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## First steps in managing the challenge of African Swine Fever in Timor-Leste

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## ABSTRACT

Since September 2019, African Swine Fever has caused extensive mortalities to the pig population of Timor-Leste, where pigs are important for traditional ceremonies and for monetary income. At the time of the outbreak we were developing a sustainable model for smallholder pig raising in Timor-Leste. We added basic biosecurity measures at our nine trial sites and conducted public awareness meetings in trial *sukus* (villages). This approach was largely successful as, despite extensive pig mortalities in the areas, few pigs died at trial sites once measures had been adopted and trial pig mortalities appeared to be linked to social issues that could be reduced through improved public awareness. We believe this approach can cost-effectively reduce the risk of mortalities due to African Swine Fever in settings where smallholder pig raising is very basic and resources limited, but pigs are of great socio-economic importance.

## 1. Introduction

Historically in Timor-Leste, pigs have been the second most commonly kept livestock species after chickens [1]. They are important in traditional ceremonies and represent the greatest contributor to monetary income from livestock [2]. Women play an important role in pig raising and marketing and pigs are considered feminine social goods [2]. The most common pig raising system has been a free-roaming scavenger system, but some pigs are raised in semi-confined or confined systems [3].

African Swine Fever (ASF) was detected in Timor-Leste in September 2019 (first outbreak in Dili on 9th, confirmed on 26th) [4]. It was recognised that responding to the disease would be a significant challenge for the country [5]. ASF spread rapidly, firstly to the municipality of Baucau in late September, with nationwide mortalities estimated to have exceeded 50,000 by March 2020 and populations almost wiped out in some municipalities including Bobonaro where over 16,000 mortalities have been reported (pers. comm. Joanita Bendita da Costa Jong, Director of Veterinary Directorate, Timor-Leste). The current status of the pig population is largely unknown and changing rapidly. The Timor-Leste government response to ASF is constrained by limited human and financial resources, but there are plans to improve public awareness and support pig raising in the future (pers. comm. Joanita Bendita da Costa Jong, Director of Veterinary Directorate,

Timor-Leste).

At the time of the outbreak we were conducting a small participatory project aiming to develop a sustainable model for smallholder pig raising in Timor-Leste, with a strong focus on identifying cost-effective diets using local ingredients. We were working with nine farmers and their respective livestock and veterinary technicians from the Ministry of Agriculture and Fisheries (MAF) in six *sukus* (villages) in the municipalities of Bobonaro and Baucau where, in 2015, 11.7 and 10.1% of Timor-Leste's pigs were raised [1]. Each farmer had a group of pigs involved in the project in addition to their own pre-existing pigs. Trial pigs were fed specific diets and farmers typically fed similar diets to their own pigs and none fed swill. Water provided to confined pigs was most commonly tap water but some farmers used ground or spring water. No other pigs were introduced at any site during the project. In this short communication we describe the additional measures we introduced to manage ASF and the successes and challenges encountered.

## 2. Activities to manage ASF

In October 2019, we conducted training sessions for all farmers and technicians involved in the project and agreed upon basic biosecurity measures suitable to the local context: construction of a fence made from corrugated metal roof sheeting around the trial pig pen and in some cases adjoining pig housing, dedicated boots for farmers and

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technicians (kept inside the fence), hand sanitiser/soap for use before entering the fence, overalls for the technicians to wear inside the fence and disinfection using a sprayer and/or bucket and brush as required. Roof sheeting and nails were provided by the project, local materials and labour by the farmers. The cost of purchased materials to fence one pig pen ranged from US\$64–82 (a small investment given we have observed typical pre-outbreak prices of US\$80–100 for a piglet and US\$250–400 for a 50–70 kg growing pig) and construction took 8–12 man-hours. Measures were introduced in Bobonaro in October and Baucau in November. We conducted public awareness meetings at one agricultural school and in seven *sukus* at the *Sede Suku* (village hall) between November 2019 and February 2020. Information on ASF, focussing on prevention and control, was delivered orally with the aid of a flip-chart that included pictorial aids to facilitate understanding among illiterate participants. Ample time was allocated for questions and discussion. Sessions were typically 2 to 3 h in duration and attended by 20–60 people. We later interviewed project farmers and two *Xefes de Suku* (village leaders) regarding local impacts of ASF and perceptions of project activities. We provided ongoing advice and support to farmers and technicians until February 2020 in the form of monthly visits and more frequent mobile phone calls and discussions via WhatsApp group messaging. At that time, blood samples were collected from three pigs from each of six trial sites and tested for ASF using the Bionote RAPID ASFV Ag<sup>®</sup> test at the Veterinary Diagnostic Laboratory, National Directorate of Veterinary. All samples were negative.

### 3. Basic biosecurity measures – Successes and challenges

The introduction of basic biosecurity measures to our existing model for smallholder pig raising was largely successful (Table 1). During October/November 2019 farmers and technicians reported unprecedented extensive mortalities in the general pig population of four *sukus*, where six trial farmers were located. Two of these *sukus*, Goulolo and Meligo, were included in a survey conducted by Agriculture Victoria and MAF, with 7 of 10 and 2 of 8 pigs testing positive for ASF in early December, respectively, using a LAMP assay with an observed specificity of 100%. This study also confirmed the presence of ASF in Baucau municipality in late November (pers. comm Grant Rawlin, Research Leader, Agriculture Victoria, Australia). All six farmers in the

four badly affected *sukus* had unfenced pig(s) and five farmers experienced at least one mortality among this group during the initial outbreak. However, no pigs kept within the fences were affected at that time. Due to limited data we cannot compare the extent of protection afforded by penning alone, fencing alone and both penning and fencing. In contrast, in the remaining two *sukus*, Raifun and Triloka, where three trial farmers were located, few pigs in the general population died during the same time frame and in both of these communities a *tara bandu* (customary law regarding interactions between species) against free-roaming pigs was in place to reduce crop damage.

Pig mortalities at two trial sites appeared to be linked to social issues: lack of awareness and jealousy. Firstly all pigs, both fenced and unfenced, died at one site with clinical signs consistent with ASF ~ 2 months after the main outbreak in that area. Improper disposal of several dead pigs in water tanks up the hill followed by heavy rains was thought to have caused widespread contamination due to water overflow. Furthermore, stray dogs were observed eating pig carcass parts at that site. It is possible that greater community awareness, particularly regarding disease transmission, could have reduced the likelihood of this occurring. Secondly one farmer, whose pigs were all penned but unfenced at the time, found part of a carcass in the water tank used to provide water to the pigs around the time some began to show clinical signs and thought this had been a deliberate action from a jealous farmer. Another farmer was also worried that his neighbours were jealous of his pigs being alive and theirs dead and feared a carcass being thrown over the fence. Social jealousy, whereby successful farmers' efforts may be sabotaged by others, has been previously raised as a concern for development activities in Timor-Leste, although a farmer survey had indicated this was not an issue [6]. However deliberate attempts by jealous farmers to spread ASF via pig carcasses has been reported along the Kenya-Uganda border [7].

Most trial farmers were very positive about the introduced measures because their pigs were alive and healthy whereas other pigs in their *suku* had died. Two farmers raised concerns about adequacy of security and one about the time required to follow recommendations.

### 4. Public awareness – Importance and challenges

Consistent with the observations of Alders and Bagnol [8] that education is critically important for successful disease control in

**Table 1**

Numbers of fenced and non-fenced pigs managed by nine farmers involved in project, mortalities between October 2019 and February 2020 among these pigs and farmers perception of ASF mortalities in their neighbourhood.

Municipality/ Suku/Farmer ID	Trial farmer's perception of ASF situation in neighbourhood	Non-fenced pigs		Fenced pigs	
		Total	Died <sup>a</sup>	Total	Died <sup>a</sup>
<i>Bobonaro</i>					
Hataz 1	Thinks > 1000 pigs died in <i>aldeia</i> (subvillage) between October and November	2 tethered	1 tethered	10 penned	None
Hataz 2	As Hataz 1	5 free-roaming, 3 penned, 1 tethered	4 free-roaming	5 penned	None
Raifun 1	Not aware of dead pigs in area close by, most pigs are confined	5 penned	None	4 penned	None
Raifun 2	As Raifun 1	2 tethered, 3 penned	1 tethered <sup>b</sup>	5 penned	None
Meligo 1	Thinks nearly all free-roaming pigs in the area died in November, only some in pens survived	1 penned	1 penned <sup>c</sup>	6 penned,	6 penned,
Meligo 2	Thinks at least 200 pigs died in the area in November, no free-roaming pigs remain	1 free-roaming	1 free-roaming	4 tethered	4 tethered <sup>3</sup>
Goulolo	Thinks many free-roaming pigs died in November	~ 50 free-roaming, 5 tethered	~ 50 free-roaming	5 penned	None
<i>Baucau</i>					
Triloka	Thinks < 50 pigs have died, many pigs still alive but in a nearby <i>suku</i> many pigs died in October–November	None	N/A	12 penned	None
Larifano <sup>d</sup>	Many free-roaming pigs died, some in pens still alive	9 penned	5 penned	4 penned	None

<sup>a</sup> Causes of death were not investigated due to lack of resources.

<sup>b</sup> Pig had been in poor condition for some time – death unlikely to be ASF-related.

<sup>c</sup> Pigs died in January, ~ 2 months after main outbreak.

<sup>d</sup> All pigs were unfenced until mid-November, mortalities occurred during this time. All four surviving pigs were then fenced.

communities with limited education, we identified that improved public awareness was an essential step in managing ASF at trial sites and in the community more broadly because of a range of observed and reported behaviours and beliefs including lack of knowledge regarding cause of pig mortalities which resulted in improper carcass disposal, social jealousy, believing that the disease would be washed away in rainy season and seeing it as natural punishment. The team member who delivered the sessions (O. M.) found it difficult to explain about ASF because of a general lack of understanding about disease and the lack of a word in Tetun (local language) for virus. These challenges made it difficult to communicate essential biosecurity messages. Despite this, the public awareness sessions were well received. In the interviews, the *Xefes* said they were beneficial and helped them manage the problem in the community but indicated more information about how to recover from the disease and re-engage in pig raising was required. The trial farmers were very positive citing that they felt other farmers now had better understanding of the disease and concerns about social jealousy were reduced. It is unfortunate that the information was delivered after many non-trial farmers pigs had already died, however guidelines on restocking were of interest to this group.

### 5. Consequences of ASF in communities

A variety of cultural, economic and personal consequences regarding ASF were raised by farmers, technicians and *Xefes*. These were all consistent with the previously recognised importance of pigs in Timor-Leste and included management of cultural needs through replacement or indebtedness until pigs were available again, lack of funds for household needs and to pay tuition fees, panic, fear and sadness and in the community, and variable pig prices, both lower and higher than previously.

Trial farmers were generally keen to continue to raise pigs in the future. However, the *Xefes* stated community members remained very worried about the disease coming back, and feared incurring more losses if they re-engaged in pig raising. However, they hoped that the disease would be eliminated, the pigs would be safe and farmers would be able to raise them again.

We anticipate that there will be widespread longer-term impacts due to reduced income and difficulties managing cultural needs. As pigs are traditionally women's goods [2] there is a risk that the impact may be greater among women. Further research to understand and action to mitigate future impacts are urgently required as ASF moves from an epidemic to an endemic situation in Timor-Leste.

### 6. Conclusions

Although we did not conduct an a priori designed study, our findings suggest that a simple, closed-herd smallholder pig raising model incorporating basic biosecurity measures combined with improved public awareness can cost-effectively reduce the risk of mortalities due to ASF in a setting where smallholder pig raising is very basic, but pigs are of great socio-economic importance. A collective response with repeated messaging is vital as widespread education and measures to address social issues have the potential to reduce disease pressure to a level where basic biosecurity measures are more likely to be successful. Community-supported agreements, such as *tara bandu*, to reduce the free-roaming pig population could be an excellent first step. Additional *suku*-level agreements such as quarantining of introduced pigs and proper disposal of dead pigs are also likely to be beneficial. We believe that our findings are likely to be applicable to other areas where pigs are of great value and resources are limited, such as in ASF-affected communities in Nusa Tenggara Timur, Indonesia [9] and Papua New Guinea [10].

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### Ethical approval

This research was approved by the University of Queensland Human and Animal Ethics Committees (Approvals: 2018001446 and SVS/299/18). Informed consent was obtained from all human subjects.

### Author statement

Tamsin Barnes – Conceptualization, Methodology, Writing - Original Draft, Supervision, Funding acquisition, Project administration  
 Olavio Morais – Conceptualization, Supervision  
 Colin Cargill – Conceptualization, Methodology, Writing - Review & Editing  
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### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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