FMD in Cambodia: How to improve surveillance in a challenging environment?

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Introduction

Eradication of foot-and-mouth disease (FMD) is the main objective of the South East Asia China Foot-and-Mouth Disease (SEACFMD) campaign led by the OIE. In Cambodia, the disease is endemic but because of under-reporting and/or under-detection there is a lack of accurate data to inform the development of realistic and affordable control strategies.

Map of the 51 villages selected in the Svay Rieng province of Cambodia

Materials and methods

Participatory epidemiology (PE) combined with a serological survey in 51 villages of Svay Rieng province allowed us to:

i) apply a two-source capture-recapture (CR) methodology to estimate the number of villages that experienced clinical cases in the province in 2009
ii) assess the knowledge and the perception of FMD by farmers.

Method 1: Participatory epidemiology

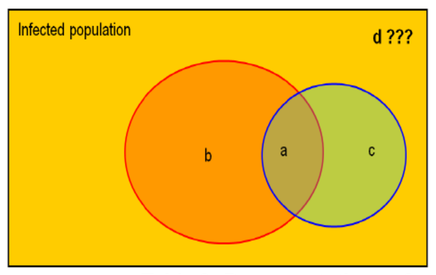
Semi Structured Interviews (SSI)

Diseases pair wise ranking

Impact matrix scoring

Proportional piling

Method 2 : Capture-Recapture



		Source 1		
		yes	no	
Source 2	yes	a	c	N_2
	no	b	**d ?**	
		N_1		**N**

Table 2: Representations of a two sources capture-recapture analysis

Source independance

P(1&2) = P(1)*P(2)
a/N = (a+b)/N * (a+c)/N

Estimated infected population size
N_{LP} = (a+b)*(a+c)/a *(Lincoln-Petersen estimator)*

Estimated sensitivity of source 1
Sb1 = (a+b)/N_{LP}

Results

Using the two-source CR analysis, we estimated that 315 [95% Confidence Interval (CI) 117-514] villages were clinically affected by FMD in 2009 in Svay Rieng province, leading to a village level annual incidence rate of about 46% [CI 17-74]. Within infected villages, the average animal level incidence rate was evaluated by proportional piling at 12% [Min-Max 2-46]. Interviews with farmers showed that even though FMD was ranked second in their list of priority diseases, farmers didn't see any benefit of reporting it since it entailed only low direct losses. Sensitivity, specificity, positive and negative predictive values of PE were estimated with a Bayesian method for assessing the performances of multiple tests in the absence of gold standard at 87%, 30%, 51% and 74%, respectively.

Result 1: Two-source capture-recapture analysis

Number of villages in source 1	Number of villages in source 2	Overlapping fraction	Estimated number of infected villages [CI 95%]
112	13	4	315 [117-514]

Result 2: Bayesian parameter inference for PE

	Mean	Median	2.5%	97.5%
Se	0.87	0.89	0.60	0.99
Sp	0.30	0.29	0.10	0.56
PPV	0.51	0.52	0.19	0.78
NPV	0.74	0.77	0.31	0.99
Pv	0.46	0.46	0.17	0.74

Pv: Prevalence of the disease among the villages investigated

Discussion

The PE was useful to better understand the economic drivers of FMD management by farmers in a rice-livestock system. Moreover, associated with the serological survey and introduced in a CR methodology, PE provided an estimation of the importance of FMD endemicity. We conclude that PE and CR are effective methods that could be used in several stages of the Progressive Control Pathway developed by FAO/OIE, to assess FMD epidemiological situation and improve farmers' involvement in countries with reduced surveillance system.