

# Impacts of Pig Management and Husbandry Farmers Towards Classical Swine Fever Transmission in West Timor Indonesia

(DAMPAK MANAJEMEN DAN CARA BETERNAK BABI  
TERHADAP PENULARAN PENYAKIT CHOLERA BABI DI TIMOR BARAT)

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## ABSTRACT

Classical swine fever (CSF) is a serious and highly infectious viral disease of domestic pigs and wild boar, which is caused by a single stranded RNA *pestivirus*. A cross sectional study was carried out on small-holder pig farmers in West Timor, in the province of East Nusa Tenggara, Indonesia. The objective of this study was to describe the management, husbandry and trading practices adopted by pig farmers in West Timor. A questionnaire survey was administered to the owners of these pigs (n = 240) to gather information from farmers in order to understand management and husbandry practices in the region. The results of the questionnaire highlighted the lack of implementation of biosecurity measures by small-holder farms in West Timor, which has the potential to increase the risk of their pigs to CSF, as well as to other diseases.

Keywords : pig husbandry and management, classical swine fever (CSF), West Timor Indonesia.

## ABSTRAK

*Classical swine fever* (CSF) atau cholera babi merupakan suatu penyakit virus yang sangat menular dan berdampak serius baik pada ternak babi maupun babi liar. Cholera babi disebabkan oleh virus RNA beruntai tunggal dari genus *pestivirus*. Penelitian ini merupakan penelitian lintas sektoral terhadap babi dengan kepemilikan skala kecil di Pulau Timor (Barat), Provinsi Nusa Tenggara Timur. Tujuan penelitian ini untuk menggambarkan praktek tatakelola, pemeliharaan, dan perdagangan yang diterapkan oleh peternak babi di Pulau Timor. Penelitian survey ini dilakukan dengan memberikan kuisioner dan wawancara tatap muka pada pemilik babi (jumlah responden: 240 orang) untuk mendapatkan informasi guna memahami praktek-praktek tata kelola dan tata pemeliharaan ternak babi di Pulau Timor. Hasil wawancara dengan kuisioner ini menunjukkan bahwa pelaksanaan tindakan/langkah-langkah biosekuriti oleh peternak babi skala kecil di wilayah tersebut masih kurang. Praktek ini berpotensi meningkatkan risiko tertular penyakit CSF dan penyakit lainnya pada ternak babi mereka.

Kata-kata kunci : tata pemeliharaan dan tata kelola ternak babi, *classical swine fever* (CSF), Pulau Timor .

## INTRODUCTION

This manuscript outlines the result of a cross-sectional study undertaken in eight villages from four subdistricts in the districts of Belu and the City of Kupang in West Timor. The study was designed to determine the routine husbandry and management practices adopted by pig farmers in West Timor, East Nusa Tenggara, Indonesia. Pigs are important to the community of West Timor and have both financial and traditional values. Pigs are a source of accumulated wealth (act as a bank) and act as a cash reserve to meet present and future household needs. Therefore the loss of pigs from CSF or other diseases can have severe direct economic consequences for individual farmers, as well as requiring a significant input (expenditure) from the local government for disease control measures. The objectives of this study were to obtain baseline information on: herd characteristics (size, structure, age, breeds, proximity to neighbouring farms), herd management (husbandry, diet, care of sick animals, disposal of dead pigs, breeding program, exposure to other pigs, water source) and herd health history (vaccination status, history of pigs in herds showing clinical signs consistent with CSF).

## RESEARCH METHODS

Data were collected from two districts in West Timor during the period of April 2010 to May 2010. The selection of districts, subdistricts and villages was based on a multistage sampling approach as described by Pfeiffer (2010)

Two subdistricts from each district were included in the survey: Maulafa and Oebobo from the five subdistricts in the district of Kota Kupang; and Atambua Selatan and Tasifeto Barat from the 25 in the district of Belu. For each selected subdistrict, two villages were selected from a sampling frame of all villages present in the subdistricts. The villages selected were : Sikumana and Oepura from Maulafa; Oebobo and Oebufu from Oebobo; Fatukbot and Lidak from Atambua Selatan; and Naitimu and Naekasa from Tasifeto Barat. A questionnaire was administered to 30 farmers who owned pigs from each sampled village. The questionnaire had been approved by the Murdoch University Human Ethics Committee and included closed, open and ranking questions. The questionnaire was initially pretrialed on a group of 12 pig

farmers from Kupang. Based on the responses from these farmers slight modifications were made to the questionnaire. The final questionnaire was administered to the selected pig owners through the use of face-to-face interviews.

## RESULTS AND DISCUSSION

### Characteristics of Pig-Owning Households and Pig Husbandry and Management Practices Adopted.

Most pig-owners (60.8%) had completed Senior High School (Table 1) with only 3.3% never having attended school. Only 0.4% of owners had received formal training on animal husbandry/management. Pig-rearing was not the principal occupation of most of the pig owners interviewed. The majority (57.1%) were civil servants or retirees (37%).

The majority of households (216/240 - 90%) kept crossbred pigs with an average of 2.47 (range 1 to 15) pigs per household (PHH). A total of 24

Table 1. Characteristics of the households owning pigs

Variables	Number of households	Percentage
<b>Educational background</b>		
Never attended school	8	3.3
Completed Primary School	39	16.3
Completed Junior High School	38	15.8
Completed Senior High School	146	60.8
Graduated from university	9	3.8
<b>Animal Training attended</b>		
Attended animal training	1	0.4
Never attended animal training	239	99.6
<b>Importance of pig rearing</b>		
Raising pigs is their main occupation	0	0.0
Raising pigs is not their main occupation	240	100
<b>Main occupation:</b>		
Civil servant/army/police	137	57.1
Agricultural farmer	8	3.3
Carpenter	1	0.4
Retired	90	37.5
Missionary	1	0.4
Driver	2	0.8
Entrepreneur	1	0.4

households owned pigs of a local breed with an average of 2.54 owned (range 1 to 6) and only four households owned landrace pigs (average 22.5 owned, range 1 to 48).

The gender and age of the pigs owned is summarised in Table 2. More households (79%) owned pigs between the age of three and six months than other age groups. In contrast few households owned pigs less than three months of age.

In this survey nearly all households (99.6%) raised their pigs using traditional husbandry methods with only one household raising pigs semi-intensively (Table 3). Most farmers (99.2%) kept pigs in pens, one household (0.4%) kept their pigs tethered and one household (0.4%) allowed their pigs to roam freely. In this survey it was found that the roof, walls and floors of pens were made up of a range of materials. The majority of the roofs (78.8%) were constructed of tin and the majority of the pen walls (71.7%) were made of wood or bamboo. Most pens had a concrete floor (83.3%). Of the 240 pig households 42% had a fattening and breeding style piggery, 31.7% were breeding only and 26.3% were fattening only. Most households spent time in the morning and

afternoon (97.5%) to look after their pigs and spent a total of 30 minutes each day (90.4% HH) looking after their pigs.

In this survey no households provided foot baths or cleaning materials for people entering pig pens and there were no limitations placed on the entry of vehicles or people onto their farm (Table 3). In contrast most (77.5%) households cleaned their pig pens at least once a day, however the pens were cleaned only with water and no disinfectants/detergents were used.

In relation to the feeding management practiced by the pig farmers in West Timor, the majority (91.7%) of farmers fed their pigs twice a day. A similar percentage (93.8%) fed swill to their pigs with only 6.3% of households feeding them a commercial feed (agricultural products-cassava root and leaves, banana stem and leaves, corn, tofu waste, and coconut pulp). Approximately two-thirds (65.8%) of the households surveyed cooked the swill prior to feeding it to their pigs, however most (85.4%) did not cook it for a set period of time. The main source of drinking water for pigs in this study was from tap (drinking) water (92%). Most pigs were provided water in a bucket, however water

Table 2. Characteristics of pigs owned by 240 surveyed households

Livestock species	Number of households	Number of livestock owned		
		Minimum	Maximum	Mean
Breed of pigs:				
Local breed	24	1	6	2.54
Cross breed	216	1	15	2.47
Landrace	4	1	48	22.50
Age and gender of pigs				
< 3 months:				
Female	4	1	4	2.50
Male	2	4	5	4.50
Castrated male	13	1	5	1.38
3-6 months:				
Female	75	1	10	1.50
Male	83	1	10	1.85
Castrated male	99	1	8	1.57
6-12 months:				
Female 38	1	6	1.50	
Male	26	1	3	1.26
Castrated male	5	1	2	1.40
> 12 months:				
Female	31	1	8	1.83
Male	19	1	2	1.10
Castrated male	22	1	20	2.27
Cattle owned	16	1	10	3.75
Goats owned	7	1	4	2.28

Table 3. Pig husbandry and management practices adopted by 240 farmers surveyed in West Timor

Variables	Number of households	Percentage
Pig raising system:		
Traditional	239	99.6
Semi-intensive	1	0.4
Pigs were kept in pens	238	99.2
Pigs were tied up	1	0.4
Pigs were free to roam	1	0.4
Roof of pen made from tin	189	78.8
Roof of pen made from palm leaves	51	21.2
Wall of pen was fully bricked	1	0.4
Wall of pen was half brick and half open	67	27.9
Wall of pen made from wood/bamboo	172	71.7
Floor of pen was dirt	19	7.9
Floor of pen made of concrete	200	83.3
Floor of pen made of wood/bamboo	10	4.2
Floor of pen was slatted wooden/bamboo floor	11	4.6
Pig raising type:		
Fattening	63	26.3
Breeding	76	31.7
Fattening and breeding	101	42.0
Pigs looked after in the morning only	4	1.7
Pigs looked after in the afternoon only	2	0.8
Pigs looked after in the morning and afternoon	134	97.5
Provide soap/disinfectant for cleaning feet and hands of workers and visitors	0	0
Did not provide soap/disinfectant for cleaning feet/hands of workers and visitors	240	100
Pig pens cleaned	186	77.5
Pig pens not cleaned	54	22.5
Pig pens cleaned once daily	179	96.2
Pig pens cleaned twice daily	2	1.1
Pig pens cleaned once weekly	4	2.2
Pig pens cleaned less frequently	1	0.5
Water used to clean the pig pens	186	100
Water not used to clean the pig pens	0	0
Pigs fed once daily	1	0.4
Pigs fed twice daily	220	91.7
Pigs fed three times daily	19	7.9
Swill fed to pigs	219	91.3
Agricultural products fed to pigs	15	6.3
Mixed feed (including swill) fed to pigs	6	2.5
Swill cooked before fed to pigs	139	63.5
Swill not cooked before fed to pigs	80	36.5
Swill cooked for at least 90 minutes	41	2.9
Unsure of length of time swill cooked	35	97.1
Source of drinking water for pigs		
Local stream/river	10	4.2
Tap water	221	92.0
Well	9	3.8

Table 4. Management of pig reproduction in West Timor

Variables	Number of households	Percentage
Used artificial insemination	32	27.4
Used natural mating	85	72.6
Used own boar for natural mating	35	42.9
Used borrowed boar from same village for mating	47	56.0
Used borrowed boar from outside village for mating	1	1.1

Table 5. Pig movement and trading in West Timor

Variables	Number of households	Percentage
Pigs sold to other farmers	1	12.5
Pigs sold to brokers/vendor	1	12.5
Pigs were given away/sold to family/relatives	5	62.5
Pigs sold to restaurant owner	1	12.5
Sell pigs to people living in their village	4	50.0
Sell pigs to people outside the village but in the same district	3	37.5
Sell pigs to people who live outside the district	1	12.5
New pigs acquired for raising (fattening)	26	89.7
New pigs (boar) acquired for breeding	3	10.3
Buy pigs from markets	7	25.0
Buy pigs from other farmers	21	75.0

was often provided *ad libitum* when pigs were fed.

The majority (72.6%) of farmers used natural mating for reproduction purposes (Table 4). Of these farmers over half (56%) borrowed a boar from other farmers from within their village, however 1.1% borrowed a boar from a farmer outside their village.

During the survey, it was found that the majority of the farmers had pigs with a body condition score (BCS) of 3 (54.2%) or 2 (42.1%). Only 2.1% of households reported pigs of BCS 4

and 1.7% had pigs of BCS 1.

**Pig Movement and Trading**

In Table 5 the pig movement and trading practices adopted by the 240 surveyed farmers in West Timor are summarised. Approximately two-thirds (62.5%) reported selling pigs to family members or relatives. Some farmers sold to other farmers, to pig sellers not from a market, or to restaurant owners (all 12.5%). Most pig owners (50%) sold pigs to relatives in the same village, with 37.5% selling to family members outside the village but in the same sub-district, and only 12.5% sold to relatives living in villages located in other districts. Only 12.1% of the interviewed farmers had acquired new pigs in the 12 months preceding the survey. The majority (89.7%) of these farmers purchased the pigs for fattening, although some were purchased as a new breeding boar for their herd (10.3%). Most households acquiring new pigs (75%) purchased these pigs directly from other farmers, although 25% did purchase them from markets.

**Pig Health Status, CSF, Treatment and Prevention.**

Nearly all interviewed households (96.7%) had never heard about or knew of CSF. Of those who had heard of the disease (3.3%), the source of information had primarily been friends (75%),

Table 6. Vaccination history of pigs in surveyed households

Variables	Number of households	Percentage
Pigs vaccinated against CSF	13	5.4
Pigs not vaccinated against CSF	227	94.6
Reason for not vaccinating the pigs?		
Does not believe in vaccination	1	0.4
Not home when the vaccinator came	1	2.6
Use natural medicines instead	220	96.9
Why were pigs vaccinated?		
The veterinarian came and vaccinated my pigs	5	38.5
Wanted pigs to be healthy	8	61.5
Pigs vaccinated once only	9	69.2
Pigs vaccinated each year	4	30.8

In Table 7 the health status of pigs and handling of sick and dead pigs of surveyed pig owning households in West Timor is although some (25%) heard of it from television, radio or newspapers.

Although vaccination is the main strategy for preventing CSF in West Timor and is provided free of charge by the government, most farmers (94.6%) had not vaccinated their pigs (Table 6). Vaccines were not used as farmers (96.9%) preferred natural medicines when they had sick pigs, although some (2.7%) had not vaccinated their pigs as they were not home when the vaccinator came to their village. A few farmers (1%) did not believe in vaccination. Most (61.5%) of those farmers who had their pigs vaccinated did so because they wanted them to be healthy. The remaining 38.5% had their pigs vaccinated because the veterinarians/vaccination team had come to their village and vaccinated their pigs. Most owners (69.2%) of vaccinated pigs stated

that their pigs had been vaccinated only once, while 30.8% had their pigs vaccinated several times (although only once each year).

Summarised. Ten percent of the pig owners had pigs that were sick in the three months preceding the survey. Two thirds of these were entire males (66.7%), followed by females (20.8%) and castrated males (12.5%). Clinical signs observed by the farmers included loss of appetite (62.5% of affected pigs) and fever and lethargy (37.5%). All pigs that were sick died and all died within one day of developing clinical signs. When farmers had sick pigs most gave them natural medicines (79.2%); however 12.5% did nothing and only one person reported that they contacted a veterinarian/veterinary assistant. Nearly all farmers (91.3%) reported that they would bury the body of any dead pigs; however 5.0% reported they would eat the dead pig after cooking.

Table 7. Health status of pigs and the handling of sick and dead pigs by households

Variables	Number of households	Percentage
Had a sick or dead pig in the last 3 months	24	10.0
Didn't have a sick or dead pig in the last 3 months	215	90.0
Gender of sick pig:		
Female	5	20.8
Male	16	66.7
Castrated male	3	12.5
Clinical signs observed in the sick pig:		
Loss of appetite	15	62.5
Pyrexia and lethargy	9	37.5
Action taken when pig became sick:		
Nothing	3	12.5
Gave natural medicine	19	79.2
Contacted veterinarian or veterinary assistant	1	4.2
Purchased medicines and treated themselves	1	4.2
Dead pigs		
A sick pig had died in the last 3 months	24	10.0
Didn't have a sick pig die in the last 3 months	216	90.0
What would you do with any sick pigs?		
Nothing	171	71.3
Treat with own medicine	34	14.2
Sell at the market	35	14.5
What would you do with the body of a dead pig?		
Burn	1	0.4
Bury	219	91.3
Eat	12	5.0
Throw away	8	3.3
Usually bury a pig that dies suddenly	238	99.2
Usually eat a pig that dies suddenly	2	0.8

In this survey most farmers raised their pigs in a traditional manner in West Timor. This raising system is characterized by owning only a small number of pigs, using local products for the pens and feeding locally available feed-stuffs, including swill. There are only a limited number of semi-intensive and intensive farms in West Timor and these are characterized by a larger herd size, use of commercial feed and the use of pens which have automatic watering systems and which are cleaned regularly. Most of the intensive pig farms also keep records of individual animals and use artificial insemination (Craig *et al.*, 2010).

The educational background of the pig farmers in West Timor varied widely, although most (61.8%) had completed senior high school. Having a good educational background, especially with respect to knowledge and skills for animal health and production, can be beneficial in increasing the production of pigs and maintaining their health and well-being. The educational standard of the owners must be considered in extension programs to ensure that any material developed is suitable for the target audience and it is delivered in a suitable manner. This is particularly important in West Timor to increase the adoption of vaccination by farmers. In the UK, better-educated farmers are known to make greater use of information, advice and training, to participate more in government schemes and to be more proactive in adjusting to change and planning for the future of their business (Gasson, 1998).

Two breeds of pigs were commonly raised by households in West Timor (local and crossbreed). Crossbreed pigs were more frequently owned which could be as a result of their larger body size, faster growth rate and higher production resulting in a higher price at sale. As well as pigs some households raised other livestock such as cattle and goats. Ownership of cattle can be important as there can be transmission of bovine viral diarrhoea (BVD) virus and mucosal disease (MD) virus to pigs resulting in the presence of antibodies in pigs (Paton *et al.*, 1992; Snowdon and French, 1968). Another member of the pestiviruses genus, namely border disease (BD) virus, can also infect pigs and consequently may interfere with the diagnosis of CSF (de Smit *et al.*, 1999; Terpstra and Wensvoort, 1988, 1997; Wensvoort *et al.*, 1994). Some authors reported that pestiviruses are able to cross species barriers with relative ease and BVD virus naturally infects pigs, sheep,

goats and a wide range of wild ruminants (Nettleton *et al.*, 1980). Reactions between swine fever antigen and sera from cattle that had experienced an infection with the MD virus has been observed (Darbyshire, 1960). Darbyshire (1962) also observed that the precipitating antigen extracted from the tissues of pigs which had died from CSF was indistinguishable from an antigen extracted from tissues of cattle affected with MD. Such reactions may make it challenging to differentiate infection from CSF and other pesti viruses.

In this survey, the majority of households (99.2%) kept their pigs in pens. These pens were usually located in the backyard of the house and were made from locally available materials such as wood, bamboo and palm leaves. Some farmers built more permanent pens from blocks and concrete and consequently invested more funds in their pig-rearing enterprise. Keeping pigs outside can allow potential contact with wildlife and the consequent associated risks of introduction of infections. This has been shown as the mode of transmission of CSFV from wild boar in Europe (Artois, 2002). This mode of transmission has been reported for other diseases, including pseudorabies, *Brucella* spp., *Mycoplasma hyopneumoniae* and porcine reproductive and respiratory syndrome virus (Vengust, 2006). Housing conditions can influence the humoral responses of animals (Barnett, 1987; Griffin, 1989; Kelley, 1980) which can result in susceptibility to a range of infections (Bolhuis, 2006).

Natural mating is still the normal mating method adopted in most pig herds in West Timor. However, there is a move towards artificial insemination, which is currently practiced by 27.4% of the households. Artificial insemination offers the advantage of being able to introduce better genetics but requires accurate detection of oestrus by farmers, availability of trained inseminators with sufficient skill and knowledge to perform the procedures and is more costly per mating. Boars were commonly exchanged between farms and these generally originated from within the household's village. This practice has the potential to spread infectious agents between groups of pigs, although if the village is considered as the unit this may be less dangerous than in commercial units.

With respect to the body condition, variations in the body composition may have important consequences for production and

health at an individual or herd level (Charette, 1996). In modern pig herds, evaluating the body condition of a sow, in particular, is of considerable importance to achieve optimal production targets (Maes, 2004), and in pigs the 'thin sow syndrome', the 'fat sow syndrome' and the 'second parity syndrome' have been related to problems with the regulation and dynamics of body condition, and therefore there is a need to adequately monitor body condition (Charette, 1996). In this study, even though, most farmers (54.2%) had pigs with BCS of three, the number of farmers who owned pigs with BCS of two was high, which might have contributed to pre-weaning mortality rates of the piglets.

This study demonstrated that live pigs are transferred extensively in West Timor between individuals both by trade or sale, and through social and family ceremonial exchanges. Traditional trading is still practiced by many farmers where pigs are sold to relatives or to other farmers. Most pigs were sold in the months of June and July in preparation to pay for school fees and allowances for their children for the commencement of the academic year in Indonesia. The spreading of CSFV is facilitated by the movement of virus excreting pigs within a dense population (Dahle and Liess, 1992). The entry of weaners from different breeding farms to fattening units or to markets carries a high risk of introducing the virus to susceptible pigs (Beals *et al.*, 1970).

Although CSF has been present in West Timor since 1998 and is now considered to be endemic, very few farmers were aware of the disease and how it was spread. This would account for the low adoption of vaccination by the farmers, even when it was provided free of charge by the Provincial Government. It is apparent that an educational campaign is needed about the disease, how it is spread, what the consequence of the disease is and how it can be controlled. Such a campaign must be specifically developed and directed towards the farmers. It is important to provide educational material on how diseases are introduced to a farm and the significance of each of the biosecurity measures in terms of risk reduction (Casal *et al.*, 2007). Most importantly, education can contribute to people correctly identifying, treating and preventing the disease.

Some farmers who believed their pigs had been vaccinated against CSF, had in fact had vitamin B-complex medications administered to their pigs. It is evident that specific educational

material is required on vaccination. Although newspapers, radio, and television can be used to disseminate information, in this situation it is believed that farmer meetings would be the best way to improve awareness of diseases such as CSF and methods of improving animal husbandry, management and production. Farmer groups have been established in Alor and have resulted in a significant reduction in the deaths from CSF, as well as increased adoption of new management and improved husbandry practices (available on <http://aci-ar.gov.au/files/node/10117/Indoneisa%202008-09%20web.pdf>).

## CONCLUSIONS

The findings of this study revealed that routine husbandry and management practices adopted by pig farmers in West Timor potentially had an impact on the transmission of CSF in West Timor. These include the pig raising system adopted, the educational background of the farmers, mating method practiced and disease prevention and control implemented. It is important for the farmers to improve these factors in order to reduce transmission of disease.

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