

Cross Sectional Study on African Swine Fever (ASF) in Neverland

Country name : **Malaysia**

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Objectives & Expected outcomes

OBJECTIVE:

1. To quantify the extent of ASF occurrence of within 2 administrative regions (**assuming that only 2 regions are affected**) from Jul – Sept. 2021
(Study Population: 266 villages with 106,667 pigs under 19,946 households; 400 pigs in 52 commercial farms)
– through Prevalence Ratio via serological surveillance from herds of affected households (**assuming that ELISA test used could quantify antibody titer**)
2. to identify & evaluate exposure factors towards ASF within the affected household via questionnaire – through Odds Ratio
3. To quantify the socioeconomic impact of ASF at household and regional level via questionnaire

OUTCOME:

- Prevalence of ASF (and extent) [disease distribution] within affected regions
- Odds Ratio towards potential sources and risk factors associated with ASF

Target group and case definition

- **Target group: 2 administrative regions** → involving 266 villages → 106,667 pigs in 19,946 backyard household & 400 pigs in 52 commercial farms (not incl. wild boar → beyond control)
- **Case definition :** ASF positive household and commercial farms (household) and pig positive for ASF (animal level) from Jul – Sept. 2021

Stepwise approach of investigation

- **Case definition :** ASF positive household and commercial farms (household) and pig positive for ASF (animal level) from Jul – Sept. 2021
- **Case Control :** ASF negative (no reported ASF) household and commercial farms within same region from Jul – Sept. 2021

Target area:

- list of backyard farming (reported confirmed and negative cases)
- list of commercial farms (reported confirmed and negative cases)

Study size

- How many and what type of pig holdings and animals should be sampled, and in which regions (make assumptions)

(Study Population: 266 villages with 106,667 pigs and 19,946 backyard household; 52 commercial farms involving 400 pigs – assuming prevalence of 10% in the region, outbreaks concentrating within this 2 regions only)

Determining Sample size for no. of pig holdings to be sampled

Sample size to estimate true prevalence

<https://epitools.ausvet.com.au/>

Analysed: Thu Dec 09, 2021 @ 13:40 UTC

Inputs

Assumed true prevalence	0.1
Sensitivity	0.85
Specificity	0.95
Desired precision	0.05
Confidence	0.95

Study size

- How many and what type of pig holdings and animals should be sampled, and in which regions (make assumptions)

(Study Population: 266 villages with 106,667 pigs and 19,946 backyard household; 52 commercial farms involving 400 pigs – **assuming prevalence of 10%, outbreaks concentrating within this 2 regions only**)

Results

Sample size required for specified inputs

<https://epitools.ausvet.com.au/>

Sample size

272 pig holdings

Sample sizes for varying prevalence and precision values

Samples sizes required for sensitivity = 0.85, specificity = 0.95 and a range of true prevalence and precision values are shown below:

	TP = 0.01	TP = 0.02	TP = 0.05	TP = 0.1	TP = 0.2	TP = 0.5
Precision = 0.01	3280	3701	4916	6789	9958	14856
Precision = 0.02	820	926	1229	1698	2490	3714
Precision = 0.05	132	149	197	272	399	595
Precision = 0.1	33	38	50	68	100	149
Precision = 0.2	9	10	13	17	25	38

Study size

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Sample sizes for varying sensitivity and specificity

<https://epitools.ausvet.com.au/>

Samples sizes required for true prevalence = 0.1, precision = 0.05 and a range of sensitivity and specificity values are shown below:

	Se = 0.7	Se = 0.8	Se = 0.9	Se = 0.95	Se = 0.99	Se = 0.999
Sp = 0.7	2156	1399	984	843	752	733
Sp = 0.8	1153	822	619	545	496	486
Sp = 0.9	574	443	355	321	298	293
Sp = 0.95	371	299	249	229	215	212
Sp = 0.99	235	200	174	163	155	153
Sp = 0.999	208	179	158	148	142	140

Study size

- How many and what type of pig holdings and animals should be sampled, and in which regions (make assumptions)

(Study Population: 266 villages with 106,667 pigs and 19,946 backyard household; 52 commercial farms involving 400 pigs – assuming prevalence of 50% at animal level)

FreeCalc sample size estimation

Determining
Sample size for no.
of pigs to be
sampled / premise

Analysed: Thu Dec 9 2021 @ 13:55

<https://epitools.ausvet.com.au/>

Inputs

Test sensitivity	0.85
Test specificity	0.95
Population size	107067
Design prevalence	0.5
Diseased elements	53534
Analysis method	Simple binomial (large population)
Target Type I error	0.05
Target Type II error	0.05
Population threshold for infinite probability formula	10000
Maximum sample size	3200

Study size

- How many and what type of pig holdings and animals should be sampled, and in which regions (make assumptions)

(Study Population: 266 villages with 106,667 pigs and 19,946 backyard household; 52 commercial farms involving 400 pigs – assuming prevalence of 50% at animal level)

Required sample size:	12 Pigs / premises
Cut-point number of positives:	2
Type I error:	0.0421
Type II error:	0.0196
Population-level sensitivity:	0.9579
Population-level specificity:	0.9804
Interpretation:	If a random sample of 12 units is taken from a population of 107067 and 2 or fewer reactors are found, the probability that the population is diseased at a prevalence of 0.5 is 0.0421.
Method:	Simple binomial (large population)

<https://epitools.ausvet.com.au/>

Stakeholder involved

How are pig households and/or piggeries accessed (who is sampling, who administers a questionnaire)

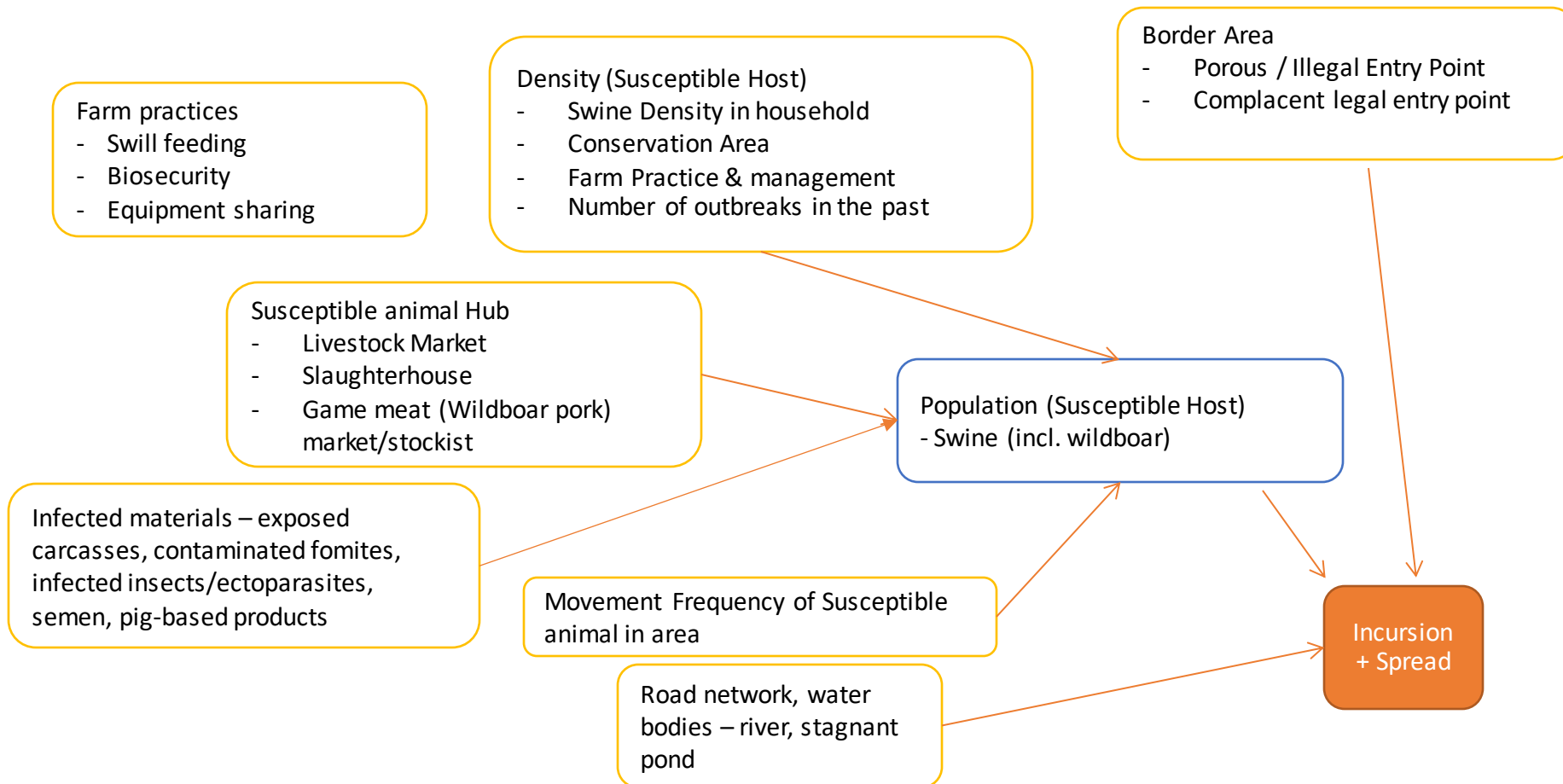
- Regional veterinarians under Ministry of Livestock Development and Fisheries (MLDF) from the 2 regions
- trained para-veterinary worker from the 2 regions

Who provides information, who are local people to be involved

- Village head, villagers
- Butchers, slaughterhouse managers, traders
- Farmer / farm manager, farm workers
- Hunters, game meat traders

Source and transmission

- Which risk factors should be investigated and what questions should be asked (design a short questionnaire, include only relevant information)



Source and transmission

- Which risk factors should be investigated and what questions should be asked (design a short questionnaire, include only relevant information)

SOALSELIDIK BAGI MENGESAN KEJADIAN PENYAKIT/TANDA KLINIKAL BAGI PENYAKIT PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRS) DAN AFRICAN SWINE FEVER (ASF) BAGI NEGERI

Objektif Soal selidik

Soal selidik ini dijalankan oleh DVS Negeri bagi mengesan kejadian penyakit dan tanda-tanda klinikal PRRS pada babi.

A. MAKLUMAT PENTERNAK

- 1 Nama :
- 2 No. K/P :
- 3 No. Tel. :
- 4 Alamat :
Ladang :
- 5 Daerah :
- 6 Mukim :
- 7 GPS : E:(contoh: E102.10084)
N: (contoh: N2.39803)

B. MAKLUMAT TERNAKAN

- a. Bilangan ternakan yang anda miliki sekarang. Sila isi ruangan di bawah.

Jurusan ternakan	Bilangan (ekor)
Induk jantan (Boar)	
Induk betina (Sow)	
Babi pembesar (Grower and Finisher)	
Anak sapih (Weaner)	
Anak babi sebelum sapih (Suckling piglets)	

- b. Adakah ladang anda memberi vaksin JE / AD / PRRS / PCV2 / FMD kepada ternakan?

Kumpulan ternakan	Jika Ya, bila tarikh vaksin diberikan
Induk Jantan (Boar)	
Induk betina (Sow)	
Babi pembesar (Grower and finisher)	
Anak sapih (Weaner)	
Anak sebelum sapih (Sucking piglets)	

c. MAKLUMAT PERGERAKAN TERNAKAN

Kumpulan ternakan	Ya	Tidak	Jika Ya, sila
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Farm management and information

Vaccination status

Animal movement information/ traceability

Wild boar exposure

			nyatakan dari mana
Adakah anda mengimport ternakan baru dalam dua tahun kebelakangan ini?			
Adakah anda membawa masuk ternakan baru dalam dua tahun kebelakangan ini?			
Adakah anda mengimport semen dalam dua tahun kebelakangan ini?			

Source and transmission

- Which risk factors should be investigated and what questions should be asked (design a short questionnaire, include only relevant information)

e. **MAKLUMAT BIOSEKURITI DAN KAWALAN VEKTOR**

Perkara	Ya	Tidak	Catatan
Pagar keliling (lengkap/tak lengkap)			
Vehicle dip/manual spray			
Pencelup kaki (Foot dip)			
Gum boot disediakan untuk pelawat			
Pakaian ladang disediakan untuk pelawat			
Kebersihan ladang memuaskan			
Rumput mestilah pendek dan ketinggian < 15 cm			
Pokok buah-buahan dalam kawasan ladang. Nyatakan Jarak dari kandang			
Longkang sempurna atau tidak (Perparitan bersambung antara kawasan kandang dan seterusnya ke kolam kumbahan)			
Longkang tersumbat			
Tangki air bertutup			
Amalan memasukkan ubat jentik-jentik di dalam takungan air jika ya nyatakan kekerapan			
Sistem air minuman menggunakan bekas/palong air. Jika tidak nyatakan sistem yang digunakan			
Cara pelupusan bangkai (Bakar/Tanam/Buang/Diberi makan kepada ternakan lain)			

Farm biosecurity
Vector control
Water source
Carcass disposal

Penemuduga:

Nama :

Jawatan:.....

Pengesahan oleh:

.....

Pegawai Veterinar Daerah

Production loss

- Develop criteria and questions to evaluate the production loss associated with mortality and morbidity due to ASF at the household level.
 - Percentage of ASF morbidity in farms
 - Percentage of ASF mortality in farms
 - Cost of culling, slaughter of affected animals
 - Operational cost for ASF control – disinfection, removal of infected fomites
 - Meat quality & production
 - Infertility, abortion rate – losses of piglets
 - Post clinical disease – cost of treatment (if non-acute cases)
 - Overall farm income / losses

Production loss

- Develop criteria and questions to evaluate the production loss associated with mortality and morbidity due to ASF at the household level.

b. Sila tandakan (/) pada ruangan disediakan.

Sistem Penternakan		Cara pembiakan		Jurusan (tandakan)	
Tradisional/ekstensif		Permanian beradas		Baka	
Semi-intensif		Pengawanan semulajadi		Pedaging	
Intensif					
Penternakan integrasi					

c. Maklumat pengeluaran. Sila nyatakan bilangan dalam ruangan yang disediakan

Maklumat kelahiran	Bil	Maklumat Kematian	Bil
Bilangan anak babi		Bilangan kematian anak babi sebelum sapih	
Bilangan anak babi dalam satu kelahiran		Bilangan kematian anak sapih	
Bilangan kematian anak babi semasa kelahiran			

d. **PARAMETER PEMBIAKAN**

Parameter	Ya	Tidak	Catatan
Mempunyai rekod pembiakan individu			
Tempoh menyusukan anak melebihi 28 hari			
Selang masa antara cerai susu dan biang (Interval between weaning to oestrus)			
Biang berulang/Servis $\geq 3x$ (Return to oestrus)			
Kadar kebuntingan (Pregnancy rate)			
Kadar kelahiran (Farrowing rate)			
Bil anak dilahirkan oleh seekor ibu setahun			
Bil ibu babi $> 6x$ beranak (Parity of sow)			

Farming system
Breeding method
Birth rate
Mortality rate
Breeding parameter

Production loss

- Develop criteria and questions to evaluate the production loss associated with mortality and morbidity due to ASF at the household level.

Bil	Tanda ASF	Ya	Tidak	Jika Ya, nyatakan bila ia berlaku	Bilangan
1	Demam suhu tinggi				
2	Kadar kematian tinggi(100 %) dalam 2-10 hari selepas tunjuk tanda klinikal				
3	Kurang selera makan				
4	Kemerahan pada telinga, abdomen,kaki				
5	Sukar bernafas				
6	Muntah				
7	Darah keluar dari hidung atau rektum				
8	Cirit-birit				
9	Keguguran				
10	Sakit sendi (Arthritis)				

ASF Clinical signs occurrence/history

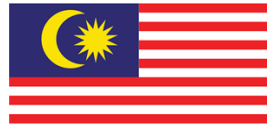
Discussion – Cost summary

- At an estimated disease prevalence of **10% at farm level; 50% at animal level**
- **3,264 animals** to be sampled through ELISA
(antibody detection – at the assumption of each kit is \$5 respectively).
$$\$5 \times 3,264 \text{ animals} = \$16,320$$
- Consumables – incl. PPE, reagents, disinfectants, sample collection tools, questionnaires, reports,
$$= \$1,216$$
- Logistics costs- petrol, toll costs for vehicles, hire car/ motorcycle
$$= \$1,200$$
- Emolument costs:
Token for paravets & households involved in study, OT
$$= \$1,264$$

Total Cost \$ 20,000

Summary

- Able to determine true prevalence through representative sampling
- Able to determine actual incursion and spread risk factors within the 2 affected regions, type of farms at risk, evaluate transmission rate of disease (R_0) – how fast & how far disease has spread, frequency of exposure of household/herd at risk
- Able to determine possible source of infection based on incursion risk factors
- Bias – recall bias esp. for old outbreaks
- ASF occurrence in Wildboar and exposure – not addressed yet
- Economic losses associated with the disease i.e. short term, medium term (recovery), long term (if involving chronic cases)



KEMENTERIAN PERTANIAN
DAN INDUSTRI MAKANAN



MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND



THANK YOU
FOR YOUR ATTENTIVE
LISTENING!
TERIMA KASIH