

Development of novel methodology for socio-economic evaluation of swine disease surveillance in Vietnam

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Introduction

- ▶ Critical issue for efficient surveillance system is the collaboration of animal owners
- ▶ To gain the support from farmers. It needs to
 - Understand farmer's perception about animal diseases and disease priority
 - Understand farmer's decision on animal health management at local area
 - Understand farmer's opinion or behavior in animal health surveillance
- ▶ Participatory Epidemiology (PE): an emerging field that is based on participatory techniques to gather epidemiological intelligence from community
- ▶ Using PE will help to capture farmer's knowledge and opinion through focus group discussion, semi-structured interview

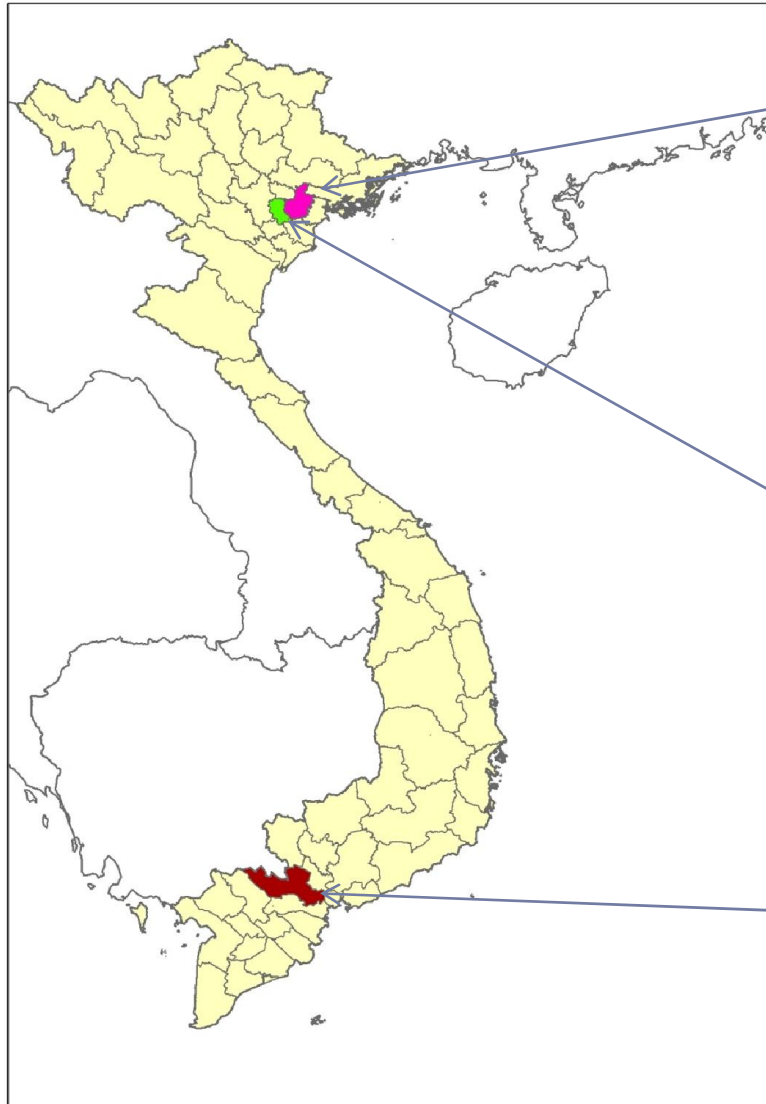


Research questions / studies

- 1. Evaluate the impact of swine diseases in Vietnam and define a framework for swine disease prioritization**
- 2. Describe swine disease surveillance and identify social-economic factors which influenced the efficiency of animal disease surveillance system**
3. Evaluate swine disease surveillance according to its costs and effectiveness



Study area



Hai Duong province
(one district, 4 villages)

Hung Yen province
(two districts, 8 villages)

Long An province
(two districts, 6 villages)

Methodology: Swine disease priority and economic impact assessment

- ▶ Uses of participatory epidemiology (PE) method
 - Focus group discussion
 - Semi-structure interview
 - Ranking and scoring

- ▶ PE tools : proportional piling, seasonal calendar, matrix scoring, pair wise ranking



Steps of disease prioritization

Step 1

- Identification of pig health problems, disease patterns and incidence (using matrix scoring, seasonal calendar, proportional piling techniques)

Step 2

- Defining indicators used for disease ranking (using pair wise ranking technique)

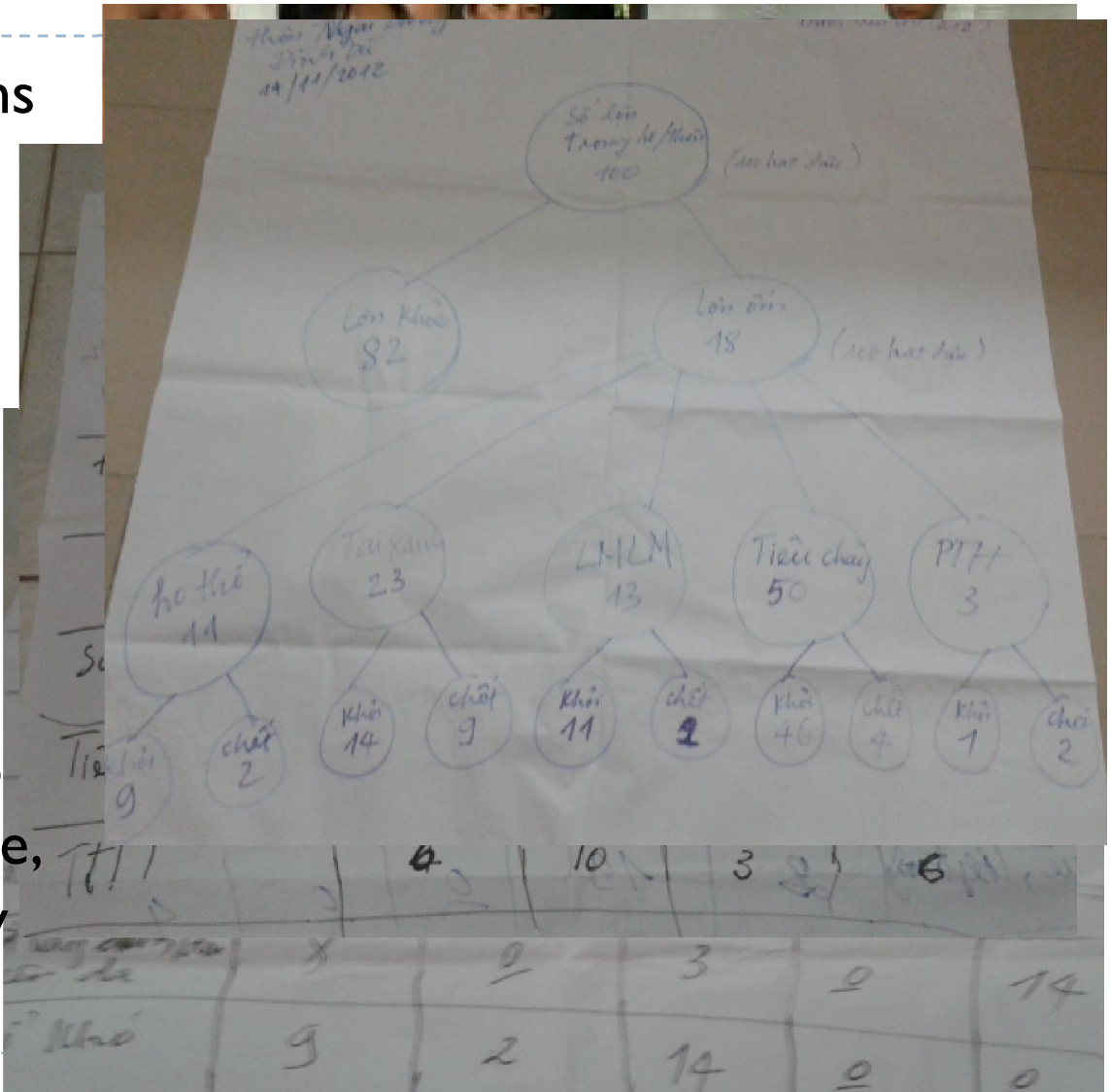
Step 3

- Swine disease ranking and weighting indicators (using matrix scoring, simple ranking techniques)

Methodology

Identification and characterization of swine diseases

- List of pig health problems occurred in the area in the last two years
- Describe symptoms and season of 5 most common diseases: using of matrix scoring and seasonal calendar techniques
- Proportion piling: used to estimate relative incidence, mortality, and case fatality of disease



Methodology

Defining indicators used for disease ranking

- ▶ Pair wise ranking:
 - five major swine diseases were listed and written in cards
 - two named diseases were shown and compared, in turn
 - reasons why one disease is more important than other were recorded as indicators



Methodology

Swine disease ranking by indicators

- Matrix scoring technique used for disease ranking by indicators
- 5 major diseases in the columns, indicators in rows
- 25 beans used for each indicator
- The higher proportion of beans, the stronger association of indicators and disease
- Disease with highest score was considered as the most important

A handwritten matrix scoring table on a piece of paper. The table has 6 columns and 10 rows. The columns are labeled: 'Bệnh' (Disease), 'Tai xanh' (Green ear), 'LMUN', 'Ho thỏ' (Rabbit cough), 'Tiêu chảy' (Diarrhea), and 'PTH' (PTD). The rows are labeled: 'Tiêu chí' (Indicator), 'ăn suất xây ra bệnh (25 hạt đậu)' (Disease occurrence rate (25 beans)), 'Ti lệ mắc bệnh' (Disease incidence rate), 'Tỉ lệ chết' (Mortality rate), 'Tốc độ lây lan' (Spreading rate), 'Thời gian điều trị' (Treatment time), 'Chi phí điều trị' (Treatment cost), 'hết đợt tư' (End of treatment), and 'Tổng số' (Total number). The table contains numerical scores for each indicator-disease combination.

Bệnh	Tai xanh	LMUN	Ho thỏ	Tiêu chảy	PTH
Tiêu chí					
ăn suất xây ra bệnh (25 hạt đậu)	7	2	6	9	1
Ti lệ mắc bệnh	10	6	2	6	1
Tỉ lệ chết	10	5	3	3	4
Tốc độ lây lan	8	6	3	4	2
Thời gian điều trị	9	5	4	2	5
Chi phí điều trị	14	2	4	2	3
hết đợt tư	0	20	0	5	0
Tổng số	69	48	28	33	22

Methodology

Assessment of economic impacts of swine diseases

- ▶ Key informant interview
- ▶ Criteria for district, commune, and village selection
 - the diversity of pig farming systems
 - PRRS and FMD outbreaks reported officially in 2010-2013
- ▶ 4-6 pig farm holdings selected per village (total 162 pig holders in 36 villages interviewed)
- ▶ Semi-structure interview of pig holders ,using questionnaire covered economic parameters on pig production, history of disease occurrence at farm, and disease management practices



Methodology

Data analysis

Disease priority

- ▶ Scores obtained from PE tools were summarized in median, 10th and 90th percentiles
- ▶ Agreement between groups was assessed using Kendal coefficient of concordance (W).
 - W values ≤ 0.26 , p value >0.05 show weak agreement,
 - $0.26 < W$ values ≤ 0.38 show moderate agreement,
 - W values > 0.38 , p value <0.01 show good agreement between group discussions (Siegel and Castellan, 1989)

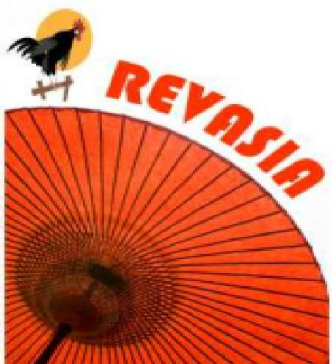
Disease impact assessment

- ▶ Identification of pig farm typologies, using cluster analysis
 - ▶ Estimation of gross margin of pig farm holding
 - ▶ Estimation of disease impacts (direct and indirect losses due to disease)
 - ▶ Economic impacts of disease were accounted as percentage loss of gross margin.
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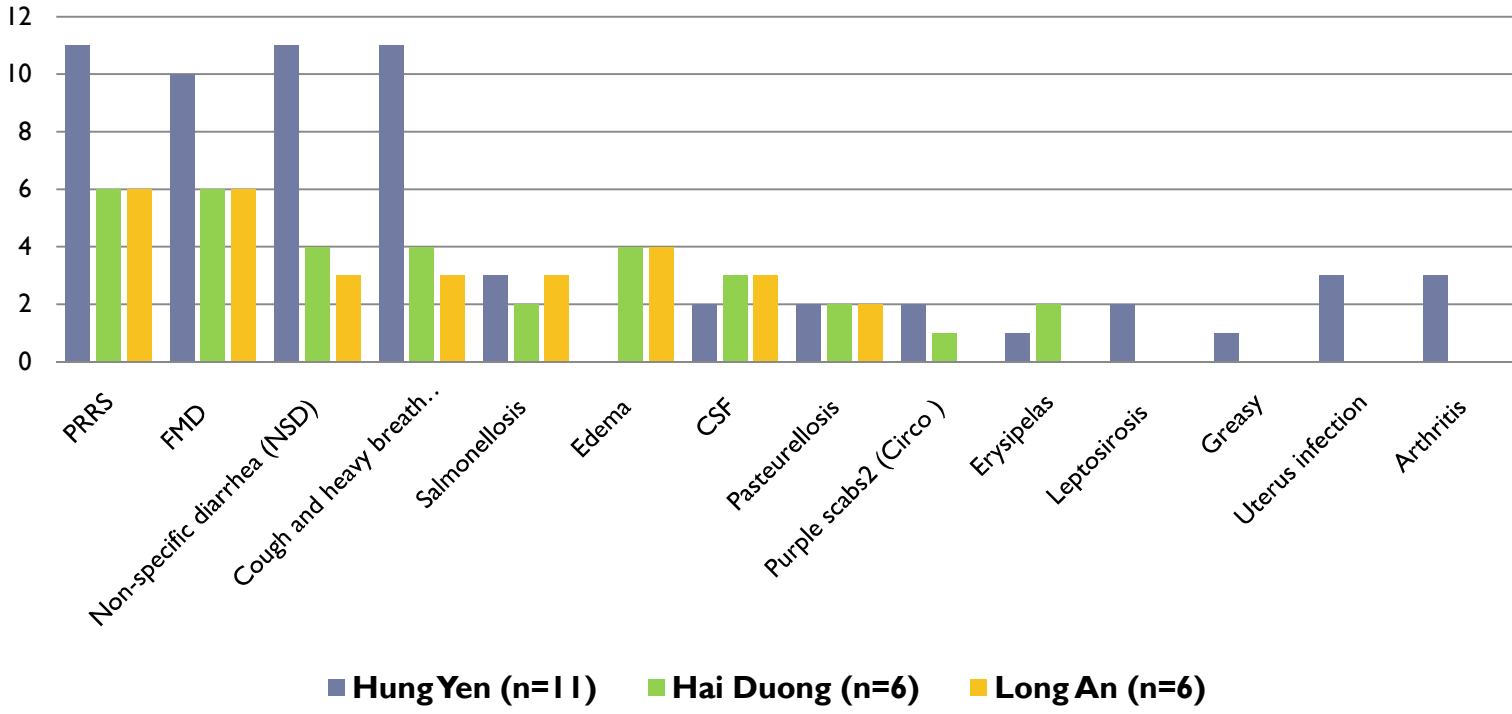
RESULTS

Swine disease priority



Swine health problems

Frequency of swine disease occurrence mentioned by focus group discussion in 2012-2014



Indicators used for disease ranking as perception of pig farmers in study sites

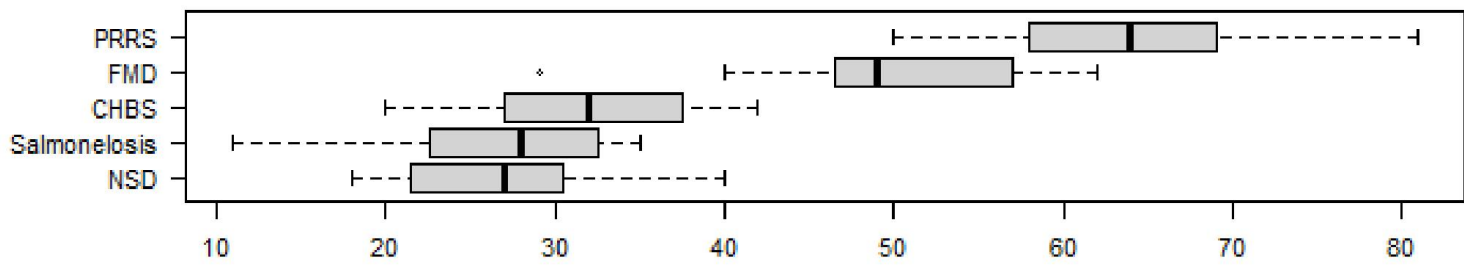
Indicators	Score and description	Ranking indicators*		
		HY (n=11)	HD (n=6)	LA (n=6)
Mortality in herd (0-100%)	Percentage of pig died due to disease: higher proportion of beans, higher mortality rate	8 (7-8)	8 (5.5-8)	8 (7.5-8)
Treatment cost	Treatment cost for infected pigs and other pig at the same batch (at risk): higher proportion of beans, higher cost	5 (4-7)	5.5 (3-7)	6 (5-7.5)
Morbidity in herd (1-100%)	Percentage of pigs at farm infected by disease: higher proportion of beans, higher proportion of herd infected	4 (2-7)	3.5 (3-6)	4 (2-6)
Time of treatment (1-30 days)	Number of treatment days applied for infected pigs: higher proportion of beans, longer treatment time	3 (1-5)	4 (2-7)	6 (3.5-7)
Spread rate	Number of days when 70-100% pigs in batch infected; higher proportion of beans, shorter time of herd infected	4 (1-7)	5 (2.5-6.5)	5 (2.5-6.5)
Combination with other diseases	Possibility of co-infection with other pathogens: higher proportion of beans, higher possibility of co-infection	5 (3-8)	3.5 (2.5-7)	3.5 (2-5)
Sudden death	Number of pigs die without any clinical signs within 2-3 days: higher proportion of beans, higher number of sudden deaths	5 (1-8)	4.5 (1.5-6.5)	2.5 (1-4)
Frequency of disease occurrence at pig farm	Higher proportion of beans, higher frequency of disease occurrence	2 (1-4)	1 (1-4)	2 (1-2.5)

Results obtained from pair wise ranking, and simple ranking

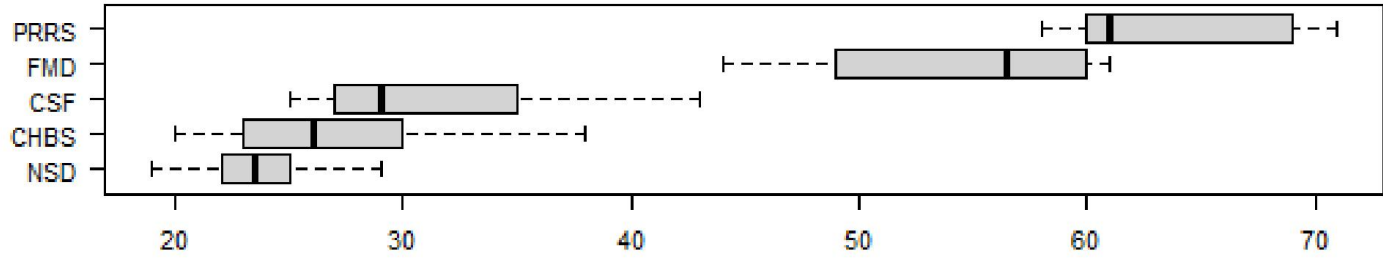
*: the most important indicators scored as 8, the least scored as 1 (Median, 10th and 90th percentile of scores of indicators)



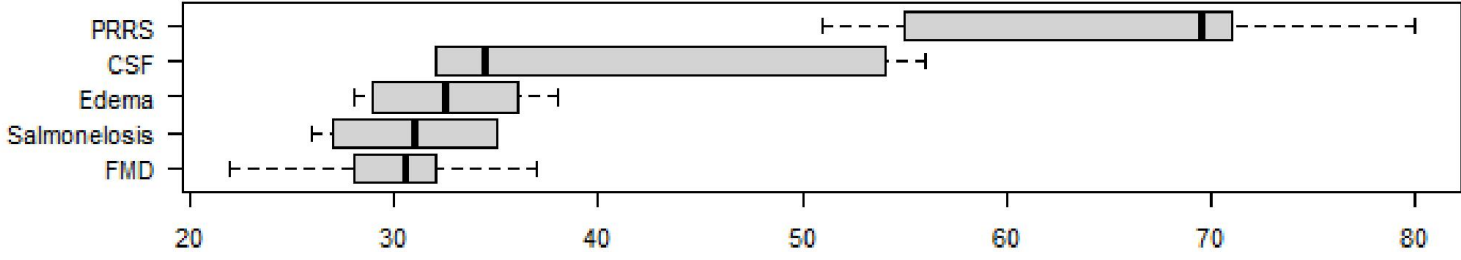
Swine disease priority



Hung Yen
(N=11)



Hai Duong
(N=6)



Long An
(N=6)

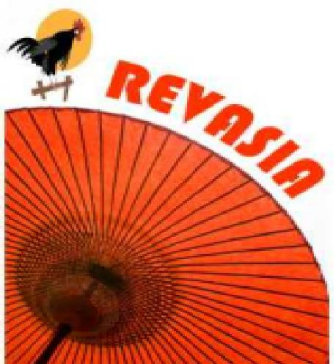
Scores

Results obtained from matrix scoring technique

NSD: non-specific diarrhea, CHBS: cough and heavy breath syndrome

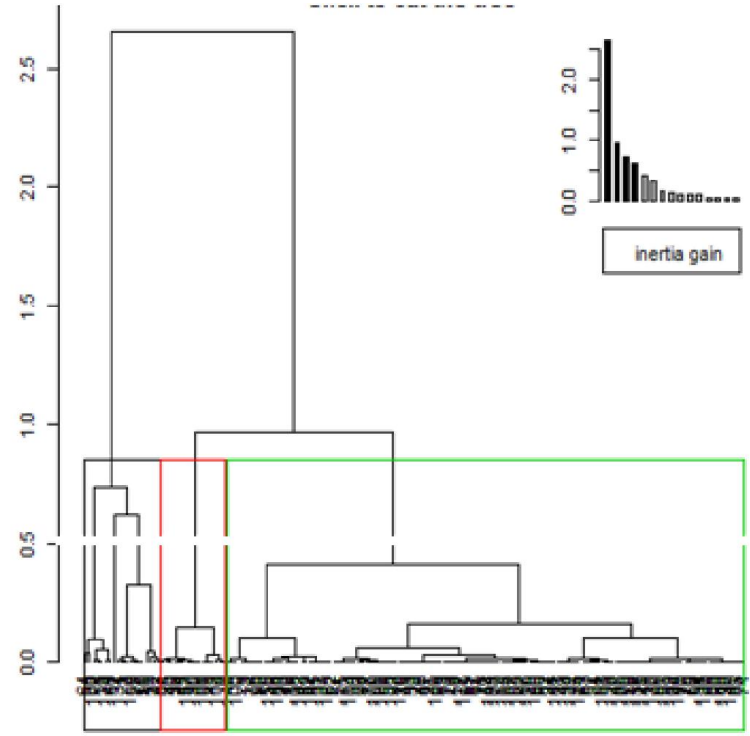
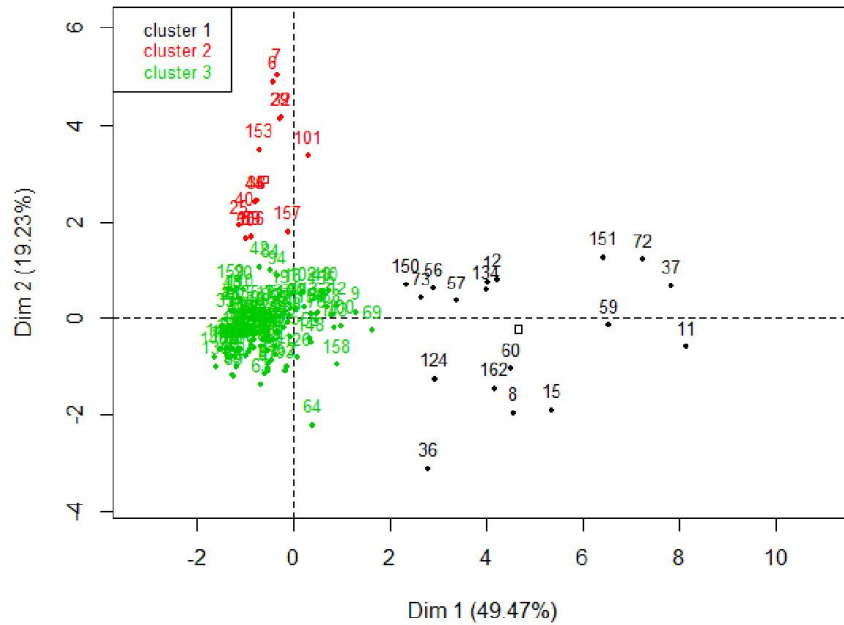
RESULTS

Economic impacts of priority swine diseases



Pig farm typologies

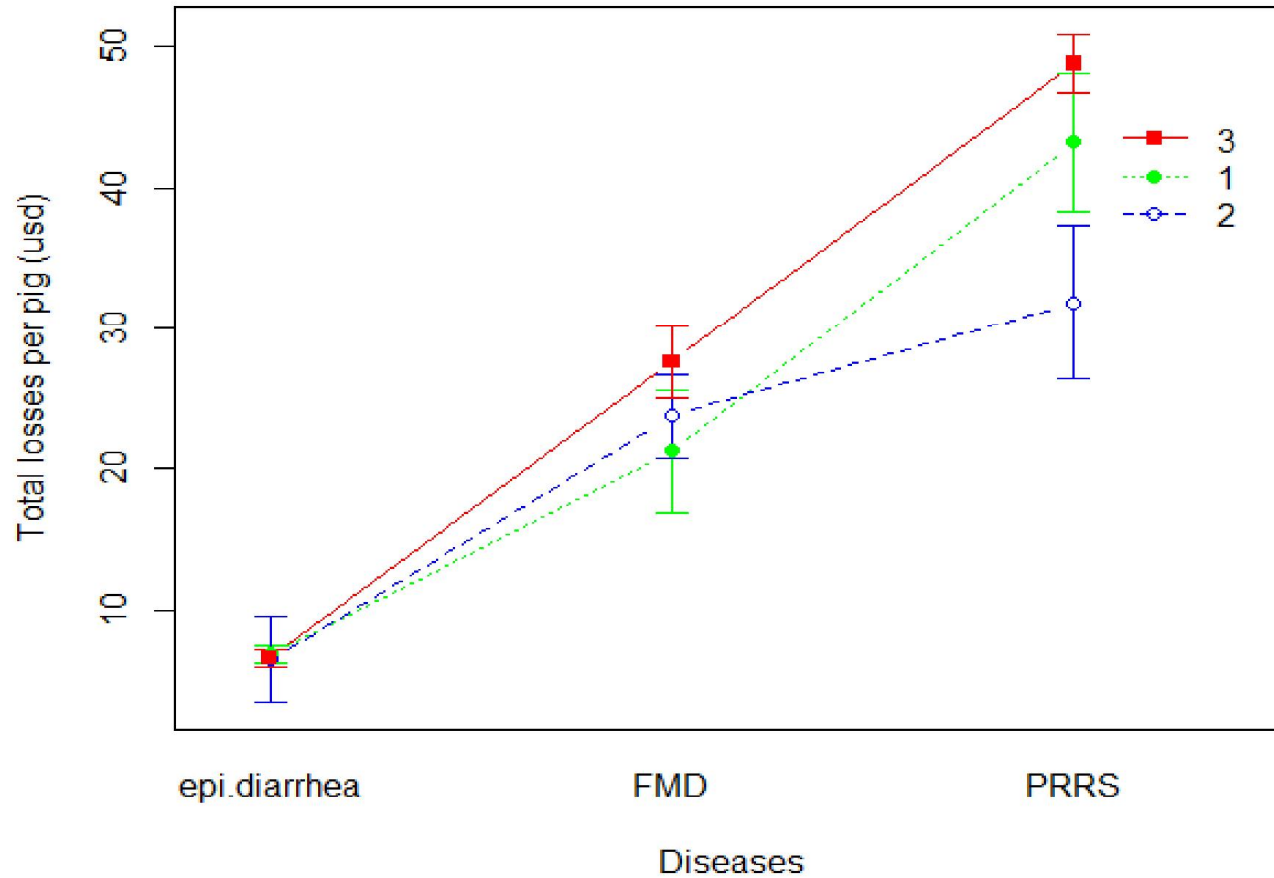
Factor map



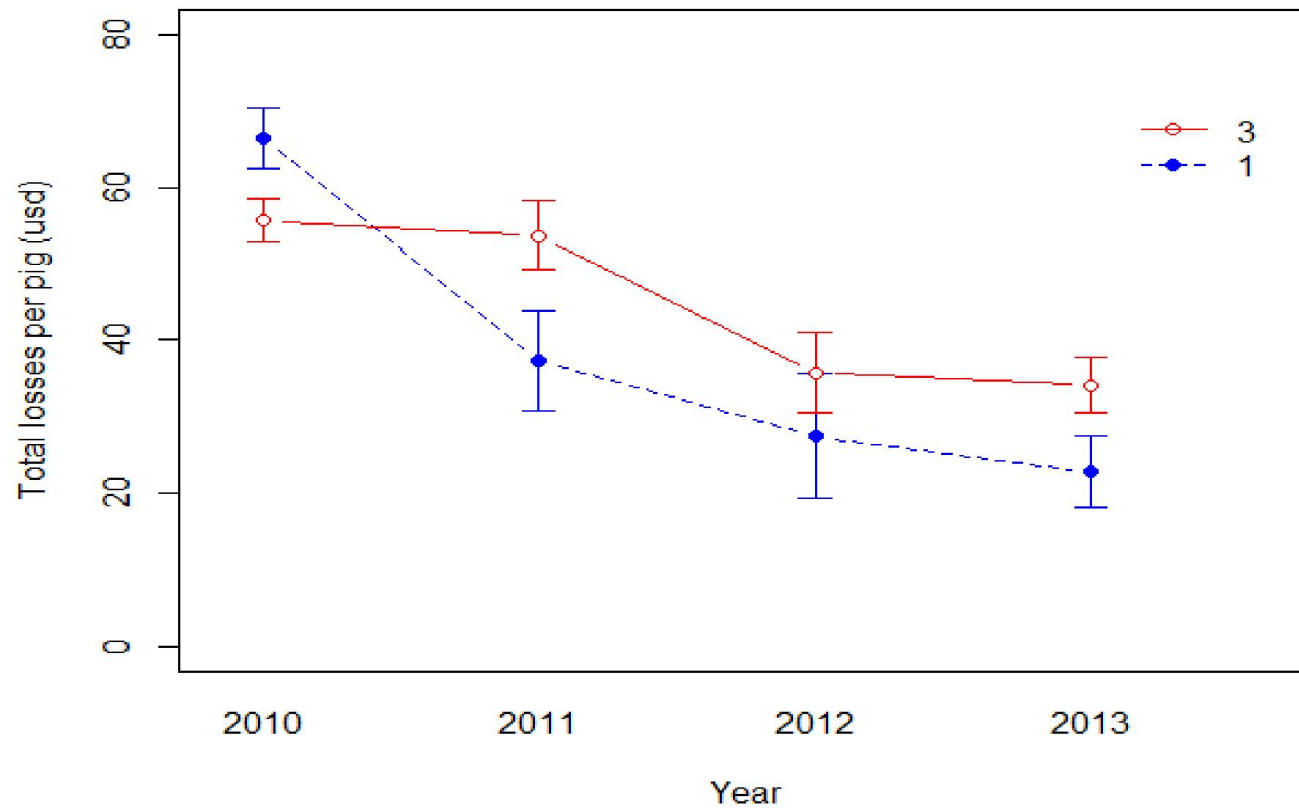
Characteristics of pig farm typologies

	group1	group2	group 3
N (%)	18 (11.1%)	15 (9.3%)	129 (79.6%)
Location			
Hung Yen	8	13	43
Hai Duong	6	1	37
Long An	4	1	49
Farming system			
mixed farm (%)	100%	13.3%	91.5%
fattening farm (%)	0 %	86.7%	8.5%
Herd size			
No of sow (min-max)	20-50	0-4	0-16
No of boar (min-max)	0-3	0	0
No of weaner sold (min-max)	0-400	0	0-220
No of weaner purchased (min-max)	0	140-400	0-120
No of fattening pig (min-max)	15-900	140-400	0-270
Pig breed			
cross breed (exotic breed x exotic breed)	100%	100%	13.9%
cross breed (local x exotic breed)	0%	0%	86.1%
Feeding regime			
Use by-product of home job or food wastes	0%	0%	50.4%
Home mixed feed (Yes)	72.2%	73.3%	95.3%
No	27.8%	26.7%	4.7%
Income contribution	82.8%	72.7%	51.8%

Financial impact of important swine diseases



Financial impact of PRRS in years



Research questions / studies

1. **Evaluate the impact of swine diseases in Vietnam and define a framework for swine disease prioritization**
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Methodology : Swine disease surveillance network

- ▶ Social network analysis: (Alexis presentation)



Network of animal health surveillance

Animal health

information systems

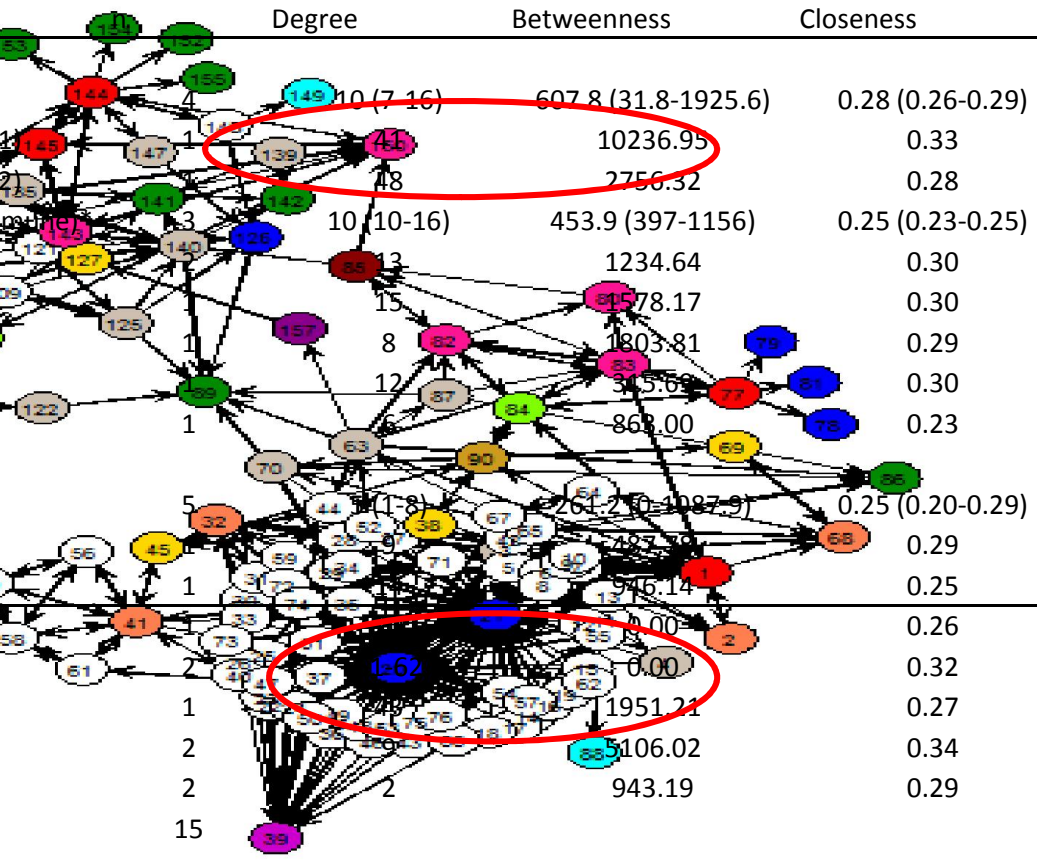
Actors

Degree

Betweenness

Closeness

Village animal health worker*
 Para-veterinarian (commune1)
 Para-veterinarian (commune2)
 Para-veterinarian (commune3)
 Veterinarian (district1)
 Veterinarian (district2)
 Veterinarian (province)
 Agricultural official (district1)
 Agricultural official (district2)



- SH Head of village *
- SC Head of commune 1
- Formal surveillance system
 - vil.vet Head of commune 2
 - dis.vet Private veterinarian
 - prov.vet Drug seller (commune 1)
 - pri.vet Drug seller (commune 2)
 - vet.expert Drug delegation
 - drug.seller Trader
 - head.vil
 - head.com
 - agri.staff
 - delegation
 - tech.staff
 - trader

Semi-commercial farmer *

3 (1-11)

9.18 (0-2421.8)

0.25 (0.20-0.33)

Informal surveillance

system

Small-holder*

76

6 (2-15)

8.17 (0-3864.4)

0.24 (0.22-0.31)

Socio-economic factors influence on farmer's decision of disease reporting

Factors	Semi-commercial farms (N=15) n (%)	Small pig farm holding (N=76) n (%)	Comments
Loss of reputation which gives a consequence of business interruption (stop breeding, feeding, drug selling)	13 (86.7)	-	Very important in breeding farms
Loss of reputation which causes the difficulty in bank loan or buying feed in credit	-	45 (59.2)	
Drop of pig price and difficulty to sell breeding/fattening pigs	13 (86.7)	67 (88.2)	
Uncertainty of being compensated	10 (66.7)	68 (89.5)	
Unclear of compensation rate	6(40.0)	49 (64.5)	
Complicated administrative procedures of compensation and long period of compensation payment	11 (73.3)	41 (53.9)	
Long period of movement restriction	8 (53.3)	18 (23.7)	
Being confident on disease risk assessment and disease management	11(73.3)	7 (9.2)	
Affection on the relationship with other farmers/relatives due to negative consequence of disease notification	2 (13.3)	5 (6.6)	
Possibility to sell sick/dead pigs	9 (60.0)	57 (75.0)	



Conclusions and recommendations

- ▶ Important indicators for farmers to rank swine diseases: mortality, treatment cost and attack rate
- ▶ Swine disease priority varied between localities and linked mainly to re-occurrence of outbreaks and the perceived significant impacts
- ▶ Financial impact of swine diseases varies between pig production systems and provinces (e.g. PRRS)
- ▶ Impact social-economic factors at local community on swine disease surveillance and control strategies: loss of reputation, dropping of pig price, and uncertainty of compensation payment
- ▶ Objective of surveillance system needs to match local situation (adapt to the needs, e.g. surveillance targeted on the economic risk)
- ▶ Organization of surveillance system needs to take into account local constraints



Acknowledgment

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 - ▶ Nông Lâm University of Ho-Chi-Minh City: Truong Dinh Bao, Nguyen Ngoc Thanh Xuan, Nguyen Van Chanh
 - ▶ Tropical Veterinary Institute, University of Liège, Belgium: Nicolas Antoine-Moussiaux
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