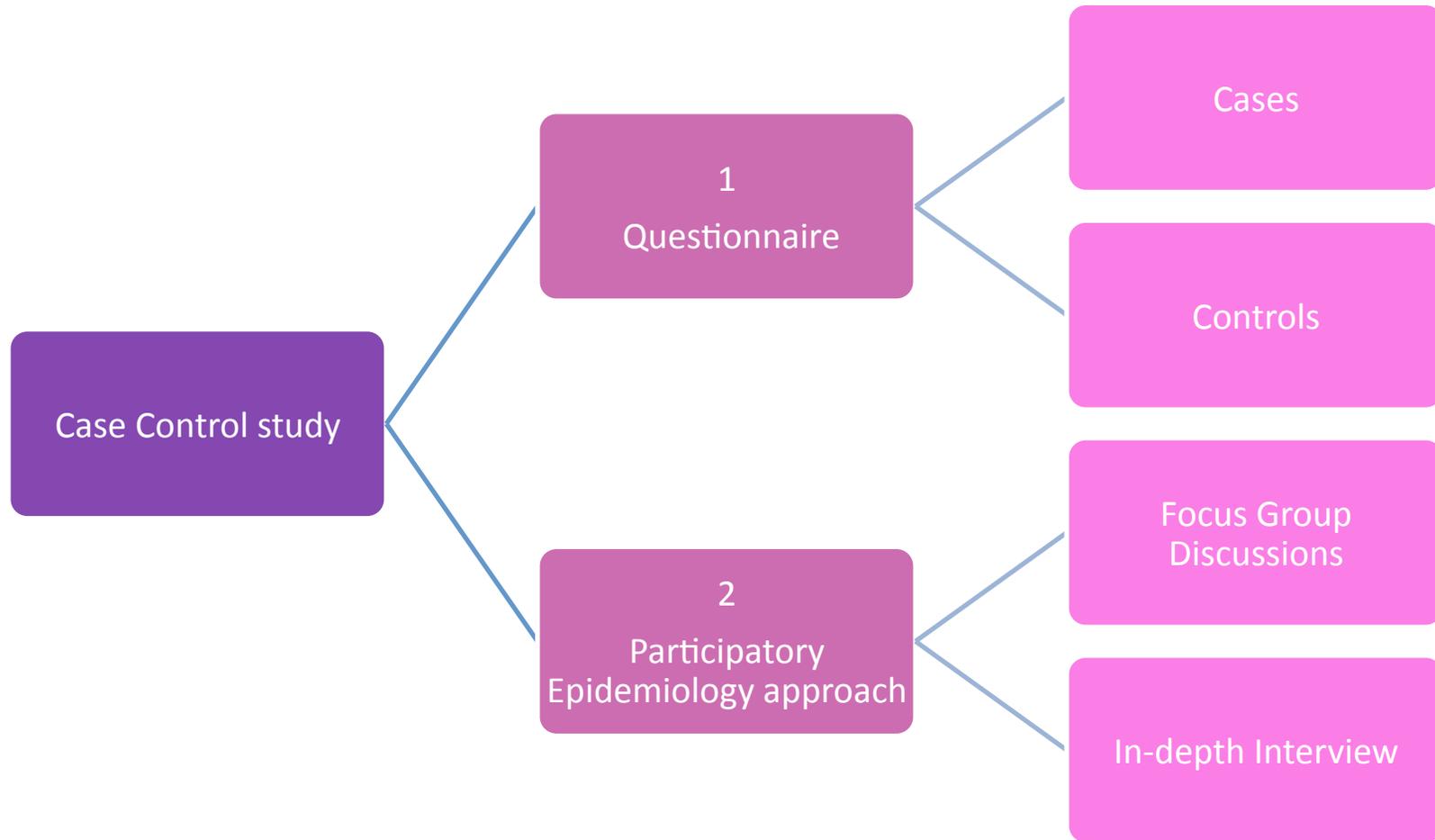
Objectives

Objectives of this study

- To Identify the potential risk factors in the recent FMD outbreak (2014) in the North Central Province, Sri Lanka

Materials and methods

Study Scope



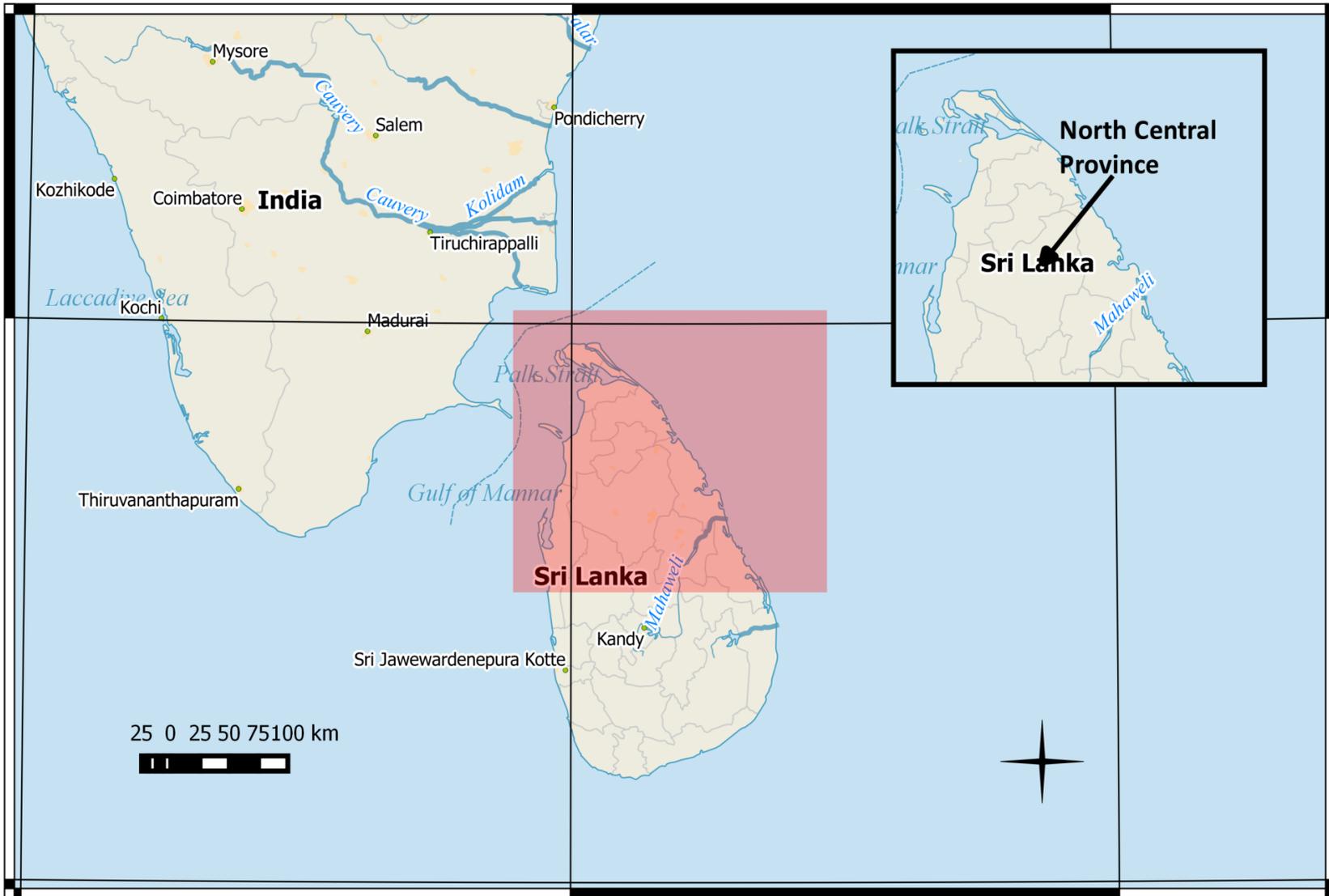
Questionnaire

- **Case definition-**

Infected farms showing the clinical signs of FMD with in the recent 12 months period based on the veterinary records.

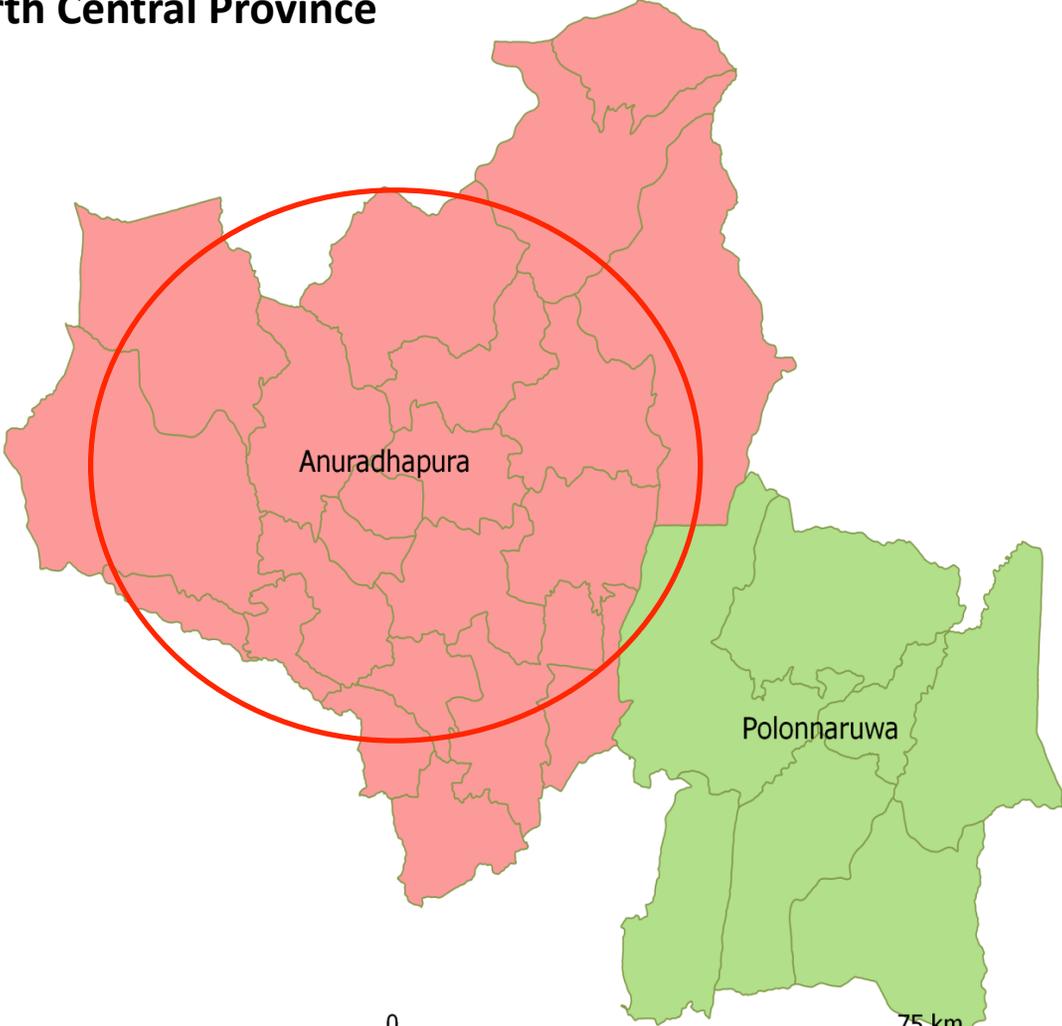
- **Control definition**

Non infected farms with FMD in the same area as the cases during the same time duration.



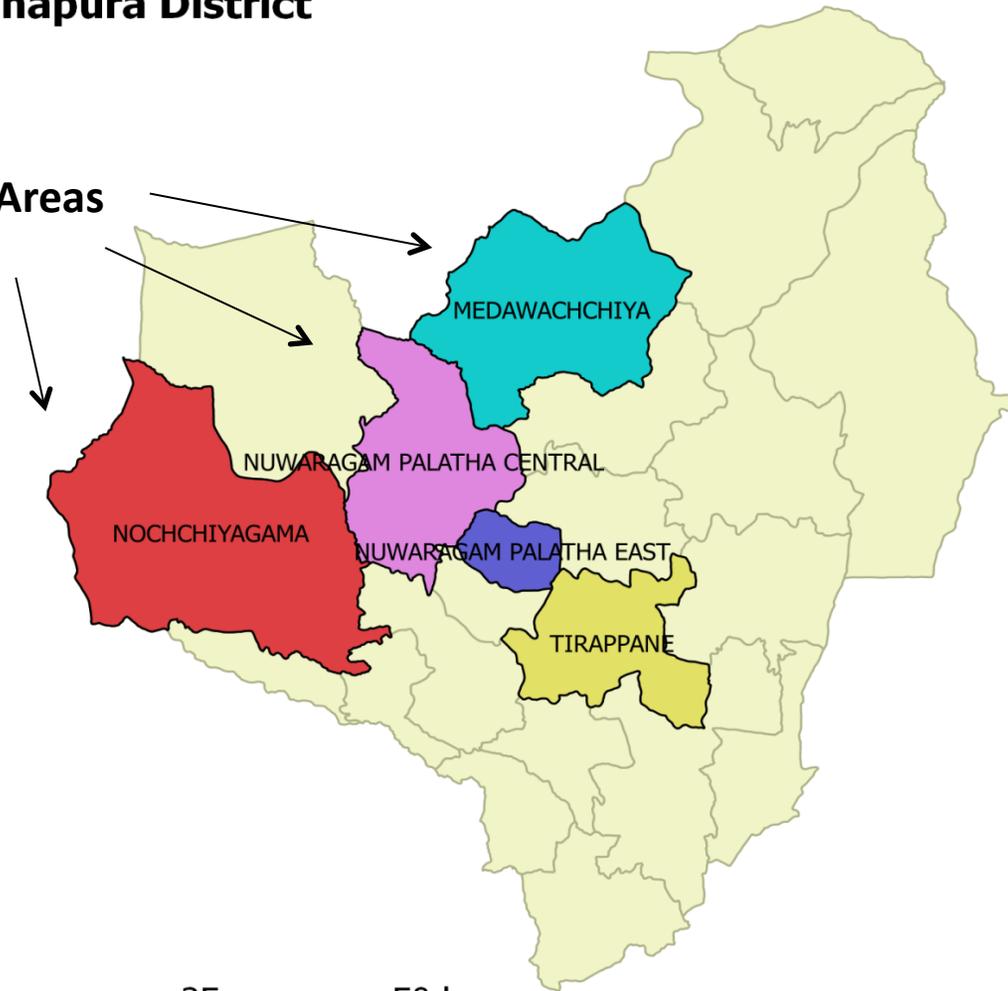
Map of Sri Lanka

North Central Province



Anuradhapura District

Study Areas



- Questionnaire → Farmer Interview
- 20 case farmers and 40 control farmers from each range
- Number of farmers interviewed (n= 240)

Contents of the questionnaire

- General information
- Livestock information
- Risk factors

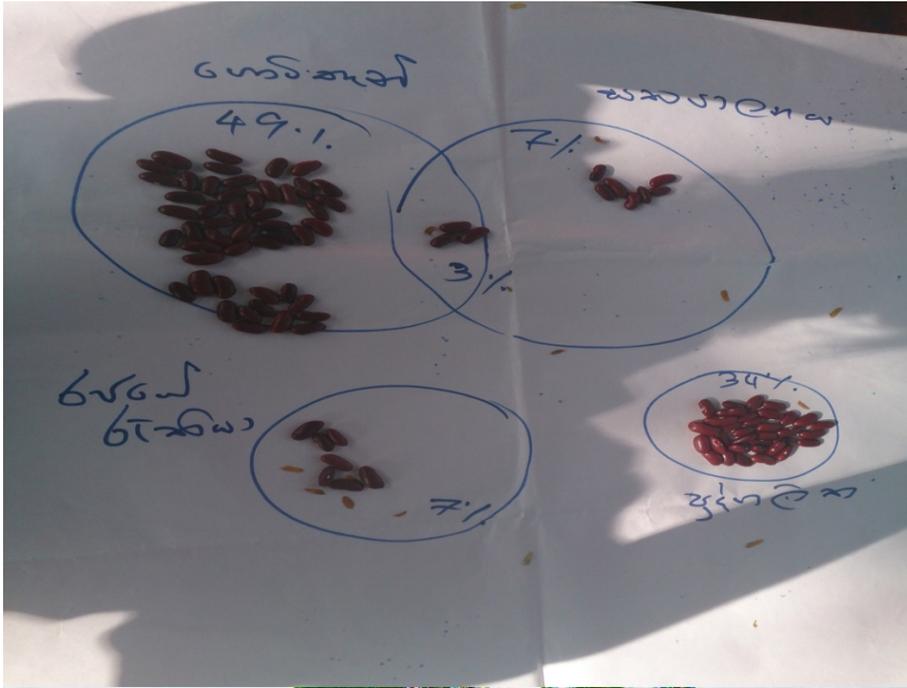
Risk factors considered

Risk Factor considered	Year and author	Country
Buying and selling of cattle during the outbreak	C. Cleland, 1996	Thailand
	Wieland et al., 2015	Mongolia
	Bronsvort 2004	Cameroon
Farm management and the farm location	Muroga et al., 2013	Japan
The distance from the slaughter house and movement of vaccinated cattle	Ann et al., 2007	Ecuador
Human activity and movement	Picado et al., 2011	Tanzania
Human activity along the main road	Chandana 2008	Sri Lanka
	Hamoongaa R., et al 2014	Zambia
Cattle herd roaming for free grazing, wetland areas, and weather conditions	Phouangsouvanh 2009	Laos
	Dukpa 2011	Bhutan
	C. Cleland, 1996	Thailand
	Bronsvort 2004	Cameroon
	Yano T (2009)	Thailand
Animal contact among nearby villages	Phouangsouvanh 2009	Laos
	Picado et al 2011	Tanzania
Aggregation of animals near communal drinking pools	Hamoongaa R., et al 2014	Zambia
	C. Cleland, 1996	Thailand
	Bronsvort 2004	Cameroon
Feeding commercial feed	Bronsvort 2004	Cameroon
Farming system and seasonal influence	Sarker, S 2011	Bangladesh

Focus group and in-depth interview

Check List for the Interviews

- To obtain general information with regard to livestock husbandry system
- Initiation of the outbreak
- Further information regarding the risk factors
- Impact of the disease
- Control measures



Techniques used

- Focus group discussions
 - 7 focus group discussions (7-8 farmers) from each study area
 - Methods used
 - Ranking method
 - Proportional piling
 - Participatory mapping
 - Seasonal calendar
- In-depth interview
 - 5 Semi structured interviews with the veterinarian and the livestock officers in the areas

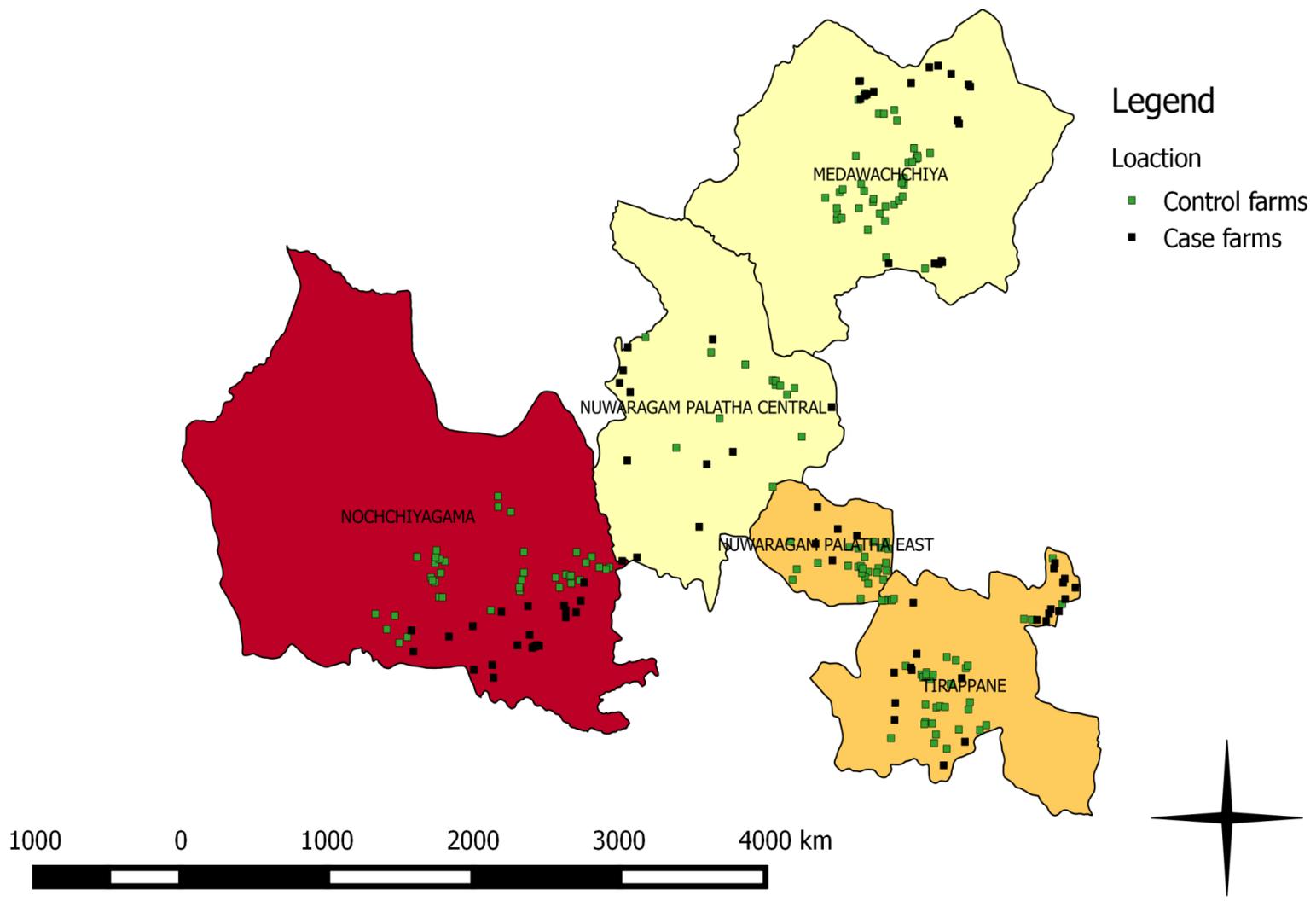
Statistical analysis

- Univariable analysis
 - OR calculation with Chi-square and Fishers exact test

A photograph of a forest scene. In the foreground, a large, thick tree trunk stands on the left. Behind it, a deer is partially visible, facing right. The background is filled with many other trees, their leaves creating a dappled light effect. The word "Results" is written in a large, bold, black font in the center of the image.

Results

Quantitative results



Results from the questionnaire

General information

Factor	Percentage
Management practice	
Open air tethering (housed in night paddock)	36% (85/243)
Free ranging at day time(housed at night)	23%(56/243)
Sick animals sent for grazing	16%(13/83)
Sick animals separated from the other animals in herd	25%(21/83)
Additional source of feed provided other than cut and fed grazing	
Cut and fed grass	68%(163/240)
Commercial feed	47%(114/240)
Crop byproducts	13%(33/240)
Vaccination	
Case farms	49%(40/83)
Control farms	52% (84/160)
Belief of the vaccine can protect animals	93%(99/107)



The housing systems in the area



Identified risk factors from the uni variable analysis

- Common cattle/buffalo grazing areas

	Cases	Controls	OR	Confidence Interval	P value
Forest	30%	30%	1	0.53 to 1.84	1
Near lake	79%	62%	2.35	1.22 to 4.68	0.009
Common grassland	83%	79%	1.95	0.96 to 4.12	0.059
Near the road side	34%	24%	1.57	0.84 to 2.91	0.134
Individual grass land	23%	30%	0.71	0.36 to 1.36	0.291



Where does the animal go for grazing?

- Additional feed sources provided by the farmers

	Case farms	Control farms	OR	Confidence Interval	P value
Commercial feed	60%	41%	2.14	1.19 to 3.84	0.009
Crop by products	14%	14%	1	0.41 to 2.3	1
Grass cut and fed	82%	61%	3.06	1.53 to 6.39	0.001



Cut and fed grass



Stored crop byproduct

- Animal movement

	Cases	Controls	OR	Confidence Interval	P value
Cattle bought /sold from other districts	15%	14%	1.02	0.42 to 2.29	1
Bought/sold animals during last year	44%	27%	2.13	1.17 to 3.36	0.009

- Animal contact

	Cases	Controls	OR	Confidence Interval	P value
Animal contact among villages	65%	50%	1.82	1.02 to 3.3	0.045
Animal contact with in the village	85%	67%	2.92	1.41 to 6.41	0.002

Qualitative results

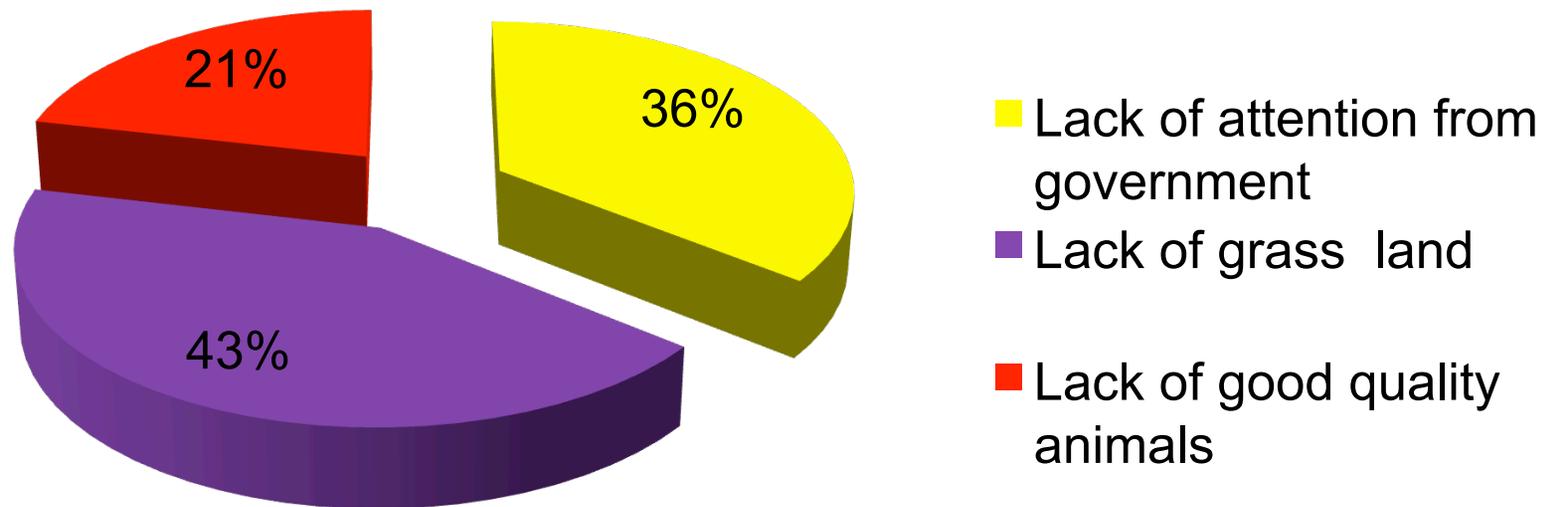
Focus group discussions

- Most of the livestock farmers participated were rearing animals for 10-15 years. Among them majority were doing the crop cultivation along with keeping the animals.
- Most of them are cattle farmers and limited buffalo, goat and swine farmers.

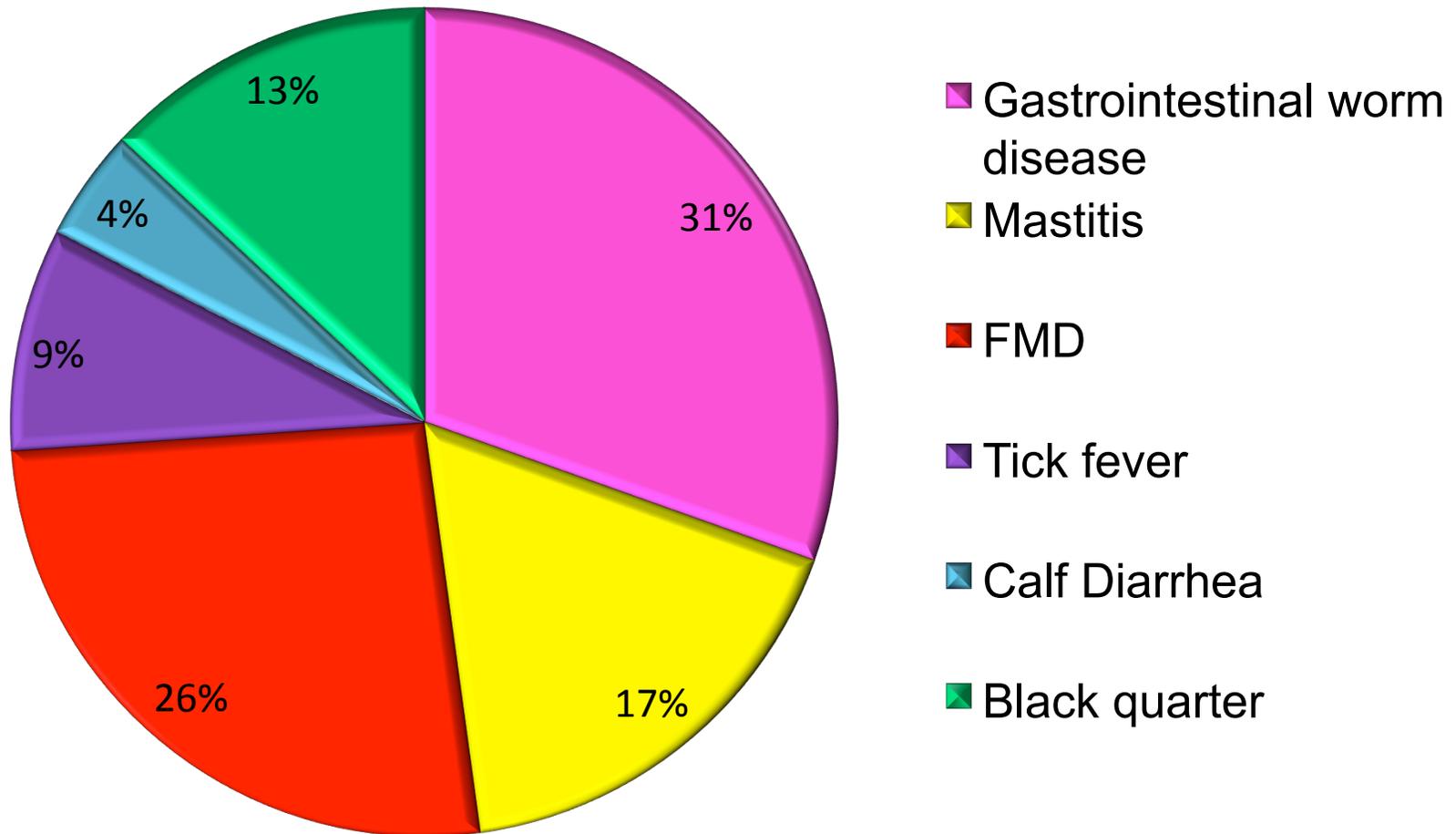


Results from the Focus Group Discussions

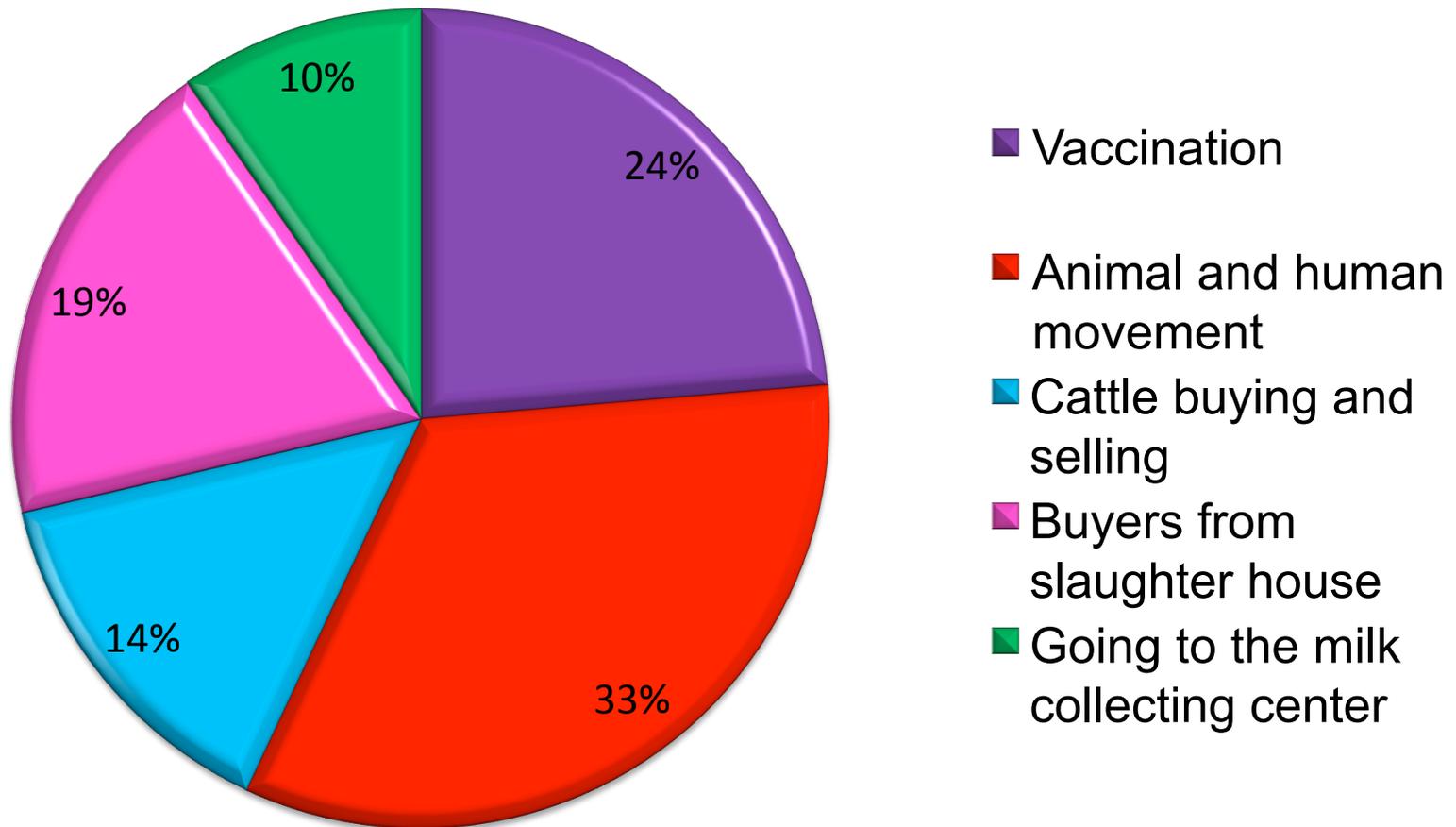
The Difficulties Faced by the Farmers in Livestock Rearing



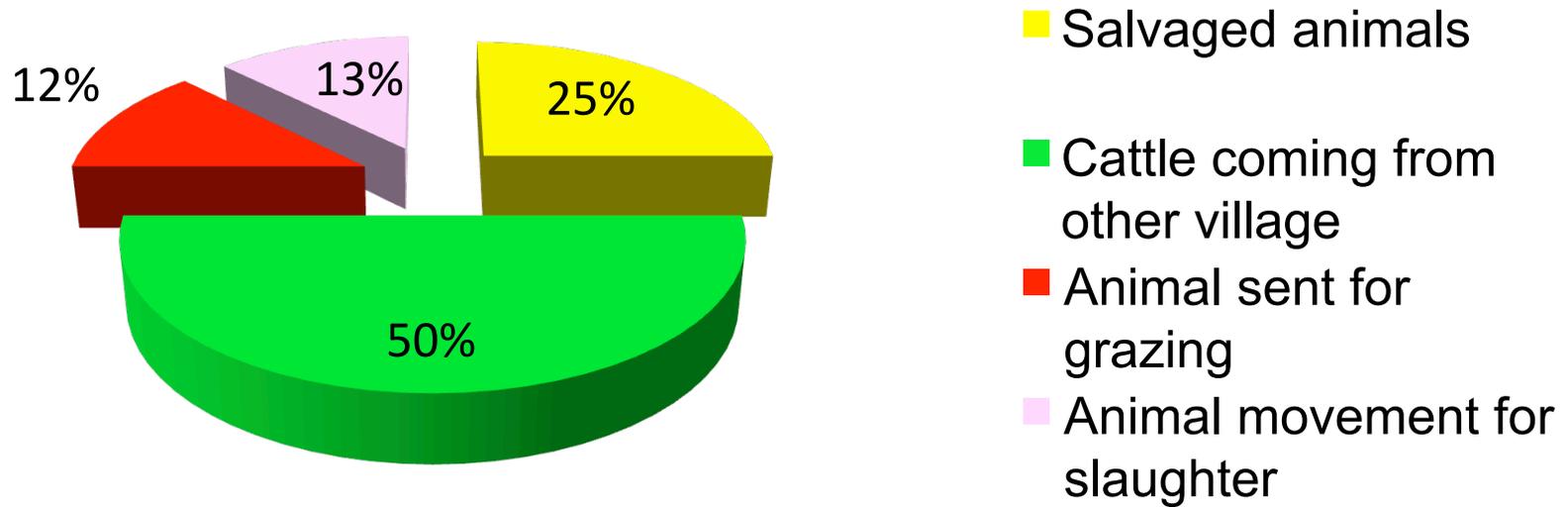
The Importance of the Disease



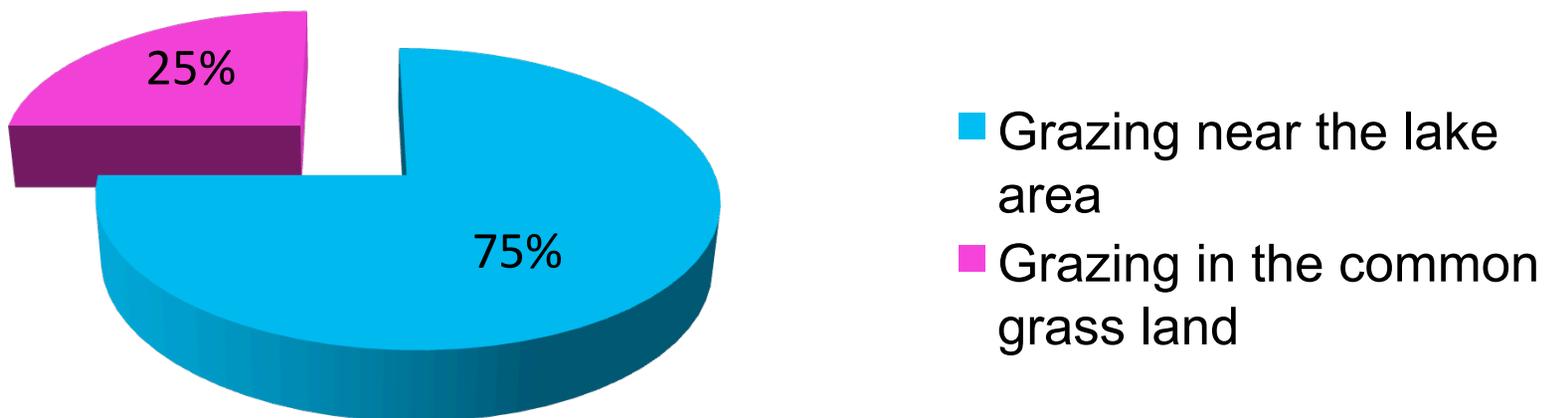
Identified Risk Factors



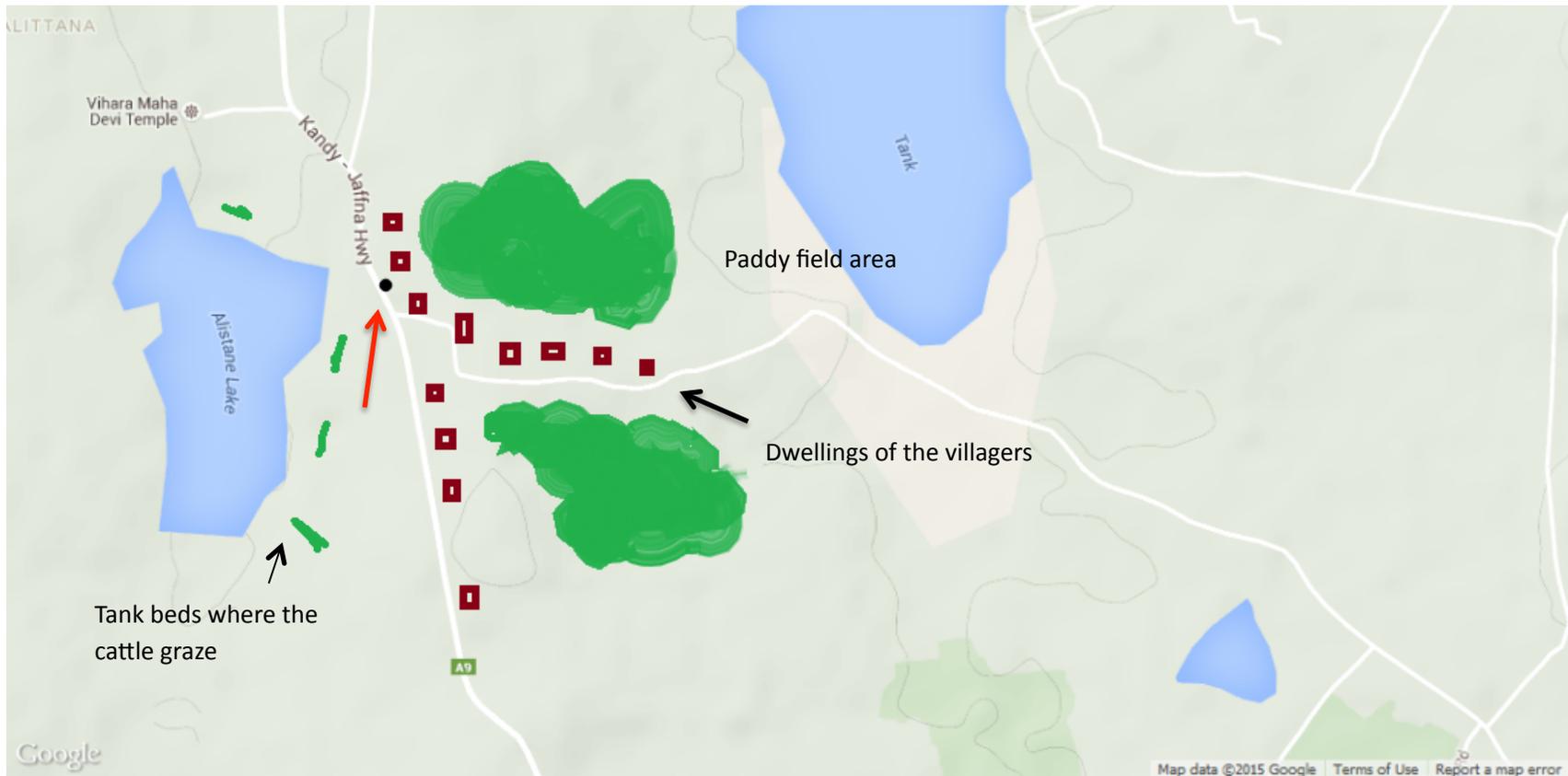
Disease Entering Routes in to the Village



Spreading of the Disease Inside the Village



Mapping of the Area





Results from the In-depth Interview

The Key Points of the In-Depth Interview

- The source of FMD to the village
 - *“The free ranging cattle and buffalos coming from other villages with the disease”*
 - *“The salvaged animals released for the religious purpose are released without consent”*
- Control measures
 - *In-depth interview 2;”The farmers should be made aware using the new communication technology so they tend to remember information better”*
 - *“ Vaccination program should be made biannual”*

A photograph of a lush forest scene. In the foreground, a large, thick tree trunk stands on the left. The ground is covered in green grass and foliage. In the background, a body of water is visible through the trees, reflecting the sky. The overall lighting is bright and natural.

Discussion

Quantitative analysis

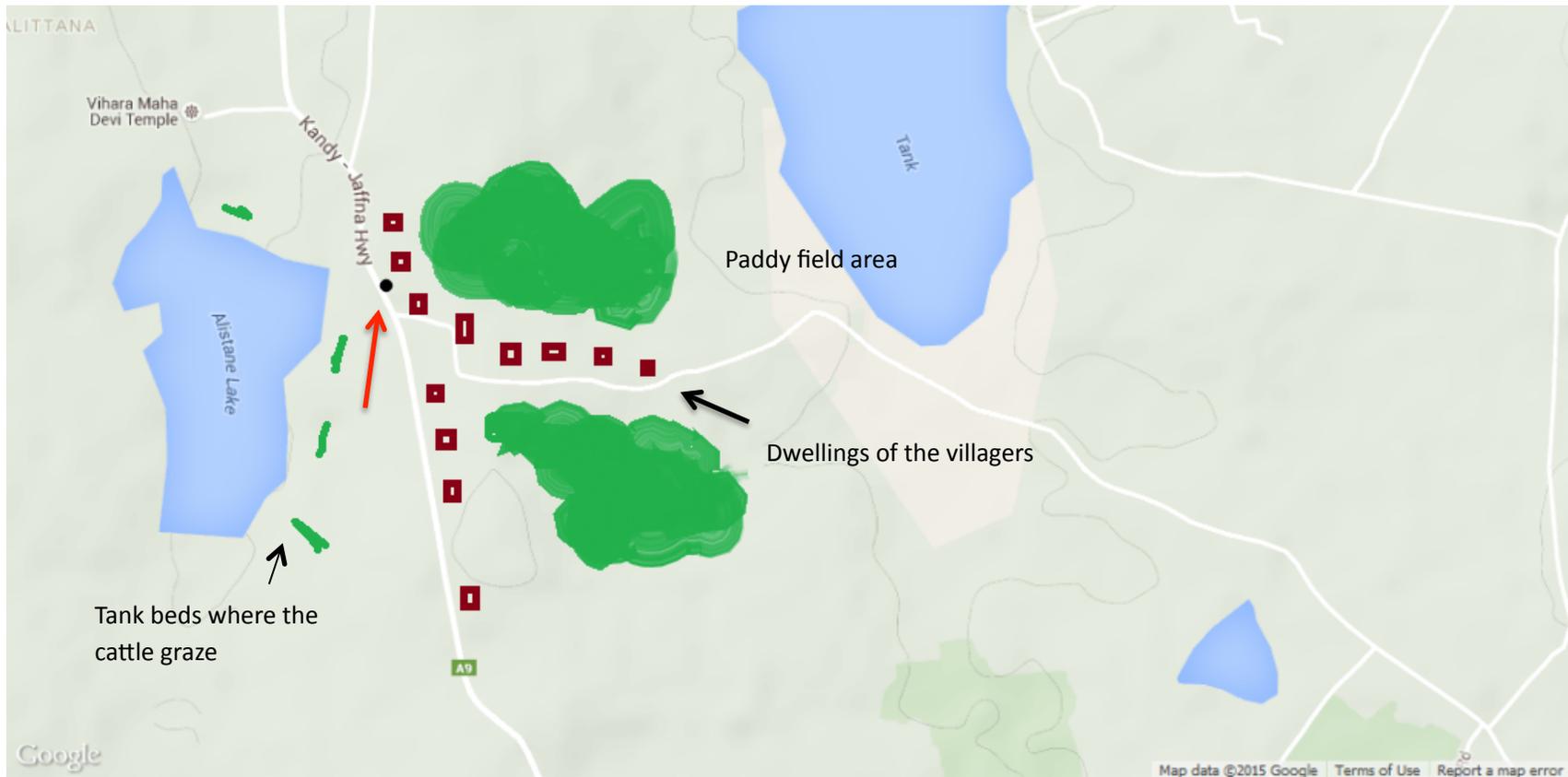
Animal contact among nearby villages
(OR 2.88 (1.23,6.72) , p =0.015)

Animal sent for grazing near tank areas
(OR 3.11 (1.21,7.97) p=0.018)

Animal brought/ sold during the outbreak
(OR 3.3 (1.39,7.83) p=0.007)

Located near a road where animal traders travel
(OR 3.44 (1.1,10.79) p=0.034)

Mapping of the Area



Qualitative conclusion

- The farmers in the area believe having large herd that they do not have an alternative to send animals for grazing
- Both focus group and in-depth interview emphasized the need of knowledge and infrastructure improvement for good biosecurity measures and disease control
- Located near a road where animal traders travel is a risk factor that cant be changed by the farmers or authority.

Acknowledgements

- **International Joint Masters program in Veterinary Public Health, of Freie University of Berlin and Chiangmai University, Thailand**
- **All the farmers, livestock officers and the veterinarians participated in the study**
- **Financial Support**
 - DAAD**
 - VPHCAP**
- **GFRA**



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- Vaccination
- 5 months of age
- After 3 months booster dose
- Annual vaccination

Major drawbacks for the disease control in Sri Lanka

- no strategic documents
- No planned vaccination
- Under reported cases
- illegal animal transport

Sri Lanka in 2014

Batch: WRLFMD/2014/00030

◆ 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

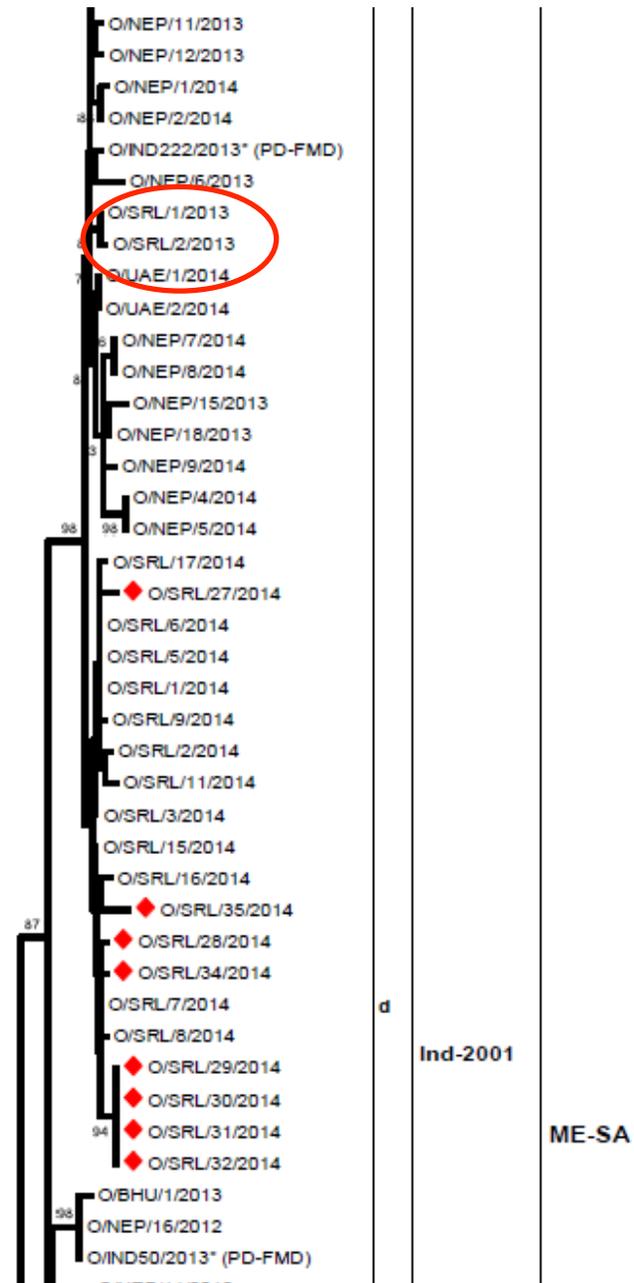
No. of Sites : 642

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,



- 70000 cases
- 2000 deaths