

# Overview of risk assessment

**Webinar #3 – 23<sup>rd</sup> October 2020**

African Swine Fever Cross Border Risk Assessment – South East Asia

*World Organisation for Animal Health (OIE)/City University of Hong Kong*

**Andrew Bremang**



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# Objectives

- Introduction to risk assessment as relates to risk analysis
  - To understand why we do risk analysis
  - Identify relevant risk pathways for a risk question
  - ASF risk assessment - examples



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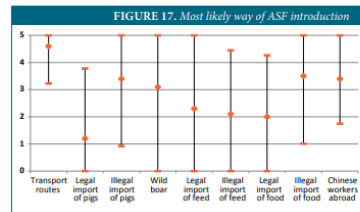


# ASFV entry to china? – FAO (2017)

## FAO EXTERNAL EXPERT CONSULTATION

The FAO rapid risk-assessment framework and questionnaire was discussed with swine disease experts attending the Second Regional Workshop on Swine Disease Control in Asia (China Workshop, 2017). Under the title "Assessment of the Risk of African swine fever introduction, spread, and persistence in China", information was obtained from five Chinese veterinary and laboratory experts from CAHEC and the China Agricultural University (CAU), as well as one FAO regional veterinary officer (total, six). In addition, the questionnaire was submitted by email to 12 experts in July, 2017. Responses were received from four of the additional 11 experts contacted. The questions, responses, and results of 11 respondents are below (11 responses unless otherwise indicated). This paper reports responses from the following experts:

- Guo Fusheng, FAO, Thailand
- Shengqiang Ge, CAHEC
- Xianodong Wu, CAHEC
- Xiaoxu Fan, CAHEC
- Changchun Tu, Academy of Military Medical Science
- Hanchun Yang, College of Veterinary Medicine, China Agricultural University



- Klaus Depner, Friedrich-Loeffler-Institut, Germany
- Huaji Qiu, Habrin Veterinary Research Institute
- Domenico Rutili, Istituto Zooprofilattico, Teramo, Italy
- Young S. Lyoo, Konkuk University
- Daniel Beltran-Alcrudo, FAO, Hungary

## Results

### 1. Introduction of ASF in China

**Question 1. What is the most likely way for the disease to be introduced?**

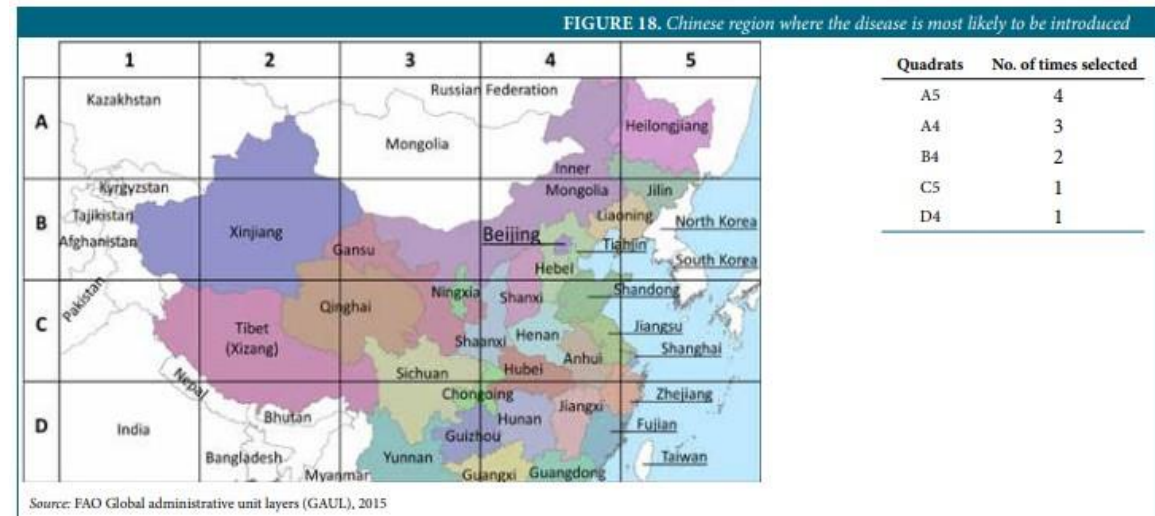
Responses were ranked from the most (5) to the least (0) relevant risk factors for the introduction of ASF into China. Experts widely agreed that the most likely way of ASF introduction into China were transport routes, followed by illegal imports of food and Chinese migrant workers. Legal imports of pigs were considered unlikely to introduce the disease into the country.

**Question 2. What is the Chinese region where the disease is most likely to be introduced?**

Respondents were asked to select the quadrats where the disease was considered likely to be introduced. Experts considered that Quadrat A5, representing the northeast of China (largely Heilongjiang Province) represents the most likely region for ASF introduction, followed by A4 (Inner Mongolia). Number of respondents: seven.

**Question 3. What are the risks of introduction through Transport-Associated Routes? Please rank from least to most relevant.**

Regarding the pathway of ASF introduction into China through TARs, the experts considered that contaminated trucks and cars, and wastes from ships, planes and trains can contribute to the introduction of the disease.



# What is risk analysis?

- Structured standard process used to evaluate risks
- Risk analysis = RA + RM + RC
- Undertaken by responsible body
  - Government
  - Regulators
- Areas of use
  - Nuclear, chemical, finance (1960s)
  - Veterinary sphere (1990s)

## Components of Import Risk Analysis

- Based on *Code* guidelines (Chapter 1.3.1)



<https://www.sciencedirect.com/science/article/pii/S0167587704002247?via%3Dihub>



# Why do risk analysis?

- Motivation = international trade
  - Harmonisation
  - Transparency
  - GATT/WTO
  - No risk no longer acceptable
- Applied to new areas
  - Food safety
  - Veterinary biologicals
  - Ecotoxicology
  - Disease transmission
  - Animal by-products

*WTO recognizes and encourages  
harmonization on standards:*

*“Members shall base their measures  
on international standards, where they exist...”*

*Annex 3*

*“the relevant international organizations”*



<https://www.sciencedirect.com/science/article/pii/S0167587704002247?via%3Dihub>

*WTO-SPS Agreement - countries are to justify their  
actions by means of a scientific risk analysis*



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# Risk analysis systems & relevant terms

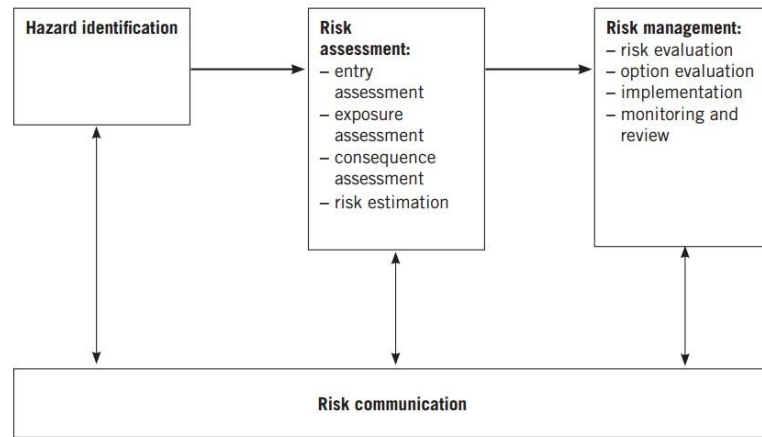


Figure 1 The structure of the OIE risk analysis process

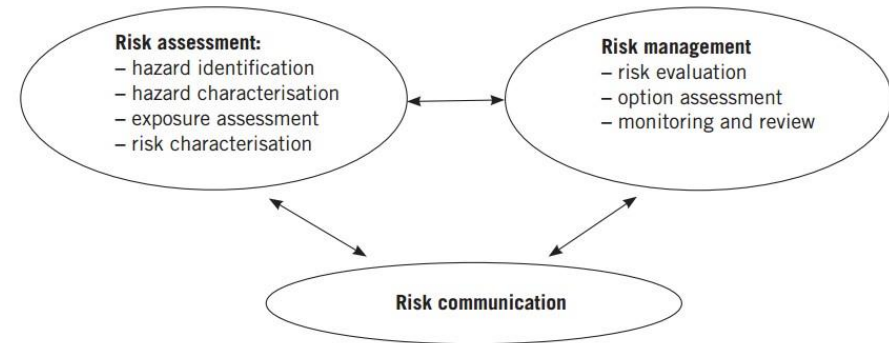


Figure 2 The structure of the NAS-NRC risk analysis process

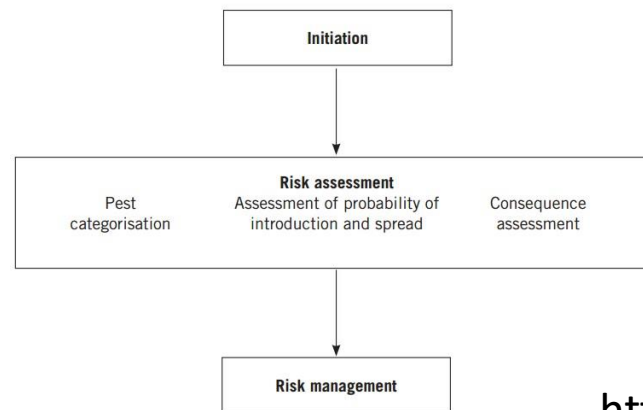


Figure 3 The structure of the IPPC pest risk analysis (PRA) process

<https://www.oie.int/doc/ged/D6586.pdf>



# Risk

- Requires the existence of some adverse **event**
- Several possible events, some adverse/harmful!
- **Uncertainty** about which **event** will occur, and the **likelihood** and **magnitude** of that **event**
- **Risk = The combination of the **likelihood** of occurrence and **magnitude of impact** of an **adverse event (hazard)**.**
- **Risk = Likelihood \* Impact**



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# Hazard

- Potentially harmful
  - humans, animals, plants, environment
- No hazard - no risk!
- Examples
  - Virus
  - Radiation
  - Earthquake zone
  - Chemical





# Risk assessment

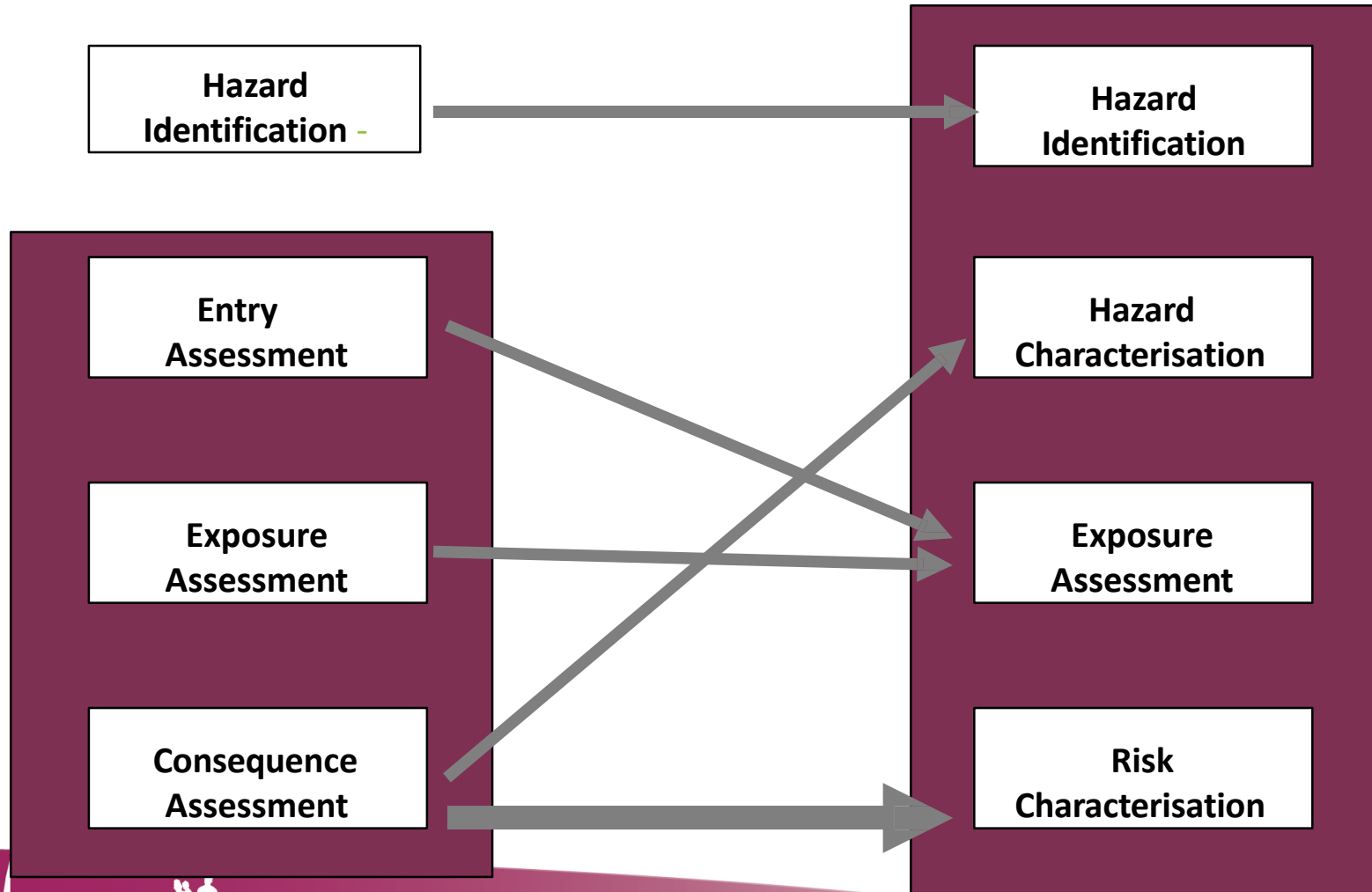
- Process of evaluating the likelihood and impact of a hazard on an importing country
- Logical description of the process – risk pathway
- Undertaken by a risk assessment expert
  - Team activity



# Comparison of RA processes

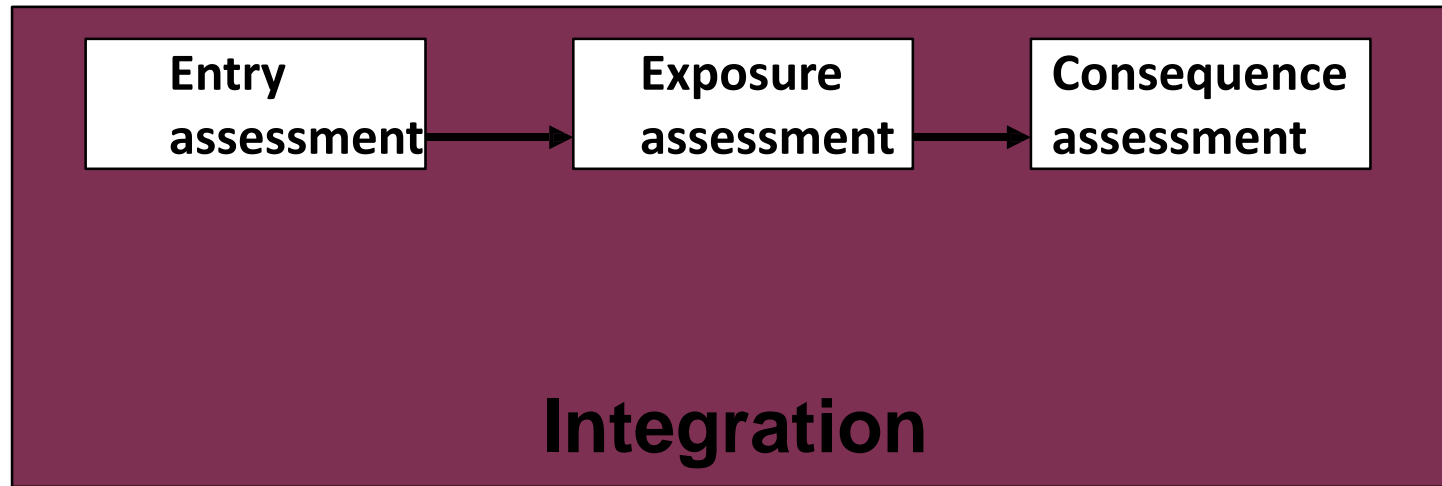
OIE

CAC

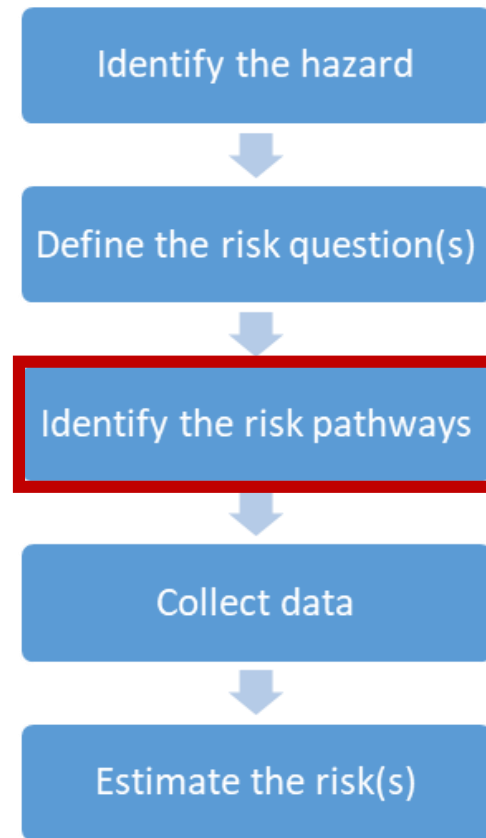


# OIE risk assessment framework

- Based on Covello-Merkhofer model
- Designed to assess magnitude of risk
- Risk analysis: 4 steps
- Risk assessment consists of 3 stages



# Risk assessment methodology



Team work

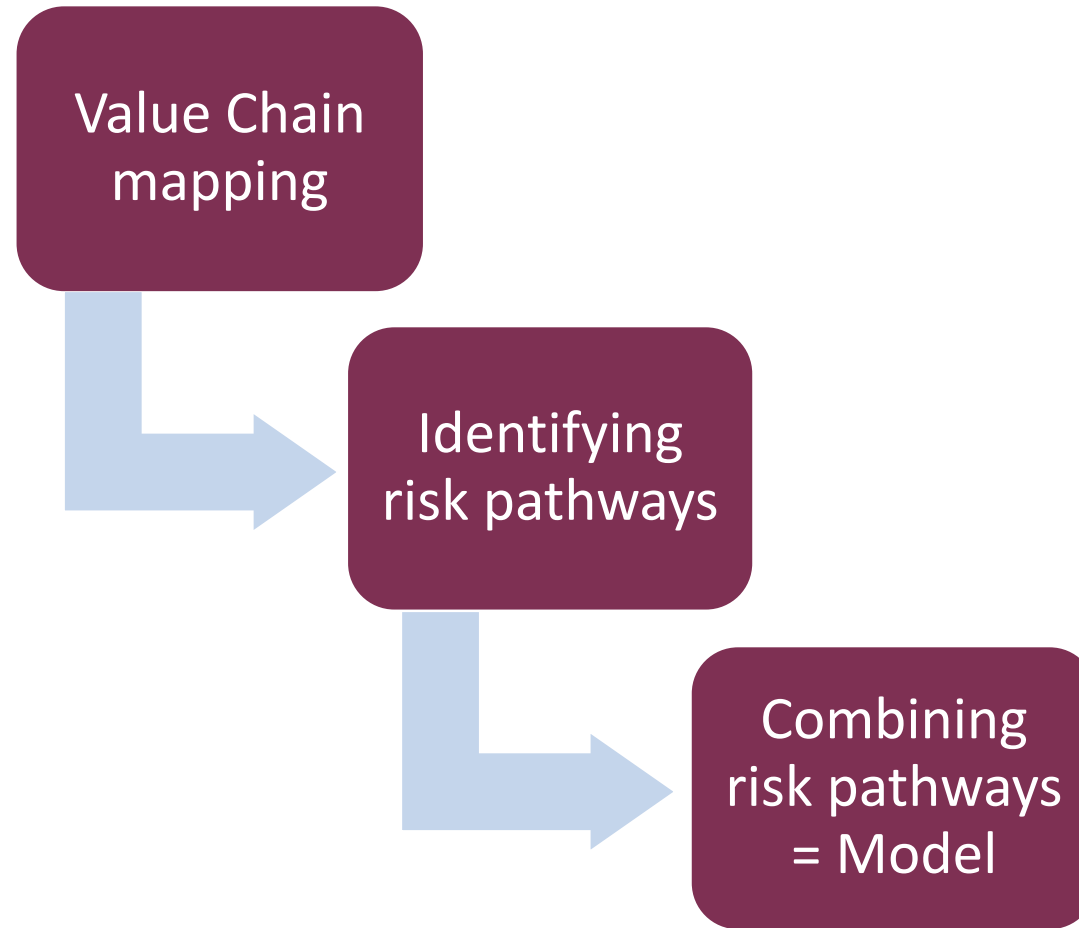


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# Estimating the risk?



# Value chains

- Understanding of value chains of animal products key to assessing disease transmission risks;
  - Production systems
  - Production centres
  - Movement and market points
  - Key actors – human behavior
- Value chain mapping allows to identify high risk nodes/actors to identify potential risk pathways

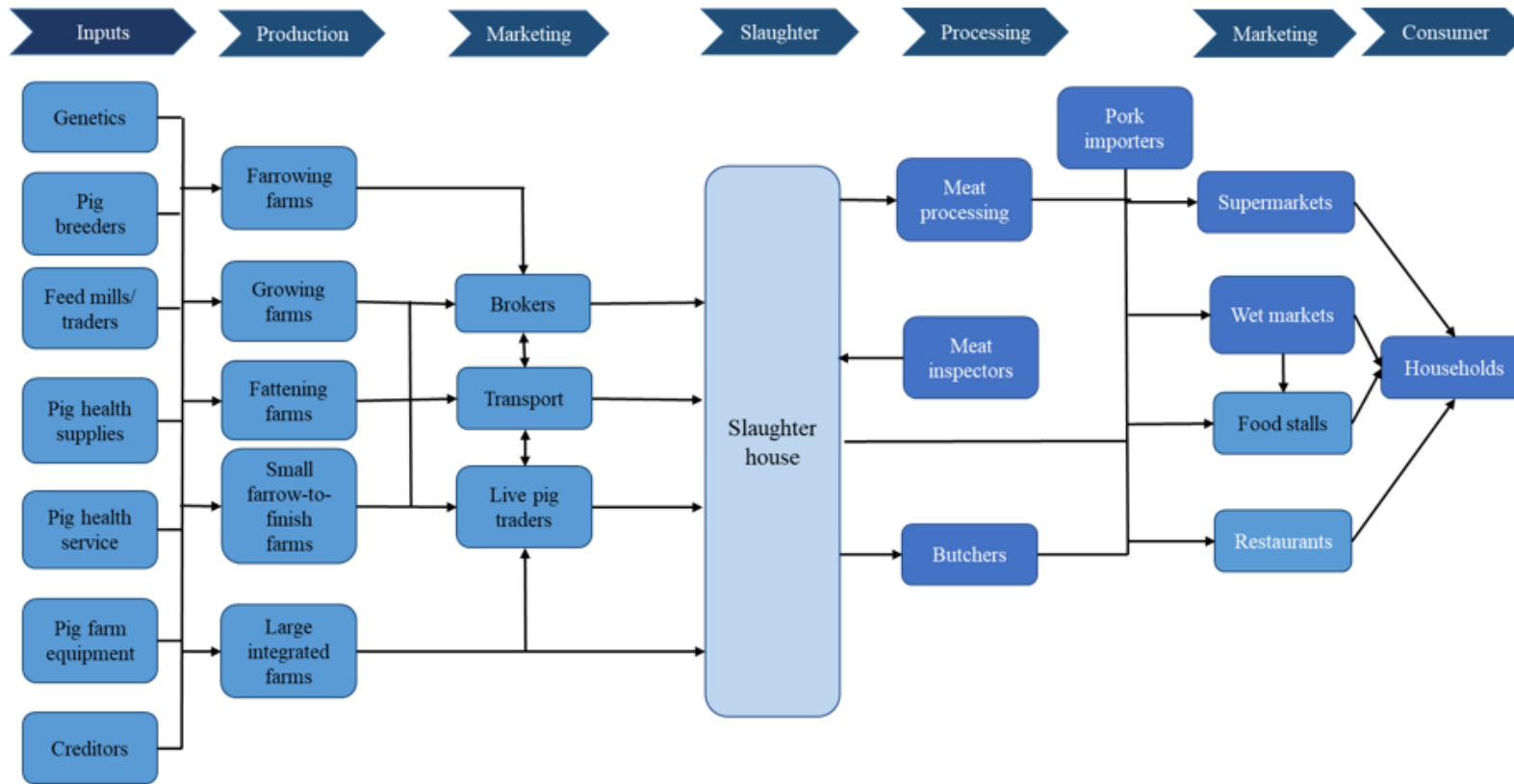


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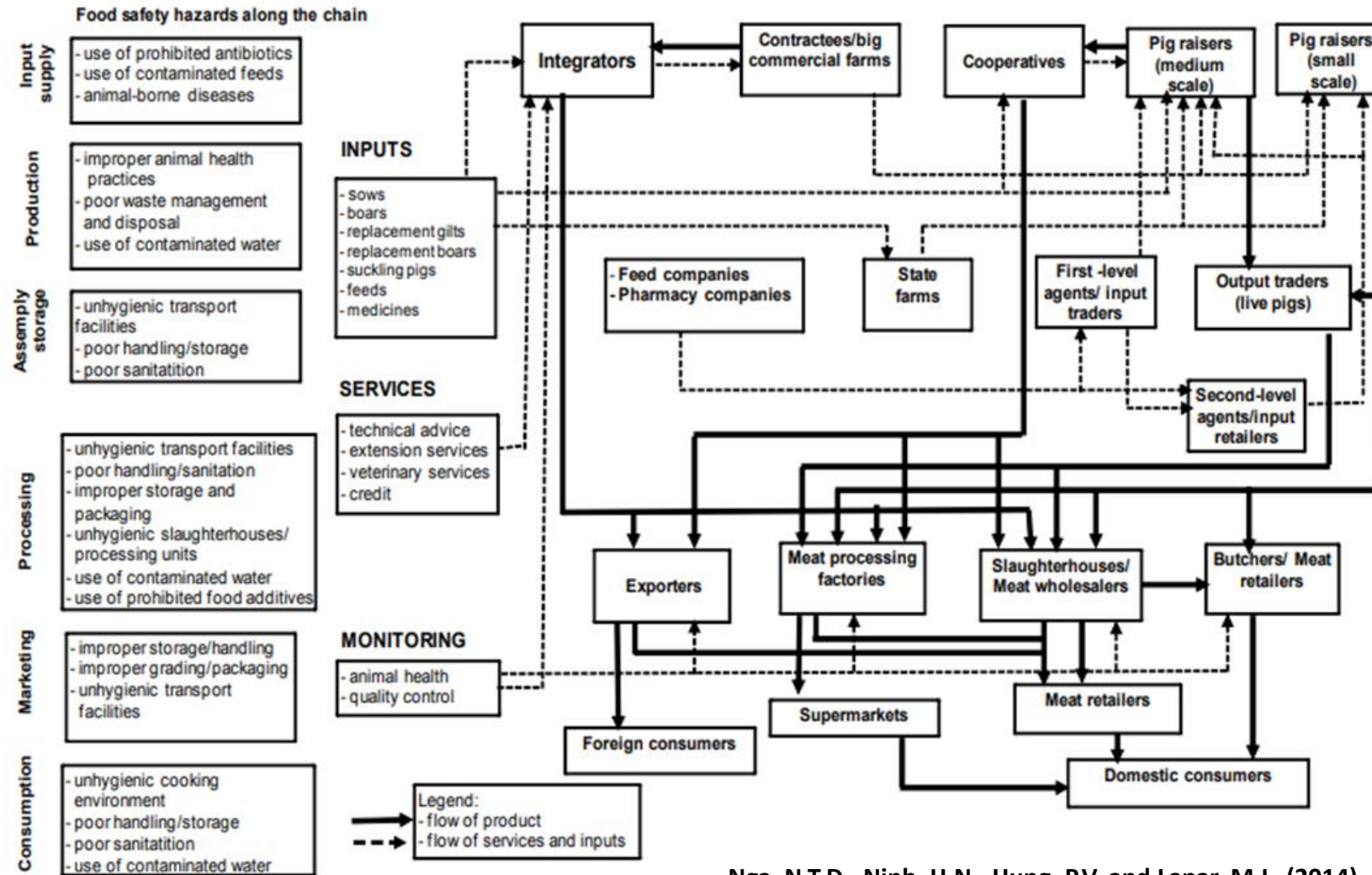
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# Generic pig value chain



# Identification of risk factors – Vietnam e.g.



Nga, N.T.D., Ninh, H.N., Hung, P.V. and Lapar, M.L. (2014)





# ASF Risk assessment examples

Rev. Sci. Tech. Off. Int. Epiz., 2018, 37 (3), 949-960

## Qualitative risk assessment for the transmission of African swine fever to Thailand from Italy, 2015

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(2) Bureau of Disease Control and Veterinary Services, Department of Livestock Development, 69/1 Ratchathewi, Bangkok 10400, Thailand  
(3) Food and Agriculture Organization of the United Nations, 39 Maliwan Mansion, Phra Athit, Phra Nakorn, Bangkok 10200, Thailand  
(4) Department of Agricultural and Resource Economics, College of Agricultural Sciences, Colorado State University, Fort Collins, CO 80523-1172, United States of America  
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### Summary

African swine fever (ASF) is a highly contagious disease that infects porcine species and has a major impact on the pig industry. Thailand imported approximately 4 million kilograms of pig products from Italy in 2015 during the same time as an ASF outbreak was occurring on the island of Sardinia in Italy, thereby posing a potential risk of introduction of ASF virus (ASFV) into Thailand. To estimate whether or not importing pig products from Italy is a risk for Thailand and to identify gaps in control and prevention measures, risk analysis was performed. The objective of this study was to estimate the risk of the introduction of ASFV through imported pig products from Italy into Thailand in 2015, using qualitative risk assessment approaches, with the aim to define specific control and preventive measures. The framework used to analyse risk in this study was composed of hazard identification, qualitative risk assessment and risk mitigation. Qualitative risk assessment revealed that the likelihood of introduction of ASFV into Thailand was negligible, while the level of consequence of virus introduction was high. The overall risk was determined to be negligible. Risk mitigation recommendations were framed to minimise the risk. In addition, this study provided a baseline qualitative risk of ASFV introduction and a systematic approach to a qualitative risk analysis.

### Keywords

African swine fever – Estimation of risk – Italy – Pork product – Qualitative risk assessment – Thailand.



## Qualitative Assessment of the likelihood of African swine fever virus entry to the United States: Entry Assessment

USDA:APHIS:VS:Center for Epidemiology and Animal Health, Risk Assessment Team.  
Fort Collins, CO

**Key Results:** Illegal entry of swine products and byproducts presents the largest potential pathway for the entry of African swine fever virus (Table 1). Port inspection and interception data indicates that 1) air passenger baggage and foreign mail are two of the largest illegal pathways and 2) pork, ham, and sausage are the products with the highest interception rates. The interception data agrees with other studies that demonstrate potential entry of African swine fever virus other swine diseases through the air passenger pathway. While there are no studies that look at foreign mail as a pathway for entry of animal disease, our interception data, estimate of annual volume of packages entering the U.S., and estimate of product concealment in mailed packages indicates that foreign mail is an entry pathway that warrants greater analytical scrutiny similar to the air passenger pathway.

TABLE 1. SUMMARY OF EVALUATED LIKELIHOOD RATINGS BY PATHWAY

Pathway	Legal	Illegal
Live Pigs	Negligible, with low uncertainty	Negligible to low, with moderate uncertainty
Semen	Negligible, with low uncertainty	Low, with moderate uncertainty
Swine products and by-products	Negligible to low, with moderate uncertainty	High, with low uncertainty
Wildlife: Meat and Trophies	<Not reviewed>	Low to moderate, with high uncertainty
Feed (animal origin)	Low to moderate, with high uncertainty	Negligible to low, with high uncertainty
Feed (plant origin)	Negligible to moderate, with high uncertainty	Low, with high uncertainty
Feed (supplements)	Negligible to low, with high uncertainty	<No data to evaluate>
Fomites	<Not reviewed>	Negligible to moderate, with high uncertainty
Regulated Garbage	Low, with moderate uncertainty	<Not applicable>



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# Qualitative Assessment of the likelihood of African swine fever virus entry to the United States: Entry Assessment

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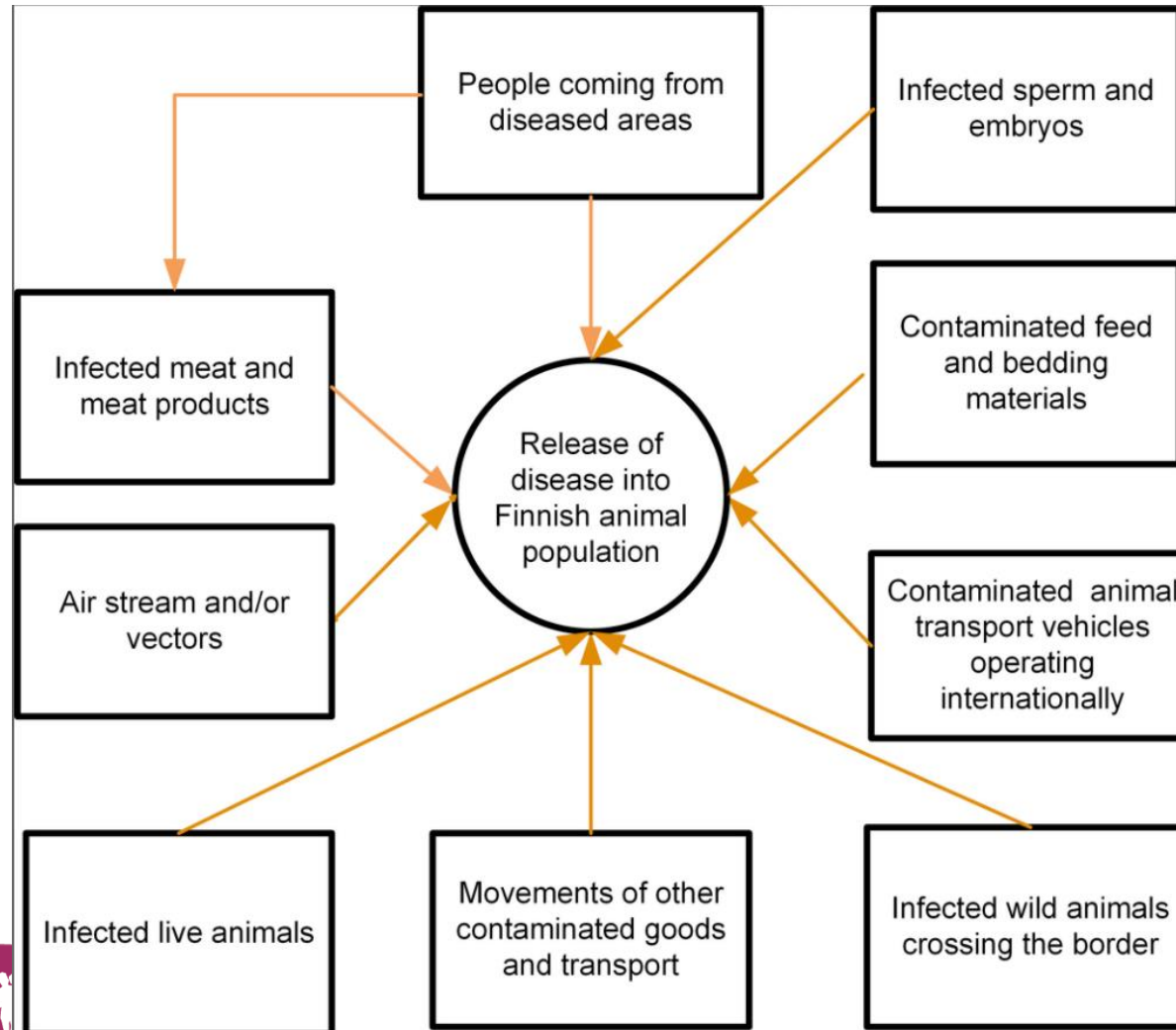


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# Possible ASFV entry risk pathways



<https://onlinelibrary.wiley.com/doi/full/10.1111/tbed.12633>

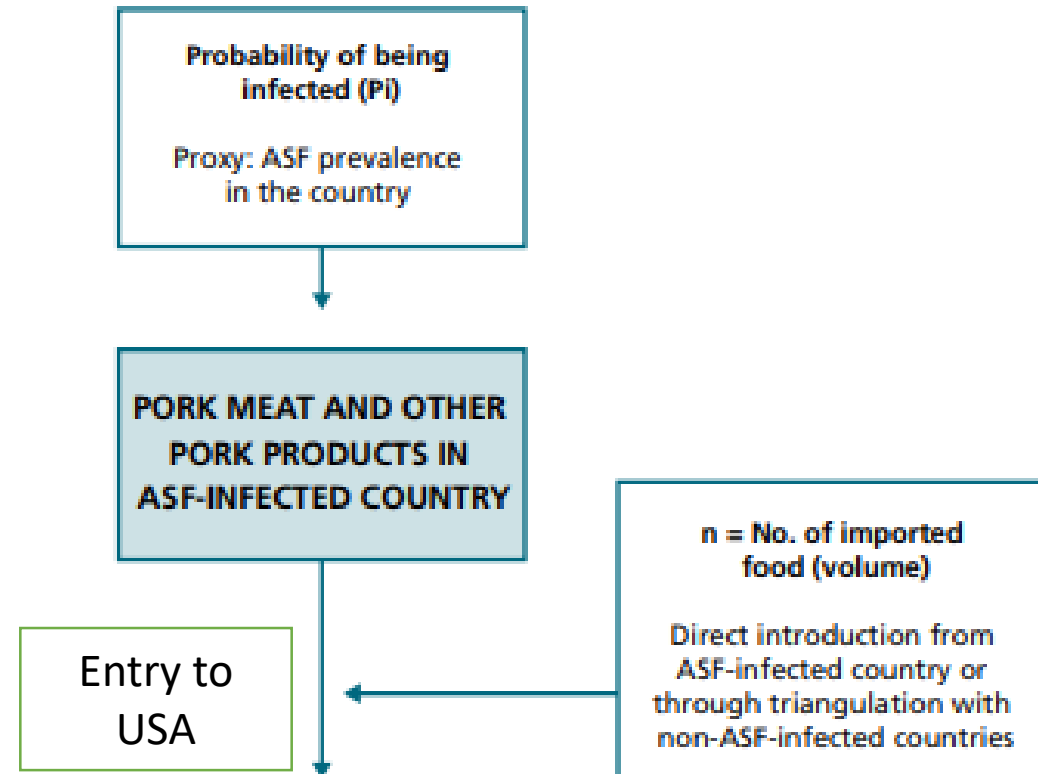


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# Pathway for illegal pork/pork products



<http://www.fao.org/documents/card/en/c/I8805EN/>



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# Data and factors considered

- Rate of import/traffic of passengers and live pigs and pig products
- Border inspection and control
- Existing mitigation measures e.g. quarantine, diagnostic tests, etc.
- Grey or peer-reviewed literature



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# Entry risk estimation of ASFV entry via the illegal entry of swine products and by-products

- High volume of arrivals/human assisted movement = Likelihood ↑
- ↓ Inspection checks/ risk-based = Likelihood ↑
- Up to date inspection database increases uncertainty
- Inefficient x-ray scanners compared to manual inspection
- Evidence of ASFV in swine products intercepted at other international airports
- High likelihood with low uncertainty of entry via pork and pork products



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# Risk estimates

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[https://www.aphis.usda.gov/animal\\_health/downloads/animal\\_diseases/swine/asf-entry.pdf](https://www.aphis.usda.gov/animal_health/downloads/animal_diseases/swine/asf-entry.pdf)



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# Definitions of categories

TABLE 3. DEFINITION OF LIKELIHOOD CATEGORIES FOR THIS QUALITATIVE ASSESSMENT

Term	Definition
Negligible	This event would almost certainly never occur
Low	This event would be unlikely to occur
Moderate	This event would be nearly as likely to occur as not to occur
High	This event would be likely to occur
Very High	This event is almost certain to occur

TABLE 4. DEFINITION OF LEVELS OF UNCERTAINTY

Term	Definition
Low	Available data is well supported, reliable, complete, accessible from multiple sources or published references, and are in general agreement.
Moderate	Data is available, and has few issues with interpretability, potential biases, reliability, insufficient attribute resolution, and/or underreporting.
High	A complete lack of available data <i>OR</i> some data is available but may be incomplete, unreliable, from a small number of published sources, and/or demonstrates conflicting evidence. Includes the combination of anecdotal evidence, personal communications, and expert opinion with available published data.

[https://www.aphis.usda.gov/animal\\_health/downloads/animal\\_diseases/swine/asf-entry.pdf](https://www.aphis.usda.gov/animal_health/downloads/animal_diseases/swine/asf-entry.pdf)



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# Risk matrix for likelihood combinations

A matrix of rules for combining descriptive likelihoods <sup>(a)</sup>					
	High	Moderate	Low	Very low	Negligible
High	High	Moderate	Low	Very low	Negligible
Moderate		Low	Low	Very low	Negligible
Low			Very low	Very low	Negligible
Very low				Negligible	Negligible
Negligible					Negligible

*Rev. Sci. Tech. Off. Int. Epiz.*, 2018, 37 (3), 949-960



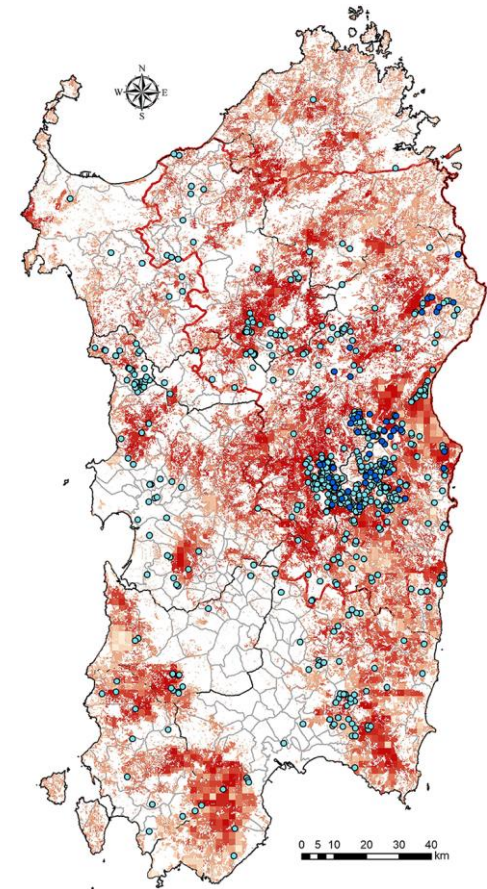
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# Risk question

- What is the risk of the introduction of ASFV through imported pig products from Italy into Thailand in 2015
- Entry, exposure and consequence assessments
- Identify high risk pathways and develop risk mitigation measures



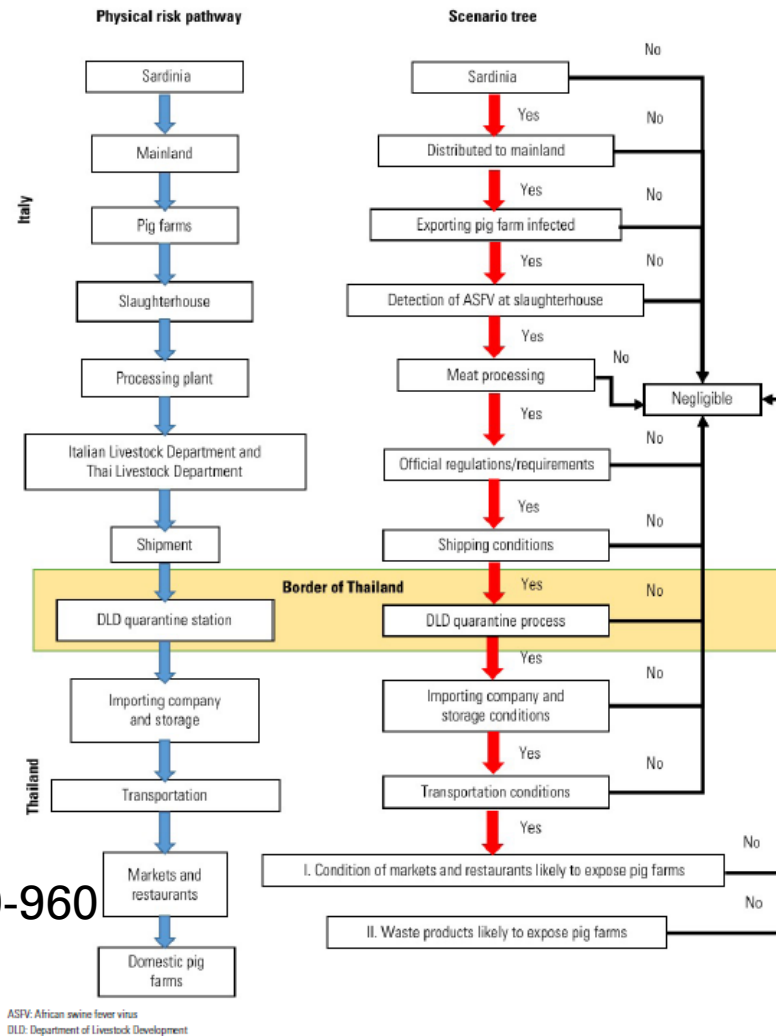
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# Risk pathway

*Rev. Sci. Tech. Off. Int. Epiz.*, 2018, 37 (3), 949-960



**Fig. 1**  
Physical risk pathway and scenario tree for introduction of African swine fever virus into Thailand by importation of pork products from Italy, 2015



# Risk Estimation

**Table V**

**Summary of levels of likelihood and uncertainty of each node in the physical risk pathway**

Nodes	Likelihood	Uncertainty
1. Island of Sardinia and Italian mainland	Very low	Low
2. Italian pig farms	Very low	Low
3. Italian slaughterhouses	Low	Low
4. Italian processing plants	Moderate	Moderate
5. Italian livestock department and DLD quarantine station	Very low	Low
6. Shipment	High	High
7. DLD quarantine station	High	Low
8. Importing company and storage	High	Moderate
9. Transportation	High	High
10.1. Market/restaurant to pig farms	Moderate	High
10.2. Waste products to domestic pig farms	Moderate	High

DLD: Department of Livestock Development

**Table VI**

**Levels of likelihood of release assessment, exposure assessment, introduction, consequence assessment and overall risk**

Pathway	Likelihood
Release assessment	Negligible
Exposure assessment	Moderate
Likelihood of introduction	Negligible
Consequence assessment	High
Overall risk	Negligible

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# Take home message...

- Risk assessment a component of risk analysis
  - Entry, exposure and consequence assessments
- Key steps include...
  - Value chain mapping
  - Scenario tree
  - Risk pathway mapping
  - Data needs
  - Risk estimation



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