Report on

African Swine Fever Disease previous outbreak impacts: A case study of impact and behavior change of ASF outbreak among smallholder pig farmer in Cambodia and Laos PDR

AVSF
AGRONOMES & VÉTÉRINAIRES
SANS FRONTIÈRES

Biosecurity
in pig production
to control African Swine Fever

Contents

1 Introduction

African swine fever (ASF) is a highly contagious and fatal viral disease affecting both domestic and wild suids. An extremely resistant viral diseases affecting pigs and wild boars, resulting a high mortality rate between 90 to 100%, economic and productivities losses among the infected pig farms, and threatens the health safety of the entire pork industry in affected countries, while there is no vaccination and treatment. ASF outbreak has been addressing in worldwide, and low- and middle-income countries; like Cambodia and Laos was reported in the year of 2019. The virus was introduced to Southeast Asia in early 2019 and has since spread rapidly throughout the region(Denstedt et al., 2021). In Cambodia, seropositive to ASF was reported in Ratanakiri, Tboung Khmum, Takeo, Kandal, and Svay Rieng in 2019 (GDAHP, 2019) and in Laos PDR the first outbreak reported in June 2019 in Toomlan district, Salavan Province. All ASF seropositive pigs, including those that gave equivocal results, originated from large-scale Cambodian-based commercial farms (Siengsanan-Lamont et al., 2022). Small livestock raisers face threats from multiple endemic diseases. Factor associated with seroprevalence of ASF was the abattoir location (Siengsanan-Lamont et al., 2022).

Lack of surveillance of animal diseases in low-and middle-income countries leads a limited access to local farmers, national stakeholders and international agencies; resulting many constraints of disease outbreak investigation. The impact will be even greater during disease epidemics, where there may be sudden and rapid mortality of animals and often a significant decrease in market demand due to the fear of diseases, depriving the poorest families of critical assets and increasing their vulnerability (Perry et al., 2002). Several advanced participatory and individual approaches are promising and could be part of an innovative method for improving the dialogue among different actors in a surveillance system (Goutard, et al., 2015).

Therefore, the individual and participatory survey for the case study of impact and behavior change of ASF outbreak will identify behavioral and socioeconomic impacts that addressing ASF outbreak report to promote the practices changes in order to reduce significant impact on affected farm to prevent the next outbreak of AVSF in history outbreak areas by using both individual and participatory approaches in order to conduct this research.

2 Objective

The main objective of these case studies investigations were implemented to understand the sequence of events during past outbreaks in Cambodia and Laos, the changes effected, the economic impact and the choices made regarding changes of practices. The results of this study will contribute to training and capacity building of smallholder pig farmer/producers in biosecurity in the fight against ASF.

2.1 Specific objectives

The specific objective of this study is to:

- Understand the sequence of event and likely cause or origin ASF outbreak
- Document the outbreak management at community level and by the different stakeholders to control the disease and their efficiency
- Access the impact of ASF on the livelihoods and economic activities of the village
- Identify the practices changes generated by the outbreak to better mitigate the risk

3 Material and method

3.1 Site selection and sample size

The survey was conducted between February 2023 to June 2023 in both Cambodia and Laos PDR. The list of villages which were affected by ASF outbreak in the provinces of Syay Rieng, Tboung Khum, Takeo and Kandal provinces in Cambodia and in Luang Prabang and Saravan provinces in Laos PDR have been selected based on the data obtained and reported by the technical services and office of animal health and production in each for the study. Only pig farmer (including inactive pig farmer) who was affected by ASF had been selected for this case study.

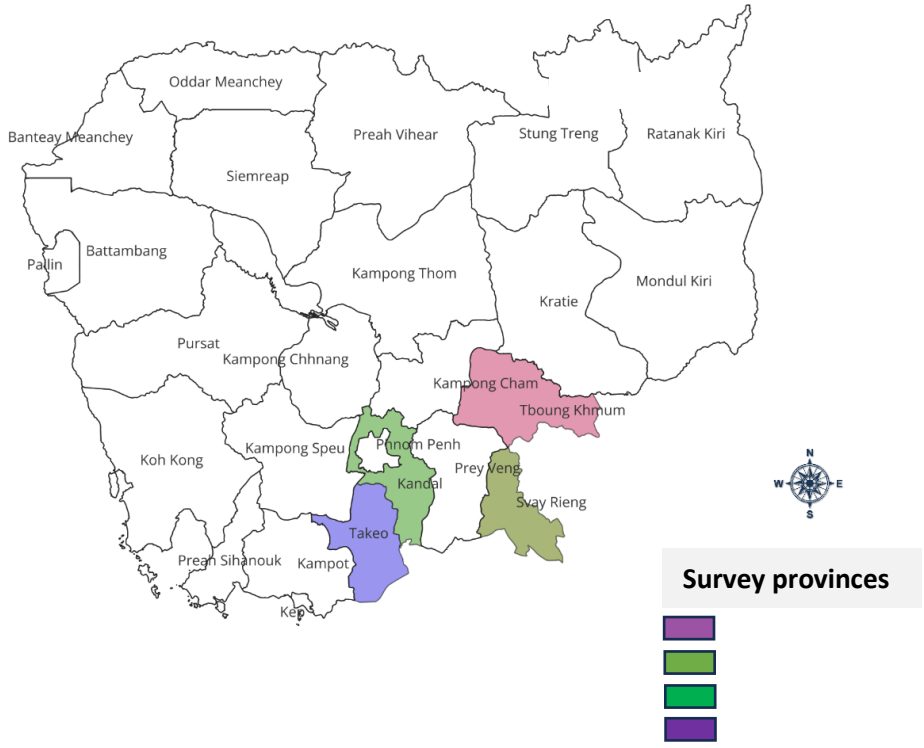
Table 1: List of selected villages and participants for individual survey and focus group discussion for case study

Country	**Village**	**No. of participants For Individual Interview (N=297)**	**No. of participants for FGD* (N=317)**	**No.of FGD***
		Pig Farmers	**-**	**-**
Cambodia n=133	Ank	10	17	2
	Chek	6	9	2
	Kandal	13	10	2

	Angk Thnoat Khang Lech	7	0	0
	Cheu Teal Prakeab	10	15	2
	Ampil	9	16	2
	Ponley Khang Cheung	12	16	2
	Thluk Yul	14	21	2
	Reussey Chour Khang Tboung	13	19	2
	Prey Khla	11	15	2
	Soay	13	24	2
	Kampoul Sarey	15	24	2
Laos n=164	Houaychor	16	13	2
	Houaythong	14	9	2
	Houaywa	14	10	2
	Kokmuang	13	11	2
	Nalachang	13	10	2
	Nanhongyai	16	15	2
	Nanoi	14	10	2
	Ombling	15	11	2
	Phoukhorng	9	10	2
	Samakkhixay	11	5	1
	Touklouk	13	10	2
	Nakatao	0	5	1
	Toumlarn	16	12	2

*Focus Group Discussion

(a)



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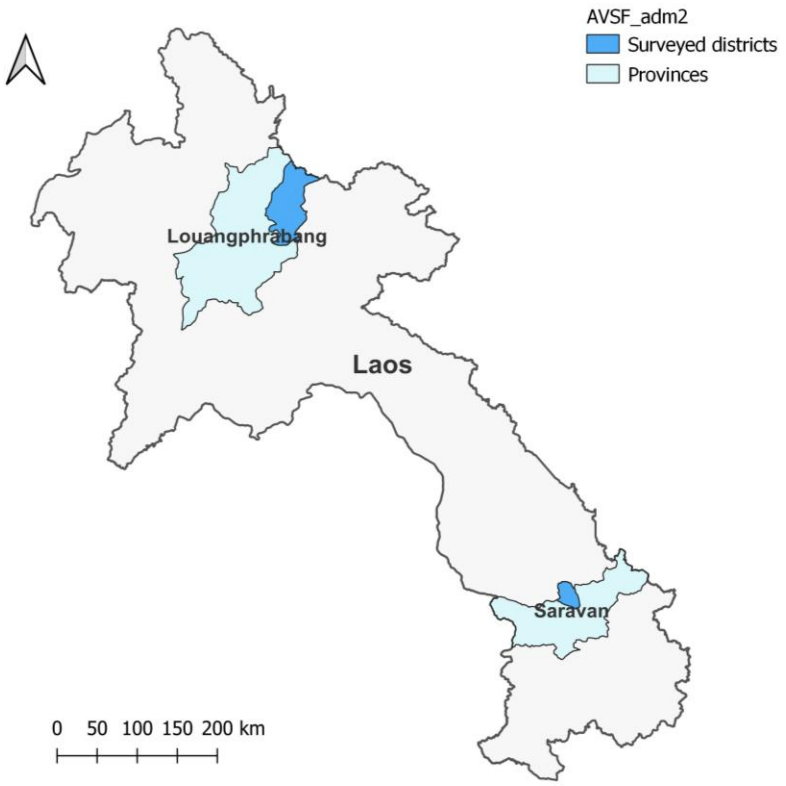


Map 1: Targeted survey area in Cambodia (a) and Laos PDR (b)

In Cambodia, five districts are represented: Orang Av, Svay Chrum, Tram Kak, Angkor Borey and Saang (Figure 1). These districts in southeastern Cambodia are areas of plains and agricultural land and have been affected by ASF outbreaks. District veterinarians were asked to select villages with sufficient pig farmers in each village. A purposively sampling of 133 pig farmers were constituted in twelves villages spread across the five districts from five consecutive provinces: 28 pig farmers in Orang Av district of Tboung Khmum province, 24 pig farmer in Svay Chrum district of Svay Rieng province, 17 pig farmers in Tram Kak district of Takeo province, 35 pig farmers in Angkor Borey district of Takeo province and 29 pig farmers in Saang district of Kandal province were selected for individual interviewed and focus group discussion.

In Laos PDR, Toomlarn district of Louangphrabang province was the province which was reported of the first outbreaks in Laos. Viengkham of Saravan province is another mountainous provincial area where bordering protected forest with potentially different livestock systems. These two districts are also already places of AVSF intervention, with teams and projects in place, which facilitates the organization of the study and access to pig farmers. A random sampling of villages

was carried out based on the list of villages in each district. A sample of 164 pig farmer was then constituted in twelves villages spread across the two districts, 52 village in Viengkham district of Saravan province and 112 village in Toomlarn district of Loungphrabang province.

3.2 Study design and participants selection criteria

For both in Cambodia and Laos PDR, Individual interviews and focus group discussion were conducted purposively with the ASF affected pig farmers from the village to assess the economic impact of the outbreak on their livelihoods and their practice changes since the last outbreak. The sample size for the individual interviews was also determined by the budget and availability of the participants but with a sufficient number to be representative of each village and province. However, several criteria of pig farmers were set to include in this study: 1) be a smallholder pig farmer (1-50 pigs), 2) be a responsible person in pig farming, 3) have at least 3-5 years of pig farming experience 4) be affected by ASF outbreak and 5) be volunteer prior to the preliminary survey.

The study was conducted from March to May of 2023. The list of existing pig farmer participant was initially listed and gathered by chief of village and with the support from the village animal health worker (VAHW) of each village. Preliminary study at the target sites was scheduled with coordination from provincial (PDAFF/PAFO) to local authority level (chief of village/VAHW/VVW) in order to get some preliminary reports of infected and uninfected pig farmers prior to the research activities be implemented.

3.3 Field survey process

Smallholder pig farmer were invited to join the research study with the assistant from local authority at district and village level including chief of village and village animal health worker of each village. Two data collection approaches were employed to gather the data: an individual approach using key informant interview (KII) and a participatory approach using focus group discussion (FGD) conducted by a livestock technical team from AVSF in Cambodia and Laos PDR containing a facilitator (AVSF technical team), a board writer and a note taker (official from DAFO in Laos and short-term hired students from Royal university of Agriculture). All field enumerators were well trained on qualitative research method before performing field data collection work. Initially, pig farmers were individual interviewed and then invited for focus group discussion at a

village public hall/pagoda or chief of village's residence. The survey processes were based on the guide and questionnaires which were developed and upload on Kobo collect application. Study objectives, methodology, confidentiality and data-use policies used in the study was explained to participants and consent obtained before interviews are conducted.

3.3.1 Questionnaire Development

An individual interview questionnaire and focus group discussion guide was developed and designed to collect data from small-scale pig farmers (Annex 1 and 2), containing all necessary information align with the objective of the study. The questionnaire was designed for both research in Cambodia and Laos PDR in English language and then translated into Khmer and Laos language. Before the field data collection started, a pre-tested was conducted internally and in the field by Agronomes et Veterinaire Sans Frontiere(AVSF) technical team and District agriculture and Forestry Office (DAFO) official and feedback was then integrated into the final version.

3.3.2 Individual interview of affected pig farmer

For the case study, the smallholder pig farmers in the ASF affected village identified for their least or the most affected during the last outbreaks was contacted and interviewed for the study. The individual interviews purposively selected between 15 to 20 pig farmers per village. The individual interview covered general demographic information of participants and livestock in the village, practices changes, practice during the outbreak and outbreak impact. The information received from the interview used to assess the economic impact of the outbreak on their livelihoods and their practice changes since the last outbreak.

3.3.3 Focus Group Discussion among local pig value chain actors

Focus group discussion approaches was used with a group of pig value chain actors at the local village: pig farmer, live pig trader, animal health service provider (VAHW, DV) and key informant in the village. To triangulate the information and ensure all opinions were taken into account, two FGDs group were held in each village. A total of 317 participants (186 participants in Cambodia, FGD=22 and 131 in Laos, FGD=24) was conducted in this research study. Each focus group discussion (FGD) was administered by a team of three enumerators (one facilitator/ board writer and one note taker). The group consisted of between 7-11 members with a mix of gender, roles and duty in the community:

Actors	Focus Group Discussion
Pig famers (person in charge of the pig farm / taking the decisions)	4-6
Village Animal Health workers (VAHWs/VVW)	1-2
Local VCAs (live pig buyers, middlemen and piglet suppliers	2-3
Key informant (chief of the village, community leader, elder person)	1-2
Total	7-11

The participatory focus group discussion covered also the demographic information of pig farmer, actors involved in the pig production chain, disease outbreak and animal production and movement patterns, impact of ASF outbreak ASF outbreak control at the community level and lesson learnt/practices changes after the outbreak. Before a group discussion begins, farmers learnt about guidelines for the study and assured that their participation was voluntary and anonymous. All participants were asked for verbal consent before any discussion or interview begins.

3.4 Data collection and analysis

Field data collection for individual interview was performed house-by-house using KoBo collect application. The data was then in real-time sent day by day and stored in Kobo toolbox project account before exporting to Excel spreadsheet for cleaning and analyzing.

The data from the FGD were recorded in two ways: 1) on the print FGD question guide form which was recorded by the facilitator and the note taker, 2) on the flipchart note which was recorded by a board writer during the FGD facilitation. The raw data was verified with all the record material and then transcripted from the printed FGD question guide and flipchart into an Excel spreadsheet for analysis. Both data from individual interview and focus group discussion was analyzed under an excel files for descriptive statistic and SPSS for inferential statistic.

4 Results and Discussion

4.1 Socio-demographic characteristic from individual interview

Table 2 presents the socio-demographic characteristics of the pig farmer interviewed for case study. Women are the majority in the survey for both in Cambodia and Laos, totally represented

at 59.25%. The average age is 43.27 years old, notably high in Cambodia (47.89 years) than in Laos (39.53 years). The minimum age of pig farmer is 17 years old and the maximum is 80 years old in Laos while in Cambodia, the minimum age of pig farmer is 24 years old and the maximum is 73 years old. Almost all the pig farmer in Cambodia belong to the Khmer ethnic group (99.24%), while the ethnic group in Laos is more diversified with 8 ethnic groups namely Katang, Hmong, Lao, Ta-Oy, Khmou, Lue, Ou and others. The level of literacy is generally low in all level of education. 16.49% are illiterate pig farmer with no schooling. Percentage of illiteracy is high in Lao (24.39%) than in Cambodia (6.77%). 50.50% of all pig farmer of both Cambodia and Laos had their primary school education. The number of pig farmer had secondary school is high in Cambodia (33.08%) than in Laos (17.68%). Households have a median of 6 people per household, they are more numerous in Laos, with extremes of up to 24 people under the same roof.

Table 2: socio-demographic of pig farmers

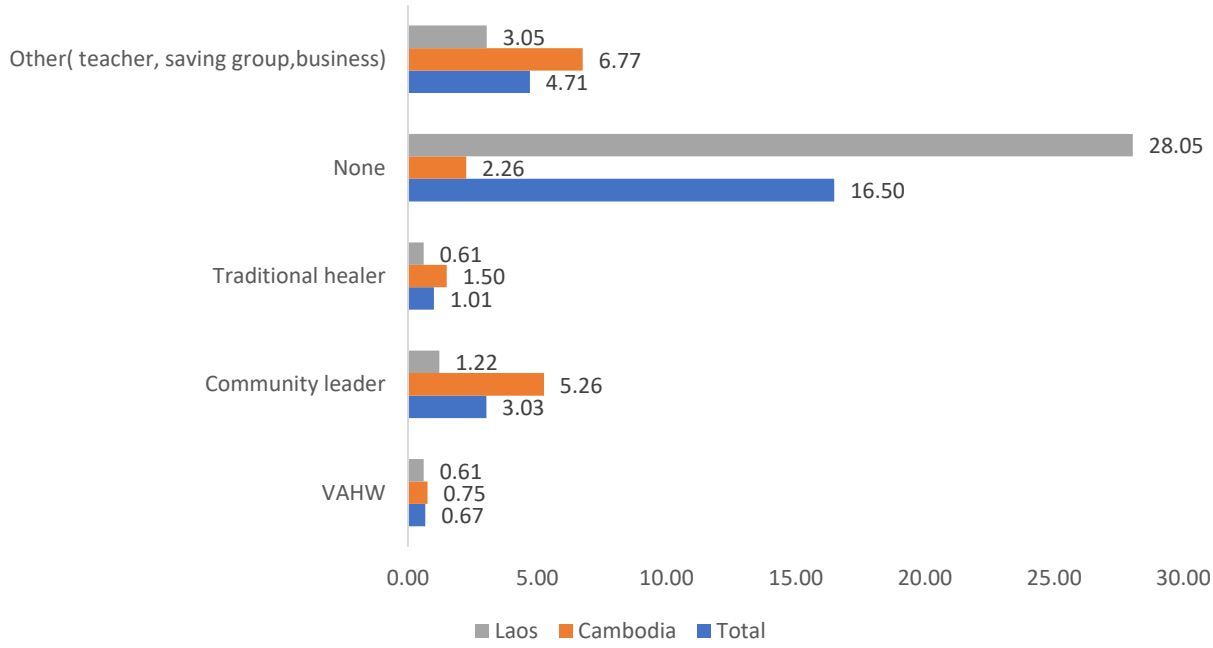
Socio-demographic of pig farmer	**Cambodge** **N**=133	**Laos** N=164	**Total** N=297
Gender, n (%)			
Male	45 (33.83%)	76 (46.34%)	121 (40.74%)
Female	88 (66.17%)	88 (53.66%)	176 (59.25%)
Age (year)			
Average ± std	47.89 ± 10.40	39.53 ± 13.98	43.27 ± 13.11
Minimum age (country)	24	17	17
Maximum age (country)	73	80	80
Ethnic group			
Khmer	132 (99.24%)		
Rhad/Degar	1 (0.75%)		
Katang		86 (52.43%)	
Hmong		54 (32.92%)	
Lao		15 (9.14%)	
Ta-Oy		4 (2.43%)	
Kmou		2 (1.21%)	
Lue		1 (0.60%)	
Ou		1 (0.60%)	
Others		1 (0.60%)	

Education level, n (%)			
Illiterate/no school	9 (6.77%)	40 (24.39%)	49 (16.49%)
Primary school	64 (48.12%)	186 (52.44%)	150 (50.50%)
Secondary school	44 (33.08%)	29 (17.68%)	73 (24.57%)
High school	10 (7.52%)	9 (5.49%)	19 (6.39%)
Higher education	6 (4.51%)	0 (0.00%)	6 (2.02%)
Household members			
Kids (<2 years old)	27 (4.01%)	141 (10.29%)	168 (8.22%)
Kids (3-5 years old)	36 (5.35%)	189 (13.80%)	225 (11.01%)
Kids (6-16 years old)	153 (22.73%)	291 (21.24%)	444 (21.73%)
Adults (>16 years old)	457 (67.90%)	749 (54.67%)	1206(59.03%)
Total			

4.1.1 Roles and Responsibilities within the village

Figure 1 presents the additional responsibility of pig farmer in the study in their community. In general for both in Cambodian and Laos PDR , additional role and responsibility of pig farmers are community leader (1.01%) , village animal health worker (0.67%), traditional healer (1.01%), majority of pig farmer has no additional role or responsibility in their village (16.50 %) and other (teacher, cooperative saving group, business) 4.71%. Notably, most of the respondent in Cambodia has more other responsibility in their community than those in Laos PDR.

Figure 1: Community responsibility of pig farmer



4.2 Pig farming characteristic from individual interview

4.2.1 Pig farming

Table 3 presents the pig farming activity by pig farmer in Cambodia and Laos. Farmer are generally experienced with more than 10 years of pig farming activity (50.84%). Pig farming experience of pig farmer in Cambodia (63.91%) is higher than in Laos (40.24%). Generally, pigs are raised for small scale commercial purposes (84.51%), self-consumption (53.20%), mobile capital (19.19%) and other (0.34%) meaning for both commercial and self-consumption. In Cambodia, the main objective pig farming is for commercial purpose (89.47%) and with very few for self- consumption (1.50%) purpose while in Laos, pig farming is mainly for self- consumption (95.12%) among the pig farmer interviewed, following by commercial purpose (80.49%).

In general, pig production system of pig farmer in Cambodia and Laos are categorized into three main production system “only breeder” (35.35%) “breeder & grower” (53.20%) while “only grower” is 24.24%. In Cambodia the proportion of production system of “only breeder” and “breeder & grower” are relatively equal to 41.35% and 40.60%, respectively, while in Laos “breeder& grower” is high (63.41%). In sum for both countries, local production system of pig farmers are “breeder and grower”.

Table 3: Pig farming activity

Pig farming	**Cambodia** N=133	**Laos** N=164	**Total** N=297
Pig raising experiences			
< 1 year	3 (2.26%)	14 (8.54%)	17 (5.72%)
1-2 years	6 (4.51%)	27 (16.46%)	33 (11.11%)
>2-5 years	15 (11.28%)	28 (17.07%)	43 (14.47%)
>5-10 years	24 (18.05%)	29 (17.68%)	53 (17.84%)
> 10 years	85 (63.91%)	66 (40.24%)	151 (50.84%)

Purpose of raising pigs including before ceasing the activity *(Multiples choices)*			
Seft-consumption	2 (1.50%)	156 (95.12%)	158 (53.20%)
Mobile capital (quick cash when needed)	22 (16.54%)	37 (21.34%)	57 (19.19%)
Commercial purposes	119 (89.47%)	132 (80.49%)	251 (84.51%)
Others	0 (0%)	1 (0.61%)	1 (0.34%)
Type of pig farming activity including before ceasing the activity)			
Only breeder	55 (41.35%)	50 (30.49%)	105 (35.35%)
Only grower	26 (19.55%)	46 (28.05%)	72 (24.24%)
Breeder & grower	54 (40.60%)	104 (63.41%	158 (53.20%)
Others	N/A	N/A	N/A

4.2.2 Pig housing system

Pigsties are most often close by their house. 84.76% of pig farmers interviewed build their pigsty around 10-100m aways from their house. In Cambodia, 99.19% of pig farmer have their pigsty nearby their house while in Laos only 71.21%.

Pigsties are mainly built by wooden fences with uncemented floor (44.10%). However, this found more practical in Laos than in Cambodia. In Cambodia, pigsty is more commonly building with concrete building (38.35%) and by wooden fence with cemented floor (34.59%). In Laos, pigsty is usually built by wooden fence with uncemented floor (77.44%) and free-range system (no housing) represent 20.12%. Laos has more percentage of free-rang/ scavenging (20.12%) than those in Cambodia which is only 0.75%.

Table 4: Pig housing system

Pig housing system	**Cambodia** **N**=133	**Laos** N=164	**Total** N=297
Distance of pig housing	n=124	n= 132	n=256
Close(<2km)	1 (0.81%)	21 (15.91%)	22 (8.59%)
Far (>2km)	0 (0.00%)	17 (1.88%)	17 (6.64%)
Next by (10-100m)	123 (99.19%)	94 (71.21%)	217 (84.76%)
Pig building			
Concrete building	51 (38.35%)	0 (0.00%)	51 (17.17%)

Elevated wooden floor	0 (0.00%)	1 (0.61%)	1 (0.33%)
Metal net and concrete floor	22 (16.54%)	0 (0.00%)	22 (7.40%)
Wood fences/cemented floor	46 (34.59%)	3 (1.83%)	49 (16.49%)
Wood fences/uncemented floor	4 (3.01%)	127 (77.44%)	131 (44.10%)
Tethered	8 (6.02%)	0 (0.00%)	8 (2.69%)
Free-ranging/scavenging	1(0.75%)	33 (20.12%)	34 (11.44%)
Other (ceasing the activity)	1(0.75%	0 (0.00%)	1 (0.33%)

For both Cambodian and Laos, reason of choosing location for pig housing and pig housing system are quite related to local agricultural seasonal practices, type of pig and disease occurrence event in the village. According to the table 5, majority of pig farmer confined their pig during the agricultural farming season or free -range at day time and confined at night for pig security to avoid damaging the crop.

Table 5: Reason of pig confinement and free-range practice

Distance of pig housing	**Case**
Close (<2km)	**22**
Confined during rice cultivation	6
Released during dry season	1
Other	15
Far (>2km)	**17**
Confined when disease outbreak	1
Strict confinement of pigs at night and release during the day	2
Strict confinement of pigs during cultivation	10
Other	4
Next by (10-100 meters)	**217**
Confined when disease outbreak	1
Free range all time	1
Free range for piglet	1
Free range in the morning and confined at night	4
Released 15/month	1
Released during dry season	2
Strict confinement of pigs during cultivation	31
Other	176
Grand Total	**256**

4.2.3 Other livestock animals on the same farms (including before stop the activity)

Table 6 present the livestock species in the farm. Majority of pig farmer interviewed has more than 1 species of livestock in their farm (79.12%) while 17.50% raise only pig. In Cambodia, beside pig, farmer also raised other livestock species more than in Laos.

Table 6: Livestock farming practice in the farm

	Cambodia N=133	**Laos** N=164	**Total** N=297
Do you keep other livestock animal in the same farm?			
Yes	113 (84.96%)	132 (80.49%)	235 (79.12%)
No	20 (15.05%)	32 (19.51%)	52 (17.50%)

4.2.4 Livestock species in the farm

Table 7 presents the species of livestock animal in the farm. Poultry farming (77.78%) is very common in addition to pig farming for both Cambodia (78.95%) and Laos (76.83%), followed by cattle raising (44.78%), water buffalo (18.86%) and goat (11.78%). Goat farming is more popular in Laos than in Cambodia.

Table 7: Livestock species in the farm

Livestock species *(Multiple choices)*	**Cambodge** N=133	**Laos** N=164	**Total** N=297
Cattle	63 (55.75%)	70 (42.68%)	133 (44.78%)
Water buffalo	4 (3.45%)	52 (31.71%)	56 (18.86%)
Goat	0 (0.00%)	35 (21.34%)	35 (11.78%)
Poultry/duck	105 (78.95%)	126 (76.83%)	231 (77.78 %)
Other	4 (3.01%)	2 (1.22%)	6 (2.02%)

4.2.5 Pig breed

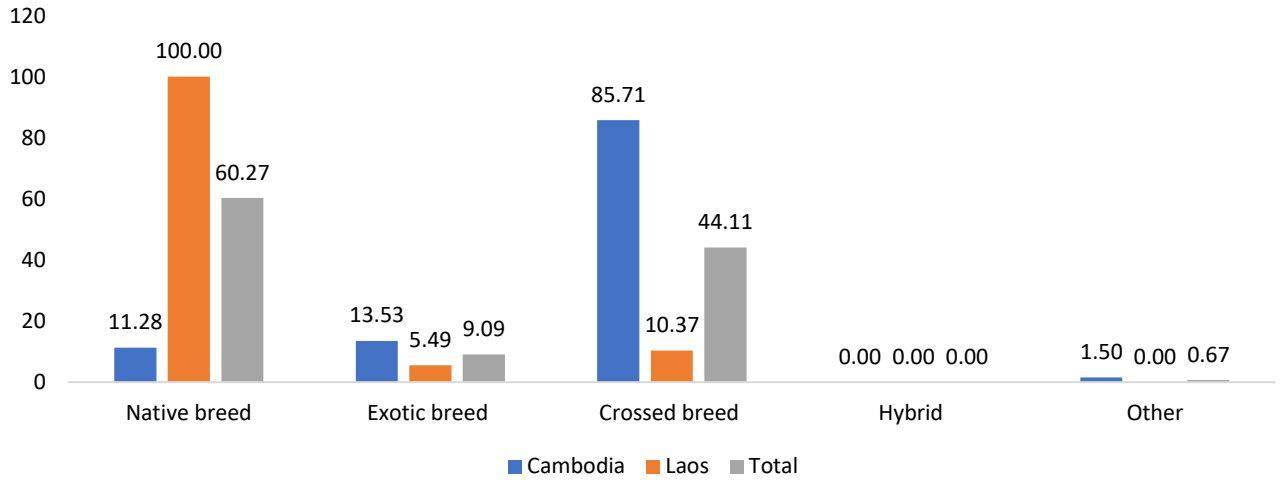
In general, local native breed is commonly raised by pig farmer (82.82%) but mostly in Laos (93.49%) than in Cambodia which is only 6.50%. In Cambodia, cross breed is commonly raised by pig farmer (85.71%) following by exotic breed (13.53%) and native breed. Notably, both countries have different name of pig native breed (Table 8).

Table 8: Pig breed

Pig breed *(Multiple choices)*	**Cambodia** N=133	**Laos** N=165	**Total** N=297
Native breed	**16 (6.50%)** Kandol 0 (0.00%) Kampot 1 (6.25%) Hainam 5 (31.25%) Damrey 1 (6.25%) Other 0 (0.00%) Nsp* 9 (56.25%)	**230 (93.49%)** Moo Lat 156 (67.83%) Moo Kang 14 (6.09%) Moo Cheed 33 (14.35%) Moo Hmong 26 (11.30%) Other 0 (0.00%) Nsp* 1 (0.43%)	246 (82.82%)
Exotic breed	18 (13.53%)	9 (5.49%)	27 (9.09%)
Cross breed	114 (85.71%)	17 (10.37%)	131 (44.11%)
Hybrid	0 (0%)	0 (0%)	0 (0%)
Others	2 (1.50%)	0 (0%)	2 (0.67%)

*Non-specific

Figure 2: Pig breed raised by ASF affected pig farmer



4.3 Practices during the outbreak

4.3.1 African Swine fever affected pig farmer

Table 9 present the pig farmer affected by African Swine Fever in Cambodia and Laos. 76.43% of pig farmer interviewed experienced ASF outbreak in their farm. It is high in Laos (85.97%) and 64.66% in Cambodia.

Table 9: Pig farmer affected by African Swine Fever

ASF outbreak	**Cambodia** N=133	**Laos** N=164	**Total** N=297
Were you personally affected during the outbreak?			
Yes	86 (64.66%)	141 (85.97%)	227 (76.43%)
No	47 (35.66%)	23 (14.02%)	70 (23.56%)

Table 10 presents the route of ASF transmission perception by pig farmer in Cambodia and Laos. In Cambodia, African Swine Fever can be transmitted in different pathway to their pig including direct contact with infected pork (20.24%), air/wind (15.48%), visitors to the pig pen (9.52%), vehicle (3.57%), feed swill/leftover, foodstuff from market and insect. However, there is a high percentage of pig farmer don't know about the route of disease transmission (38.10%).

In Laos, pig farmer perceives that ASF can be transmitted by direct contact with infected pig (15.11%), wind/air (11.51%), contaminated food leftover (10.79%) and pig raising system free-roaming (3.60%). Pig farmers also considered ASF as a seasonal disease (6.47%) while there is also high percentage of pig farmer don't know about the transmission route of ASF (35.35%).

Table 10: Way of disease introduction to the herd

Cambodia	**84**	**%**
Contaminate commercial feed that I bought from depot	2	2.38
Direct contact with infected pig	2	2.38
Food stuffs from market	2	2.38
Gathering and meeting with people and clothes	1	1.19
Death pig of the neighbor	1	1.19
Infected pork	17	20.24

Insect vector	1	1.19
Mobile market in the village	2	2.38
Vehicle	3	3.57
Visitor into pigsty (veterinary, pig trader, middleman, pig farmer…)	8	9.52
Wind/air	13	15.48
I don't know	32	38.10
Laos	**139**	
Contaminated food leftover	15	10.79
Contacted with carcass (death pig)	2	1.44
Direct contact with infected pig	21	15.11
Disease transmission	1	0.72
Free range (free roaming pig)	5	3.60
Human and vehicle (trader/middleman)	4	2.88
Observe symptoms (loss of appetite, sudden death)	6	4.32
Pig farmers bring infected pork for home consumption from pig farmers in other villages	2	1.44
Poor condition (Pen never cleaned, non-disinfected pen)	4	2.88
Seasonal disease	9	6.47
Pig eats human feces that eat infected pig meat	1	0.72
Stay together with many pigs	4	2.88
Wind/air	16	11.51
I don't know	49	35.25

Table 11: Ranking the way of disease introduction to the pig herd perceived by the participant from FGD (from high=1 to low=12 ranking)

Way of disease introduction and spread pathway	Cambodia	Laos	Total
Visitors spreading the germs (e.g.: pig traders), butcher	1	1	1
Infected pig meat/swill/offal/commercial feed	4	5	2
Feeding of infected pig meat/swill/offal/commercial feed	3	4	3
Direct contact with an infected pig, pig farmer	6	2	4
Vehicles or equipment's spreading the germs	2	7	5
Through the wind/ air	5	6	6
Buying pig meat/products from local market	9	3	7
Biting insects (ticks, flees…)	7	11	8
Contact with infected water	11	8	9
Pets, rodent, bird, livestock	8	12	10
Climate weather	12	9	11
Contact with infected boars	10	10	12

In general, the relevant pig production actors in both Cambodia and Laos perceived the same way of disease introduction to their pig herd. The disease spread via the visitor (including pig trader, butcher) is high, followed by the infected pig meat or swill providing to pig. Direct contact with the infected pig and vehicle or equipment were also high for both in Cambodia and Laos. Disease spread through air or wind was also perceived by all the actors along the pig production chain for both in Cambodia and Laos.

Table 12: Top down ranking the ASF clinical sign perceived by relevant pig production value chain actors in FGD

ASF Clinical sign perceived by actors in FGD	Cambodia	Laos	Total
Changes in skin color/Red dots on skin	1	4	1
Mortality in a few days	2	7	2
Fever	3	2	3
Red spot on the skin and dark red ears	4	-	4
Loss of appetite	8	3	5
Swollen face/joints/eyes/mouth….	5	1	6
Poor general condition / weight loss / apathy	23	6	7
Cough/breathing problems	6	8	8
Seizure	7	12	9
Paralysis/ affected movements	9	14	10
Diarrhea	14	9	11
Shiver	19	5	12
Suddenly death (no clinical sign)	13	-	13
Others: sore throat, kidney was bigger than usual, hard liver with Hemorrhagic	10	-	14
White mucosis	21	11	15
Salivation	18	13	16
Meat color different	15	18	17
Vomiting	12	16	18
Yellow urine	17	20	19
Erected hair	22	17	20
Abortion	16	19	21
Red eyes	20	10	22
Blood in diarrhea/nose/eyes/hair follicles	11	15	23

Table 12 shows the top-down ranking of ASF clinical signed perceived by the relevant pig production actors in the FGD. Changing in skin color and swollen face were perceived the typically signed of ASF by participants in FGD, followed by high mortality, fever, red skin, loss of appetite, apathy, coughing, seizure, paralysis and suddenly death were considered the sign of ASF identified by the participants.

4.3.2 Intervention to be taken when pig start sick

Table 13 presents the action taken by pig farmer when their pig gets sick in Cambodia and Laos. 48.90% pig farmer treat the animal by themselves with the drug they bought from market. It is high in Laos (65.96%) than Cambodia (20.93%). 35.24% isolate the sick pig to other pens than call a veterinary professional for advice and treatment (31.72%). 19.38% of pig farmer sell out their animal as soon before death when their pig gets sick. This is commonly practice in Cambodia (37.21%). However, when their pig is death, 40.09% bury the carcass of dead animal, sell out the mead of dead animal for consumption (8.37%) and dispose the carcass in the forest (7.04%). There is also high percentage of pig farmer doing nothing 16.30%) and take other action (18.06%) when their pig gets sick.

Table 13: Intervention taken when pig start sick

Intervention activity	**Cambodia** N=133	**Laos** N=164	**Total** N=297
When the pigs started being sick did you implement any of the following?			
-Call a veterinary professional for advice and/or treatment	54 (62.79%)	18 (12.77%)	72 (31.72%)
-Isolate the sick animals in a different pen	24 (27.91%)	56 (39.72%)	80 (35.24%)
-Sold as many pigs as possible before they died	32 (37.21%)	12 (8.51%)	44 (19.38%)
-Treat them based on my knowledge with drugs I got in pharmacies	18 (20.93%)	93 (65.96%)	111 (48.90%)
-Made sure my animals were all kept in pens (stopped free grazing)	9 (10.47%)	3 (2.13%)	12 (5.29%)
-Buried the carcasses of dead animals	26 (30.23%)	65 (46.10%)	91 (40.09%)
-Dispose of the carcasses of dead animals in the forest	3 (3.49%)	14 (9.93%)	17 (7.49%)
-Sold the meat of dead animals for consumption	14 (16.28%)	5 (3.55%)	19 (8.37%)
-Made sure not to leave my farm without changing clothes and shoes	2 (2.33%)	0 (0.00%)	2 (0.88%)
-Cleaned and disinfected the pens before introducing all animals	9 (10.47%)	1 (0.71%)	10 (4.41%)
-Nothing special	5 (5.81%)	32 (22.70%)	37 (16.30%)
-Other	5 (5.81%)	8 (5.67%)	13 (18.06%)

4.3.3 Outbreak management

Table 14: Scoring of ASF outbreak management measures recommendation reported in FGD (Low=1 to high=4)

Measures	Effectiveness score		
	Cambodia	Laos	Total
No free ranging/ strict confinement	3	2	3
Restriction (animal, human and animal product)	3	-	3
No buying sick pigs	2	4	3
Not feeding uncooked waste pig meat/carcasses	4	2	3
Ban visits to other farms	3	2	3
Not eating dead pig	3	3	3
No buying pig products from infected area	4	2	3
Move Pig away from village (paddy rice fields)	-	3	3
Culling affected animals	3	2	2
Cleaning Pens	3	1	2
Other: Lockdown the village	3	0	2
Bury dead pigs	1	3	2
Sanitary zone	2	3	2
Separate healthy pig from sick pig	4	2	2
Report to vets authority	4	2	2
Vaccination	2	2	2
Moving pig to new areas (Semi-free range)	3	2	2
Treatment	2	1	1
Disclosing animal health status	2	-	1
Implementation of local punitive measure	-	-	-
Closing market	-	-	-

Table 14 descripted the average scoring of biosecurity measure effectiveness for ASF outbreak management in Cambodia and Laos. In general, no free-rang, restriction of animal, human movement, purchasing of sick pig, no feeding of uncooked swill, visitor control, avoid consumption of death and infected pig, pig isolation were considered highly effective in ASF outbreak management.

4.3.4 Pig restocking Process

Table 15 presents the pig restocking process at post-outbreak in Cambodia and Laos. Majority of pig farmer interviewed start restocking their pig more than 1 year after the first outbreak (54.63%). About 20% of pig farmer restart their pig farming activity between 2-6 months after the first outbreak and 9.27% start restocking their pig about 7 to 12 months after the outbreak.

For both Cambodia and Laos, 71.43% of pig farmer restock their pig farming by introducing 1-2 pigs first before full restocking. This practice is high in Laos (92.59%) than in Cambodia (45.45%). 23.47% restart their pig farming activity by purchasing several pigs for raising but this practice is more common in Cambodia (50.00%) than in Laos which is only 1.85%.

Table 15: Pig restock process at post-outbreak

Time of restocking	**Cambodia** N=43	**Laos** N=54	**Total** N=97
How long after the outbreak did you restock?			
Less than 1 week	1(2.32%)	3(5.55)	4(4.12%)
After 2 weeks	0(0.00%)	4(7.04%)	4(4.12%)
After 2-4 weeks	0(0.00%)	4(7.04%)	44.12%)
After 2-3 months	5(11.62%)	5(9.25%)	10(10.30%)
After 4-6 months	6(13.95%)	4(7.40%)	10(10.30%)
After 7-12 months	7(16.27%)	2(3.70%)	9(9.27%)
More than 1 year after	22(51.16%)	31(57.40%)	53(54.63%)
I don't remember	2(4.65%)	1(4.65%)	3(3.09%)
When you restocked, how did you proceed?	N=44	N=54	N=98
-Introduce 1-2 pig first before full restocking	20(45.45%)	50(92.59%)	70(71.43%)
-Purchasing directly several pig	22(50.00%)	1(1.85%)	23(23.47%)
-Other*	2(4.55%)	3(5.56%)	5(5.10%)
Before restocking what did you do?	N=43	N=54	N=97
-Cleaned the pens	41(95.35%)	40(74.07%)	81(83.51%)
-Disinfected the pens	25(58.14%)	2(3.70%)	27(27.84%)
-Cleaned all the materials and equipment used for the pigs	15(34.88)	4(7.41%)	19(19.59)
-Disinfected all the material used for the pigs	9(20.93%)	0(0.00%)	9(9.28%)
-Nothing special	3(6.98%)	17(31.48%)	20(20.62%)

***Use survivor for keeping the farming activity

Usually, 83.51% of pig farmer from the two countries properly clean the pens first before restocking the pig. Other 27.84% more pig farmer clean and disinfect their pig pens before restocking and 19.59% clean all the material and equipment used for the pigs and disinfect them (9.28%) before restocking the pig into the pigsty. However, there is also pig farmer who do not take any measures on restocking process their pig (20.62%).

Table 16: Product for pig pen disinfection

Products	*Number of respondents*
Hot water	3
Disinfectant	1
Disinfectant (Bestaguam from Medivet)	1
Disinfectant (Bestaguam)	1
Disinfectant (Bestaguam) to clean pen and surrounding with chemical every 15 days	1
Apply CaCO3 powder	6
Calcium carbonate as disinfectant	1
Calcium carbonate, put cement with hot water to clean the pigsty	1
Detergent (Chloride)	2
Disinfectant (Civax)	2
Fire on pen floor and clean by water	1
I don't know	2
Not answered	1
Detergent (Shampoos)	1
TH4	1
Thailand products CP	1

4.4 Practice change

4.4.1 Practice change of pig housing system at pre-and post-outbreak

In general, 84.42% (168) of pig farmer keep the same pig housing system as before and after the outbreak for both Cambodia and Laos, while 15.58% (31) of pig farmer from the two countries changed the pig housing system after the outbreak.

Table 17: Pig housing system practice change

Pig housing system	**Cambodia N=88**	**Laos N=111**	**Total N=199**
The same pig housing system before the outbreak?			
Yes	74 (84.09%)	94 (84.68%)	168 (84.42%)
No	14 (15.91%)	17 (15.32%)	31 (15.58%)

4.4.2 Pig housing system at pre-and post-outbreak

Table 18 shows the pig housing system in Cambodia and Laos at pre and post ASF outbreak. Pig housing system differs depending on the context of the country. Before the ASF outbreak, pig was kept full-time free-ranging/scavenging (35.48%), other type of housing system like neck or

leg tethered (35.48%), full-time housed (12.90%) and part-time housed (16.12%). In Laos, 64.71% among pig farmer interviewed practices full-time free-ranging/scavenging while it was not the case for Cambodia before the first outbreak. In Cambodia, full-time housing (21.43%) and other type of pig housing like tethering (78.57%). At post outbreak, there is remarkably change in term of pig housing among pig farmer interviewed for both in Cambodia and Laos. Pig is kept fully housed (59.60%), part-time housed (26.60%), full-time ranging (10.44%) and other (3.37%). However, in Cambodia, pigs are practically kept indoor or building (92.48%) more than those in Laos (32.93%). In Laos, half of the pig farmer keep their pigs in the pigsty at night and free-range during the day, and only 32.93% are full-time kept in the pen.

Figure 3: Backyard Pig housing system in Cambodia

Figure 4: Backyard Pig housing system in Laos

Table 18: Pig housing system at pre and post outbreak

	Pre-outbreak			**Post-outbreak**		
	Cambodia N=14	**Laos N=17**	**Total N=31**	Cambodia N=133	Laos N=164	Total N=297
Pig housing system at pre and post outbreak						
Full time free-ranging/ scavenging	0 (0.00%)	11 (64.71%)	11 (35.48%)	1 (0.75%)	30 (18.29%)	31 (10.44%)
Full-time housed/fenced/penning	3 (21.43%)	1 (5.88%)	4 (12.90%)	123 (92.48%)	54 (32.93%)	177 (59.60%)
Part-time housed/ fenced/penning	0 (0.00%)	5 (29.41%)	5 (16.12%)	1 (0.75%)	78 (47.56%)	79 (26.60%)
Other (tethered)	11 (78.57%)	0 (0.00%)	11 (35.48%)	8 (6.01%)	2 (1.22%)	10 (3.37%)

4.4.3 Reason of changing the pig housing system

There are several reasons of changing the pig housing system of pig farmer after the outbreak. Pig farmer perceived the important of pig housing system raising their pig. Protecting their pig from disease infection, building of new pigsty, changing of pig raising system are notably the reason of changing pig housing system in Cambodia.

In Laos, there are slightly different in term of reason for practice change regarding pig housing system. Since majority of pig farmer practice free-range/ scavenging system, their pig was severely infected by disease. Pig farmer change their practice from free-range to confinement to avoid high mortality rate from disease infection, pig management, and also damaging the crop of their neighbor.

Table* 19*: Reason of pig housing system practice change

Country: Cambodia
The old pigsty was broken and need to build a new one
Demolished the old pen and have no enough money to build the new pigsty
Just start raising the pig
Changing the location of the pigsty but the same system, if pig is raised in the same place, the ***pig might be infected by the disease***
Pig destroyed the land when tethering and built the pigsty for the pig
Build the pigsty to protect from disease
The old pigsty closed to the main route into the village, build a new one
Just start raising, so I don't know
The old pigsty is closed by the kitchen. Food stuff bought from market may affect the pig raising nearby the kitchen
Changing of the pig housing to make it easier for raising
Changing of the pig housing to avoid disease
Changed the place before pig raised in house but right now, pig raised in the field, to prevent disease and move the pen out of the village
Country: Laos
Confined pig because of high rate of mortality

Pig got disease then buying pig from near by

No money to build pigs' pen

Due to pig died

Due to disease outbreak

Difficulty to take care if free range

Confined during rice cultivation

Due to pig death and enter another garden(?)/ crop field

Free range after rice harvesting

Due to disease outbreak

4.4.4 Pig herd at pre- and post-outbreak

Figure 5 and 6 show the number of pig herd raised by pig farmer at pre-and post- ASF outbreak in Cambodia and Laos.

Figure5: Pig herd at pre-outbreak

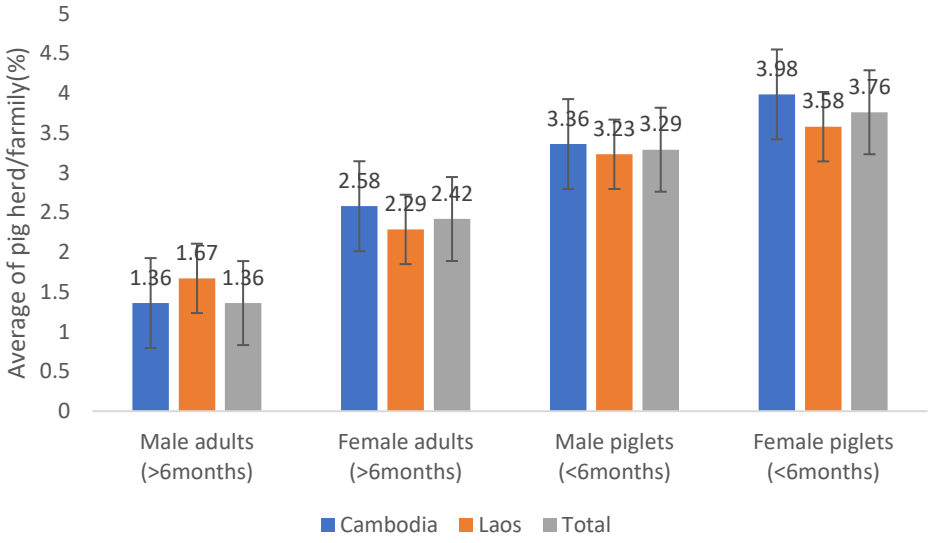
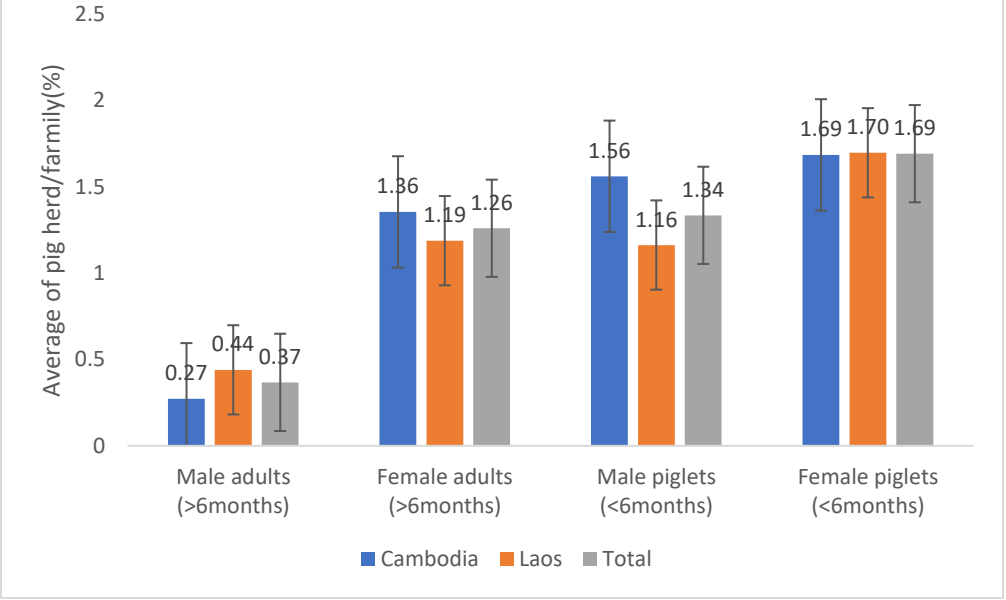


Figure6: Pig herd at post-outbreak



4.4.5 Pig feeding method at pre-and post- outbreak

Table 20 present the pig feeding method at pre-and post-outbreak. In both Cambodia and Laos, pig is fed by local ingredients at pre (88.94%) and post-outbreak (89.90%), followed by scavenging (36.70%), swill and leftover food (25.90%). In Laos, due to a greater proportion of free-rang farming, scavenging is a common feeding method (65.20%) while in Cambodia is only 1.50%. Contrarily, commercial feed is widely used in Cambodia (63.16%), while in Laos only 2.44%. Swill and leftover food from kitchen are often combined with local ingredients or commercial food for the pig with almost the same proportion in Cambodia and Laos.

Before the first outbreak, pig is fed by local ingredients (88.94%), followed by scavenging (29.65%) most commonly in Laos, swill and leftover food (25.13%) for both countries. In Laos, scavenging is a common feeding method (52.25%) while in Cambodia is only 1.13%. Commercial feed is the main source of feed used in Cambodia (57.95%), while in Laos only 3.60%. Swill and leftover food from kitchen are often combined with local ingredients or commercial food for the pig with almost the same proportion in Cambodia and Laos (3.01% to 25.13%). In both Cambodia and Laos, there is no much change in term of pig feeding practice before and after the first outbreak (65.82%). Pig feeding method changed due to several reason such changing of pig

housing system (4.08%), feeding type, type of pig, price of feed and there is also changing of feeding method to protect from disease infection such as from swill or leftover food (table 21).

Table 20: Pig feeding method at pre-and post- outbreak

Type of feeding (Multiple choices)	Pre-outbreak			Post-outbreak		
	Cambodia N=88	Laos N=111	Total N=199	Cambodia N=133	Laos N=164	Total N=297
- Scavenging	1 (1.13%)	58 (52.25%)	59 (29.65%)	2 (1.50%)	107 (65.20%)	109 (36.70%)
- Local feed ingredient	69 (78.41%)	108 (97.30%)	177 (88.94%)	108 (81.20%)	159 (97%)	267 (89.90%)
- Swill/leftover food	25 (28.41%)	25 (22.52%)	50 (25.13%)	41 (30.83%)	36 (22%)	77 (25.90%)
- Local feed ingredient combined with swill/leftover food	23 (26.14%)	23 (20.72%)	46 (23.12%)	38 (28.57%	38 (23.20%)	76 (25.60%)
- Commercial feed	51 (57.95%)	4 (3.60%)	55 (27.64%)	84 (63.16%)	4 (2.44%)	88 (29.60%)
- Commercial feed combined with swill/leftover food	2 (2.27%)	4 (3.60%)	6 (3.01%)	3 (2.26%)	4 (2.44%)	7(2.36%)
- Rice bran/soup	32 (36.36%)	0 (0.00%)	32 (16.08%)	51 (38.35%)	1 (0.61%)	52 (17.50%)
- Other	3 (3.40%)	2 (1.80%)	5 (2.51%)	14 (10.53%)	0 (0%)	14 (4.71%)

Table 21: Reason of changing pig feeding method

Reason of changing pig feeding method	Cambodia N=86	Laos N=110	Total N=196
- Added commercial feed for piglet	1 (1.16%)	0(0.00%)	1 (0.51%)
- Better growing (grow faster)	3 (3.49%)	0(0.00%)	3 (1.53%)
- Disease control by providing commercial feed only	1 (1.16%)	0(0.00%) 0(0.00%)	1 (0.51%)
- For sow, change from premix to rice bran and rice soup, less protein, pig less hot, less fatigue	1 (1.16%)	0(0.00%)	1 (0.51%)
- High prices of commercial feed	5 (5.81%)	0(0.00%)	5 (2.55%)
- No change, still mix between water spinach with rice and cook them together	1 (1.16%)	0(0.00%)	1 (0.51%)
- No changes	51 (59.30%)	78 (70.90%)	129 (65.82%)
- No rice bran for piglets	1 (1.16%)	0 (0.00%)	1 (0.51%)
- Pigs raised by house instead of scavenging in the field which need to be fed by food waste	0 (0.00%)	1 (0.09%)	1 (0.51%)
-Provide only rice bran	0 (0.00%)	1 (0.09%)	1 (0.51%)
- Raise only breeder now	1 (1.16%)	0 (0.00%)	1 (0.51%)
- Reasons not specified	21 (24.42%)	20 (18.20%)	41 (20.92%)
- Stopped free roaming	0 (0.00%)	8 (7.30%)	8 (4.08%)
- Wild taro leaves and roots	0 (0.00%)	2 (1.80%)	2 (1.02%)

More than 50% of pig farmers in this study for both in Cambodia and Laos responded that they didn't change the feeding method: 59.30% and 70.90%, respectively. As notice, some pig farmer changed their feeding method in order to make pig grow faster, high cost of feed and some other do not specify the reason of changing the method. In Laos, 7.30% of pig farmer have changed their feed method due to changing of pig raising system, from free-range to confinement.

4.4.6 Pig biosecurity practices at pre-outbreak

Table 22: Pig biosecurity practice at pre-outbreak

Pig biosecurity practice before the first outbreak	Cambodia N=45	Laos N=53	Total N=98
Did you have a footbath at the entrance of your pens?			
Yes	3 (6.67%)	1 (1.89%)	4 (4.08%)
No	42 (93.10%)	47 (88.70%)	89 (90.82%)
N/A	0 (0.00%)	5 (9.43%)	5 (5.10%)

The last time you purchased a new pig, did you keep it quarantine for at least 2 weeks before mixing with the others?			
Yes	2 (4.44%)	14 (26.40%)	16 (16.33%)
No	41 (91.10%)	39 (73.60%)	80 (81.63%)
N/A	2 (4.40%)	0 (0.00%)	2 (2.04%)
The last time one of your animals was sick, did you isolate it from the others?			
Yes	24 (53.30%)	13 (24.50%)	37 (37.76%)
No	21 46.70%)	39 (73.60%)	60 (61.22%)
N/A	0 (0.00%)	1 (1.89%)	1 (1.02%)
Did you allow visitors (e.g: butcher/ middle men /relatives) to enter the pig pen?			
Yes	19 (42.20%)	15 (28.30%)	34 (34.69%)
No	25 55.60%)	38 (71.70%)	63 (64.29%)
N/A	1 (2.22%)	0 (0.00%)	1 (1.02%)
Did you ask visitors entering the farm/ the pens to Change footwear?			
Yes	4 (8.89%)	4 (7.55%)	8 (8.16%)
No	41 (91.10%)	45 (84.90%)	86 (87.76%)
N/A	0 (0.00%)	4 (7.55%)	4 (4.08%)
Did you ask visitors entering the farm/ the pens to Change cloth?			
Yes	1 (2.22%)	2 (3.77%)	3 (3.06%)
No	44 (97.80%)	47 (88.70%)	91 (92.86%)
N/A	0 (0.00%)	4 (7.55%)	4 (4.08%)
Did you ask visitors entering the farm/ the pens to disinfect their shoes?			
Yes	3 (6.67%)	0 (0.00%)	3 (3.06%)
No	41 (91.10%)	49 (92.50%)	90 (91.84%)
N/A	1 (2.22%)	4 (7.55%)	5 (5.10%)
Did you visit other pig farms frequently (>once/week)			
Yes	8 (17.80%)	8 (15.10%)	16 (16.33%)
No	37 (82.20%)	45 (84.90%)	82 (83.67%)
N/A	0 (0.00%)	0 (0.00%)	0 (0.00%)
Did you protect the pigs' feed from possible contamination by wildlife? (Stored in a closed place)			
Yes	22 (48.90%)	20 (37.70%)	42 (42.86%)

No	21 (46.70%)	32 (60.40%)	53 (54.08%)
N/A	2 (4.44%)	1 (1.89%)	2 (3.06%)
Did you keep the pigs pens clean and dry all the time?			
Yes	42 (93.30%)	17 (32.10%)	59 (60.20%)
No	3 (6.67%)	36 (67.90%)	39 (39.80%)
N/A	0 (0.00%)	0 (0.00%)	0 (0.00%)
Did you ever feed your pigs with swill food?			
Yes	20 (44.40%)	19 (35.80%)	39 (39.80%)
No	25 (47.20%)	34 (64.20%)	59 (60.20%)
N/A	0 (0.00%)	0 (0.00%)	0 (0.00%)
Did you vaccinate your pigs over the last 12 months?			
Yes	16 (35.60%)	12 (22.60%)	28 (28.57%)
No	29 (64.40%)	40 (75.50%)	69 (70.41%)
N/A	0 (0.00%)	1 (1.89%)	1 (1.02%)
The last time you purchased pigs, did you ask if there was an on-going outbreak in the community or farm from where you are buying the pig?			
Yes	20 (44.40%)	19 (35.80%)	39 (39.80%)
No	23 (51.10%)	33 (62.30%)	56 (57.14%)
N/A	2 (4.40%)	1 (1.89%)	3 (3.06%)
Were the piglets, sows and boars kept in separated pens?			
Yes	33 (73.30%)	2 (3.77%)	35 (35.71%)
No	10 (22.20%)	50 (94.30%)	60 (61.22%)
N/A	2 (4.40%)	1 (1.89%)	3 (3.06%)
Did you use a drainage system?			
Yes	28 (62.20%)	0 (0.00%)	28 (28.57%)
No	17 (37.80%)	53 (100%)	70 (71.43%)
N/A	0 (0.00%)	0 (0.00%)	0 (0.00%)
Did you use specific tools when taking care of your pigs (eg.Shovels, ...) ? Meaning tools that you didn't use for other animals			
Yes	33 (73.30%)	0 (0.00%)	33 (33.67%)
No	12 (26.70%)	52 (98.10%)	64 (65.31%)
N/A	0 (0.00%)	1 (1.89%)	1 (1.02%)
Did you use specific tools only for each Pig pens (eg.Shovels, ...) ?			
Yes	7 (15.60%)	0 (0.00%)	7 (7.14%)

No	37 (82.20%)	51 (96.20%)	88 (89.80%)
N/A	1 (2.20%)	2 (3.77%)	3 (3.06%)
Did you wear specific clothes/footwear for taking care of pigs? (Different from your daily life clothes/footwear)			
Yes	3 (6.67%)	0 (0.00%)	3 (3.06%)
No	41 (91.10%)	53 (100%)	94 (95.92%)
N/A	1 (2.20%)	0 (0.00%)	1 (1.02%)
Did you use pig manure for fertilizing crops?			
Yes	41 (91.10%)	18 (34.00%)	59 (60.20%)
No	4 (8.89%)	35 (66.00%)	39 (39.80%)
N/A	0 (0.00%)	0 (0.00%)	0 (0.00%)
Did you share boars with other farms (lend out or borrow)?			
Yes	35 (77.80%)	8 (15.10%)	43 (43.88%)
No	8 (17.80%)	45 (84.09%)	53 (54.08%)
N/A	2 (4.44%)	0 (0.00%)	2 (2.04%)
Were all replacement stocks produced and grown within your farm?			
Yes	10 (22.20%)	18 (34.00%)	28 (28.57%)
No	34 (75.60%)	35 (66.09%)	69 (70.41%)
N/A	1 (2.22%)	0 (0.00%)	1 (1.02%)

4.4.7 Pig biosecurity practice changed at post-outbreak

Table 23: pig biosecurity practice at post-outbreak

	Cambodia N=88	**Laos** N=111	**Total** N=199
Do you have a footbath at the entrance of your pens?	n=87	n=108	n=195
No and I never had	72 (82.76%)	90 (83.33%)	162 (83.08%)
No but I used to have them	3 (3.45%)	2 (1.85%)	5 (2.56%)
Non application	4 (4.60%)	14 (12.96%)	18 (9.23%)
Yes but I did not have them before	2 (2.30%)	0 (0.00%)	2 (1.03%)
Yes and I also had them before the first outbreak	6 (6.90%)	2 (1.85%)	8 (4.10%)
The last time you purchased a new pig, do you keep it quarantine for at least 2 weeks before mixing with the others?			
No and I never had	81 (92.05%)	59 (53.15%)	140 (70.35%)
No but I used to have them	0 (0.00%)	4 (3.60%)	4 (2.01%)

Non application	3 (3.41%)	1 (0.90%)	4 (2.01%)
Yes but I did not have them before	0 (0.00%)	6 (5.41%)	6 (3.02%)
Yes and I also had them before the first outbreak	4 (4.55%)	41 (36.94%)	45 (22.61%)
The last time one of your animals was sick, do you isolate it from the others?			
No and I never had	44 (50.00%)	51 (45.95%)	95 (47.74%)
No but I used to have them	1 (1.41%)	2 (1.80%)	3 (1.51%)
Non application	1 (1.41%)	4 (3.60%)	5 (2.51%)
Yes but I did not have them before	1 (1.41%)	7 (6.31%)	8 (4.02%)
Yes and I also had them before the first outbreak	41 (46.59%)	47 (42.34%)	88 (44.22%)
Do you allow visitors (e.g: butcher/ middle men / relatives) to enter the pig pen?			
No and I never had	50 (56.82%)	68 (61.26%)	118 (59.30%)
No but I used to have them	4 (4.55%)	4 (3.60%)	8 (4.02%)
Non application	1 (1.14%)	2 (1.80%)	3 (1.51%)
Yes but I did not have them before	2 (2.27%)	4 (3.60%)	6 (3.02%)
Yes and I also had them before the first outbreak	31 (35.23%)	33 (29.73%)	64 (32.16%)
Do you ask visitors entering the farm/ the pens to Change footwear?			
No and I never had	79 (89.77%)	93 (83.78%)	172 (86.43%)
No but I used to have them	0 (0.00%)	1 (0.90%)	1 (0.50%)
Non application	4 (4.45%)	14 (12.61%)	18 (9.05%)
Yes but I did not have them before	0 (0.00%)	0 (0.00%)	0 (0.00%)
Yes and I also had them before the first outbreak	5 (5.68%)	3 (2.70%)	8 (4.02%)
Do you ask visitors entering the farm/ the pens to Change cloth?			
No and I never had	84 (95.45%)	92 (82.88%)	176 (88.44%)
No but I used to have them	0 (0.00%)	4 (3.60%)	4 (2.01%)
Non application	3 (3.41%)	14 (12.61%)	17 (8.54%)
Yes but I did not have them before	0 (0.00%)	0 (0.00%)	0 (0.00%)
Yes and I also had them before the first outbreak	1 (1.14%)	1 (2.70%)	2 (1.01%)
Do you ask visitors entering the farm/ the pens to disinfect their shoes?			
No and I never had	82 (93.18%)	91 (81.98%)	173 (86.93%)
No but I used to have them	2 (2.27%)	3 (2.70%)	5 (2.51%)
Non application	1 (1.14%)	16 (14.41%)	17 (8.54%)
Yes but I did not have them before	1 (1.14%)	0 (0.00%)	1 (0.50%)
	2 (2.27%)	1 (0.90%)	3 (1.51%)

Yes and I also had them before the first outbreak			
Do you visit other pig farms frequently (>once/week)			
No and I never had	64 (72.73%)	85 (76.58%)	149 (74.87%)
No but I used to have them	1 (1.14%)	2 (1.80%)	3 (1.51%)
Non application	1 (1.14%)	2 (1.80%)	3 (1.51%)
Yes but I did not have them before	0 (0.00%)	0 (0.00%)	0 (0.00%)
Yes and I also had them before the first outbreak	22 (25.00%)	22 (19.82%)	44 (22.11%)
Do you protect the pigs' feed from possible contamination by wildlife? (Stored in a closed place)			
No and I never had	37 (42.05%)	40 (36.04%)	77 (38.69%)
No but I used to have them	1 (1.14%)	2 (1.80%)	3 (1.51%)
Non application	6 (6.82%)	0 (0.00%)	6 (3.02%)
Yes but I did not have them before	3 (3.41%)	1 (0.90%)	4 (2.01%)
Yes and I also had them before the first outbreak	41 (46.59%)	68 (61.26%)	109 (54.77%)
Do you keep the pigs pens clean and dry all the time?			
No and I never had	10 (11.36%)	55 (49.55%)	65 (32.66%)
No but I used to have them	1 (1.14%)	3 (2.70%)	4 (2.01%)
Non application	1 (1.14%)	1 (0.90%)	2 (1.01%)
Yes but I did not have them before	4 (4.5%)	3 (2.70%)	7 (3.52%)
Yes and I also had them before the first outbreak	72 (81.82%)	49 (44.14%)	121 (60.80%)
Do you ever feed your pigs with swill food?			
No and I never had	60 (68.18%)	64 (57.66%)	124 (62.31%)
No but I used to have them	1 (1.14%)	3 (2.70%)	4 (2.01%)
Non application	1 (1.14%)	0 (0.00%)	1 (0.50%)
Yes but I did not have them before	1 (1.14%)	1 (0.90%)	2 (1.01%)
Yes and I also had them before the first outbreak	25 (28.41%)	43 (38.74%)	68 (34.17%)
Do you vaccinate your pigs over the last 12 months?			
No and I never had	44 (50.00%)	79 (71.17%)	123 (61.81%)
No but I used to have them	2 (2.27%)	4 (3.60%)	6 (3.02%)
Non application	2 (2.27%)	3 (2.70%)	5 (2.51%)
Yes but I did not have them before	4 (4.55%)	1 (0.90%)	5 (2.51%)
Yes and I also had them before the first outbreak	36 (40.91%)	24 (21.62%)	60 (30.15%)

The last time you purchased pigs, do you ask if there was an on-going outbreak in the community or farm from where you are buying the pig?			
No and I never had	50 (56.82%)	50 (45.05%)	100 (50.25%)
No but I used to have them	0 (0.00%)	3 (2.70%)	3 (1.51%)
Non application	3 (3.41%)	1 (0.90%)	4 (2.01%)
Yes but I did not have them before	4 (4.55%)	2 (1.80%)	6 (3.02%)
Yes and I also had them before the first outbreak	31 (35.23%)	55 (49.55%)	86 (43.22%)
Are the piglets, sows and boars kept in separated pens?			
No and I never had	32 (36.36%)	94 (84.68%)	126 (63.32%)
No but I used to have them	1 (1.14%)	2 (1.80%)	3 (1.51%)
Non application	7 (7.95%)	3 (2.70%)	10 (5.03%)
Yes but I did not have them before	1 (1.14%)	0 (0.00%)	1 (0.50%)
Yes and I also had them before the first outbreak	47 (53.41%)	12 (10.81%)	59 (29.65%)
Do you use a drainage system?			
No and I never had	26 (29.55%)	100 (90.09%)	126 (63.32%)
No but I used to have them	1 (1.14%)	2 (1.80%)	3 (1.51%)
Non application	3 (3.41%)	6 (5.41%)	9 (4.52%)
Yes but I did not have them before	0 (0.00%)	1 (0.90%)	1 (0.50%)
Yes and I also had them before the first outbreak	58 (65.91%)	2 (1.80%)	60 (30.15%)
Do you use specific tools when taking care of your pigs (eg.Shovels, ...) ? Meaning tools that you didn't use for other animals			
No and I never had	33 (37.50%)	101 (90.99%)	134 (67.34%)
No but I used to have them	0 (0.00%)	3 (2.70%)	3 (1.51%)
Non application	1 (1.14%)	4 (3.60%)	5 (2.51%)
Yes but I did not have them before	1 (1.14%)	0 (0.00%)	1 (0.50%)
Yes and I also had them before the first outbreak	53 (69.23%)	3 (2.70%)	56 (28.14%)
Do you use specific tools only for each Pig pens (eg.Shovels, ...) ?			
No and I never had	67 (76.14%)	103 (92.79%)	170 (85.43%)
No but I used to have them	0 (0.00%)	3 (2.70%)	3 (1.51%)
Non application	2 (2.27%)	4 (3.60%)	6 (3.02%)
Yes but I did not have them before	0 (0.00%)	0 (0.00%)	0 (0.00%)
Yes and I also had them before the first outbreak	19 (21.59%)	1 (0.90%)	20 (10.05%)

Do you wear specific clothes/footwear for taking care of pigs? (Different from your daily life clothes/footwear)			
No and I never had	75 (85.23%)	101 (90.99%)	176 (88.44%)
No but I used to have them	0 (0.00%)	4 (3.60%)	4 (2.01%)
Non application	2 (2.27%)	4 (3.60%)	6 (3.02%)
Yes but I did not have them before	1 (1.14%)	0 (0.00%)	1 (0.50%)
Yes and I also had them before the first outbreak	10 (11.36%)	2 (1.80%)	12 (6.03%)
Do you use pig manure for fertilizing crops?			
No and I never had	9 (10.23%)	76 (68.47%)	85 (42.71%)
No but I used to have them	0 (0.00%)	3 (2.70%)	3 (1.51%)
Non application	1 (1.14%)	0 (0.00%)	1 (0.50%)
Yes but I did not have them before	2 (2.27%)	0 (0.00%)	2 (1.01%)
Yes and I also had them before the first outbreak	76 (86.36%)	32 (28.83%)	108 (54.27%)
Do you share boars with other farms (lend out or borrow)?			
No and I never had	12 (13.64%)	84 (75.68%)	96 (48.24%)
No but I used to have them	2 (2.27%)	4 (3.60%)	6 (3.02%)
Non application	3 (3.41%)	1 (0.90%)	4 (2.01%)
Yes but I did not have them before	3 (3.41%)	1 (0.90%)	4 (2.01%)
Yes and I also had them before the first outbreak	68 (77.27%)	21 (18.92%)	89 (44.72%)
Are all replacement stocks produced and grown within your farm?			
No and I never had	48 (54.55%)	46 (41.44%)	94 (47.24%)
No but I used to have them	5 (5.68%)	4 (3.60%)	9 (4.52%)
Non application	5 (5.68%)	0 (0.00%)	5 (2.51%)
Yes but I did not have them before	5 (5.68%)	2 (1.80%)	7 (3.52%)
Yes and I also had them before the first outbreak	25 (28.41%)	59 (53.15%)	84 (42.21%)

4.4.8 Carcass Disposal practice at pre-and post-outbreak

Table 24 present the carcass disposal management practice by pig farmer at pre-and post- ASF outbreak. Majority of pig farmer had no carcass disposal point before the outbreak (64.98%). This proportion is high in Laos (70.73%) than in Cambodia (57.89%). Contrarily, the percentage of pig farmer had carcass disposal point in Cambodia (42.11%) is more than Laos (29.27%), meaning that Cambodia pig farmer had better practice than pig farmer in Laos.

At post-outbreak, majority of pig farmer interviewed still have no disposal point like at pre-outbreak (66.07%). Pig farmer in Cambodia (38.02%) has better knowledge in term of carcass management in Laos (30.82%).

4.4.9 Distance of Carcass Disposal point to the farm at pre-and post- outbreak

Table 25 show the distance of carcass disposal point practice at pre-and post-outbreak by pig farmer in Cambodia and Laos. Both Cambodia and Laos, the distance of carcass disposal point practice by pig farmer was between 10 to more than 30 meters from their farm (29.41%-58.82%) , while at post-outbreak, the distance of carcass disposal point practice by pig farmer is between 10 to more than 30 meters from their farm (26.32%-60.00%).

4.4.10 Carcass Disposal management at pre-and post-outbreak

Table 26 presents the carcass disposal management before the first outbreak in Cambodia and Laos. Death carcass was usually managed by burying for both Laos and Cambodia (73.20%), followed by sell out the death carcass for consumption, high in Cambodia 39.50%, burning (9.27%), and donation to the villager (7.37%-8.78%). Pig farmer in Laos has better practice in death carcass management than in Cambodia.

At post-outbreak, the carcass disposal management after the outbreak in Cambodia and Laos. Death carcass is usually buried for both Laos and Cambodia (73.20%), followed by sell out the death carcass for consumption, high in Cambodia 39.50%, burning (9.27%), and donation to the villager (7.37%-8.78%). Pig farmer in Laos has better practice in death carcass management than in Cambodia.

Table 24: Carcass disposal Practice at pre-and post-outbreak

Carcass management	**Pre-outbreak**			**Post-outbreak**		
	Cambodia N=133	Laos N=164	Total N=297	Cambodia N=121	Laos N=159	Total N=280
Do you have the carcass disposal point?						
Yes	56 (42.11%)	48 (29.27%)	104 (35.02%)	46 (38.02%)	49 (30.82%)	95 (33.93%)
No	77 (57.89%)	116 (70.73%)	193 (64.98%)	76 (61.98%)	110 (69.18%)	193 (66.07%)

Table 25: Distance of carcass disposal point at pre-and post-outbreak

	Pre-outbreak			**Post-outbreak**		
Distance of CDP	Cambodia N=32	Laos N=36	Total N=68	Cambodia N=46	Laos N=49	Total N=95
What was/is the approximate distance of the CDP to your farm?						
<10 meters	6 (18.75%)	0 (0.00%)	6 (8.82%)	8 (17.39%)	0 (0.00%)	8 (8.42%)
10-20 meters	3 (9.38%)	17 (47.22%)	20 (29.41%)	4 (8.70%)	21 (42.86%)	25 (26.32%)
21-30 meters	2 (6.25%)	0 (0.0%)	2 (2.94%)	4 (8.70%)	1 (2.04%)	5 (5.26%)
>30 meters	21 (65.63%)	19 (52.78%)	40 (58.82%)	30 (65.22%)	27 (55.10%)	57 (60.00%)

Table 26: Carcass disposal management at pre-and post-outbreak

Carcass Disposal Management	**Pre-outbreak**			**Post-outbreak**		
	Cambodia N=76	Laos N=129	Total N=205	Cambodia N=121	Laos N=159	Total N=280
Burning	4 (5.26%)	15 (11.60%)	19 (9.27%)	12 (9.92%)	21 (13.20%)	33 (11.79%)
Burying	40 (52.60%)	110 (85.30%)	150 (73.20%)	66 (54.50%)	135 (84.90%)	201 (71.80%)
Use of chemical/lim	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (0.83%)	2 (1.26%)	3 (1.07%)
Throw it into the bush	2 (2.63%)	9 (6.98%)	11 (5.37%)	3 (2.48%)	12 (7.55%)	15 (5.36%)
Sell it of	30 (39.50%)	2 (1.55%)	32 (15.60%)	42 (34.70%)	3 (1.89%)	45 (11.10%)
Eat the meat or give to relative	5 (6.58%)	13 (10.10%)	18 (8.78%)	13 (10.70%)	15 (9.43%)	28 (10.00%)
Others*	11 (14.50%)	4 (3.10%)	15 (7.31%)	18 (14.90%)	5 (3.14%)	23 (8.21%)

*(93.33%) Donate or share to the villager for consumption and no dead pigs.

4.4.11 Carcass disposal management practice changed

Table 27 presents the practical way of carcass disposal management before and after the outbreak among the pig farmer interviewed. 86.07% of pig farmer from the two countries, Cambodia and Laos, practice the same of carcass disposal before and after the outbreak.

Table 27: Way of carcasses disposal management practice changed

	Cambodia N=121	**Laos** N=159	**Total** N=280
Before the first outbreak, were you disposing carcasses the same way?			
Yes	95 (78.51%)	146 (91.82%)	241 (86.07%)
No	26 (21.48%)	13 (8.17%)	39 (13.92%)

However, 13.92% of them don't have the same way of carcass disposal before and after the outbreak. As shown on table 18, mostly those pig farmers ceased the activity after the outbreak, apply different raising system before and after the outbreak which is not applicable for carcass management (raising in the field).

Table 28: Practice changed on carcass disposal management

How were you doing before?	**Cambodia** **N**=24	**Laos** N=6	**Total** N=30
Burying/burning	3 (12.50%)	3 (50.00%)	6 (20.00%)
Eat/consumption	3 (12.50%)	0 (0.00%)	3 (10.00%)
Sell out the pig	5 (20.83%)	0 (0.00%)	5 (16.67%)
Throw it into the bush	0 (0.0%)	2 (33.33%)	2 (6.67%)
Stop raising pig	6 (25.00%)	0 (0.00%)	6 (20.00%)
Give to other pig farmer	1 (4.17%)	0 (0.00%)	1 (3.33%)
Pig farming outside the village	0(0.00%)	1 (16.67%)	1 (3.33%)
Not affected	5 (20.83%)	0 (0.00%)	5 (16.67%)
Non applicable	1 (4.17%)	0 (0.00%)	1 (3.33%)

4.4.12 Biosecurity measures applied by pig farmer to prevent/ control diseases

Table 29 presents the biosecurity measure applied by pig farmer to prevent and control diseases. Beside carcass disposal management, they also have applied some measure to prevent the diseases such as cleaning and disinfection the pig pen, avoid purchasing the affected pork, no scavenging system, not providing swill to the pig and visitor control. However, there is also farmer who keep their death pig for consumption or sell out, by considering that it is also a measure to control the disease.

Table 29: Biosecurity measure applied by pig farmer to prevent/control disease

Measure to prevent the disease	Cambodia N=57	Laos N=35	Total N=92
Is there any other measure you are doing to prevent or control diseases?			
Yes	10 (17.54%)	5 (14.29%)	15 (16.30%)
No	47 (82.46%)	30 (85.71%)	77 (83.70%)

Table 30: Specific measure implemented by pig farmer to prevent disease

Biosecurity measures	Number of respondents	Percentage
Cambodia		
Clean and disinfectant 2-3 time/day	1	11.11
Avoid buying affected pork	3	33.33
Death pig usually kept for consumption and sell to middleman/slaughter	1	11.11
No scavenging	1	11.11
Not providing swill to pig	2	22.22
Visitor control	1	11.11
Total	**9**	**100**
Laos		
Confined pig and not food feed contaminated food	2	40
Applying vaccination and treatment	3	60
Total	**5**	**100**

4.4.13 Pig farmer knowledge on biosecurity measure to prevent and control ASF

Table 31: Pig farmer knowledge on biosecurity measure applying

Biosecurity practice	Cambodia N=88	Laos N=111	Total N=199
You considered "Having a foot bath at the entrance of the pens" as important for ASF prevention and control but you are not doing it. Why?	n=10	n=15	n=25
I don’t know	3 (30.00%)	4 (26.67%)	7 (28.00%)
Not feasible	3 (30.00%)	0 (0.00%)	3 (12.00%)
Take too much time	1 (10.00%)	0 (0.00%)	1 (4.00%)
Too expensive	1 (10.00%)	9 (60.00%)	10 (40.00%)

Other	2 (20.00%)	2 (13.33%)	4 (16.00%)
You considered "Purchasing a new pig, keeping it in quarantine for at least 2 weeks before mixing it with the others" as important for ASF prevention and control but you are not doing it. Why?	n=6	n=10	n=16
I don’t know	2 (33.33%)	4 (40.00%)	6 (37.50%)
Not feasible	0 (0.00%)	0 (0.00%)	0 (0.00%)
Take too much time	0 (0.00%)	1 (10.00%)	5 (31.25%)
Too expensive	4 (66.67%)	4 (40.00%)	4 (25.00%)
Other	0 (0.00%)	1 (10.00%)	1 (6.25%)
You considered "Isolating sick pigs from the others " as important for ASF prevention and control but you are not doing it. Why?	n=4	n=8	n=12
I don’t know	2 (50.00%)	4 (50.00%)	6 (50.00%)
Not feasible	1 (25.00%)	0 (0.00%)	1 (8.33%)
Take too much time	0 (0.00%)	0 (0.00%)	4 (33.33%)
Too expensive	0 (0.00%)	4 (50.00%)	0 (25.00%)
Other	1 (25.00%)	0 (0.00%)	1 (8.33%)
You considered "Not allowing visitors (e.g.: butcher/ middle men / relatives) to enter the pig pen" as important for ASF prevention and control but you are not doing it. Why?	n=22	n=9	n=31
I don’t know	6 (27.27%)	2 (22.22%)	8 (25.81%)
Not feasible	11 (50.00%)	5 (55.56%)	16 (51.61%)
Take too much time	1 (4.55%)	1 (11.11%)	2 (6.45%)
Too expensive	0 (0.00%)	1 (11.11%)	1 (3.23%)
Other	4 (18.18%)	0 (0.00%)	4 (12.90%)
You considered "Asking visitors entering the farm/ the pens to change footwear" as important for ASF prevention and control but you are not doing it. Why?	n=2	n=4	n=6
I don’t know	0 (0.00%)	2 (50.00%)	2 (33.33%)
Not feasible	1 (50.00%)	1 (25.00%)	2 (33.33%)
Take too much time	0 (0.00%)	0 (0.00%)	0 (0.00%)
Too expensive	1 (50.00%)	1 (25.00%)	2 (3.33%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)
You considered "Asking visitors entering the farm/ the pens to change cloth" as important for ASF prevention and control but you are not doing it. Why?	n=3	n=3	n=6
I don’t know	0 (0.00%)	2 (66.67%)	2 (33.33%)
Not feasible	3 (100.00%)	1 (33.33%)	4 (66.67%)

Take too much time	0 (0.00%)	0 (0.00%)	0 (0.00%)
Too expensive	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)
You considered "Asking visitors entering the farm/ the pens to disinfect their shoes" as important for ASF prevention and control but you are not doing it. Why?	n=2	n=4	n=6
I don't know	0 (0.00%)	1 (25.00%)	1 (16.67%)
Not feasible	0 (0.00%)	1 (25.00%)	1 (16.67%)
Take too much time	0 (0.00%)	1 (25.00%)	1 (16.67%)
Too expensive	2 (100.00%)	1 (25.00%)	3 (50.00%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)
You considered "Not visiting other pig farms frequently (>once/week)" as important for ASF prevention and control but you are not doing it. Why?	n=15	n=3	n=18
I don't know	4 (26.67%)	1 (33.33%)	5 (27.78%)
Not feasible	3 (20.00%)	1 (33.33%)	4 (22.22%)
Take too much time	1 (6.67%)	0 (0.00%)	1 (5.56%)
Too expensive	1 (6.67%)	0 (0.00%)	1 (5.56%)
Other	6 (40.00%)	1 (33.33%)	7 (38.89%)
You considered "Protecting the pigs' feed from possible contamination by wildlife (Stored in a closed place)" as important for ASF prevention and control but you are not doing it. Why?	n=2	n=2	n=4
I don't know	1 (50.00%)	0 (33.33%)	1 (25.00%)
Not feasible	0 (0.00%)	0 (33.33%)	0 (0.00%)
Take too much time	1 (50.00%)	2 (0.00%)	3 (75.00%)
Too expensive	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	0 (0.00%)	0 (33.33%)	0 (0.00%)
You considered "Keeping the pigs pens clean and dry all the time" as important for ASF prevention and control but you are not doing it. Why?	n=2	n=6	n=8
I don't know	0 (0.00%)	2 (33.33%)	2 (25.00%)
Not feasible	2 (100.00%)	0 (33.33%)	2 (25.00%)
Take too much time	0 (0.00%)	1 (16.67%)	1 (12.50%)
Too expensive	0 (0.00%)	1 (16.67%)	1 (12.50%)
Other	0 (0.00%)	2 (33.33%)	2 (25.00%)

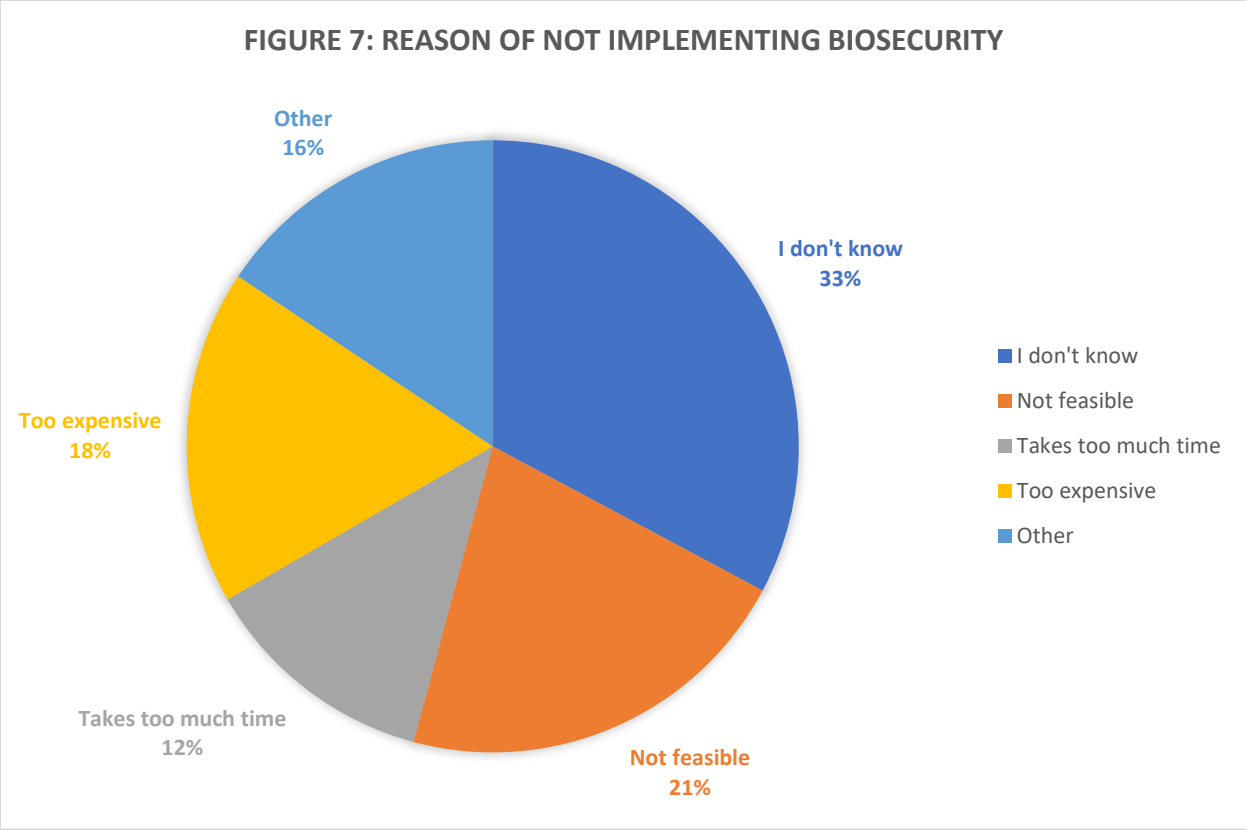
You considered "Keeping the pigs pens clean and dry all the time" as important for ASF prevention and control but you are not doing it. Why?	n=18	n=8	n=26
I don’t know	9 (50.00%)	5 (62.50%)	14 (53.85%)
Not feasible	0 (0.00%)	0 (0.00%)	0 (0.00%)
Take too much time	0 (0.00%)	1 (12.50%)	1 (3.85%)
Too expensive	2 (11.11%)	1 (12.50%)	3 (11.55%)
Other	7 (38.89%)	1 (12.50%)	8 (30.77%)
You considered "Vaccinating the pigs every 6 months" as important for ASF prevention and control but you are not doing it. Why?	n=2	n=9	n=11
I don’t know	1 (50.00%)	3 (33.33%)	4 (36.36%)
Not feasible	0 (0.00%)	0 (0.00%)	0 (0.00%)
Take too much time	0 (0.00%)	0 (0.00%)	0 (0.00%)
Too expensive	1 (50.00%)	6 (66.67%)	7 (63.64%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)
You considered "Asking if there is an on-going outbreak in the community or farm from where you are buying the pig" as important for ASF prevention and control but you are not doing it. Why?	n=4	n=2	n=6
I don’t know	1 (25.00%)	0 (0.00%)	1 (16.67%)
Not feasible	2 (50.00%)	1 (50.00%)	3 (50.00%)
Take too much time	0 (0.00%)	1 (50.00%)	1 (16.67%)
Too expensive	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	1 (25.00%)	0 (0.00%)	1 (16.67%)
You considered "Keeping piglets, sows and boars in separated pens" as important for ASF prevention and control but you are not doing it. Why?	n=1	n=1	n=2
I don’t know	0 (0.00%)	1 (100.00%)	1 (50.00%)
Not feasible	0 (0.00%)	0 (0.00%)	0 (0.00%)
Take too much time	1 (100.00%)	0 (0.00%)	1 (50.00%)
Too expensive	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)
You considered "Having draining system" as important for ASF prevention and control but you are not doing it. Why?	n=1	n=0	n=1
I don’t know	1 (0.00%)	0 (0.00%)	1 (100.00%)
Not feasible	0 (0.00%)	0 (0.00%)	0 (0.00%)
Take too much time	0 (0.00%)	0 (0.00%)	0 (0.00%)
Too expensive	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)

You considered "Using specific tools (not used for other animals) to take care of the pigs (eg. shovels, ...)" as important for ASF prevention and control but you are not doing it. Why?	n=1	n=1	n=2
I don’t know	0 (0.00%)	0 (0.00%)	0 (0.00%)
Not feasible	1 (100.00%)	0 (0.00%)	1 (50.00%)
Take too much time	0 (0.00%)	1 (100.00%)	1 (50.00%)
Too expensive	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)
You considered "Using specific tools for each pig pens (eg. shovels, ...)" as important for ASF prevention and control but you are not doing it. Why?	n=3	n=1	n=4
I don’t know	0 (0.00%)	0 (0.00%)	0 (0.00%)
Not feasible	2 (66.67%)	0 (0.00%)	2 (50.00%)
Take too much time	1 (33.33%)	0 (0.00%)	1 (25.00%)
Too expensive	0 (0.00%)	1 (100.00%)	1 (25.00%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)
You considered "Using specific clothes/footwear for taking care of pigs (Different from your daily life clothes/footwear)" as important for ASF prevention and control but you are not doing it. Why?	n=3	n=0	n=3
I don’t know	0 (0.00%)	0 (0.00%)	0 (0.00%)
Not feasible	1 (33.33%)	0 (0.00%)	1 (33.33%)
Take too much time	0 (0.00%)	0 (0.00%)	0 (0.00%)
Too expensive	1 (33.33%)	0 (0.00%)	1 (33.33%)
Other	1 (33.33%)	0 (0.00%)	1 (33.33%)
You considered "Using pig manure to fertilize crops" as important for ASF prevention and control but you are not doing it. Why?	n=0	n=1	n=1
I don’t know	0 (0.0%)	0 (0.00%)	0 (0.00%)
Not feasible	0 (0.00%)	0 (0.00%)	0 (0.00%)
Take too much time	0 (0.0%)	1 (100.00%)	1 (100.0%)
Too expensive	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)
You considered "Not sharing boars between pig farms (lending or borrowing)" as important for ASF prevention and control but you are not doing it. Why?	n=0	n=2	n=2
I don’t know	0 (0.00%)	1 (50.00%)	1 (50.00%)
Not feasible	0 (0.00%)	1 (50.00%)	1 (50.00%)

Take too much time	0 (0.00%)	0 (0.00%)	0 (0.00%)
Too expensive	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	0 (0.00%)	0 (0.00%)	0 (0.00%)
You considered "Using all replacement stocks that are produced and grown within your farm / not buying pigs from outside" as important for ASF prevention and control but you are not doing it. Why?	n=1	N=0	n=1
I don't know	1 (100.00%)	0 (0.00%)	1 (100.00%)
Not feasible	0 (0.00%)	0 (0.00%)	0 (0.00%)
Take too much time	0 (0.00%)	0 (0.00%)	0 (0.00%)
Too expensive	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	0 (0.00%)	0 (0.00%)	0 (00.00%)

4.4.14 Reason of not implementing biosecurity practice to prevent and control disease

In sum, there are many reasons for pig farmer not to implement biosecurity measure to prevent and control their pig both Cambodia and Laos. Majority of pig farmer (33%) have no any reason of why they should apply biosecurity to protect their pig from disease. 21% more think that it is not feasible to prevent and control ASF infection by implementing biosecurity. 18% of pig farmer perceive about biosecurity measure to prevent and control ASF to their herd but they don't apply it because it is too expensive to invest on biosecurity measure. Other 12% of pig farmer think that it takes too much time to prevent and control ASF by implementing biosecurity measure (Figure7).



4.4.15 Other reasons not to implement the biosecurity

Table 32 show the other reason of not to implement the biosecurity to prevent and control ASF by each country. Among the pig farmer interviewed in Cambodia and Laos, few pig farmer have provided some reason of not implement the biosecurity. Among of that their knowledge, attitude, traditional practice and economic aspect are the main reasons burden them from implement the measure which help them to prevent and control the ASF.

Table 32: Reason not to implement the biosecurity

Reason of not implement the biosecurity	Number of respondents	Percentage
Cambodia		

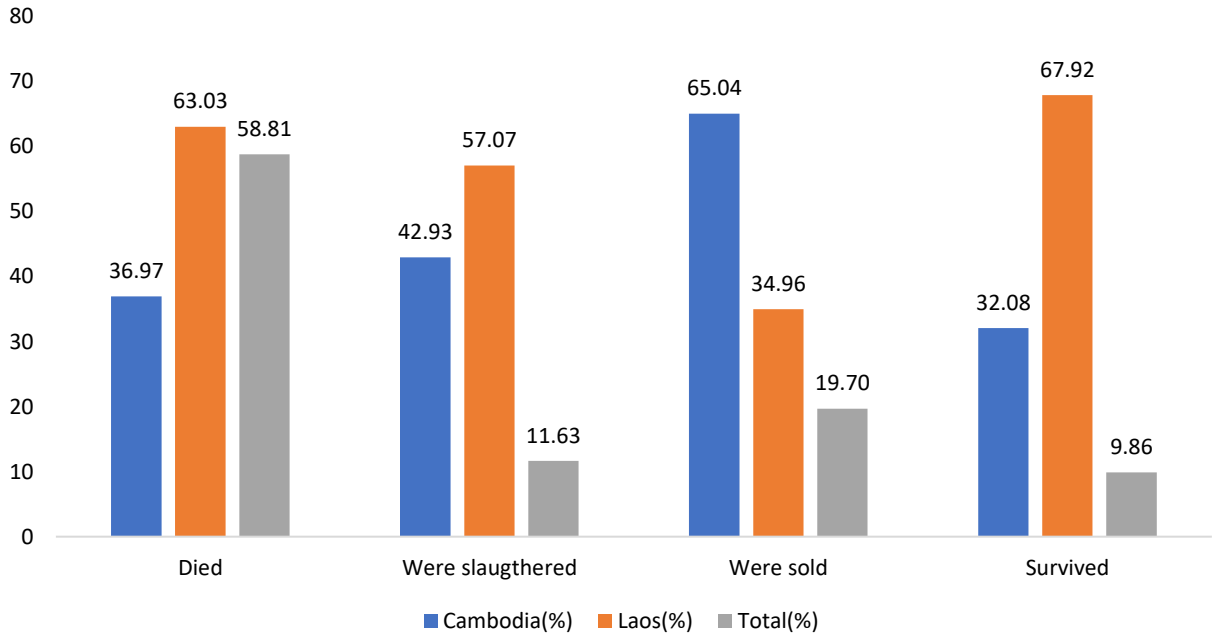
-Attitude of pig farmer (laziness)	2	11.76
-Do not go into pig pen often, not need to apply biosecurity	1	5.88
-Not feeding swill food before and after the outbreak	1	5.88
-Don't want to waste/invest anything sometime	1	5.88
-Ineffective of biosecurity measure (pig was isolated but still infected)	1	5.88
-Before the pen so tiny and right now I have more space because I build the pen in other place so there is space to build	1	5.88
-No visitor to go into the pen due to the number of pigs is less	1	5.88
-I can't ban the visitor	1	5.88
-Only healthy pig farmers	1	5.88
-Prevent disease	1	5.88
-Forget about biosecurity	1	5.88
-Visit a friend's home	1	5.88
-Visit my neighbor	1	5.88
-Do not feed pig with swill food	1	5.88
-Last time I provide swill food contain pork only one time after that my pig got sick so right now, I stop. I never feed swill food but last time I miss and there was not enough food.	1	5.88
-Always not feeding swill food before and after	1	5.88
-No more ASF	1	5.88
Total	**18**	**100**
Laos		
New practice	1	14.28
Not many pigs' feces	1	14.28
Not many pig	1	14.28
No feeding leftover to pig	1	14.28
Difficulties in control visitor	1	14.28
Lack of water supply	1	14.28
Isolation when pig got infected	1	14.28
Total	**7**	**100**

4.5 Socio-economic impact due to ASF outbreak in ASF outbreak village

4.5.1 Effect of ASF outbreak

African Swine Fever outbreak impacts on socio-economic of pig farmers in both Cambodia and Laos. 58.81% of pig affected by ASF dead, 11.63% slaughtered(culled), 19.70% sold out and 9.36% survived after the outbreak. Laos had high percentage of pig dead due to ASF (63.03%), slaughtered (57.07%) and pig survived after infection (67.92%) but low in sell out (34.96%) comparing to Cambodia. Cambodia had less affected than Laos in term of pig died and culled but most of the pig infected was sold out before death (65.04%).

Figure 8: Effect of ASF outbreak



4.5.2 Pig market value due to ASF outbreak

Table 33 present the impact of ASF outbreak on the pig market value in Cambodia and Laos. 51.75% of pig farmer faced the decrease of price of their pig when selling. This event happening more in Cambodian pig market (75 %) than in Laos pig market (33.33%). However, 46.23% of pig farmer also found pig price increased when selling, specifically for pig market in Laos (66.66%) than in Cambodia (20.45%).

Table34: Pig market value

	Cambodia N=88	**Laos** N=111	**Total** N=199
Since the outbreak, did the value of the pig when selling pig?			
Increase	18 (20.45%)	74 (66.66%)	92 (46.23%)
Decrease	66 (75.00%)	37 (33.33%)	103 (51.75%)
Did not change	4 (4.54%)	0 (0.00%)	4 (2.01%)
Since the outbreak, did the value of the pig when buying pig?	N=88	N=111	N=199
Increase	55 (62.50%)	89 (80.18%)	144 (72.36%)
Decrease	21 (23.86%)	22 (19.81%)	43 (21.60%)
Did not change	12 (13.63%)	0 (0.00%)	12 (6.03%)

4.5.3 Household impact due to ASF outbreak

Table 35 presents the household impact due to ASF outbreak in Cambodia and Laos. 83.16% of pig farmer lost their income due to the outbreak. Some farmer stops the pig farming activity (37.37%) due to the price of live pig (piglet) increased (48.82%) because they need to purchasing pig from outside for restocking (32.66%).

Table 35: Household impact due to ASF outbreak

	Cambodia N=133	**Laos** N=164	**Total** N=297
In/for your household, did the outbreak lead to the following event (s)?			
-We lost income	105 (78.95%)	142 (86.59%)	247 (83.16%)
-We had to purchase pig from outside	16 (12.03%)	81 (49.39%)	97 (32.66%)
-The price of live pigs increased	16(12.03%)	129(78.66%)	145(48.82%)
-The price of pork products increased	12(9.02%)	47(28.66%)	59(19.87%)
-We had to request for a loan/ borrow money or asset	15(11.28%)	2(1.22%)	17(5.72%)
- We had to sell assets to cover our needs	6(4.51%)	2(1.22%)	8(2.69%)
- We engaged into other economic activities	13(9.77%)	23(14.02%)	36(12.12%)
- We stopped raising pigs	58(43.61%)	53(32.32%)	111(37.37%)
- We lost quality of life	20(15.04%)	16(9.76%)	36(12.12%)

- We had to take some kids out of school as we could not pay the school feed any more	0(0.00%)	0(0.00%)	0(0.00%)
- We are eating less meat than before	10(7.52%)	19(11.59%)	29(9.76%)
- We had to reduce some expenses to save money	6(4.51%)	29(17.68%)	35(11.78%)
- It became more difficult to sell the pigs	32(24.06%)	26(15.85%)	58(19.53%)
- Nothing	17(12.78%)	8(4.88%)	25(8.42%)
-Other*	14(10.53%)	1(0.61%)	15(5.05%)

*Decrease of live pig price (1), loss of time (7), loss on feed cost (1), no impact (1) and don't know (1)

Table 36: ASF outbreak impact on local community by FGD

Impact on community	Cambodia(%)	Laos(%)	Total(%)
Other (immigration, loss of confidence in pig farming, loss of connect among villager, impact on pig sector, no pig raising, pig farming sector drop-off, change of profession)	89.84	-	81.29
Loss of traditional ceremonies	-	54.69	54.69
Increased number of families falling in poverty and to be assisted	74	34.44	46.62
Lower consumption of meat in diet	19	48.82	46.33
Loss of income	78	40	43.17
Increase pig prices	-	23	23

Table 36 presents the impact of ASF outbreak on local community, perceived by participants in focus group discussion. Majority of participants in FGD in Cambodia (89.84%) perceived that ASF outbreak was the cause of immigration of pig farmers in the village. Due to the outbreak, pig farmers loss the confidence in pig farming, making the pig farming sector drop-off and finally, the village cease this farming activity. However, this was not the case in Laos. Major impact of ASF outbreak on the local community was on the local ceremony celebration (54.69%). The two highlighted impact made the local pig family increased (46.62) led to the low consumption of pork (46.17%). As the consequence, pig farmer lost their income from pig farming. Loss of income was found high in Cambodian (78%) than in Laos (40%).

4.5.4 Source of income of pig farmer at pre-and post- outbreak

Table 37 presents the source of income for pig farmer at pre- and post-ASF outbreak. In general, pig farming is not the main source of income to support the family of pig farmer. It is just relatively a second source of income (27.27%) for both Cambodia and Laos at pre-and post-outbreak. However, in Laos, pig farming is mainly an additional source of income (37.80%) for both pre-and post-outbreak while in Cambodia, it constitutes the 2nd source of income (31.58%) for both pre- and post-outbreak. Rice production is the main source of income for both Cambodia but an additional source of income in Laos. In Cambodia, rice constitutes a main source of income represent for 37.59% and 48.87% respectively at pre-and post-outbreak of the pig farmer interviewed, while it is only 18. 90 and 20.73 % of pig farmer in Laos earn for their income from rice farming. Other sources of income for pig farmer like livestock raising, cropping, working, business and fishing are just an additional or not even a source of income.

In sum, there is not significant different in term of source of income for pig farmer at pre- and post the ASF outbreak in their community for both Cambodia and Laos. Just like after the outbreak, some pig farmer reluctant or ceased the pig farming activity making other source of income raised up such as running the private business.

Focus group discussion among the relevant pig value chain actors in the village revealed also that rice production is the most important source of income for local farmer for both at pre-and post-outbreak, followed by cattle/buffalo farming and some other non-farming activity. Pig farming stayed at the fourth rank among the income activity at the local village. For both in Cambodia and Laos, pig farming activity become less important source of income after the ASF outbreak, moving from the second source of income to the fourth rank of income, replaced by non-farming activity which were before the ASF outbreak was at the fourth rank (table 4).

Table 37: Source of income of farmer at pre-and post-outbreak

Source of income (Pre-and post- outbreak)	**Pre-outbreak**			**Post-outbreak**		
	Cambodia N=133	Laos N=164	Total N=297	Cambodia N=133	Laos N=164	Total N=297
Pig as the source of income						
Main source of income	37 (27.81%)	11 (6.70%)	48 (16.16%)	13 (9.77%)	9 (5.49%)	22 (7.40%)
Second source of income	41 (30.82%)	40 (24.39%)	81 (27.27%)	42 (31.58%)	39 (23.78%)	81 (27.27%)
Third source of income	31 (23.30%)	31 (18.90%)	62 (20.87%)	29 (21.80%)	31 (18.90%)	60 (20.20%)
Additional sources of income	11 (8.27%)	59 (35.97%)	70 (23.56%)	14 (10.53%)	62 (37.80%)	76 (25.58%)
Not a source of income	13 (9.77%)	23 (14.02%)	36 (12.12%)	35 (26.32%)	23 (14.02%)	58 (19.52%)
Livestock as the source of income*					**(n=161)**	**(n=294)**
	4 (3.00%)	34 (20.73%)	38 (12.79%)	8 (6.02%)	31 (19.25%)	39 (13.26%)
Main source of income	20 (15.03%)	24 (14.63%)	44 (14.81%)	21 (15.79%)	29 (18.01%)	50 (17.00%)
Second source of income	41 (30.82%)	41 (25.00%)	82 (27.60%)	33 (24.81%)	38 (23.60%)	71 (24.14%)
Third source of income	47 (35.33%)	55 (33.53%)	102 (34.34%)	44 (33.08%)	51 (31.68%)	95 (32.31%)
Additional sources of income	21 (15.78%)	10 (6.09%)	31 (10.43%)	27 (20.30%)	12 (7.45%)	39 (3.26%)
Not a source of income						
Crop as the source of income						
Main source of income	4 (3.00%)	8 (4.87%)	12 (4.04%)	2 (1.05%)	12 (7.32%)	14 (4.71%)
Second source of income	6 (4.51%)	10 (6.09%)	16 (5.38%)	6 (4.51%)	8 (4.88%)	14 (4.71%)
Third source of income	7 (5.26%)	15 (9.14%)	22 (7.04%)	10 (7.52%)	17 (10.37%)	27 (9.09%)
Additional sources of income	27 (20.30%)	75 (45.73%)	102 (34.34%)	25 (18.80%)	76 (46.34%)	101 (34.00%)
Not a source of income	89 (66.91%)	56 (34.14%)	145 (48.82%)	90 (67.67%)	51 (31.10%)	141(47.47%)
Rice as the source of income						
Main source of income	50 (37.59%)	31 (18.90%)	81 (27.27%)	65 (48.87%)	34 (20.73%)	99 (33.33%)
Second source of income	40 (30.07%)	15 (9.14%)	55 (18.51%)	27 (20.30%)	14 (8.53%)	41 (13.80%)
Third source of income	16 (12.03%)	7 (4.26%)	23 (7.74%)	15 (11.27%)	10 (6.09%)	25 (8.41%)
Additional sources of income	18 (13.53%)	58 (35.36%)	76 (25.58%)	15 (11.27%)	66 (40.24%)	81 (27.27%)
Not a source of income	9 (6.76%)	53 (32.31%)	62 (20.87%)	11 (8.27%)	40 (24.39%)	51(17.17%)

Working as the source of income	15 (11.27%)	18 (10.97%)	33 (11.11%)	9 (6.77%)	28 (17.07%)	37 (12.45%)
Main source of income	3 (2.25%)	9 (5.48%)	12 (4.04%)	9 (6.77%)	9 (5.49%)	18 (6.06%)
Second source of income	6 (4.51%)	9 (5.48%)	15 (5.05%)	5 (3.76%)	8 (4.88%)	13 (4.37%)
Third source of income	12 (9.02%)	22 (13.41%)	34 (11.44%)	14 (10.53%)	23 (14.02%)	37 (12.45%)
Additional sources of income	97 (72.93%)	106 (64.63%)	203 (68.35%)	96 (72.18%)	96 (58.54%)	192 (64.64%)
Not a source of income						
Private/business as the source of income	**(n=131)**			**(n=131)**		
Main source of income	16 (12.21%)	7 (4.26%)	23 (7.79%)	19 (14.50%)	8 (4.88%)	27 (9.15%)
Second source of income	8 (6.10%)	2 (1.21.%)	10 (3.38%)	14 (10.69%)	1 (0.61.%)	15 (5.08%)
Third source of income	7 (5.34%)	0 (0.00%)	7 (2.37%)	6 (4.58%)	0 (0.00%)	6 (2.03%)
Additional sources of income	15 (11.45%)	8 (4.87%)	23 (7.79%)	12 (9.16%)	11 (6.71%)	23 (7.79%)
Not a source of income	85 (64.88%)	147 (89.63%)	232(78.64%)	80 (61.07%)	144 (87.80%)	224(75.93%)
Employment/regular salary as the source of income						
Main source of income	7 (5.26%)	7 (4.26%)	14 (4.71%)	16 (12.03%)	6 (3.36%)	22 (7.40%)
Second source of income	8 (6.01%)	2 (1.21%)	10 (3.36%)	5 (3.76%)	2 (1.22%)	7 (2.35%)
Third source of income	5 (3.75%)	0 (0.00%)	5 (1.68%)	7 (5.26%)	0 (0.00%)	7 (2.35%)
Additional sources of income	7 (5.27%)	2 (1.21%)	9 (3.03%)	8 (6.02%)	2 (1.22%)	10 (3.36%)
Not a source of income	106 (79.69%)	153 (93.29%)	259 (87.20%)	97 (72.93%)	154 (93.90%)	251 (84.51%)
Fishing/forest product collection as the source of income	(n=5)	(n=24)	(n=29)	(n=8)	(n=27)	(n=35)
	1 (20.00%)	00 (0.00%)	1 (3.44%)	4 (50.00%)	00 (0.00%)	4 (11.43%)
Main source of income	2 (40.00%)	00 (0.00%)	2 (6.89%)	2 (25.00%)	00 (0.00%)	2 (5.71%)
Second source of income	1 (20.00%)	1 (4.16%)	2 (6.89%)	1 (12.50%)	00 (0.00%)	1 (2.85%)
Third source of income	0 (0.00%)	23 (95.83%)	23 (79.31%)	1 (12.50%)	27 (100%)	28 (80.00%)
Additional sources of income	1 (20.00%)	**N/A**	1 (3.44%)	N/A	**N/A**	N/A
Not a source of income						

Table 38: Ranking the source of income responded at pre-and post-outbreak by participatory survey using FGD (1=most important to 7= least important)

Ranking the Source of income activity	Pre-outbreak			Post-outbreak		
	Cambodia	Laos	Total	Cambodia	Laos	Total
Rice production	1	1	1	1	1	1
Cattle/buffalo farming	4	3	3	4	2	2
Other (including non-farming activities)	3	6	4	2	6	3
Pig farming	2	2	2	3	3	4
Other livestock (poultry, chicken, goats)	5	4	5	5	4	5
Crop/vegetable production	6	5	6	6	5	6
Fishing	7	7	7	7	7	7

4.6 Recommended measures and Practice change toward ASF prevention in FGD

Table 39: Recommended measures applied by FGD participants

Measures	Cambodia(%)	Laos(%)	Total(%)
Vaccination	2.13	19.30	11.54
Strict confinement / movement ban of pig	4.26	17.54	11.54
Hygiene of pig pens	19.15	3.51	10.58
Restricted access of middlemen to the pig farms	8.51	8.77	8.65
Burying dead pig	9.57	7.02	8.17
Burning dead pig	5.32	6.14	5.77
Bane visitors entering to the pig farms	7.45	3.51	5.29
Keep pigs far from village	4.26	5.26	4.81
Vector control	9.57	0.00	4.33
Isolation of sick pigs	1.06	6.14	3.85
Not buying meat from infected pigs for consumption	6.38	1.75	3.85
Check status of village of origin when buying pigs	2.13	3.51	2.88
No buying live animals from middle men and collection points	2.13	2.63	2.40
Personal disinfection on entry to farm	3.19	1.75	2.40
No visiting other pig farms	1.06	1.75	1.44
Lime powder apply	2.13	0.88	1.44
Treatment	1.06	1.75	1.44
Report cases to VAHW/ VVW or DV/DAFO	0.00	2.63	1.44
Leave the truck/vehicle fare from the pig pen	1.06	1.75	1.44

Proper pig feeding (no kitchen waste/ in cooked pig products)	3.19	0.00	1.44

Table 40 ranking the recommended measures and practices by participants in FGD toward ASF outbreak prevention. In general, among the local actors participated in the FGD, measure and practice change recommended like vaccination (11.54%), strictly confinement of pig (11.54%), pigsty hygiene (1058%), pig farming visitor restriction (8.65%), death carcass management (8.17%) were considered the effective to prevent the outbreak of ASF among measure listed. However, the effectiveness of these measure were perceived differently between local pig actors at local level in Cambodia and Laos. Vaccination was considered effective in Laos (19.30%) but not in Cambodia (2.13) while there is no vaccine available. Strictly confinement of pig was considered effective in Laos (17.54%) rather than in Cambodia since in Laos, free-range is more practical than in Cambodia as pigs are usually full-time housed in Cambodia. Pigsty hygiene is high in Cambodia (19.15%) since pigs are full-time house while in Laos is only 3.51% because of free-range practice. Vector control measure was better perceived by local pig actors in Cambodia than in Laos.

5 Reference

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6 Annexes

Annex 1: Questionnaire- Individual interviews of random pig farmers on ASF impact on livelihoods and practices in ASF affected villages for case study

The objectives of this interview is to obtain the general characteristics of the farm, assess the impact of the ASF outbreak and the practice changes adopted after the outbreak
Date of the interview (DD/MM/YY):.....
Name of interviewer…….

Part I: General information

1.1. Are you the one responsible/ taking the decisions regarding the pigs?
Yes or no? If not then stop interview as we want to interview the person responsible/ taking the decisions, not a caretaker
1.2. Were you raising pigs before the outbreak?
O Yes
O No
If not then stop interview as he does not fit criteria
1.3. If yes: are you still raising pigs?
O Yes
-O No
1.4. Country
O Cambodia
O Laos
1.5. Province
1.6. District
O Viengkham
O Phonhong
O Toomlarn
O Ba Phnum
O Svay Chrum
O Tram Kak
O Ankgor Borey
O Saang
O Ou Reang Ov
1.7. Village

Village in Lao PDR	Village in Cambodia
Tanua	Ta Pech Khang Cheung
Dornsad	Thmey Krao
Nahongnoi	Pranhang
Namatorng	Boeng Rae Khang Tboung
Kokmuang	Prey Khla
Samakkhixay	Ruessei Chuor Khang Cheung
Taeyor	Ruessei Chuor Khang Tboung
Tambaeng	Khourch
Nakatao	Ou Phot
Nanhongyai	Prey Teal Prakeab

Dornboung Houaywa Chaengsavang Houaydeua Nakam Namchaeng Nasorm Phongkhorng Phonkham Tay Phonngam Tay Houaychor Houaythong Nanoi Navaen Ombling Paklao Phadaeng Phoukhorng Phoutong Samsoum Samton	Angk Tnaot Khang Lech Trapeang Srangae Ampil Ponley Khang Tboung Thlok Yul Kampong Chomlong Ank Kandal Svay Damnak Chek Ta Pech Kampoul Sarey Saoy Boeung Cheung Thma Krachum Others (Please specify) ……

1.8. Farm address

GPS coordinates: ……

1.9. Gender of farmer/interviewee

O Male

O Female

1.10. Ethnic group (*non mandatory*)

Ethnics of Lao PDR	Ethnics of Cambodia
Lao Katang Makong Oy Ta-Oy Tri Xuay Brao Lue Phouthai Khmou Hmong Others (Please specify) ……	Khmer Cham Krom Surin Kachok Krung Brao Kavet Kuy Phnong Tampuan Stieng Mnong Samre Jarai Rhade Others (Please specify) ……

1.11. Year of birth (XXXX): ……..

1.12. Do you have community responsibilities within the village/district?

O Farmer
O Farmer group member
O VAHW/VVW
O Community leader
O Traditional healer
O None
O Other (if other please precise)

1.13. Education level

O Illiterate/no school
O Primary school
O Secondary school
O Higher education
O University/ above

1.14. How many persons are part of your household?

Category	Number
Kids (< 2 years old)	
Kids (3-5 years old)	
Kids (6-16 years old)	
Adults (>16 years old)	

1.15. What are the main sources of income for your household (reorder from the most important to the least important:

O Pigs
O Other livestock
O Crops
O Rice
O Worker
O Private business
O Employment/regular salary
O Other (if other please specify)

Part II: Farm characteristics

Note for enumerator:For the farmers still active, they should mention their actual farm characteristics. For the farmers who stopped raising pigs after the outbreak, they should mention their farm characteristics before the first outbreak

2.1. How long have you been involved in raising pigs (till now if still active or before ceasing your activity)?

O <1-year
O 1-2 years
O >2-5 years
O >5-10 years
O >10 years

2.2. For which purpose(s) do you raise pigs (or did before ceasing your activity) ?
O For self-consumption
O Mobile capital (quick cash when needed)
O Commercial purposes (sale)
O Other
If others (Please specify) ……..
2.3. What type of pig farming activity do you do (or did before ceasing your activity)? (Several answers can be selected)
O Only breeder (sell piglets)
O Only grower (buy piglets, fattens and sell for slaughter)
O Breeder & grower
O Other
If other, please specify……

2.4. What type of housing systems do you have (or did have before ceasing your activity)?
O Full time Free- ranging/scavenging
O Full time housed/fenced/penning
O Part time house/fenced/penning
O Other
2.4.1. If "part time housed/fenced/penning", please specify when are they kept inside and when are they free ranging?
2.4.2. If other, please specify……
2.4.3. If full or part time house/fenced/penning:
2.5. How far is the pig pen from your house?
O Next by (10-100 meters)
O Close (<2km)
O Far (>2km)
2.6. What type of housing do you have?
O Wood fences / uncemented floor
O Wood fences / cemented floor
O Elevated wooden floor
O Concrete building
O Other
If other, please specify……
2.7. Before the first outbreak, did you have the same housing system? (Only for farmers still active)
O Yes
O No
2.7.1. If not:
-what type of housing system did you had?……
-why did you change? ……
2.8.How many pigs do you have now? (Only for farmers still active)

Adults (>6 months)		Piglets (<6 months)	
Male	Female	Male	Female

2.9. How many pigs did you have before the first outbreak?

Adults (>6 months)		Piglets (<6 months)	
Male	Female	Male	Female

2.10. Do you have other animals on the same farms (or did you before stopping the activity) ?

O Yes

O No

If yes, which one? (Select all that apply)

O Cattle

O Buffalo

O Goats

O Poultry/ducks

O Other

If other, please specify……

2.11. How frequently do you observe wild pigs in the surroundings of your farms (or did you before stop the activity)?

O Several time per week

O 1 to 4 times a month

O Once every 2-3 months

O A few times per year

O Never

O I don't know

2.12. Which breed of pig do you keep (or did you before stop the activity)?

O Native breed

In Laos: O Moo Lat, O Moo Kang, O Moo Cheed, O Moo Hmong, O I don't know, other (if other please specify….)

In Cambodia: O Kandol, O Hainam, O Damrey, O I don't know, other (if other please specify….)

O Exotic breed

O Crossed breed

O Hybrid (Domestic pigs * wild pigs)

O Other

If other, please specify……

Part III: Practices and practice changes

3.1. What were you feeding your pigs with before the first outbreak (select all that apply)?

O Scavenging

O Local feed ingredients

O Swill/leftover food

O Local feed ingredients combined with Swill/leftover food

O Commercial feed

O Commercial feed combined with Swill/leftover food

O Other

If other, please specify……

3.2. What do you feed your pigs with (select all that apply)? (only for farmers still active)

O Scavenging

O Local feed ingredients

O Swill/leftover food

O Local feed ingredients combined with Swill/leftover food

O Commercial feed

O Commercial feed combined with Swill/leftover food

O Other

If other, please specify……

3.3. Skip logic: if any differences between the answer, since the outbreak, you have changed your feeding practices. Please explain why. (Only for farmers still active)

3.4. Which of the following practices are you implementing and where you also implementing it / not implementing it before the first outbreak? (Only for farmers still active)

Practices	Implementation now o Yes o No o NA	Implementation before the first outbreak o Yes o No oNA	If answer is different (now versus before) please explain the main reason for change
Do you have a foot bath at the entrance of your pens			
The last time you purchased a new pig, did you keep it in quarantine for at least 2 weeks before mixing them with the others?			
The last time one of your animals was sick, did you isolate it from the others?			
Do you allow visitors (e.g: butcher/ middle men / relatives,) to enter the pig pen?			
Do you ask visitors entering the farm/ the pens to Change footwear ?			
Do you ask visitors entering the farm/ the pens to Change cloth?			
Do you ask visitors entering the farm/ the pens to disinfect their shoes ?			

Do you visit other pig farms frequently (>once/week)			
Do you protect the pigs' feed from possible contamination by wildlife? (Stored in a closed place)			
Do you keep the pigs pens clean and dry all the time?			
Do you ever feed your pigs with swill food?			
Did you vaccinate your pigs over the last 12 months?			
The last time you purchased pigs, did you ask if there was an on-going outbreak in the community or farm from where you are buying the pig?			
Are the piglets, sows and boars kept in separated pens ?			
Do you use a drainage system?			
Do you use specific tools when taking care of your pigs (eg.Shovels, ...) ? Meaning tools that you don't use for other animals			
Do you use specific tools only for each Pig pens (eg.Shovels, ...) ?			
Do you wear specific clothes/footwear for taking care of pigs? (Different from your daily life clothes/footwear)			
Do you use pig manure for fertilizing crops?			
Do you share boars with other farms (lend out or borrow)?			
Are all replacement stocks produced and grown within your farm?			

3.5. Which of the following practice were you practicing during the outbreak? (Only for farmers who stopped raising pigs after the outbreak)

Practices	• Yes • No • NA
Having a foot bath at the entrance	

Purchasing a new pig, keeping it in quarantine for at least 2 weeks before mixing it with the others	
Isolating sick pigs from the others	
Not allowing visitors (e.g.: butcher/ middle men / relatives,…) to enter the pig pen	
Asking visitors entering the farm/ the pens to change footwear	
Asking visitors entering the farm/ the pens to change cloth	
Asking visitors entering the farm/ the pens to disinfect their shoes	
Not visiting other pig farms frequently (>once/week)	
Protecting the pigs' feed from possible contamination by wildlife (Stored in a closed place)	
Keeping the pigs pens clean and dry all the time	
Not feeding pigs with swill food	
Vaccinating the pigs every 6 months	
When purchasing pigs, asking if there is an on-going outbreak in the community or farm from where you are buying the pig	
Keeping piglets, sows and boars in separated pens	
Having draining system	
Using specific tools (not used for other animals) to take care of the pigs (eg. shovels, ...)	
Using specific tools for each pig pens (eg. shovels, ...)	
Using specific clothes/footwear for taking care of pigs (Different from your daily life clothes/footwear)	
Using pig manure to fertilize crops	
Not sharing boars between pig farms (lending or borrowing)	
Having all replacement stocks produced and grown within your farm	

3.6. Carcass disposal (only for farmers still active)

3.6.1. Do you have a carcass disposal point (CDP)?

O Yes

O No

3.6.2. If Yes, what is the approximate distance of the CDP to your farm?

O <10 meters

O 10-20 meters

O 21-30 meters

O >30 meters

3.6.3. If yes did you already had one carcass disposal point before the first outbreak?

3.7. How do you dispose carcasses? (Select all that apply) (only for farmers still active)
O Burning
O Burying
O Use of chemical
O Throw it into the bush
O Sell it off
O Other
If other (please specify) ……..
Before the first outbreak, were you disposing carcasses the same way? If not, how were you doing it? Why did you change?
3.8. Carcass disposal system (Only for farmers not raising pigs any more)
3.8.1. Did you had a carcass disposal point (CDP)?
O Yes
O No
3.8.2. If Yes, what was the approximate distance of the CDP to your farm?
O <10 meters
O 10-20 meters
O 21-30 meters
O >30 meters
3.8.3. How did you dispose carcasses? (Select all that apply)
O Burning
O Burying
O Use of chemical
O Throw it into the bush
O Sell it off
O Other
If other (please specify) ……..

Part IV: Practices during outbreak

4.1. Were you personally affected during the outbreak? Yes / No
O Yes
O No
If yes:
4.2. When did you observe the first cases in your herd (number of days after the onset of the outbreak)?
4.3. Do you know how the disease was introduced to your herd?
4.4. When the pigs started being sick did you implement any of the following (multiple choices):
O Call a veterinary professional for advice and/or treatment
O Isolate the sick animals in a different pen
O Sold as many pigs as possible before they died
O Treat them based on my knowledge with drugs I got in pharmacies
O Made sure my animals were all kept in pens (stopped free grazing)
O Buried the carcasses of dead animals
O Dispose of the carcasses of dead animals in the forest
O Sold the meat of dead animals for consumption
O Made sure not to leave my farm without changing clothes and shoes

O Cleaned and disinfected the pens before introducing all animals

4.5. Did all you animals died/ were slaughtered and/or sold?

O Yes

O No

4.6. How long after the outbreak did you restock? ….. (only for farmers still active)

O Less than 1 week
O After 2 weeks
O After 2-4 weeks
O After 2-3 months
O After 3-6 months
O After 6-12 months
O More than 1 year after
O I don't remember

4.7. When you restocked, how did you proceed? (only for farmers still active)

O Introduced 1-2 pigs first before full restocking
O Purchasing directly several pigs
O Others

if other, please specify……

4.8. Before restocking what did you do? (Multiple choice) (only for farmers still active)

O Cleaned the pens
O Disinfected the pens (if yes, please precise with which product)
O Cleaned all the materials and equipment used for the pigs
O Disinfected all the materials and equipment used for the pigs
O Nothing special

Part V: Outbreak impact

5.1. Before the outbreak, what was the relative importance of your pig raising activities compared to other sources of income? (Reorder from the most important to the least important

O Pigs
O Other livestock
O Crops
O Rice
O Worker
O Private business
O Employement/regular salary
O Other (if other please specify)

5.2. How many of your pigs:

	Died	Were slaughtered	Were sold	Survived
Nr of pigs who				

5.3. Since the outbreak, did the value of the pig when selling them: (only for farmers still active)

O Increased
O Decreased
O Did not changed
5.4. Since the outbreak, did the value of the pig when buying them: (only for farmers still active)
O Increased
O Decreased
O Did not changed
5.5. In/for your household, did the outbreak lead to the following event (s) ? Multiple choice

Event	
We lost income	
We had to purchase pigs from outside	
The price of live pigs increased	
The price of pork products increased	
We had to request for a loan / borrow money or assets	
We had to sell assets to cover our needs	
We engaged into other economic activities	
We stopped raising pigs	
We lost quality of life	
We had to take some kids out of school as we could not pay the school feed any more	
We are eating less meat than before	
We had to reduce some expenses to save money, if yes, please precise which expenses were reduced)	
It became more difficult to sell the pigs	

5.6. Did the ASF outbreak had other consequences which have not been listed above? If yes, please precise
5.7. Is there anything you would like to add?

Annex 2: Focus Group Discussion Guide

"Identification of biosecurity measure in farming practices and marketing systems in the pig value-chain and how practices changed after the outbreak"

Objectives
This study aims to identify biosecurity measures taken by pig farmers, how they effected marketing systems and then how those practices changed after the ASF outbreak. Three specific objectives have been raised: Illustrate best practices that reduce productive (economic) losses caused by outbreaks in villages covered in the study Investigate biosecurity practices implemented farmers and live-pig value-chain and the perception of prevention and control of outbreaks. Determine what barriers resulted from changes made in feeding, carcass management, overall farm management and drug consumption. Methodology: Informal interviewing using Focus group discussions (PRA), Listings, hand counts, Ranking and scoring and proportional piling tools with groups of 7 to 12 members: 1 to 2 VAHWs, 6 to 7 independents pig farmers (backyard farms) from affected and non-affected villages, 1 to 2 live pig trader and 1 to 2 resources person (e.g: village chief, traditional healer or head of a farm group).

FGD facilitation principles

During the discussions, to not lead answers or make any judgment call/ give your opinion on the proposed answers.

For questions involving a listing, the proposed list is not to be read, it is only there to facilitate data encoding afterwards by presenting a list of possible answers to be completed with potential "others"

Make sure everybody talks freely, encourage the participation of everybody

Material: Flip chart, digital camera, tape recorder, 100 counters (beans or stones), colored markers, manilla paper, pictures, masking tape, big sheet of paper, pencil, rulers.

Steps to follow

Welcome the participants and if need to be proceeding to traditional welcome and blessing

Introduce yourself, the team and the research topics.

Explain the confidentiality of the interviews, ask for the written consent and for the authorization to record the interview / take pictures.

Explain the structure of the meeting: "We will start by a short questionnaire on general information and then we will have a discussion to document. FGDs will be used to collect data on:

Village typology and characteristic of participants,

Knowledge and perceived efficiency of the public policies,

Existing disease surveillance, and reporting system and efficiency,

Existing village level pig products marketing systems,

Local constraints on biosecurity systems and any necessary changes.

The discussion will be last for 3 hours for FGD, Set the ground rules together with them.

Start the interview based on the interview guidelines.

At the end of the discussion, ask if the interviewee has questions, if she/he wants to share more information

Casual conversation and thanks.

Date:

Research team: - Facilitator:

- Note taker:

- Board writer (if any) :

Starting time: Finish time:

Name of village:

Total number of participants: No. of women:

Participants characteristics

Tool: Handcounts

Facilitator: - Ask among the participants how many of them have the following roles and write down the numbers based on hand counts.

Ask them if any of them has any other role or responsibility in the village, if so, please write them down based on hand-counts

Ask them to raise the hand for those being less than 20 years old, being between 20-30 years old, between 30 to 45 years old and older than 45 years old. At each step proceed to hand-counts and write down the numbers.

and older than 45 years old. At each step proceed to hand-counts and write down the numbers.

Category of person	Number present
Pig farmers	
VAHWs	
Local VCAs	
Resource person/key informant	
Other role and responsibilities of persons present:	
-	
-	
-	
Age groups	
<20-year-old: …….	
20-30 years old	
30-45 years old	
>45 years	

Village characteristics (30min)

Ask how many HH are in the village: …….

Remark: If the participant is not clear about the number of households in the village, the facilitator will get the information from the chief of the village later on.

List of ethnics present in village and proportion of each of them (list and proportional ranking)

Tool: list and proportional ranking

Facilitator: ask each participant to list down the name of ethnic group represented in the village. After listed by participant, ask them to rank the proportion of each ethnic group with 100 counters.

Material: flipchart, big markers and small markers and 100 counters

List of ethnic group	Proportional ranking with 100 counters
1-	
2-	
3-	
4-	

Proportion of HH doing pig farming in the village (proportional ranking with 100 counters)

Tool: list and proportional ranking

Facilitator: - Draw a circle or rectangle and place the 100 stones/counters in it.

Tell the participants, the stones represent the HH present in the village.

Ask them what is the actual proportion of HH having pigs and not having pigs in the village by dividing these stones in 2 groups: one representing the HH having pigs and the second group the ones which are not having pig. Once the participants agree on the repartition, count and write down the number of counters affected to each category.

Ask them to proceed the same why to show us the proportion of HH which were having pigs and not having pigs before the first outbreak. Once the participants agree on the repartition, count and write down the number of counters affected to each category.

Material: flipchart, big markers and small markers and 100 counters

	Non pig farmers	Pig farmers
Before the first outbreak(years)		

Now		

Compare the importance to pig farm activities for their livelihoods to other activities by allocating different numbers to each category (proportional piling with 100 stones, all group to agree on repartition).

Tool: list and proportional ranking

Facilitator: - Present them the list of livelihoods below

Ask them to allocate a number of stones/counters to each of the livelihood listed based on their importance for the village: (1) Now) and (2) Before the first outbreak.

Once the participants agree on the repartition, count and write down the number of counters affected to each category.

Material: flipchart, big markers and small markers and 100 counters

Activities	Before 1st outbreak	Now
	No. of bean/stone	No. of bean/stone
Pig farming		
Cattle/buffalo farming		
Other livestock (poultry, chicken, goats)		
Fishes		
Rice production		
Crops /Vegetable production		
Other (including non-farming activities such as handicrafts, labor, ….)		

Identify direct/indirect actors involving in the pig sector

Tool: Listing and drawing

Facilitator: - Ask them to list the different actors/stakeholders involved in the pig sector in the village (remark: not only for pig raisin but also services to pig farmers, actors involved in trade/marketing).

- Ask them to describe the roles and responsibilities of each of these actors

- Have them draw a diagram in which they represent each of these actors and the interaction between them (direction, frequency and type of interaction):

Venn diagram with: representation of each actor, arrows of different colors (for the different types of interaction), different directions (way of interaction) and size/width based on the importance/frequency of the interactions. Eventually, actors can be positioned geographically within the village, you can add circle around their name of different sizes to represent their importance for the pig sectors in addition to arrows

Remark: If no VAWH was mentioned, please specifically ask the question if there is one in the village? If yes, what are is roles and responsibilities, interaction, then have him included him in the diagram

Material: Flipchart, color markers, camera

Data capture: example of Venn diagram showing interrelations between different stakeholders

Perceptions/ knowledge

Ask the participants to raise their hand if they heard about ASF and proceed to handcounts.

Heard of ASF	Never heard of ASF

Ways of introduction of ASF

Possible pathways

Tool: Listing and scoring (discussion and general agreement)

Facilitator: Ask the participants to list, from their opinion, the possible ways ASF could be introduced in a farm/ in the village. Once they listed them, ask them to score the likelihood of ASF being introduced by this pathway. Score of 0 (no risk at all/very unlikely) to 3 (very high risk/ most likely). Need of a consensus/global agreement by the group for the score given to each pathway.
Note taker: should also write down the score justification elements provided by the participants
Material: flipchart, colour markers, camera

Introduction or spread pathway	Likelihood of the pathway (0: no risk to 3: very high)	Score justification elements discussed
Direct contact with an infected pig		
Feeding of infected pig meat/swill/offal to pigs		
Contact with infected wild boars		
Visitors spreading the germs (e.g.: pig traders)		
Vehicles or equipment's spreading the germs		
Through the wind/ air		
Contact with infected water		
Biting insects (ticks, flees…)		
Other……		

How do you think the first farm got the disease?
Tool: List established under 3.2.1 and scoring (discussion and general agreement)
Facilitator: Ask the participants to look at the list of possible pathways they established. Ask them, when the first case of ASF came into their village, how do they think the first farm got the disease? If they cannot agree on 1 single answer, they can provide the top three possibilities.
Note taker: should also write down the score justification elements provided by the participants
Material: flipchart, colour markers, camera

Most likely pathway	
1.	
2.	
3.	

Symptoms of ASF
Tool: Listing and proportional piling
Facilitator: Based on their experience and knowledge of the disease, can they list the clinical signs observed in case of ASF? Once the list is established, ask the participants to determine the importance of their association with ASF by using 100 counters (low importance/nr of counters means this same symptom is associated to many other diseases, high importance/ higher nr of counters meaning this symptom is characteristics of ASF, it is not or rarely observed with other disease). Once they agreed on the repartition of the counters, write down the number in front of each symptom.
Material: flipchart, colour markers, camera and picture of ASF symptom

Symptom	Is this sign highly related to ASF or not (proportional pilling with 100 counter)
Loss of appetite	
Changes in skin color	
Poor general condition	

Paralysis/ affected movements	
Salivation	
Vomiting	
Shiver	
Diarrhea	
Erected hair	
Cough/breathing problems	
Meat color different	
Mortality in a few days	
Fever	
abortion	
Weight loss	
Yellow urine	
White mucosa	
Other……	

Diseases outbreaks in pig farms

Did you already suffer outbreaks of pig diseases with high mortality in your village? If yes how many outbreaks occurred and when (year and month)

Sequence of events for the first outbreak

Do you remember when it occurred? Year……. Month …….

Visualization of disease introduction and spread

On a map, please represent the following structure:

- The main access road to the village
- The village centers
- The market place (if any)
- River (if any)
- The first farm affected
- The different farms affected in a second phase (other color)
- The different farms affected in a third phase (other color)

Once finalized, take a picture of the map, don't forget the legend to remember which sign represents what.

Diagnosis of ASF:

How was ASF diagnosed and by whom?.....

Disease surveillance and control

Do you know who reported the disease to:

- the village authority
- the district authorities

Please list the measures which the village took to try and limit the spread of the disease:

Once all the measures are listed, ask, for each measure (need common agreement from all participants):

A) If the measure was implemented based on: (1) an initiative from your village/ (2) community members, (3) recommended by the VAHWs / recommended by the district veterinarians, (4) mandatory as directed by the district authority

B) If they think the measure was helpful / efficient (score from 0 to 4, 0: being completely useless and ineffective and 4: very useful, could not have controlled the outbreak without doing it) ?

Data capture

Attention: the list provided below is to facilitate notes taking, it is not to be provided to the participants. The list of measures to score has to be established by the participants.

ASF biosecurity measures in village level	Basis of implementation	Efficiency of the measure (Score 0 to 4)
Confining pig from disease introduction		
Confining pig contact with other pigs and people		
Restrict pigs movement to control what the pig eat and avoid		
Disclosing animal health status		
Implementation of local punitive measure		
Waste carcass feeding need to be properly cooked		
Report to vets authority		
Culling affected animal		
Closing market		
Separate healthy pig from sick pig		
Closing of market		
Separate healthy pig from the suspect cases		
Sanitary zone (cleaning and disinfection the building)		
Restriction (animal, human and animal product)		
Vector control		
Vaccination		
Other……		

How many days after the first case was the outbreak controlled/resolved?.....
Impact of ASF outbreaks (30min)
For the first and last outbreak (if more than 2):
Tool: Proportional Piling
Facilitator:
Can they tell us the proportion of pig farmers which were affected by the ASF outbreak (farmers which had sick animals and/or animals slaughtered for prevention) and non-affected (had no pigs falling sick and/or animals slaughtered)? Ask them to answer by dividing the 100 stones/counters into two groups: affected / non affected.
proportional piling with 100 beans) affected in the village? Which proportion of the pig farmers were
Ask, them, if the 100 stones/ counters now represent the total number of pigs of the village before the first different outbreaks, can they divide them into 3 groups: (1) the pigs who died or were slaughtered, (2) the pigs which had been sick but recovered and (3) the pigs that remained healthy and were not slaughtered.

Last outbreak	Pig farmers	Pigs affected

	Affected	Non-affected	Dead or slaughtered	Recovered (sick but survived)	Healthy (never sick)
First Outbreak					
Last Outbreak no. 2					

What was the impact/ What were the consequences of the outbreak(s) on the village and household?
1. Ask participants to detail and list all the consequences the ASF outbreak(s) at community level and at HH level.
Remark: remind participants to think of all consequences: social, economic, well-being, … and ask them to explain about their choice. Display their choice in the diagram.
3. Once all the impacts are identified, sum up the discussions by going through the diagram.
4. Implement the proportional piling with 50 or 100 counters. Ask respondents to split the counters between each impact/consequence according to the probability of occurrence. The more they put counters the higher was the impact is. Ask participants to explain about their choices.
Data capture
Attention: the list provided below is to facilitate notes taking, it is not to be provided to the participants. The list of measures to score has to be established by the participants.

1. Consequence at HH level	Relative importance of the consequence compared to other (proportion pilling)
Loss of income	
Failure to pay for agriculture labour	
Poorer diet	
Lower consumption of meat in diet	
Failure to pay for medical expenses	
Lost pig breed of quality	
Increase in pig price	
Postpone marriage	
Sale of assets	
Other……	
2. Consequence at village level	Relative importance of the consequence compared to other (proportion pilling)
Increased number of families falling in poverty and to be assisted	
Lower consumption of meat in diet	
Increase pig prices	
Other……	

Lessons learnt and practice changes
Based on your experience, if a new case was detected in the village, which measures would you implement (start from results of question 3252 to go faster, they can say which measures they would still do, the ones they wouldn't do and add measures they didn't do then but will be based on lessons learnt):
At village level

At farm level

Attention: the list provided below is to facilitate notes taking, it is not to be provided to the participants. The list of measures to score has to be established by the participants.

Prevention measures	Listed by participants? (1: Yes / 2: No)
Community level measures	
Banning pig movements within the village	
No buying live animals from middle men and collection points	
Movement ban	
Closing of market	
Setting up a quarantine area	
Vaccination	
Other……	
Individual measures by pig farmers	
Burning dead pigs	
Safe disposal of offal and blood	
Safe disposal of meat	
Safe processing of meat (heat treatment)	
Slaughtering only in official abattoirs	
Strict confinement of pigs	
Restricted access of middle men to farms	
No buying live animals from middle men and collection points	
Movement ban	
Closing of market	
Personal disinfection on entry to farm	
Vector control	
Keep domestic pigs from mixing with wild pigs	
Vaccination	
Isolation of sick pigs	
Killing sick pigs	
Other……	
Individual measures by VCA	
Hygiene staff, truck and buying material	
Leave the truck/vehicle fare from the pig pen	
Banning pigs movements within the village	
No buying live animals from middle men and collection points	
Movement ban	
Closing of market	
Setting up a quarantine area	

Burning dead pigs	
Safe disposal of offal and blood	
Safe disposal of meat	
Safe processing of meat (heat treatment)	
Slaughtering only in official abattoirs	
Strict confinement of pigs	
Restricted access of middle men to farms	
Personal disinfection on entry to farm	
Keep domestic pigs from mixing with wild pigs	
Vaccination	
Isolation of sick pigs	
Killing sick pigs	
Others	

To mitigate the impacts listed in section 4 and in addition to the measures discussed to better prevent and control the disease, are there any other actions or measures which could be taken to reduce the economic impact of future outbreaks?
List all measures proposed and, ask to rank them in terms of relative importance (proportional piling)
For each of the 3 most important measures, ask:

Action or measure to be taken	Relative importance of the consequence compared to other (proportion pilling)	Who should be in charge of implementing this measure?	How feasible is the measure?	How costly is the measure?

Success stories / Identification of key informants:
In your opinion is there any farmer or person whose attitude or measure taken during the previous outbreak allowed to prevent more deaths either in his farm or within the community? Yes / No
If yes and for each of them:

Farmer 1	Answer
In your opinion, what does he do differently to prevent the deaths?	……..
Name and location/ How can we contact him for a visit/ interview	……

Is there some pig farmers who were more affected than others?
If yes and for each of them

Farmer 1	Answer
In your opinion, why is he more affected than others?	……..
Name and location/ How can we contact him for a visit/ interview	……

Are there some pig farmers in the village you consider as “model farmer”, to take example on in terms of disease control? If so who and how can we contact him/them?
Do you have any other comments?