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# A risk assessment for the introduction of African swine fever into Vanuatu



(TCP/SAP/3805)



MASSEY UNIVERSITY  
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(TCP/SAP/3805)

by

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Required citation:

Subharat, S., Han, J.H. and Cogger, N. 2023. *A risk assessment for the introduction of African Swine into Vanuatu*. Apia, FAO.

<https://doi.org/10.4060/cc6829en>

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## Executive summary

This report describes a risk assessment mission in Vanuatu, undertaken by the EpiCentre, School of Veterinary Sciences, Massey University, and the Food and Agriculture Organization of the United Nations (FAO) under the FAO Technical Cooperation Programme (TCP/SAP/3805). The assessment aimed to evaluate the risk of introducing the African swine fever virus (ASFV) into Vanuatu. The risk assessment results were then used to recommend measures to prevent or reduce the impacts of African swine fever (ASF) incursion in Vanuatu.

ASF is a highly contagious viral disease that affects domestic and wild pigs. The virus was first reported in Africa and has spread to eastern Europe, China and Southeast Asia. Due to the recent ASF outbreaks in Asia and Papua New Guinea, Pacific Islands countries are now prioritising steps to prevent the introduction of ASF. An important first step is to conduct an import risk assessment of ASFV to identify the main pathways for introduction and exposure. The knowledge informs decision making as to which measures to prevent or reduce the impact of ASF are likely to be most effective in Vanuatu.

The assessment of risk was conducted using the WOAHS import risk analysis framework.

The most likely pathway for introducing ASFV into Vanuatu was through contaminated pork products that international arrival passengers might bring in via the airport. Should infected products enter Vanuatu, there is a distinct pathway for exposure because pigs are routinely fed food scraps (swill) from households. The likelihood of transmission of ASFV to other susceptible pigs was considered extremely high due to the lack of farm biosecurity and the presence of feral pigs.

The assessment method was a systematic, qualitative import risk analysis of ASFV introduction to Vanuatu. Results provide information about high-risk areas for ASF introduction, exposure and spread in Vanuatu. They also identify gaps in control and prevention measures. The following steps are being proposed to minimize the likelihood of entry and exposure and the consequence of ASFV introduction.

Key recommendations are to:

1. Increase awareness among information passengers of the ASFV risk posed by food products and instruct them to declare risk products to the biosecurity officer on arrival or dispose of the product in the designated bins in the arrival hall. Failure to make truly declarations should be penalised
2. Passengers should be instructed to declare to the biosecurity officer if they have visited any farms recently (30 days). In addition, the Biosecurity services should inspect any clothing or footwear they have with them that was worn on the farm. Dirty clothing or footwear should be disinfected or confiscated. Failure to make truly declarations should be penalised
3. Strengthen biosecurity procedures to ensure all baggage is scanned upon arrival and manual searches are performed when suspect items are observed.
4. Ensure appropriate disposal of confiscated products through the incinerator.
5. Encourage households and restaurants to separate meat from vegetable waste and ban the supply of meat leftovers to pig owners.
6. Ensure sufficient cooking of swill (core temperature of 70°C for 30 minutes).

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7. Increase awareness of pig owners and villagers about the ban on meat waste feeding, especially pork meat.
  8. Educate stakeholders on ASF clinical signs and prompt reporting by pig owners/animal workers/public of signs of disease to the Ministry of Agriculture.
  9. Promote and strengthen farm biosecurity practices, i.e., proper fencing of pigs, apply appropriate hygiene and sanitation measures.
  10. Regularly review the ASF status of countries where pork and pork products are being imported and do not accept products from countries with uncontrolled ASF outbreaks in commercial pigs.
  11. Prepare an emergency response plan for ASF with implementation and financial plan.
  12. Strengthen biosecurity legislations/regulations to include ASF and other TADs preventive and response measures, including the ability to fine companies/people who break these regulations where they exist.
  13. Encourage a multi-sectoral and multidisciplinary approach (One health) to address biosecurity threats of ASF and other TADs.

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## Acknowledgements

The authors wish to acknowledge the substantial contributions of the FAO Subregional Office for the Pacific Islands in Apia (Ms Xiangjun Yao, Ms Temwanoku Ioakim and Dr Kenneth Cokanasiga), FAO Regional Office for Asia and the Pacific in Bangkok (Dr Ian Dacre and Dr Scott Newman), Ministry of Agriculture Livestock Forestry Fisheries & Biosecurity (Mr Kenny Swua and Dr Ian Peebles) and Dr Ahmed Fayaz (EpiCentre, Massey university). Outputs would not have been achieved without their support.



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## Abbreviations and acronyms

<b>ASF</b>	African swine fever
<b>ASFV</b>	African swine fever virus
<b>DOA</b>	Department of Agriculture and Rural Development of Vanuatu
<b>GDP</b>	gross domestic product
<b>MALFFB</b>	Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity of Vanuatu
<b>NDMO</b>	National Disaster Management Office of Vanuatu
<b>PCR</b>	polymerase chain reaction
<b>PGCs</b>	Provincial Government Councils
<b>PICs</b>	Pacific Island Countries
<b>FAO RAP</b>	FAO Regional Office for Asia and the Pacific
<b>FAO SAP</b>	FAO Subregional Office for the Pacific Islands
<b>SEA</b>	Southeast Asia
<b>TAD</b>	transboundary animal disease
<b>VNSO</b>	Vanuatu National Statistics Office
<b>WAHIS</b>	World Animal Health Information System
<b>WOAH</b>	World Organisation for animal health



# 1. Introduction

## 1.1.1 BACKGROUND

African swine fever (ASF) is a highly infectious transboundary animal disease affecting pigs (Costard *et al.*, 2013). ASFV-infected pigs develop severe lethargy, diarrhoea, or acute haemorrhagic fever, which typically results in death (Gabriel *et al.*, 2011; Gallardo *et al.*, 2017). After introducing ASF to Georgia in 2007, the disease has spread to nearly every Eastern European country (Rowlands *et al.*, 2008). The situation was worse in 2018 as ASF was reported in China and rapidly spread to other adjacent Asian countries, causing the loss of more than 6.7 million pigs, mostly as pre-emptive culling (OIE, 2022). Furthermore, the movement of the ASFV into the Asia Pacific region poses a risk of ASF introduction to Pacific Island countries (PICs) such as Vanuatu. An outbreak of ASF in Vanuatu would result in high levels of pig mortality which would significantly affect food security in the country as most pigs are kept for subsistence. In addition, the costs associated with safely disposing of animals that die because of the disease and the slaughter and disposal of healthy animals to control the outbreak would be significant.

In 2020, a pilot project was initiated by the FAO Subregional Office for the Pacific Islands (FAO SAP) based in Apia, Samoa, in close collaboration with FAO Regional Office for Asia and the Pacific (FAO RAP) to assess the risk of ASF introduction to Samoa. The mission was completed by EpiCentre, Massey University, New Zealand. Given the lack of import risk assessment of ASF in other Pacific countries, the project's scope was recently expanded to cover the risk for Vanuatu.

## 1.1.2 MISSION ACTIVITIES

Due to the travel restriction caused by the COVID-19 pandemic, EpiCentre consultants couldn't visit Vanuatu. Therefore, instead of face-to-face interviews administered by EpiCentre consultants, questionnaires were developed (attached in Annex) and administered by the Department of Agriculture and Rural Development of the Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity of Vanuatu (Mr Kenny Swua and Dr Ian Peebles). The questionnaires were used to collect information from the following agencies:

- Department of Agriculture (DOA) of the Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity (MALFFB),
- Customs office,
- Ports authority/Marine office,
- Airport authority office.

The information collected aimed to aid our understanding of the roles and responsibilities of various government agencies and gather information on factors influencing the occurrence and spread of ASF for import risk analysis. For data relating to the introduction pathway, the focus was on what happened before the travel restrictions imposed due to the COVID-19 pandemic.

The survey also included pig farmers and traders to understand the farming practices and biosecurity measures in commercial/subsistence pig farms and local pork supply. Visits were made to four representative pig farmers and one pig trader in Vanuatu.

## 2. African swine fever (ASF)

### 2.1.1 ASF VIRUS

ASFV is a double-stranded DNA arbovirus of the family of *Asfarviridae*. ASFV isolates can be classified into eight serogroups, and recent genetic research has demonstrated that the virus can be categorised into 23 geographically related genotypes with numerous subgroups (Beltrán-Alcrudo *et al.*, 2017). ASFV genotype is classified via the variability of a segment in the VP-72 gene. The phenotypic analysis is used to identify the source of outbreaks. No distinctive differences in the virulence between different genotypes have been reported.

ASFV can be isolated from the blood, faeces, urine, and nasal/ocular/vaginal excretions of infected pigs up to at least 70 days of infection (de Carvalho Ferreira *et al.*, 2012). Depending on the environmental conditions, the virus can still be isolated from the carcasses of infected pigs and the soil of the deathbed for up to several months (Fischer *et al.*, 2020; Zani *et al.*, 2020). In addition, the virus can survive in fresh, salted, dried, and frozen meat for months to years (Table 1).

**Table 1. Expected survival time of African swine fever virus in various conditions**

Product	Survival time (days)
Meat (boned, de-boned, ground)	105
Salted meat	182
Cooked or canned meat	0
Dried meat	300
Smoked meat	30
Chilled meat	110
Frozen meat	1 000
Fat or skin	300
Offal	105
Urine	15
Faeces	11

Source: adapted from Adkin, A., Coburn, H., England, T., Hall, S., Hartnett, E., Marooney, C. & Wooldridge, M. 2004. *Risk assessment for the illegal import of contaminated meat and meat products into Great Britain and the subsequent exposure of GB livestock (IIRA): foot and mouth disease (FMD), classical swine fever (CSF), African swine fever (ASF), swine vesicular disease (SVD)*. New Haw: Veterinary Laboratories Agency, Anonymous. 2010. *Scientific Opinion on African Swine Fever*. EFSA Journal, 8(3): 1556. <https://doi.org/10.2903/j.efsa.2010.1556> and Davies, K., Goatley, L.C., Guinat, C., Netherton, C.L., Gubbins, S., Dixon, L.K. & Reis, A.L. 2017. *Survival of African Swine Fever Virus in Excretions from Pigs Experimentally Infected with the Georgia 2007/1 Isolate*. *Transboundary and Emerging Diseases*, 64(2): 425–431. <https://doi.org/10.1111/tbed.12381>

Transmission of ASFV can occur via direct contact with infected animals, consumption of contaminated pork or material, fomites (e.g. cloths, trucks, feeds), and soft tick vectors of *Ornithodoros* spp. (Dixon *et al.*, 2020). In ASFV-free countries, the virus could be introduced through the movement of infected wild boars or contaminated pork products carried by passengers (Kim *et al.*, 2019; Sauter-Louis *et al.*, 2021).

There are no treatments for ASF or vaccines to prevent the spread of ASF. The only way to contain an outbreak of ASF is the immediate culling of pigs on infected farms and those near or in contact with infected farms (OIE, 2019). Therefore rapid, and reliable detection is required for the timely implementation of the control measures. Early detection relies on immediate reporting when pigs are observed to have clinical signs consistent with ASF (i.e. dermal haemorrhages, fever, diarrhoea, bleeding from orifices, high mortality) and rapid testing of dead pigs. A PCR based on the VP-72 gene is the test of

choice for early detection in peri-acute, acute or subacute ASF cases. However, PCR cannot confirm infectivity but can confirm the presence and quantitative information (Beltrán-Alcrudo *et al.*, 2017).

## 2.1.2 ASF SITUATION

ASF was an endemic disease found only in Africa until 1957 when the first transcontinental case occurred in Portugal (Boinas *et al.*, 2011). ASF then spread to other European and American countries. In 1995, except for Sardinia in Italy, the regions were declared free of ASF (Dixon *et al.*, 2020). Almost two decades later, another introduction of ASFV to Europe was reported from Georgia in June 2007 (Rowlands *et al.*, 2008). ASF quickly spread to the Caucasus region (Beltrán-Alcrudo *et al.*, 2009) and persisted in the continent mainly via the "wild boar–habitat cycle" that the transmission of ASF occurs directly between wild boars and indirectly through carcasses in the habitats (Chenais *et al.*, 2018). Since its re-introduction in 2007, ASF has transmitted to other European countries, including Ukraine, Belarus, Poland, Moldova, the Czech Republic, Romania, Hungary, Bulgaria, Belgium, Slovakia, Serbia, Greece, Lithuania, Estonia, Italy, Latvia, and Germany (OIE, 2020; Sauter-Louis *et al.*, 2021; Schulz *et al.*, 2019).

In 2019 ASFV was reported in China and has rapidly spread to other Asian countries, most likely via the illegal importation of pig meat from affected countries (Schulz *et al.*, 2019). Since ASFV was reported in China, outbreaks have been reported in 15 other countries in the Asian Pacific (see Figure 1; FAO, 2022). Affected countries implemented control measures, such as pre-emptive culling and movement restriction. Between 2018 and 2020, nearly 7 million Asian domestic pigs were culled to prevent the spread of ASF. The Ministry of Agriculture and Fisheries of Timor-Leste announced the culling of 100 000 pigs after the confirmation of ASF in September 2019. In January 2022, an outbreak of ASF was reported in Thailand, and the government allocated USD 17.3 million to control the disease spread. Due to the geographical proximity to Thailand, the Cambodian government restricted any importation of pigs from its neighbouring countries. In addition, Nepal reported its first cases of ASF in May 2022. ASF outbreaks and followed control measures have severely affected national food security and livelihood, especially in poor rural families in many Asian countries. However, ASF control was largely ineffective due to a lack of technical or financial resources.

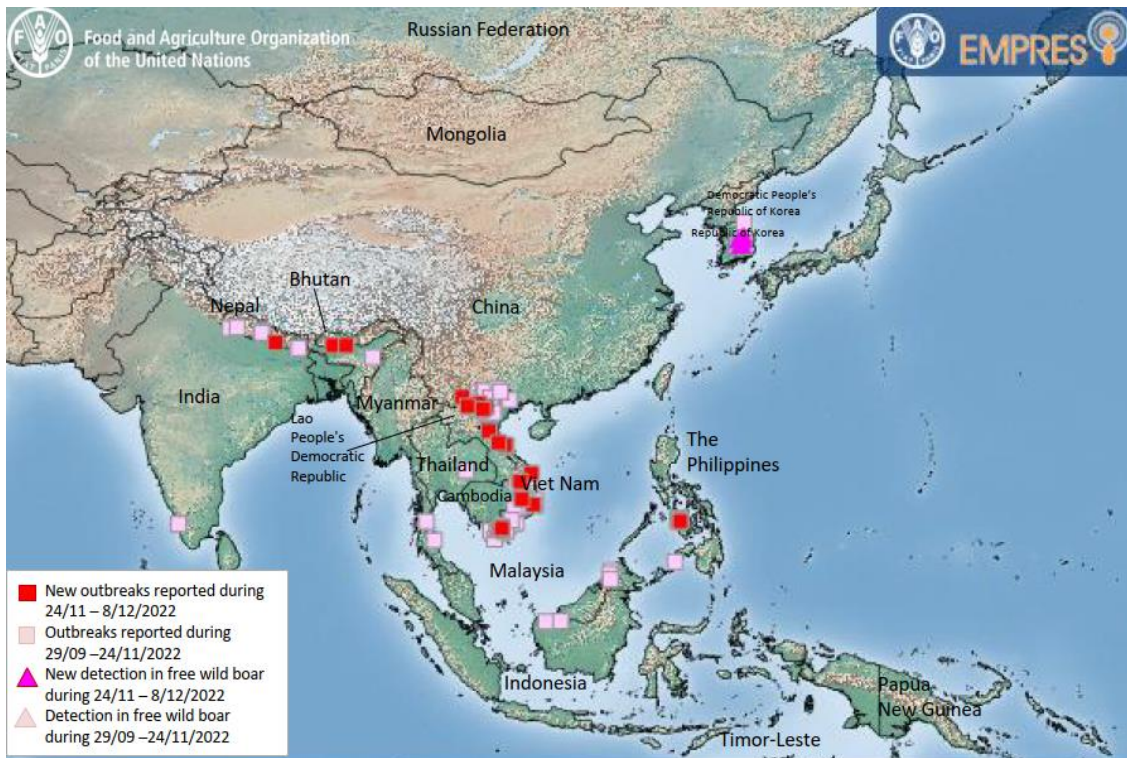


Figure 1. Current situation of ASF in Asia as of December 2022; Source: FAO. (2022) ASF situation in Asia update. <https://www.fao.org/animal-health/situation-updates/asf-in-asia-pacific/en>

## 3. Vanuatu

### 3.1.1 GENERAL PROFILE

Vanuatu is an island country located in the South Pacific Ocean. It is a Y-shaped archipelago consisting of 83 main islands (65 of them can be inhabited), with about 1 300 kilometres between the most northern and southern islands (Vanuatu National Statistics Office, 2010). The islands are scattered between the latitude of 13° and 21° south and between the longitude of 166° and 171° west (Figure 2).

Figure 2. Location of Vanuatu;



Source: United Nations. 2022. Geospatial, location data for a better world. Cited 20 August 2022. <https://www.un.org/geospatial/mapsgeo/>

There are six provinces in Vanuatu; Torba, Sanma, Penama, Malampa, Shefa, and Tafea (Vanuatu National Statistics Office, 2010). These provinces are spread over an area of more than 610 000 km<sup>2</sup> in the South Pacific Ocean, with a total land area of over 12 000 km<sup>2</sup>. However, the land surface is very limited (roughly 4,700 km<sup>2</sup>), as most islands are steep with unstable soils and little permanent fresh water. An estimate made in 2020 is that 15.3 percent of the land is used for agriculture (The World Bank, 2020a).

According to the census in 2009, the population of Vanuatu was 234 023 from 47 373 households (Vanuatu National Statistics Office, 2010). Compared to 1999, the population had grown approximately 25 percent (186 678 in 1999), and the growth of population places increasing pressure on land and resources for agriculture, grazing, hunting, and fishing. About 24 percent of the population reside in the urban area, which is limited to the province of Sanma and Shefa (where the capital of Vanuatu, Port Vila, is located). The rest of the populations are scattered in the rural area of all six provinces with a population size of between 30 000 and 37 000, except in Torba, where only over 9 000 people inhabit (Table 2). The average number of people per household was about five.

The gross domestic product of Vanuatu is approximately USD 1 billion (The World Bank, 2020b), with almost 17 percent of the GDP accounting for agriculture, fishery, and forestry (Vanuatu National Statistics Office, 2008). According to the Vanuatu National Statistics Office (VNSO), agricultural exports make up about three-quarters (73 percent) of all exports. In addition, almost all people in the rural area engage in agriculture, fisheries, or forestry activities (Vanuatu National Statistics Office, 2008), indicating that subsistence farming is a dominant farming type in Vanuatu.

**Table 2. Number of people and households in Vanuatu. The numbers are stratified by province.**

Area type	Province						Total
	Torba	Sanma	Penama	Malampa	Shefa	Tafea	
<b>People</b>							
Urban	-	13 156 (23.0%)	-	-	44 039 (77.0%)	-	57 195
Rural	9 359 (5.3%)	32 699 (18.5%)	30 819 (17.4%)	36 727 (20.8%)	34 684 (19.6%)	32 540 (18.4%)	176 828
<b>Households</b>							
	1 766 (4.3%)	9 213 (22.3%)	6 620 (16.0%)	7 991 (4.8%)	15 930 (38.5%)	5 853 (14.1%)	47 373

Source: **Vanuatu National Statistics Office. 2010.** 2009 National Population and Housing Census - Analytical Report Volume 2. Vanuatu, Vanuatu National Statistics Office.

The most common livestock in Vanuatu are cattle, followed by chicken, pig, and goat. According to the census in 2007, more than 170 000 cattle were raised in 24 808 farms (Table 3) (Vanuatu National Statistics Office, 2008). The main use of cattle is to supply milk and meat to the Vanuatu communities. Chickens and pigs are also important livestock as a food source and part of custom (Table 4).

**Table 3. Number of cattle farms in different provinces of Vanuatu.**

	Province						Total
	Torba	Sanma	Penama	Malampa	Shefa	Tafea	
<b>Number (%) of cattle farms</b>	848 (3.4%)	6 179 (24.9%)	4 533 (18.3%)	4 806 (19.4%)	2 513 (10.1%)	5 929 (23.9%)	24 808

Source: **Vanuatu National Statistics Office. 2008.** Census of Agriculture 2007 Vanuatu, Vanuatu National Statistics Office.

**Table 4. Number of chickens and pigs in different provinces of Vanuatu.**

Area type	Province						Total
	Torba	Sanma	Penama	Malampa	Shefa	Tafea	
<b>Chicken</b>	12 606 (3.4%)	75 182 (20.4%)	87 252 (23.7%)	71 502 (19.4%)	54 593 (14.8%)	67 116 (18.2%)	368 251
<b>Pigs</b>	2 934 (3.3%)	9 645 (10.9%)	24 210 (27.3%)	15 763 (17.8%)	14 765 (16.6%)	21 378 (24.1%)	88 694

Source: **Vanuatu National Statistics Office. 2008.** Census of Agriculture 2007 Vanuatu, Vanuatu National Statistics Office.



### 3.1.2 PIG INDUSTRY AND PORK PRODUCTS

Pigs are raised for meat supply as well as specific local demands such as for marriages or funerals. The 2007 Agricultural census reported that 86 694 pigs were raised in 17 981 households across Vanuatu (Table 5). This is equivalent to an average of five pigs per household. Since then the total number of pigs reared across the country has increased; although there is variations between the province. For example, the number of pigs nearly doubled in Penama, mainly due to the increased demand from local chiefs for practicing Nimangki, or grade taking; a practise in which individual rise in status by performing a series of ceremonies that involve the slaughter of pigs. On the other hand, only the limited number of pigs increased in Sanma province, where chickens were substituted for pigs because of religious beliefs and urbanisation. Commercial pig farms exist in Vanuatu; however, the number of commercial farms in the pig industry is unknown. A typical subsistence farm in Vanuatu is shown in Figure 3.

**Table 5. Number of pigs based on the type and province in Vanuatu.**

Pig type	Province						Total
	Torba	Sanma	Penama	Malampa	Shefa	Tafea	
<b>Breeding boars</b>	1 128 (5%)	3 507 (14%)	6 413 (26%)	4 407 (18%)	2 972 (12%)	6 003 (25%)	24 430
<b>Breeding sows</b>	1 367 (4%)	3 849 (11%)	9 066 (25%)	6 422 (18%)	6 110 (17%)	9 323 (26%)	36 137
<b>Others</b>	439 (2%)	2 289 (8%)	8 730 (31%)	4 934 (18%)	5 683 (20%)	6 053 (22%)	28 128

Source: **Vanuatu National Statistics Office. 2008.** Census of Agriculture 2007 Vanuatu, Vanuatu National Statistics Office.

More than 15 000 pigs are annually consumed in Vanuatu. The most common reason is self-consumption, followed by selling alive and using it for gift or feast (Table 6). Like other Pacific countries, this is a clear indication that pig farming is predominantly conducted at the subsistent level. Surveyed farmers unanimously reported that pigs are normally slaughtered around 18 months to 24 months old when their lightweight reaches between 150kg and 200kg.

Farmers mainly used coconut and swill as feed for pigs. Among four surveyed farmers, none of them reported using commercial feeding. Even more, only one reported cooking the feed, while the rest of the farmers admitted that there is no heating process in swill feeding. Although the farmers reported that the swill mainly consists of coconuts, copra meal, and scraps from root vegetables, they did not rule out inclusion of meat, if available. The finding implies that the risk of ASF spread via swill feeding might be substantial in pig farms of Vanuatu.



Figure 3. Pigs in a confined system of subsistence farms in Vanuatu; ©FAO

Table 6. Number of annual dispose pigs based on the type and province in Vanuatu.

Pig type	Reason					Total
	Self-consumed	Sold alive	Gift or feast	Lost or dead	Others	
Breeding boars	1 889 (32.4%)	1 386 (23.8%)	1 289 (22.1%)	971 (16.7%)	296 (5.1%)	5 831
Breeding sows	2 165 (38.8%)	1 032 (18.5%)	1 212 (21.7%)	970 (17.4%)	198 (3.6%)	5 577
Others	1 271 (29.2%)	1 230 (28.3%)	944 (21.7%)	621 (14.3%)	287 (6.6%)	4 353

Source: Vanuatu National Statistics Office. 2008. Census of Agriculture 2007 Vanuatu, Vanuatu National Statistics Office.

There is evidence that feral pigs exist in at least some islands of the country (Wehr, Hess and Litton, 2018). Given the high proportion of disposed pigs being lost or found dead, it is likely that the feral pig population may partially consist of escaped domestic pigs.

Vanuatu imports an unknown quantity of pork meat and pork products (e.g., retail cuts, bacon, dumpling, canned pork, etc.) for local consumption and supply to local restaurants (Figure 4). All pork products are imported from Australia and New Zealand and certified by their standards. Based on the survey, the value chain of pork products in Vanuatu is illustrated in Figure 5.



Figure 4. Example of pork products in local markets of Vanuatu; ©FAO

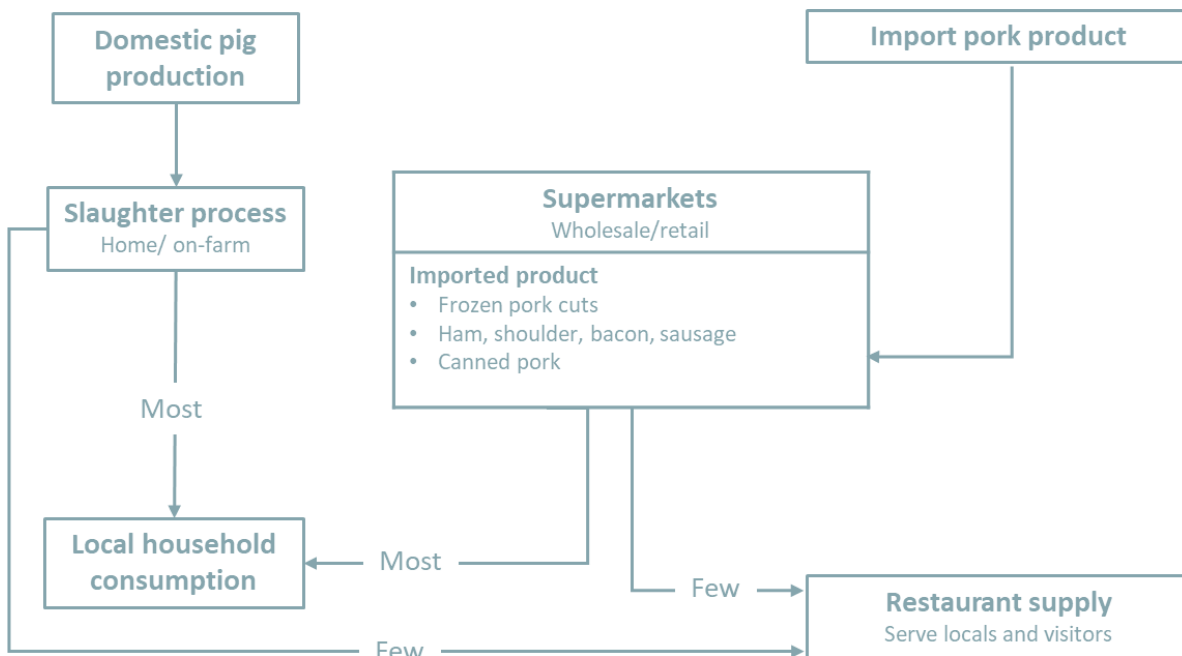


Figure 5. The value chain of pork products in Vanuatu; Source: elaborated by the authors.

### 3.1.3 ROLES OF AGENCIES FOR PREVENTING AND RESPONDING TO AN ASF OUTBREAK

Securing the border of Vanuatu against invasive pathogens is a task of Biosecurity Vanuatu, which is a government organisation. Biosecurity Vanuatu liaises with Customs, Airport authority and Port authority/Marine offices. The importation of live animals or meat products to Vanuatu requires a Biosecurity Import Permit. Also, before arrival, any imported live animals must undergo a pre-departure health treatment specified in the Import Health Standard. When found, illegally imported animals or animal products, including those without the permit, are confiscated for incineration and burial. However, it is possible that items would be missed as both passenger baggage and cargo are search without the aid of x-ray.

In an animal disease emergency, such as ASF, MALFFB and the National Disaster Management Office (NDMO) sanctions provisional measures to verify the outbreak and control its spread. The legal basis for declaring a biosecurity emergency is Animal Disease (Control) Act 2006. Should an ASF outbreak occur, The MALFFB and NDMO have the legal powers to coordinate the response involving several government agencies and other parties, such as Police, to exercise reasonable force to ensure compliance. However, there is no standard procedure prepared against an outbreak of ASF in Vanuatu.

Two qualified veterinarians are working at DOA in Vanuatu. During an ASF response, veterinary officers may take the actions below to prevent the spread of the disease;

- Surveillance of animal populations for ASF outbreaks;
- Prohibition of animal movements;
- Prohibition of the distribution, sale or use of any animals, animal products or animal-related items;
- Slaughter of animals for disease control purposes to prevent the spread of ASF, instructions for the disposal of animal carcasses;
- Implementation of official control programmes, including disinfection and eradication measures.

Recently, Vanuatu has scaled up its preparedness efforts against any possible outbreak of ASF, with support from the Pacific Horticultural and Agricultural Market Access Program (PHAMA Plus). There was production and distribution of ASF awareness materials through MALFFB (such as signboards, posters and videos) at ports of entry and the community level in several provinces. In addition, there was an ASF training in May 2022 for livestock officers in Vanuatu (Figure 6). The training includes ASF awareness, sampling, performing ASF rapid test kits, and post-mortem examination of pigs.



Figure 4. The ASF awareness training in Vanuatu in May 2022; ©FAO

## 4. Import Risk Analysis

The methodology used in this mission follows the WOA (formerly known as OIE) import risk analysis framework (OIE, 2010) and the New Zealand Biosecurity Risk Analysis guidelines (Biosecurity New Zealand, 2006). The terminology used for risk attributes and descriptors is provided in Table 7. The import risk analysis process is shown in Figure 7.

**Table 7. Terminology for Risk Attributes and Descriptors (Biosecurity New Zealand, 2006)**

Risk Attributes	
- Negligible	Not worth considering; insignificant
- Non-negligible	Worth considering; significant
Risk Descriptors	
- Very Low	Close to insignificant
- Low	Less than normal level
- Medium	Around normal level
- High	Extending above normal level
- Very high	Well above normal level

Source: Biosecurity New Zealand. 2006. Risk Analysis Procedures, Version 1. Cited 31 May 2022. [www.mpi.govt.nz/dmsdocument/2032/direct](http://www.mpi.govt.nz/dmsdocument/2032/direct)

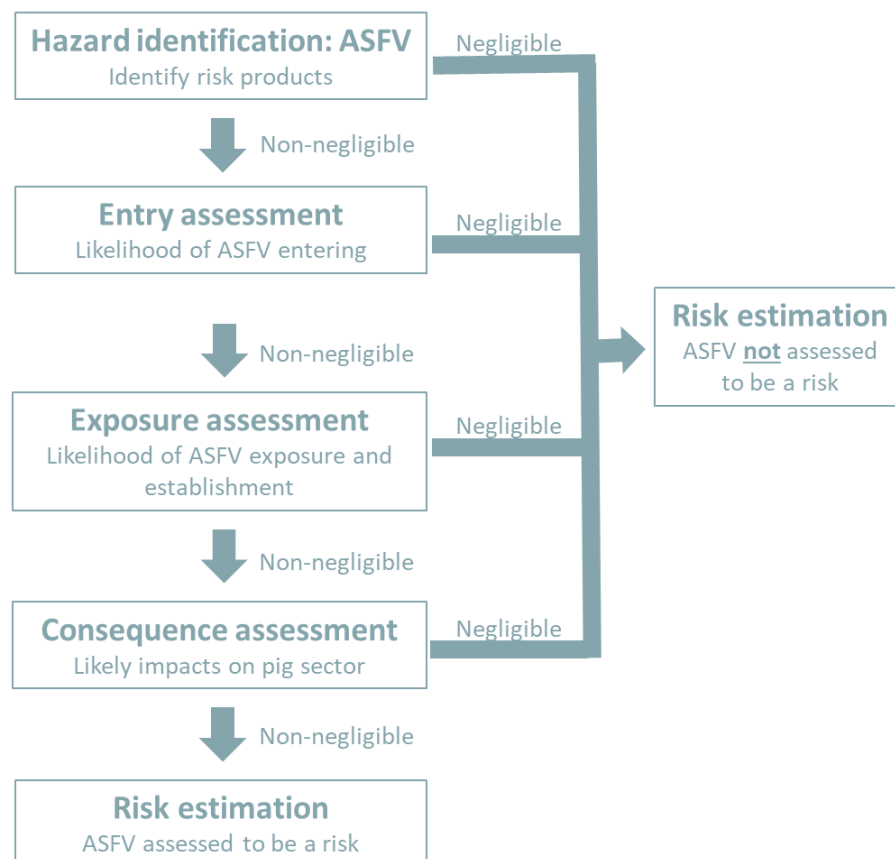


Figure 7. Import risk analysis process; Source: elaborated by the authors.

### 4.1.1 HAZARD IDENTIFICATION

ASFV is known to be exotic to Vanuatu and has been identified as a potential hazard. Thus, the main goal for this step is to identify risk products/items from ASF-affected countries that could be contaminated with ASFV and enter any state of Vanuatu. According to the latest WOA World Animal Health Information System (WAHIS), ASF was reported in Africa, the Eastern part of Europe, the Russian Federation, and 17 countries in Asia, including China, Mongolia, Viet Nam, Cambodia, the Democratic People's Republic of Korea, the Republic of Korea, Lao People's Democratic Republic, Myanmar, The Philippines, Timor-Leste, Indonesia, Papua New Guinea, India, Malaysia, Bhutan, Thailand, and Nepal (FAO, 2022; OIE, 2020). ASFV can be transmitted directly or indirectly via pig-to-pig, feed-to-pig and fomites-to-pig (Guinat et al., 2016). Therefore, it was assumed that pork meat products, pig feed, and contaminated fomites from these regions would pose a non-negligible risk of ASF introduction into Vanuatu.

### 4.1.2 ENTRY ASSESSMENT

Vanuatu is an island country located some distance from its nearest neighbour. Therefore, ASFV entry into Vanuatu would be limited to international air and seaports. The ASFV could enter the country through contaminated pork meat products and fomites from the passenger. Figure 8 summarises the pathways by which ASFV might enter Vanuatu.

According to the interviews from government agencies, live pigs are rarely imported to Vanuatu. Also, it is mandatory to quarantine imported live animals for 30 days before entering the country, and only pigs from ASF-free countries are allowed to be imported to Vanuatu. Moreover, pork meat and products are mainly imported from Australia and New Zealand. Therefore, it is unlikely for ASFV to be introduced to Vanuatu via live pigs and pork products importation through the legal channel.

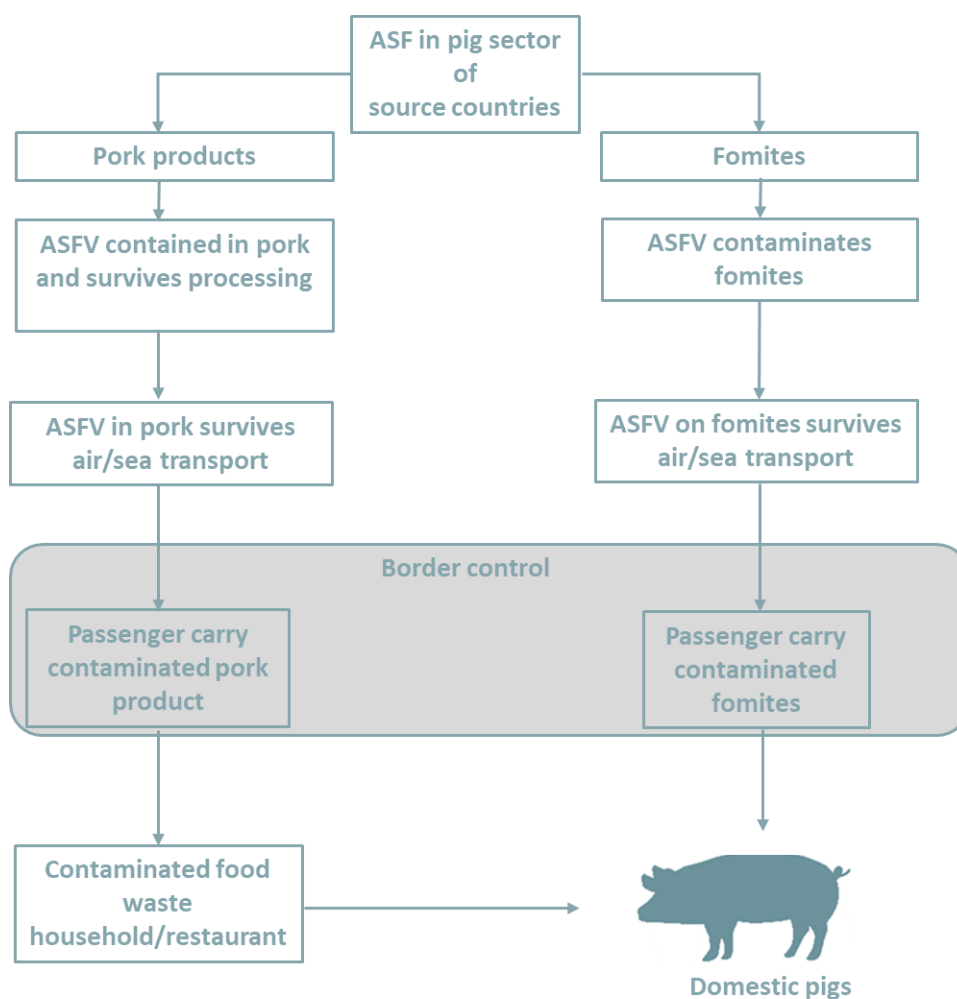


Figure 8. The risk pathway of African Swine Fever virus into Vanuatu; Source: elaborated by the authors.

As there is no importation of pork or pork products directly to Vanuatu, ASFV could be introduced into Vanuatu by infected pork products via passengers or cargos illegally bringing infected pork products at international arrival. Currently arriving passengers' luggage or cargo is manually search without the use of x-rays. The process may result in missing illegal pork products. All the officers working at the border narrated that they confiscated illegal pork products from passengers and cargo (before the COVID-19 pandemic). Unconstrained imports of pork products, either accidentally by tourists from affected countries or intentionally smuggling the products for personal or commercial use, present a continuous threat to ASF introduction (Wooldridge et al., 2006).

The ASFV can also be carried on clothing or footwear that could have contact with pigs in the source country. Such risky fomites are not being cleaned and disinfected at arrival. In addition, the virus can persist for several days on fomites, particularly if protected by organic matter (Bellini, Rutili and Guberti, 2016). Therefore, anyone who had contact with an infected area, such as walkers, hunters or farmworkers visiting/returning to Vanuatu, could bring contaminated fomites into the country. According to the Vanuatu National Statistics Office, prior to the COVID-19 pandemic, there average number of international visitors, per month, was 10 000 per. Visitors were returning residents or travellers from Oceanian countries, such as Australia, New Zealand, and New Caledonia. However, more than 11% of the visitors were from China and Europe, some regions where ASF are endemic (Vanuatu National Statistics Office, 2021). Therefore, international travellers could carry infected pork products or contaminated fomites into Vanuatu.

International waste originating from aeroplanes and ships arriving from endemic countries is another important pathway of ASF introduction (Costard *et al.*, 2009). Different maritime transport vessels arrive in Vanuatu, such as commercial ships with cargo and fishing vessels. Crews and passengers may carry and not declare pork products; containers may be contaminated with viruses, and catering waste may contain contaminated pig meat. Disposal of catering waste to Vanuatu for any foreign aircraft and vessel is confirmed from the narration of the Aviation and Marine officers.

In conclusion, the likelihood of ASFV entry through arrival passengers/cargo, as well as catering waste, is non-negligible. It was impossible to quantify the risk because of the limited data on pork meat and products (i.e. type of products, volume) ceased from arriving passengers.

### 4.1.3 EXPOSURE ASSESSMENT

Pigs could be exposed to ASFV via feeding of leftover pork meat products or through contact with contaminated fomites from ASF-affected countries. From the surveyed farmers, it was narrated that swill feeding without any heat treatment is quite common in Vanuatu. As a result, household scraps or food wastes could be contaminated with infected pork meat. Although some pig farmers may cook waste materials before feeding them to pigs, it is difficult to ensure that traditional cooking over an open fire is sufficient to inactivate the virus. Thermal inactivation at a core temperature of 70°C for a minimum of 30 minutes is required to destroy ASFV (Beltrán-Alcrudo *et al.*, 2017).

Feral pigs may play a key role in ASFV exposure. Feral pigs could be exposed to food waste by scavenging food waste with contaminated pork meat products or fomites contaminated by villagers. Although the feral pig population size in Vanuatu is unknown, their existence has been reported (Wehr, Hess and Litton, 2018). Also, all surveyed farmers reported observing feral pigs around their farms several times yearly. During the current project, we have observed that feral pigs in Pacific Island countries are quite apt at competing for food resources, including scraps. Therefore, there might be more contact between domestic and feral pigs for food waste, which will contribute to the spread of ASFV if the virus is introduced to the country. Accordingly, the likelihood of ASFV exposure is non-negligible.

### 4.1.4 CONSEQUENCE ASSESSMENT

The spread of ASFV in the pig population depends on the speed of transmission and its economic impact. Once established, ASFV spreads rapidly among pig populations. Pig farms in Vanuatu generally have no or very low levels of biosecurity, a lack of which is recognised as a risk factor for ASF transmission (Sanchez-Vizcaino *et al.*, 2015). Given that the trade of pigs and crossbreeding with neighbouring farms is common practice in Vanuatu, the lack of basic biosecurity would enhance the horizontal and local spreading of ASF via pig-to-pig contact opportunities. Local traders could also spread ASFV by travelling between villages and collecting live or slaughtered pigs contaminated with ASFV.

The inability of extension officers and farmers to prevent and control common diseases was stated as one of the major challenges of the livestock sector in Vanuatu. Farmers on outer islands do not have the essential information and knowledge on best farming practices. Extension, awareness and communication strategies are poor (Vanuatu National Livestock Policy, 2015)

Inadequate home slaughter facilities, sewage and waste disposal, could be potential infection sources. The guts and trim wastes were normally buried or composted. They could be directly accessible by feral pigs. Due to ASF being absent from Vanuatu, farmers are entirely unaware of the disease and its transmission



mechanisms. Lack of awareness could increase the time from introduction to detection, increasing the epidemic's size. It is unlikely that a disease outbreak will be promptly reported to MOA if farmers are unaware of it. Moreover, vehicles for the transport of pigs, pig feed, and equipment may be shared.

Due to the absence of vaccination, rapid detection and timely implementation of control measures, such as pre-emptive culling or fencing, could be one of the most effective ways to prevent the spread of ASF (OIE 2019; Han *et al.*, 2021). In Vanuatu, in the case of an ASF outbreak, it is speculated that a timely response to prevent the spread of ASF may not occur. A survey from DOA narrated that there is a limited active/passive surveillance system for animal diseases. Also, it was reported that there is no capacity to manage/control/contain an animal disease outbreak in Vanuatu. In addition, feral pigs are known to be a risk factor for ASF sustainability (Mur *et al.*, 2016) as these animals are at high risk of contact with household food waste and wild pigs. Therefore, feral pigs could pose an additional risk of ASF spread in Vanuatu.

The domestic pig population of Vanuatu consists of approximately 89 000 animals reared on more than 17 980 properties, mostly backyard piggeries (Vanuatu National Statistics Office, 2008). Pigs are an integral component of the agriculture of Vanuatu. They have cultural values and provide food security, high-protein nutrition, and financial assets. Therefore, the socio-economic consequences of introducing and establishing ASF for the Vanuatu pig sector must be considered extreme. In an ASF outbreak, the rapid slaughter of pigs and proper disposal of pig carcasses are required to control the disease (OIE, 2019). The mortality and mass culling could substantially reduce pig numbers and limit pig meat supply to the local restaurant. The destruction of large numbers of pigs would cause significant socio-economic losses and threaten food security, culture, and livelihood in Vanuatu.

In conclusion, the socio-economic consequences of an ASFV introduction were assessed to be very high, thus non-negligible.

#### **4.1.5 OVERALL RISK ESTIMATION**

The likelihood of an ASFV introduction and its exposure were regarded as non-negligible. The consequences of ASFV spread and its economic impact are considered very high and non-negligible. Therefore, ASF is considered to pose a risk to Vanuatu.

## 5. Recommendations

### 5.1.1 REDUCING THE LIKELIHOOD OF ASF ENTRY

The main pathways for entry of ASFV into Vanuatu are pork products. The less likely but non-negligible pathway was through contaminated fomites (boots, gears). These could enter via cargo, package and passenger's luggage. To reduce the likelihood of entry, we recommend the following:

- Passengers should be instructed to declare food products to the biosecurity officer on arrival or dispose of the product in the designated bins in the arrival hall.
- Passengers should be instructed to declare to the biosecurity officer if they have visited any farms recently (30 days). In addition, the Biosecurity services should inspect any clothing or footwear they have with them that was worn on the farm. Dirty clothing or footwear should be disinfected or confiscated.
- To improve compliance, passengers who are not truthful on their declaration form should be fined.
- Promotional material should be placed in highly visible locations in arrival halls and at baggage carousels of airports to increase awareness of incoming passengers about pork products that can carry ASF and the importance of ASF to Vanuatu.
- Ensure the practice of disposing of confiscated products in high-temperature incinerators.
- Increase awareness and provide training on ASF prevention, including the importance of biosecurity measures and penalties for non-compliance to relevant stakeholders (Farmers, businesses, the public, Biosecurity services, Customs, Airport authorities and Ports authority).
- Strengthen biosecurity procedures and infrastructure to ensure that all baggage is x-rayed and manually searched if suspect items are visible on the x-ray.

### 5.1.2 REDUCING THE LIKELIHOOD OF ASF EXPOSURE

From risk analysis, pigs raised in Vanuatu would primarily be exposed to ASFV via waste feeding of meat scraps with ASFV present. The consultants recommend a public awareness campaign focused on the negative impacts of ASF and highlighting the need to 1) avoid feeding meat waste to pigs and 2) cook waste for food waste should be thoroughly cooked to reach the core temperature of 70°C for 30 minutes. While it would be preferable to avoid swill feeding altogether, that is not realistic given the cost and availability of commercial feed. Public awareness, including social media, TV, radio, printed materials, posters and organising meetings for those who raise pigs and the public, should focus on encouraging the separation of meat from vegetable waste. Consideration should be given to implementing a ban on the feeding of meat.

### 5.1.3 REDUCING THE SIZE OF AN OUTBREAK

In the event of an ASF outbreak, the key to preventing further spread is early detection. Effective prevention requires a monitoring and surveillance system, facilitating early detection and timely intervention. Sufficient budget and personnel resources must be allocated to motivate early reporting, implement active disease investigation and control, and organise access to laboratories capable of

diagnosing ASF. DOA should provide information for veterinary paraprofessionals and livestock owners to recognise ASF and report promptly. Those who care for pigs need to be aware of the signs of ASF and be given clear information about who they need to notify if suspicious. Ways to raise awareness include social media, TV, radio, printed materials, posters and organising meetings with those responsible for caring for pigs.

Once infected with ASF, all animals on the infected property, whether affected or unaffected, must be destroyed and disposed of correctly to prevent further spread. Vanuatu government need to train and equip sufficient personnel for rapid culling and carcass disposal and cleaning and disinfection in the event of an outbreak. Such an action plan to mitigate the impact of ASF infection would require compliance from pig owners. Therefore, there needs to be a compensation strategy and allocate financial resources to ensure adequate compensation for the removal and disposal of affected pig herds as part of disease control measures.

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# Annex 1. Questionnaires and data items

Following data items are submitted in electronic format

1. ASF Import Risk Assessment Questionnaires
2. GEMP questionnaire completed by DOA
3. ESRI shapefile of Vanuatu administrative division (GADM)
4. ESRI shapefile of Vanuatu OpenStreetMap (OSM)





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