Bureau of Animal and Plant Health Inspection and Quarantine, Chinese Taipei

FMD Situation

- Chinese Taipei consists of Taiwan, Penghu, Kinmen and Matsu islands, located in East Asia between the Pacific Ocean and the Taiwan Strait.
- According to the annual statistics report of 2017, there are 7,407 pig farms, holding 5,432,676 pigs; 1,916 cattle farms, holding 147,152 cattle; 1,886 goat farms, holding 144,733 goats and 595 deer farms, holding 18,851 deer.
- In Chinese Taipei, Foot and Mouth Disease (FMD) was first found in pigs on 19th March 1997. The virus (O/Taiwan/97 (Cathay Topotype)) is a pig-adapted strain that does not infect ruminants. Between 2002 and 2008, there were no FMD outbreaks in Chinese Taipei. In 2009, FMD reoccurred and the virus isolated had about 90% similarity to the virus isolated before 2001. On Taiwan island, the last case occurred in a pig farm located in Taichung City on 27th May 2013 .
- Except for the 2 cases of Type A FMD found in Kinmen County in May and June 2015, the remaining parts of Chinese Taipei have been free from FMD cases and the surveillance result shows that there has been no evidence of FMDV transmission for more than 3 years.
- During the 85th General Session of the World Assembly of OIE Delegates held in Paris in 2017, a zone covering Taiwan, Penghu and Matsu was officially recognized by the OIE as free from FMD with vaccination.
- During the 86th General Session of the World Assembly of OIE Delegates held in Paris in 2018, a zone covering Kinmen was officially recognized by the OIE as free from FMD with vaccination.
- FMD vaccination program in the zone covering Taiwan, Penghu and Matsu areas has ceased since 1st July 2018.

FMD Control Policy

Risk Assessment

Before cessation of vaccination, in the zone covering Taiwan, Penghu and Matsu:

1. **FMD vaccination rate in cloven-hoofed animals has exceeded 90% in the zone**
2. **FMD immunization coverage rate at farms has exceeded 80% in the zone**
3. **Test results of the environmental samples collected from pig auction markets and pig slaughterhouses as well as sentinel pig experiments all indicate that FMD virus has been eliminated from this zone**

Surveillance

Active surveillance

On-farm active surveillance:

- Clinical inspections
- Serological testing: 1,400 pig farms and 460 ruminant farms per year; 15 serum samples per farm based on epidemiological principle

The achievements in 2017

- **82.68% of tested pig farms reached geometric mean SN titer ≧ 16x**
- **89.7% of tested ruminant farms reached geometric mean SN titer ≧ 32x**

*Serum-neutralization (SN)

Auction market surveillance

- **Clinical inspections**
- **Serological testing for NSP antibody on a daily basis 1-2 animals per original farm around 40 thousands samples/year**

Passive surveillance

Clinically suspected cases are traced back to the original farm to conduct:

- movement restriction
- follow-up serological and virological sampling and testing

Other Prevention Measures

- Application of biosecurity principles at the farm level:

- On and off farm control
- Personal and vehicle biosecurity: Changing outer clothes and footwear when moving between different buildings, with the frequent use of disinfection baths and separate equipment
- Routine cleaning and disinfection
- Selective purchasing and quarantine
- Self monitoring and reporting suspected cases

.Application of vehicle control through disinfection of transporting vehicles and establishments at auction markets and slaughterhouses

.Awareness program and education for farmers and stakeholders

Case Control

.Movement restriction on the infected farms

.Culling of all animals on the infected farms

.Disposal of carcasses

.Vaccination on surrounding cloven-hoofed animal farms within 1 km radius area of the infected farms

.Surveillance on surrounding cloven-hoofed animal farms within 3 km radius area of the infected farms

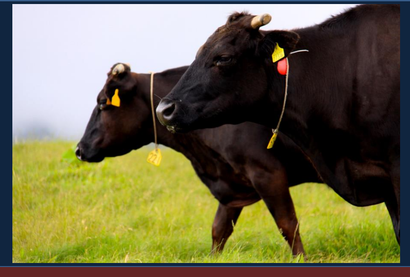
Achievements and Challenges

Achievements:

- No FMD cases have been detected since June 2013 in Taiwan, Penghu and Matsu islands
- No FMD cases have been detected since July 2015 in Kinmen islands
- If there will have been no cases of FMD in this zone for 12 months after the cessation of vaccination, and all other criteria listed in Article 8.8.2. of the Terrestrial Code are met, Chinese Taipei plans to submit an application in 2019 for OIE's official recognition of the zone covering Taiwan, Penghu and Matsu as a FMD free zone where vaccination is not practiced

Challenges:

- High density of livestock farms
- Low biosecurity level on family farms or small scale farms
- Frequent transportation of livestock between livestock auction markets and slaughterhouses
- Smuggling is highly risky



Ministry of Agriculture, Forestry and Fisheries of Japan

FMD SITUATION OF JAPAN

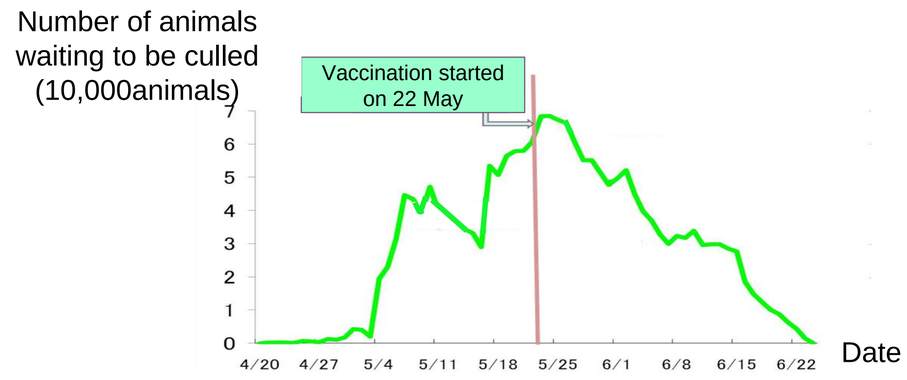
Past FMD Outbreaks in Japan

(From1908 to 2000 Japan was Free from FMD for 92 years)

Year	Prefecture	Type of livestock	Number of culled animals	Number of affected farms	Virus type
Mar-May 2000	Miyazaki, Hokkaido	Cattle	740	4	O type ME-SA
Apr-Jul 2010	Miyazaki	Cattle, pigs	210,714	292	O type SEA

FMD-free country without vaccination status regained on Feb 2011.

2010 FMD outbreak



CONTROL MEASURES

1. Preparedness
- National FMD control guidelines
- Awareness of farmers, related persons of industry, travelers
- Simulation exercises
- Vaccine stock for emergency use
- Nationnal stockpile (disinfectant, infection protective ware, equipment for culling, carrying vehicle etc.)

2. Prevention
- Impose strict biosecurity measures at farms
- Alerts on the outbreaks information
- Border protection and control (import inspection, quarantine)

3. Early response
- Monitoring disease outbreaks (active/passive surveillance)
- Early detection and reporting
- Compensation

4. Containment
- Culling of infected animals
- Disinfection of farms, contaminated materials and vehicles
- Movement restrictions
- Surveillance of farms around affected farms
- Financial support for implementation of the measures

SCIENTIFIC RESEARCH

- OIE Collaborating Centre for **Diagnosis and Control of Animal Diseases and Related Veterinary Product Assessment in Asia**
  - National Institute of Animal Health (NIAH) ,NARO/ National Veterinary Assay Laboratory
- Science and technology research promotion program for agriculture, forestry, fisheries and industry
  - Practical study of antigen detection and serotyping immunochromatography kit for foot-and-mouth disease virus (NIAH)

INTERNATIONAL COOPERATION

Cooperation through OIE
- Voluntary contribution to the improvement of Animal Health in East Asia and South-East Asia (SEA) countries
  - Projects for One Health, Veterinary Service (VS), Transboundary Animal Diseases (TADs) Control and Animal Health, etc
- Support for the activities of the OIE Headquarters
  - Since 1999, Japanese experts have been appointed to the OIE HQ

Cooperation with other countries
- OIE Laboratory Twinning on FMD with Mongolia (2016.1~)
  - ✓ Parent Lab: NIAH (Japan)
  - ✓ Candidate Lab: State Central Veterinary Laboratory (Mongolia)
- FMD Vaccine donation to Laos and Myanmar
- Tripartite Cooperation among China-R.O.Korea-Japan
  - MOU among China, Korea and Japan on response against TADs
  - Symposium on Prevention and Control of FMD in East Asia
  - Joint Communique on cooperation for effective border control
- Annual G7 CVO Forum (1st forum held in Japan in Nov 2016)
  - Dialogue on global challenges in the field of VS (TADs, food-borne diseases, AMR, biological threats)

CHALLENGES

- Difficulties in identifying source and route of infection
- Elevated introduction risk
- Ensuring the observance of biosecurity standards

FUTURES

Future activities for FMD control in East Asia and SEA countries
- Secure Biosecurity and Disease Prevention
  - ✓ continuous & steady efforts, awareness, appropriate vaccination
- Early detection and notification
  - ✓ legislative system
  - ✓ sufficient compensation with measures avoiding moral hazard
- Rapid and appropriate initial responses
  - ✓ culling, incineration / burying, disinfection, movement restrictions, testing
- International cooperation
  - ✓ International organizations, bi-, multilateral frameworks
  - ✓ research collaboration

New Zealand Ministry for Primary Industries

Foot-and-mouth preparedness

Evaluating the benefits of vaccination when used in combination with stamping-out measures against hypothetical introductions of FMD into NZ: a simulation study

AIMS: To evaluate the benefits of vaccination against simulated outbreaks of foot-and-mouth disease (FMD) in New Zealand, when applied as an additional measure to stamping-out.

METHODS: A simulation modelling approach was used. The study population comprised all known farms in New Zealand with FMD-susceptible livestock. Infection was seeded into three different areas of New Zealand. Transmission mechanisms included direct and indirect contacts, local spread and airborne spread. Efficacies of some of the stamping-out measures were varied. Vaccination strategies involved different start times, size and type of vaccination zone, and species vaccinated. Personnel resources for vaccination were varied as was the herd immunity profile following vaccination. Altogether, 336 models were specified, with 100 iterations conducted for each model. Generalised linear modelling and boosted regression trees were used to evaluate which variables had the biggest effect on the number of infected premises (IP), epidemic duration and area under control.

RESULTS: Vaccination, when used as an adjunct to the standard stamping-out programme, significantly reduced the outbreak size. Vaccination reduced the median number of IP by 26 (95% CI=18–35), epidemic duration by 16 (95% CI=13–19) days and area under control by 474 (95% CI=250–699) km^2 when there was no airborne spread, and when there was airborne spread the median reduction was 87 (95% CI=70–105) IP, 32 (95% CI=28–35) days and 898 (95% CI=665–1139) km^2, respectively. Multivariable analyses showed that starting vaccination 11 days after first detection of FMD produced greater benefits than starting 16 or 21 days after detection. Increasing vaccination zones resulted in increased benefits. Boosted regression tree analyses showed that the most influential variables on the outcome measures were interval to first detection, incursion location, whether there was airborne spread or not and herd immunity profile.

CONCLUSIONS AND CLINICAL RELEVANCE: This study showed that there are benefits to the use of vaccination in combination with a stamping-out policy for control of FMD outbreaks under New Zealand conditions. The optimal vaccination strategy was identified as being a 3–5 km radius suppressive vaccination zone deployed between 11–16 days after first detection. Vaccination had a greater benefit during larger outbreaks, such as when there was airborne transmission. The key factors which were identified from this study will help inform New Zealand's competent authority on how best to deploy vaccination to further strengthen its approach to FMD eradication should New Zealand ever experience an outbreak.

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Ministry for Primary Industries
Manatū Ahu Matua

24th SEACFMD Subcommission Meeting, 27-30 November 2018, Ho Chi Minh City, Vietnam

Risk assessment study for incursion of exotic FMDVs into South-East Asia

BACKGROUND

- At the 19th South East Asia and China Foot and Mouth Disease (SEACFMD) National Coordinators Meeting held in Bangkok, Thailand, on 17-19 August 2016, it was recognized that foot and mouth disease viruses (FMDV) of the lineages O/ME-SA/Ind2001 and A/Asia/G-VII potentially pose serious risks to SEACFMD Member Countries, including the Association of South East Asian Nations (ASEAN) member states (AMS). To help understand and mitigate these risks, it was recommended to conduct a formal Regional Risk Analysis study.

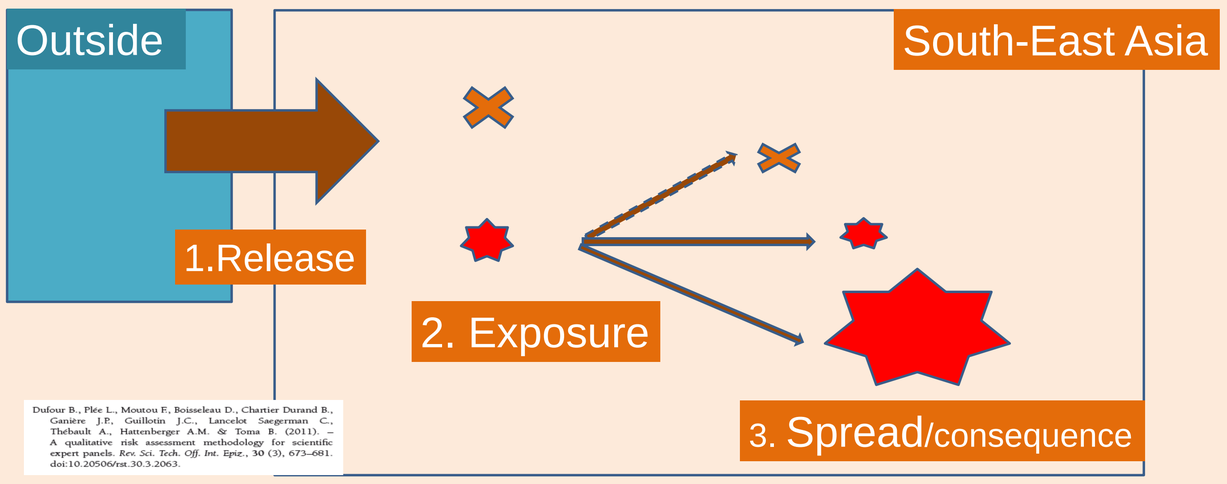
REASON

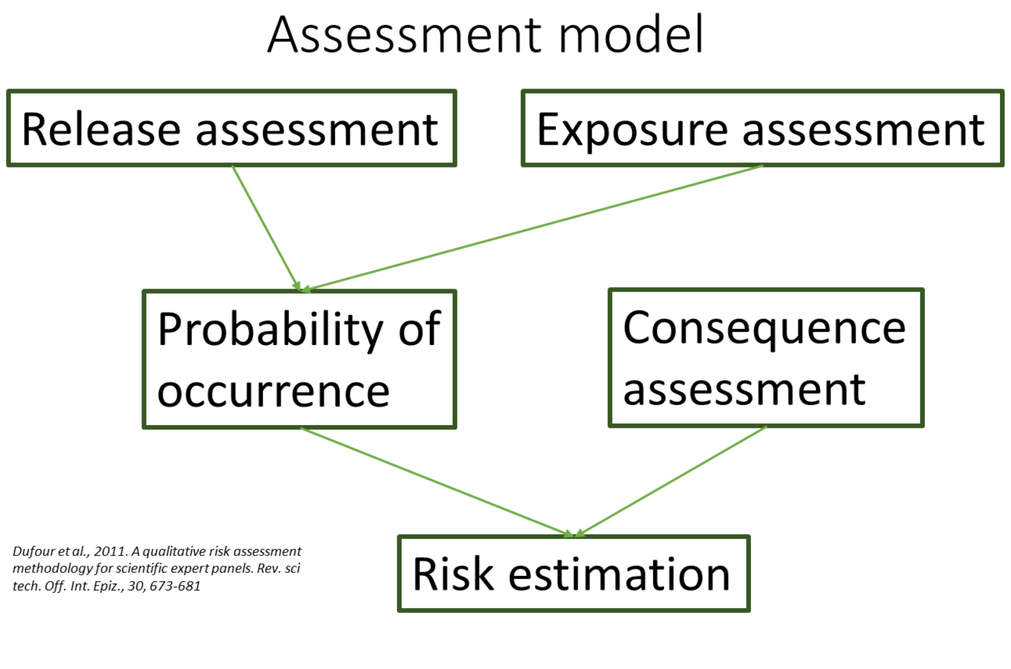
- SEACFMD meeting (2016) concluded it needed to understand and mitigate risks of incursion of exotic FMD viruses present in other FMD-endemic regions of the world.

METHODOLOGIES

Qualitative assessment

Risk assessment of incursions of exotic FMDV strains into SE Asia





Risk pathways

Import livestock legal
Import livestock informal
Import animal (by-)products legal
Import animal (by-)products informal
Wildlife
Communal grazing
Human movements
Feed/fodder
Vehicle
Genetic materials

Release through livestock and animal (by-)products

Table VIII. Overview of likelihood of release for each of ten risk pathways, assessment of level of uncertainty and additional notes

	Pathway	Likelihood	Uncertainty	Notes
R1	Legal import live animals	Moderate	Moderate	A small number of live animals are imported from FMD-endemic countries including: – China (Malaysia, Singapore, Indonesia) – Saudi Arabia (Thailand) – Pakistan (Malaysia) – South Korea (Cambodia) – India (Malaysia).
R2	Informal import of live animals	High	High	The main route is believed to be animals smuggled from India and Bangladesh to Myanmar, then to consumers in China and Thailand. Goats and pigs are being informally exported from China to Vietnam.
R3	Legal import of animal products and/or by-products	Moderate	Moderate	Animal product are imported from several FMD-endemic countries including Bahrain, China, Egypt, India, Iran, Israel, Pakistan, South Korea, Saudi Arabia, Sri Lanka, Tunisia and the United Arab Emirates. The largest importers are Malaysia, Philippines and Thailand.
R4	Informal import of animal products and/or by-products	High	High	Evidence from the field visits supported other evidence that there are informal imports of animal products into SEA; however, the origin of these imports was largely unknown. An exception was anecdotal evidence of informal imports from India to Malaysia.

RESULTS

Overall, the risk for exotic FMDV incursion into South-East Asia is high. The results conclude the risk of further incursion is not a matter of "when" but a matter of "if".

Release assessment

Exposure assessment

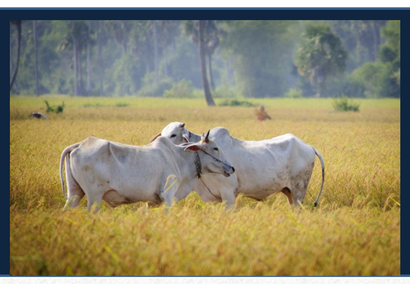
Probability of occurrence

Consequence assessment

Risk estimation

RECOMMENDATIOINS

Regional vaccine stock	Legalize livestock trade between countries and China	Private sector initiatives to increase vaccination coverage	Community Animal Health Workers (VAHWs, VVWs)
On the agenda for the region	Negotiations between China and Myanmar	**From project-based to market driven vaccination**	Vaccination, sampling and outbreak response
PRAGMATIST may be helpful • Disintegrate Pool • Vaccine coverage and risk-mapping	Negotiations between China and Lao PDR	Allow private sector to apply FMD vaccination	Surveillance (early detection, monthly reporting)
	Requirements for 'FMD free status'. Include vaccination and testing	Role of VS is to register and evaluate quality vaccine	Accreditation



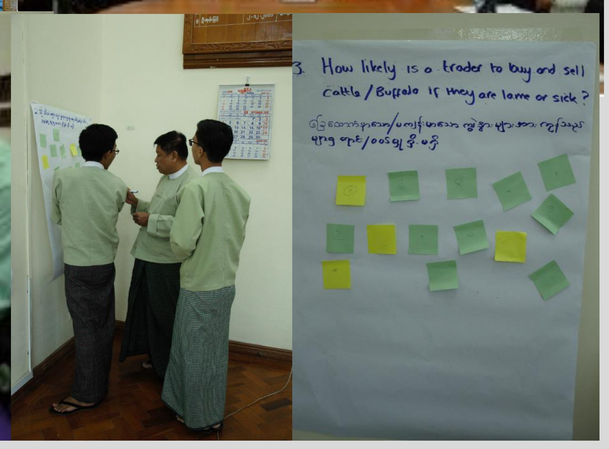
Risk assessment of transboundary spread of FMD from Myanmar and Laos into China through livestock movements

STUDY OBJECTIVES

- This risk assessment aims to examine the risk of FMDV introduction into China due to movement of FMD-susceptible livestock along the major trade routes
- The assessment considers risk mitigation measures along these pathways and the impact that these may have on the overall risk of FMDV introduction
- The assessment also takes into account the existence of unofficial animal movements and the impact that different measures may have on the proportion of animals moving unofficially vs those moving through official channels

METHODOLOGY

Dara Collection: Stakeholder meetings



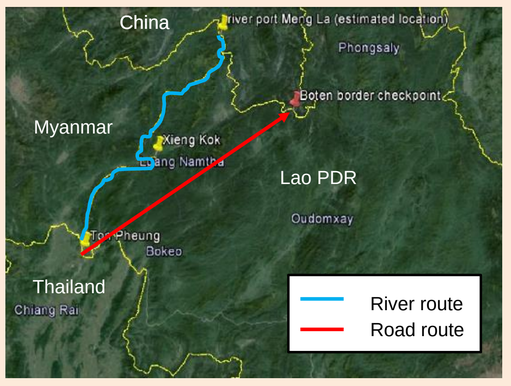
Dara Collection: Field trips

ANIMAL MOVEMENT PATHWAYS

Myanmar

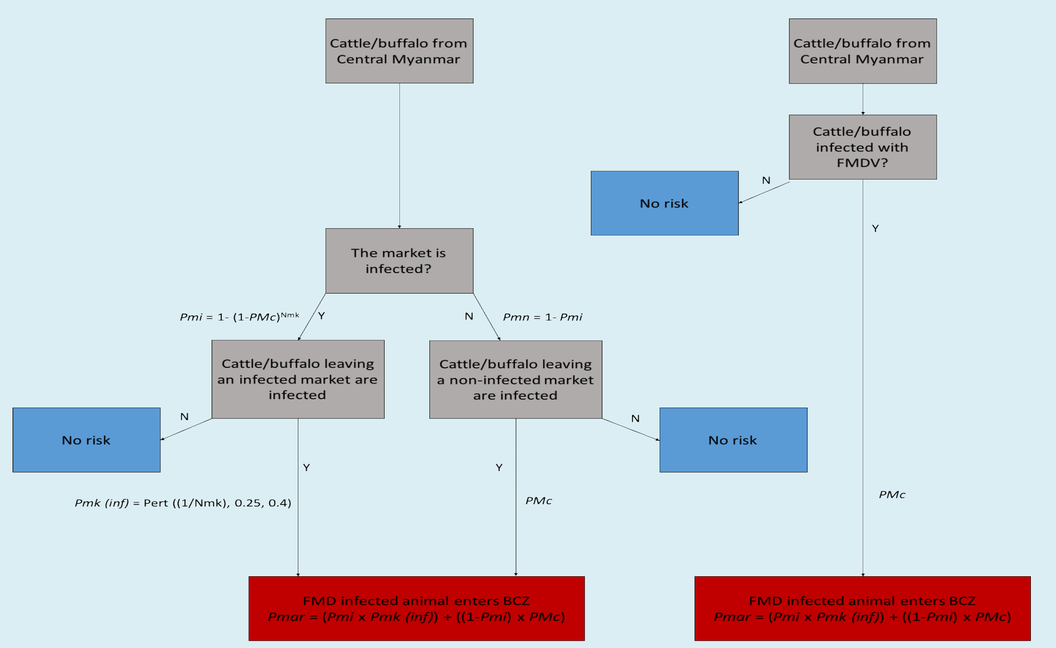
- ~ 6,000-18,000 cattle and buffaloes moved per month
- ~ 11,000 goats moved each month

Laos



~ 30,000 large ruminants and 10,000 pigs are moved per month

QUANTITATIVE RISK MODEL



Scenario 1: Livestock passing through a market/collection area en-route to BCZ

Scenario 2: Livestock passing directly from source to the BCZ without mixing with other livestock

An example of scenario trees for livestock passing through a market en-route to border control areas in Muse and for livestock travelling directly from their source in Central Myanmar to border control areas. These trees show the parameters used for calculation of the risk in each pathway.

RESULTS

Transboudary spread of FMD from Myanmar to China

- The probability that at least one FMDV infected cattle/buffalo or small ruminant will enter China each year is very high, with a mean probability of 0.99 (95% CI:0.92, 1) and 0.99 (95% CI: 0.86, 1), respectively.
- The probability that at least one infected pig will enter China is lower, with a mean probability of 0.59 (95% CI: 0.044, 1), which equates to a mean of one infected pig entering every 1.7 years, but according to the model, up to 9 infected pigs could enter China each year (based on the upper CI).

Transboudary spread of FMD from Laos to China

- The probability that at least one FMDV infected cattle/buffalo will enter China from Laos each year is high, with a mean probability of 0.997 (95% CI: 0.95, 1).
- The probability that at least one infected pig will enter the China each year is lower, with a mean probability of 0.34 (95% CI 0.016, 0.93).

CONCLUSION

- Cattle and buffalo movement represents the highest risk of FMDV incursions into the proposed control zones, followed by small ruminants and then pigs
- While the risk of FMDV infected pigs entering the control zones may be lower than other species, the consequences could be significant
- While little is known about the role of sheep and goats in the epidemiology of FMD in the region, the frequently mild or subclinical infection represents a specific risk for undetected spread of FMDV