Peste des Petits Ruminants (PPR) Preparedness Strategy (2023 – 2030)

Adopted at the 45th Meeting of AMAF
on 4 October 2023

one vision
one identity
one community

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967. The Member States of the Association are Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam.

The ASEAN Secretariat is based in Jakarta, Indonesia.

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List of abbreviations

ACCAHZ	ASEAN Coordination Centre for Animal Health and Zoonoses
ALDF	ASEAN Laboratory Directors' Forum
AMS	ASEAN Member States
APPS	ASEAN PPR Preparedness Strategy
ARAHIS	ASEAN Regional Animal Health Information System
ASEAN	Association of Southeast Asian Nations
ASWGL	ASEAN Strategic Plan of Action for Cooperation on Livestock
AusAID	Australian Aid
AVEG	ASEAN Veterinary Epidemiology Group
EID	emerging infectious disease
FAF	Food, Agriculture and Forestry
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and agriculture data
GEMP	Good emergency management practice
GF-TADs	Global Framework for the Progressive Control of Transboundary Animal Diseases
Lao PDR	Lao People's Democratic Republic
PMAT	PPR Monitoring and Assessment Tool
PPR	Peste des Petits Ruminants
PPR GCES	Global Strategy for the Control and Eradication of PPR
PPR GEP	PPR Global Eradication Programme
PPRV	Peste des Petits Ruminants Virus
PVE	Post-Vaccination Evaluation tool
PVS	Performance of Veterinary Services
RAG	Regional Advisory Group
RRL	Regional Reference Laboratory
SDG	UN Sustainable Development Goals
SOPs	Standard operating procedures
TADs	Transboundary animal diseases
TAHC	Terrestrial Animal Health Code
UK	United Kingdom
UN	United Nations
US	United States of America
VEU	Veterinary Epidemiology Units
WAHIS	World Animal Health Information System
WOAH	World Organisation for Animal Health

Background

Southeast Asia is an important region located in tropical and subtropical areas of Asia with a rich cultural heritage and a diverse landscape covering about 4.5 million km². The region has become a hub of economic growth and development in recent years and is expected to play an increasingly important role on the global stage in the 21st century. It is home to over 687 million people of diverse cultures, mainly relying on tourism, agriculture, fisheries and animal husbandry as a source of income and livelihood. Small ruminants are crucial to the region's rural economy, but they face several challenges, including decreasing land for grazing due to rapid urbanisation and the impact of endemic diseases and emerging transboundary animal diseases (TADs).

Peste des Petits Ruminants (PPR) is one of the most important TADs of small ruminants. Caused by the PPR virus (PPRV) belonging to the genus *Morbillivirus* and the family *Paramyxoviridae* (Bailey et al., 2005), PPRV has a single serogroup but four genetic lineages (I-IV) (Shaila et al., 1996). The disease is characterised by high fever, respiratory distress, diarrhoea and lesions in the oral mucous membranes (pneumo-enteritis syndrome). It is highly contagious and spreads mainly through direct contact with infected animals and contaminated feed, water, and fomites. It can lead to high mortalities in infected farms, particularly in naïve populations and younger animals. The incubation period is typically 4-6 days but can be as long as 21 days, and the virus can be shed from infected animals before the onset of clinical signs. Please refer to WOAH Technical Disease Card for further information (WOAH, 2020).

Although domestic small ruminants (sheep and goats) are the most important hosts of PPR, the virus can infect a wide range of other host species within the order Artiodactyla. PPRV infection of captive and free-ranging wildlife may result in severe outbreaks and mortality, threatening biodiversity. Camels may also develop clinical signs, while other domestic ruminants, like cattle and buffaloes, may become subclinically infected. However, the role of wild and atypical hosts in PPR epidemiology is poorly understood.

International organisations, including the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (WOAH), have taken several steps to prevent and control PPR and other TADs and emerging infectious diseases (EIDs). Learning from the lessons of rinderpest eradication, they have developed the PPR Global Control and Eradication Strategy (PPR GCES) with three components: (i) the eradication of PPR globally by 2030, (ii) the strengthening of Veterinary Services, which will generate an enabling environment for eradicating PPR and other priority diseases, and (iii) the coordinated control of other high-impact small ruminant diseases. While the Performance of Veterinary Services (PVS) Pathway, WOAH's programme for improving national Veterinary Services, is expected to support the evaluation of the capacity of national Veterinary Services, specific tools such as the PPR Monitoring and Assessment Tool (PMAT) and the Post-Vaccination Evaluation tool (PVE) have been developed to support countries in controlling and eradicating PPR in line with the PPR GCES.

Control and eradication of PPR are expected to improve food security and reduce poverty in the most vulnerable communities globally, besides helping to achieve the Sustainable Development Goals (SDGs). The disease is amenable to control and eradication due to the availability of highly effective live-attenuated vaccines generating lifelong immunity and diagnostic tests with high sensitivity and specificity and the absence of a carrier state. However, there are challenges for disease eradication and control because of patchy data on small ruminant population sizes, a lack of control over their movements, uncoordinated actions by neighbouring countries and poor infrastructure for vaccine transport and delivery in countries where it is endemic. Nevertheless, there is political will globally to eradicate the disease to alleviate the impact of the disease on smallholder livelihoods, food security and rural economies.

PPR had never been reported in Southeast Asia until recently. However, serological evidence has been detected in some countries, and an incursion was reported in Thailand in 2021 due to the importation of live-infected animals (WOAH, 2022). Further, the region is surrounded by three PPR-affected countries as of 2022 (Figures 1 and 2). Therefore, PPR remains a significant concern for the region because, if introduced, it can significantly impact small ruminant health and production and negatively impact farmers' livelihoods, the rural economy and food supply/security. Therefore, there is a need to coordinate and harmonise disease surveillance, awareness, prevention and control strategies at the regional level.
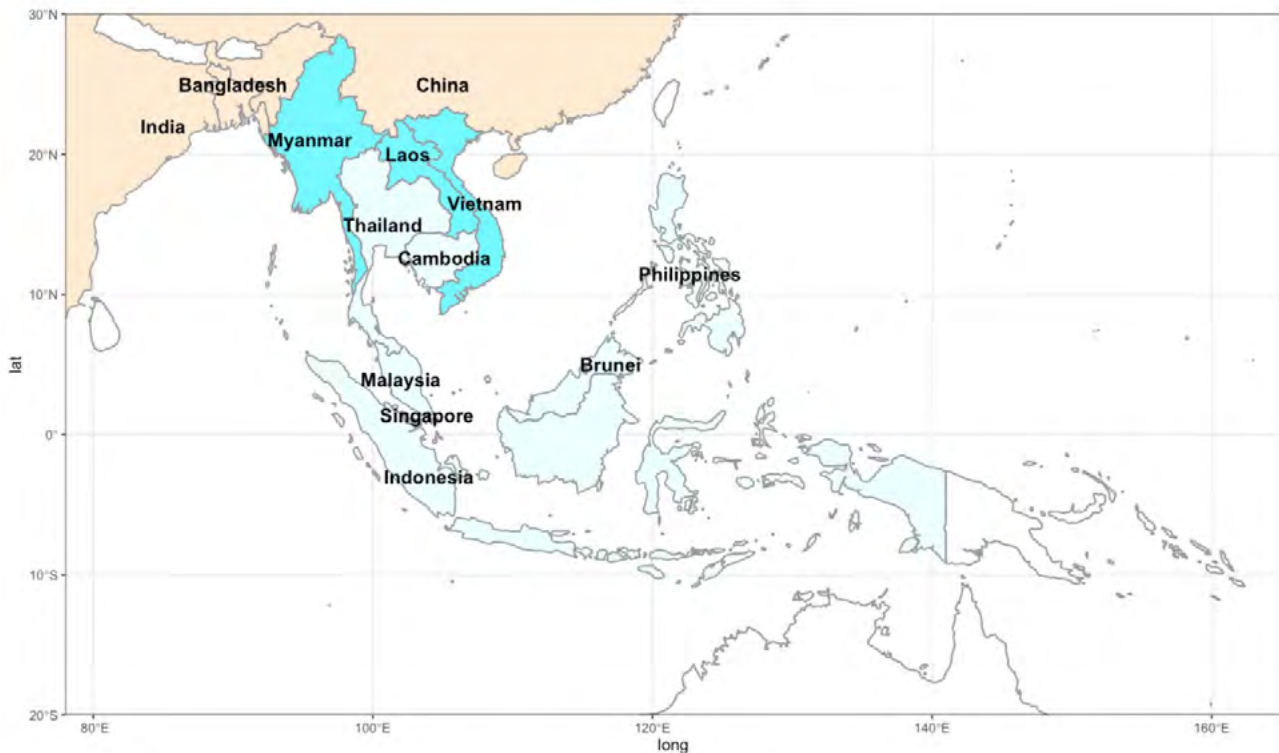
Figure 1. Neighbouring countries where PPR is present (Bangladesh, China and India) surround the countries in the ASEAN region and share borders with Myanmar, Lao PDR and Vietnam.

Countries	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bangladesh			2	2	2	2	2	2	2	2	2	2	2	2	2	2
China	0	0	1	2	0	1	0	0	1	2	2	2	2	2	1	2
India	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	

Figure 2. PPR status of Bangladesh, China, and India based on WOAH's World Animal Health Information System (WAHIS) information system data reported between 2005 and 2020 (WOAH-WAHIS, 2022). The cell numbers indicate the number of positive six-monthly reports each year.

The regional intergovernmental organisation, the Association of Southeast Asian Nations (ASEAN), is crucial in promoting economic growth and cooperation among its ten member states: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. Therefore, in accordance with the PPR GCES, the ASEAN Sectoral Working Group on Livestock (ASWGL) decided to develop a regional PPR Preparedness Strategy in its 2021 meeting to support ASEAN Member States to prevent PPRV incursions, rapidly detect and contain PPR outbreaks, and enhance coordination and information sharing in the ASEAN region.

The ASEAN PPR Preparedness Strategy (APPS) was prepared in consultation with a core group of experts. A draft outline was shared with the group and updated after their feedback. A draft strategy was then developed and a workshop was organised involving representatives of ASEAN Member States (AMS) and core group members to discuss and refine the objectives, outcomes and outputs of the strategy. Feedback from the workshop was integrated into preparing the next draft. Further revisions were made based on feedback from the core team, and the strategy was then shared with AMS for further feedback. An ASEAN PPR Consultative Meeting was organised in June 2023 involving core group members, AMS representatives and other stakeholders to receive final inputs and finalise the monitoring and evaluation (M&E) framework of the strategy.

APPS aligns with PPR GCES and incorporates the findings of the PPR risk assessment conducted in this project. APPS is expected to enhance early warning and early reaction to PPR incursions in the region, thus protecting the region from PPR outbreaks and enhancing the sustainability of the small ruminant sector in the region. Furthermore, since FAO and WOAH coordinate an ongoing global effort through the PPR secretariat to prioritize PPR eradication, APPS would guide coordinated efforts for PPR eradication and provide a mechanism for cooperation in the region towards global PPR eradication.

Rationale

Disease epidemiology

First reported in Côte d'Ivoire in 1942, PPR now occurs in about 70 countries in Africa, Asia, and the Middle East. Southeast Asia has been historically free from PPR except for a few reports (Figure 3). Serological evidence of PPR was reported in Vietnam in 2008 as a study detected five seropositive PPR cases (3 in goats, 1 in cattle and 1 in buffalo) and ten suspicious cases (3 in goats, 5 in cattle and 2 in buffalo) based on testing of 368 ruminant sera, but without the evidence of any clinical signs or mortality (Maillard et al., 2008). Later, 2.2% (23/1072) of the goat sera samples collected from five provinces in Laos were found to be positive (Burns et al., 2019).

PPR antibodies in Laos and Vietnam could indicate the exposure of animals to the virus. However, these findings should be interpreted with caution as they could also be false positive results due to the imperfect specificity of the diagnostic tests, cross-reactivity with other morbilliviruses, or arise from the importation of vaccinated or infected goats. Maillard

and colleagues also speculated that this could be due to the co-evolution of PPRV and host populations, leading to epidemiological equilibrium and reduced disease expression. The studies suggest that the small ruminant populations in these countries are naïve and thus at risk of contracting infection (Burns et al., 2019).

The first clinical disease outbreak in the region was reported in Thailand in 2021 in goats imported from Western Africa (WOAH, 2022), raising concerns about the risk of incursion of PPR via livestock trade. In addition, some ASEAN countries, such as Myanmar, Lao PDR and Vietnam, are neighbours of China, India and Bangladesh, which are endemic to PPR (Figures 1 and 2). Therefore, PPRV can also spread from neighbouring countries to Southeast Asia through legal or illegal movements of small ruminants. It is worth mentioning that Myanmar and Thailand were officially recognised as PPR-free countries previously, but their status was suspended in 2018 and 2019, respectively, due to non-compliance with the provisions of the *Terrestrial Animal Health Code* (WOAH, 2018, 2019).
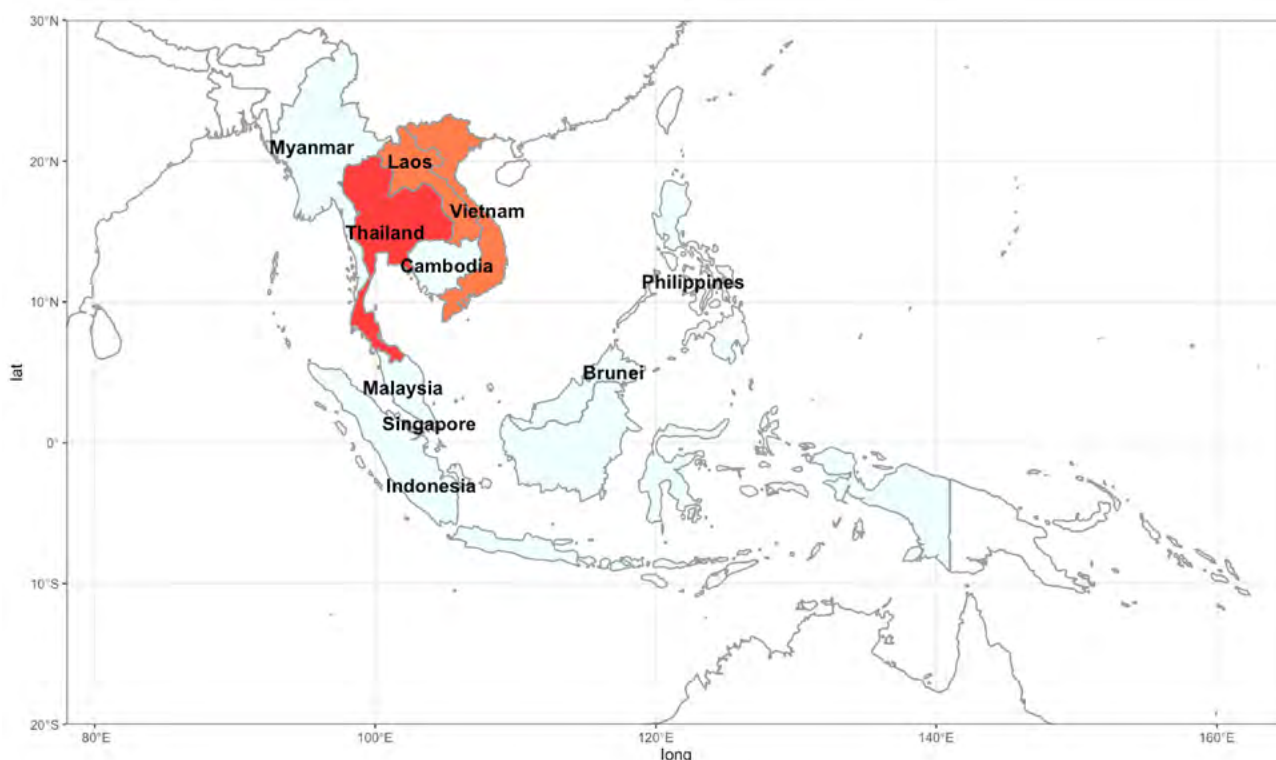

Figure 3. The ASEAN region has been historically free from PPR except for serological evidence of the disease in Laos and Vietnam and an outbreak in imported goats in Thailand.

Small ruminant production in Southeast Asia

Small ruminants are vital to Southeast Asia's economy and food security. They are suited to the region's landscape and climate and provide a valuable source of food and income. They require fewer resources and are relatively easier to care for, and thus, are suitable for smallholders.

Acknowledging missing data for some countries, analysis of FAOSTAT data indicates that the region's population of goats and sheep is over 28 million head and 17 million head, respectively (Table 1).

Table 1. Goat and sheep populations (head) in the countries of the Association of Southeast Asian Nations (ASEAN) in the year 2020 based on the data sourced from the FAO STAT database (FAO, 2022). Data from the last decade are summarised in Appendix 2. It is acknowledged that data from some countries are missing.

Country	Goat population (heads)	Sheep population (heads)
Brunei Darussalam	6110	4378
Indonesia	18689711	17523689
Lao PDR	682000	–
Malaysia	324355	124674
Myanmar	2145200	439400
Philippines	3813454	30000
Singapore	727	–
Thailand	477170	41914
Viet Nam	2654573	–
Total	**28793300**	**17523689**

Small ruminants are a valuable source of milk, meat, wool and manure. In just 2020, they produced over 130 thousand tonnes of goat meat, 58 thousand tonnes of sheep meat, 27 thousand tonnes of raw hides/skins of goats or kids and 12 thousand tonnes of raw hides/skins of sheep or lambs (Table 2). In addition, over 37 thousand tonnes of goat and 16 thousand tonnes of sheep milk were produced in Indonesia and Myanmar that year. These results suggest that small ruminants contribute substantially to the region's food security, rural economy and farmers' livelihoods.

Table 2. Goat and sheep meat (tonnes) and raw hides/skins of goats and sheep in the countries of the ASEAN region in the year 2020 based on the data sourced from the FAO STAT database (FAO, 2022). Data from the last decade are summarised in Appendix 2. It is acknowledged that data from some countries are missing.

Country	Goat meat (tonnes)	Sheep meat (tonnes)	Raw hides and skins of goats or kids (tonnes)	Raw hides and skins of sheep or lambs (tonnes)
Brunei Darussalam	30	29	18	6
Indonesia	61711	54188	13130	11529
Lao PDR	2699	-	589	–
Malaysia	1823	2094	594	523
Myanmar	9900	2000	1980	400
Philippines	31556	117	6825	26
Singapore	10	23	0	3
Thailand	1942	157	263	27
Viet Nam	21318	-	3600	–
Total	**130988**	**58607**	**27000**	**12513**

Socio-economic impact of PPR

PPR causes substantial economic losses in endemic countries. Jones and colleagues estimated that PPR causes over 37 million deaths (20.2 million to 67.7 million) in sheep and goats each year in the 65 infected countries globally, resulting in a median loss of USD 1.48 billion per annum (USD 794 million to USD 2.7 billion) (Jones et al., 2016). These losses become even more significant as they affect the world's poorest people, as most of the world's 2.1 billion sheep and goat populations are reared by impoverished communities. Other impacts of PPR include biodiversity loss, such as the impacts on free-ranging saiga antelopes that lost 80% of their population in a PPR outbreak in 2016-17 in Mongolia.

Jones and colleagues estimated that PPR eradication would have a high benefit-cost ratio of 33.8 (18.5 to 60) and an internal rate of return of 199% (104% to 219%) (Jones et al., 2016) as they estimated the

15-year programme could generate discounted benefits of US$76.5 billion, with discounted costs of US$2.26 billion in the most likely scenario. Sensitivity analyses further indicated that investment in PPR eradication would be economically beneficial under all scenarios. However, the benefit estimates are likely conservative as they do not include the avoided cost of reduced milk production, weight loss and abortion due to PPR infection or the downstream impact of these losses (Jones et al., 2016). Thus, there is a strong case for implementing measures to eradicate PPR.

PPR is expected to have a significant economic impact if established in the ASEAN region. Assuming the population of sheep and goats in the ASEAN region to be 46 million based on the available data on the FAO STAT website (Table 1) and assuming a median annual mortality rate of 2.6% per year as used in the Jones model, the ASEAN region could have 1.2 million (0.65 to 2.18 million) deaths of sheep and goats each year if PPR establishes in the region. Further, making an extrapolation of the value of the animal from the model proposed by Jones and colleagues, the estimated losses due to mortality alone in the ASEAN region would be over USD 47 million per year (USD 26 to 86 million). However, it is likely an underestimate as mortality in the naïve populations of the ASEAN region is expected to be much higher than that in endemic countries, and as the value of an animal now is higher than when it was estimated.

The results suggest that PPR incursion and possible subsequent establishment would have a substantial socio-economic impact in the region, particularly on the vulnerable, impoverished communities rearing small ruminants. Therefore, efforts should be made to prevent the incursion of the disease into the region.

Guidelines
and recommendations
underpinning APPS

Guidelines and recommendations underpinning APPS

FAO, WOAH and their partners have developed several guidance documents to help prevent, detect and control TADs and PPR. This section summarises recommendations from these guidelines that underpin APPS.

Global generic guidelines

Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs)

FAO and WOAH jointly developed the GF-TADs Framework in 2004 to prevent, detect and contain TADs. The Framework emphasises strengthening collaboration and cooperation between various governments, regional and international organisations, and other stakeholders to control TADs. GF-TADs has three components: (a) prevention - focuses on preventing the introduction and spread of TADs, (b) preparedness - aims to develop the capacity of Veterinary Services to detect TADs promptly, and (c) response - focuses on rapid response to TAD incursions and outbreaks.

GF-TADs have contributed to better control of several TADs, such as foot and mouth disease, African swine fever and PPR, and have helped to develop Members' capacity to deal with these diseases. The GF-TADs Global Secretariat works under the supervision of the GF-TADs Management Committee and the leadership of the GF-TADs Global Steering Committee. GF-TADs contributes to several UN SDGs, including SDG 1 – No poverty, SDG 2 – Zero hunger, SDG 10 – Reduced inequalities, SDG 12 – Responsible consumption and production, and SDG 17 – Global partnerships for sustainable development.

APPS is aligned with the overall goal of the GF-TADs Strategy to improve food security and nutrition, reduce poverty and enhance safe trade in livestock and their products.

GF-TADs Strategy for 2021–2025

The first GF-TADs Global Five-Year Action Plan was developed for 2013 – 2017. The current GF-TADs Strategy for 2021–2025 aims to further strengthen the control of TADs and has three objectives: (a) establish strategies for priority TADs at the regional and subregional level, (b) develop capacities to prevent and control TADs, and (c) improve the sustainability of priority TAD strategies through multi-disciplinary partnerships.

APPS was prepared following the recommendation of the GF-TADs Strategy to formulate regional and sub-regional TAD control strategies, identify capacity gaps and build capacity, strengthen engagement and coordination with relevant stakeholders, and promote sustainable funding mechanisms.

FAO's Good emergency management practice (GEMP)

The FAO's GEMP provides guidance about preparing for animal health emergencies from infectious diseases and other threats, including natural disasters and non-infectious agents. Reinforcing the involvement of all stakeholders in emergency management using the One Health approach, GEMP recommends implementing five types of emergency management actions: prepare, prevent, detect, respond, and recover during four phases of an animal health event: peacetime, alert, emergency, and reconstruction.

The 'prepare' action refers to steps taken before an emergency to prevent, detect, respond to, and recover from, that emergency, whereas the 'prevent' is about actions to avoid, preclude or mitigate the impact of an event. The 'detect' action is about identifying an incursion, emergence, or re-emergence of a disease, but it also includes actions to estimate disease prevalence or demonstrate freedom from the disease. The 'respond' action refers to measures to contain and eradicate the disease or mitigate its effects rapidly, and the 'recover' action aims to restore production and livelihoods.

FAO's Manual for the Management of Operations during an Animal Health Emergency complements the GEMP guide. It provides guidelines for countries and other organisations to prepare for and manage operations during an animal health emergency. Preparedness recommendations from GEMP and the Manual are directly relevant to APPS.

WOAH's standards, guidelines and tools

WOAH Tool for the Evaluation of Performance of Veterinary Services (PVS) provides a thorough, benchmarked methodology for the consistent, comprehensive evaluation of Veterinary Services.

WOAH PVS Tool is aligned with the WOAH standards, particularly the quality standards for Veterinary Services defined in Chapter 3.2 of the Terrestrial Animal Health Code (TAHC). WOAH offers its Members new opportunities presented by PVS Pathway evolution and gives them the option to supplement PVS Evaluation and Evaluation Follow-Up missions with specific content on PPR.

WOAH has developed guidelines for simulation exercises to strengthen the capacity of Veterinary Services for preparedness against all hazards that affect animal health and welfare, and veterinary public health. These guidelines encourage Veterinary Services to collaborate with other agencies and stakeholders in emergency preparedness planning and response.

WOAH is piloting an Emergency Preparedness and Response tool in South-East Asia, which is similar to the PVS methodology to support countries to establish a baseline and assess the preparedness and response capabilities of Veterinary Services to provide a foundation for advocacy and systems improvement.

WOAH has developed SOPs for its Members wishing to apply for official recognition of animal health status and for the endorsement of official control programmes. In addition, SOPs are available for reconfirmation of disease status or an endorsed control programme, for suspension, recovery or withdrawal of officially recognised animal health status and withdrawal of the endorsement of official control programmes, and for the establishment of a protection zone in a country or zone having an officially recognised animal health status.

WOAH has also established a reference laboratory network for PPR to build partnerships between the WOAH Reference Laboratories and national reference laboratories to support the PPR GCES in preventing, detecting and controlling PPR. In addition, WOAH has set up a PPR vaccine bank to ensure the procurement of high-quality vaccines and their delivery in a timely manner.

Global PPR control guidelines

Global Strategy for the Control and Eradication of PPR (PPR GCES)

PPR is one of the priority diseases under GF-TADs. The PPR GCES was developed in 2015 based on the GF-TADs recommendations and has three components: (a) PPR control and eradication, (b) strengthening veterinary services, and (c) improving the prevention and control of other major diseases of small ruminants.

At the national level, the strategy consists of four stages with decreasing epidemiological risk and increasing control capabilities. Each stage has minimum entry requirements, epidemiological assessments, and specific objectives and outcomes for five technical elements (PPR diagnosis; surveillance, prevention and control systems; legal framework; and stakeholder involvement).

At the regional level, this strategy focuses on enhancing regional coordination, harmonising national strategies and activities, and developing solid partnerships and networks. At the global level, the strategy focuses on the GF-TAD governing bodies.

Successful implementation of the strategy is expected to strengthen global food security, boost the rural economy, and improve smallholder livelihoods.

PPR Global Eradication Programme (PPR GEP I): 2017 – 2021

This first 5-year programme was developed to implement the Global Strategy for the Control and Eradication of PPR. Building on the partnerships established under the Global Rinderpest Eradication Programme, this programme aims to reduce PPR prevalence in PPR-positive countries and build the capacity to demonstrate disease freedom and achieve the official WOAH recognition of PPR-free status in PPR-negative countries.

The Programme has four components: (a) Promote an enabling environment and reinforce veterinary capacities for the five critical elements of the PPR prevention and control strategy, (b) Support the diagnostic and surveillance systems to better understand the presence or the absence of PPR in a country or region, (c) Support PPR eradication including vaccination, improved biosecurity, animal identification, movement control, quarantine and stamping out, and (d) Coordinate and manage to establish effective global, regional and national coordination. Implementing these components is also expected to reduce the prevalence of other prioritised small ruminant diseases.

PPR Global Eradication Programme II & III (Blueprint)

FAO, WOAH and their partners reviewed PPR GEP I and developed a plan for the next phase of the programme to eradicate PPR globally by 2030. The first 5-year programme identified the constraint of access

to preventive animal health services to achieve PPR vaccination rates required to control and eradicate PPR. Therefore, the updated programme aims to enhance access of all stakeholders to livestock and livestock product markets and animal health value chain markets and improve the coordination and delivery of animal health programmes.

The action plan intends to stop virus circulation through an episystems-led approach, enhanced coordination, strengthened PPR epidemic risk management capability, increased access to animal health services, and achieve freedom from PPR. Following the GF-TADs Strategy for 2021–2025, the updated programme focuses on (a) prioritisation to ensure a clear emphasis on PPR in national strategies, (b) capacity development by supporting regional and national players in implementing PPR control measures and monitoring progress, and (c) partnering, by strengthening stakeholder engagements and public-private-community partnerships. It is expected that a coordinated programme can help control and eradicate PPR and support human livelihoods and food security.

ASEAN guidelines

Strategic Plan for ASEAN Cooperation in Food, Agriculture and Forestry (2016-2025)

Food, Agriculture and Forestry (FAF) is a critical sector in ASEAN countries as it is a significant source of income and employment as the livelihoods of over 40% of the ASEAN population rely on this sector. The Strategic Plan for ASEAN Cooperation in FAF presents a vision for the sector, identifies priorities for cooperation and coordination, and proposes strategic activities.

The Strategic plan's vision is to develop a robust and resilient FAF sector that contributes to the food and nutrition security in the region. The priority areas of the strategic plan include enhancing production, facilitating trade, ensuring food security, increasing resilience to climate change and strengthening collaboration on international issues. About 50 working groups have been established to implement activities for this strategy to coordinate activities in the livestock sector.

ASEAN Strategic Plan of Action for Cooperation on Livestock (ASWGL): 2021-2025

An ASEAN Strategic Plan of Action for Cooperation on Livestock (2021-2025) was developed following the vision and strategies of the Strategic Plan for ASEAN Cooperation in FAF and the original Strategic Plan of Action for Cooperation on Livestock (2016-

2020). This plan aims to achieve sustainable livestock production and trade for poverty alleviation, food security and improved nutrition in the region.

The plan's objectives include implementing disease control and food safety measures to expand trade and protect human health. The activities include increasing veterinary epidemiology capacity, strengthening emergency preparedness and response, and strengthening the veterinary laboratory capacity network. A key thrust area of the plan is to support smallholders for poverty alleviation, improved nutrition, food security and gender equality.

ASEAN Strategy for Exotic, Emerging, Re-emerging Diseases and Animal Health Emergencies

This strategy was developed in 2021 to strengthen animal health emergency preparedness to ensure the ASEAN region can prevent, detect, and respond to animal health emergencies effectively and efficiently. It aims to strengthen response capacity by improving animal health systems, regional coordination, and performance.

The strategy has six objectives: (a) Strengthen effective preparedness for emerging animal disease and zoonosis emergencies, (b) Reduce the risk of introducing emerging animal disease and zoonosis emergencies, (c) Strengthen early detection and assessment of outbreaks and animal health and zoonosis emergencies, (d) Strengthen rapid and appropriate response to and recovery from emerging animal diseases and zoonosis emergencies, (e) Build strategic partnerships and sustainable financing for animal health preparedness and response, and (f) Strengthen disease prevention through livestock and animal health treatment.

Risk Assessment for the Introduction of PPR into the ASEAN Region

Before developing APPS, a qualitative risk analysis was conducted to understand the likelihood of PPR introduction in the ASEAN Member States via legal and illegal trade of live sheep and goats and their products. The findings indicate that the ASEAN region faces a risk of introducing PPR through the trade of small ruminants and their products and via cross-border illegal animal movement from the neighbouring countries. However, most risks are manageable by changing the country of origin and the source of small ruminants and their products, requiring the presentation of an international veterinary certificate along with the imported animals/products confirming compliance with WOAH standards, and strengthening border quarantine and

veterinary and laboratory facilities. APPS follows the risk management strategies outlined in the risk assessment report that are expected to reduce the risk of PPR incursion and strengthen the capacity of Member States to tackle other transboundary diseases while continuing the desired trade in small ruminants and their products.

It is worth mentioning here that there could also be risks due to transboundary movement of PPR-infected wildlife though the epidemiology of PPR in wildlife is not clear, and further information is required about PPR susceptible species in the region, their geographical range, their movement patterns and overlap of their distribution with the domestic small ruminant distribution.

Guiding Principles

APPS was developed based on the following guiding principles, broadly aligned with the global guidelines and recommendations discussed above.

Proactive

APPS is proactive rather than reactive, focusing on preventing incursion and ensuring early detection of PPR. Although it is comprehensive and covers all aspects of PPR control, the focus is undoubtedly on prevention and detection, given that PPR has never been reported in most countries in the region. This approach is more cost-effective than trying to control the disease once it is established.

Risk-based

APPS was developed after a risk assessment of the introduction of PPR into the ASEAN region. Countries adopting this strategy should consider the findings of their national-level risk assessments for the likelihood and potential impact of PPR introduction before making policy and implementation decisions.

Evidence-based

APPS has been developed by considering the scientific evidence and the lessons learnt from the rinderpest eradication programme and other control programmes implemented in various countries. However, it may have to be updated based on new research and development findings. The strategy encourages new research on poorly understood aspects of PPR epidemiology, including the role of wildlife in the spread of the disease.

Participatory

APPS is multi-stakeholder and multi-disciplinary that encourages collaboration and coordination among different sectors, such as animal health, agriculture, wildlife and the environment. Therefore, the committees and groups established to coordinate the strategy should have representation from multiple sectors.

Engaging stakeholders in implementing the recommendations is a cornerstone of the strategy. Establishing public-private partnerships involving farmers, traders, consumers, and animal health and food safety professionals is critical in adapting APPS to the country's needs and decision-making. In addition, political support and effective communication with stakeholders will be crucial for successfully implementing the strategy.

Humans make decisions based on various social, economic, and behavioural factors. Even an outstanding strategy and control programme can only deliver the outcomes if there is buy-in and ownership of the program and if implemented appropriately. Therefore, it is important to consider human behaviour while implementing the strategy. Social scientists and psychologists could be involved in understanding the drivers and barriers to implementing the recommendations and developing practical audience-focused communication tools.

Sustainable

APPS was designed to be sustainable to ensure the long-term benefits of its implementation. Therefore, a key recommendation was made to identify sustainable sources of funding. Importantly, the resources used in strengthening systems and workforces will have benefits beyond PPR control and eradication to help tackle other TADs and EIDs.

The Strategy

The Strategy

Vision

The ASEAN Member States are officially recognised as PPR-free by WOAH and maintain PPR freedom.

Goal

To strengthen capacity in the ASEAN region to prepare, prevent, detect, respond to, and recover from *outbreaks of PPR and other priority small ruminant diseases.*

The achievement of the goal will be indicated by:

- the absence of incursion of PPR in the region,

- the prompt detection and containment of a future PPR outbreak, and

- the achievement and maintenance of the official recognition of Members' PPR-free status.

APPS aspires to achieve this goal by 2030, in accordance with the global eradication program. Achieving this goal will improve food and nutrition security, enhance economic development and safer trade, and improve farmer livelihoods. In addition, it will also reduce the occurrence of other infectious and high-impacting diseases and strengthen collaboration and coordination among ASEAN Member States.

Objectives

1. **To establish effective coordination and collaboration framework with harmonised legal and regulatory framework, improved stakeholder engagement and an agreed funding mechanism**

2. **To enhance the capability of the animal health systems in the ASEAN region to prevent, detect, and contain outbreaks of PPR and other priority small ruminant diseases.**

3. **To strengthen the capacity of the veterinary and laboratory workforce in the ASEAN region for early warning and rapid response to PPR and other priority small ruminant disease outbreaks.**

Theory of change

Outcome 1. **The ASEAN region has enhanced coordination, legal and regulatory frameworks and resources for PPR early warning and rapid response.**

Output 1.1. *Enhanced coordination among ASEAN Member States (AMS).*

Enhanced coordination of PPR preparedness activities is critical to achieving the goal of the strategy. This aspect of APPS aligns with the PPR GCES that recommends regional coordination of activities, strengthening partnerships between international and regional organisations, and establishing regional networks.

The ASEAN Coordinating Centre for Animal Health and Zoonoses (ACCAHZ) is being set up as the regional technical arm of ASEAN. The ASEAN Laboratory Directors Forum (ALDF), ASEAN Veterinary Epidemiology Group (AVEG), and ASEAN Communication Group for Livestock (ACGL) will be subsumed in ACCAHZ once it is fully functional. Therefore, ACCAHZ should be further strengthened and given the responsibility to coordinate, implement and monitor APPS.

ACCAHZ should work closely with the FAO, WOAH, the PPR Secretariat, the GF-TADs Global Secretariat and the Regional Steering Committee of GF-TADs for Asia and the Pacific and sub-regional GF-TADs to implement the strategy. ACCAHZ should provide an annual update on the achievements, challenges and successes of the strategy at their regular annual meetings or in conjunction with meetings of other established programs and update the strategy based on the new scientific information.

ASWGL has already nominated Thailand and Indonesia as the ASEAN Lead Countries for PPR to lead ASEAN PPR activities. The role of Lead Countries is similar to Regional Leading Epidemiology Centre envisaged in PPR GCES. In addition, ASWGL could consider establishing a Regional Advisory Group (RAG) to oversee the implementation of APPS in the ASEAN region as envisaged in PPR Monitoring and Assessment Tool (PMAT). It should be chaired by a Chief Veterinary Officer (CVO) and include

Theory of Change - ASEAN PPR Preparedness Strategy

Vision

The ASEAN Member States are officially recognised as PPR-free by WOAH and maintain PPR freedom

Goal

To strengthen capacity in the ASEAN region to prepare, prevent, detect, respond to, and recover from outbreaks of PPR and other priority small ruminant diseases.

- Absence of incursion of PPR in the region*
- Prompt detection and containment of a future PPR outbreaks*
- Achievement and maintenance of the official recognition of Members' PPR-free status*

* The achievement of the goal will be indicated by meeting the three criteria.

Problem statement

PPR remains a significant concern for the ASEAN region because, if introduced, it can significantly impact small ruminant health and production and negatively impact farmers' livelihoods, the rural economy and food security.

Objectives

Objective 1

Establish effective coordination and cooperation framework for PPR preparedness (early warning and rapid response)

Objective 2

Improve capability of ASEAN Member States to prepare and respond to PPR

Objective 3

Strengthen capacity of veterinary workforce for early warning and rapid response

Outputs

1.1 Enhanced coordination among AMS

1.2 Enhanced communication and stakeholder engagement

1.3 A sustainable funding mechanism

1.4 A harmonised legal and regulatory framework

2.1 Strengthened surveillance systems in AMS

2.2 Strengthened laboratory diagnostic systems in AMS

2.3 Strengthened pre-border, border and post-border biosecurity.

2.4 Official WOAH recognition of PPR-free status by 2030

3.1 The capacity of the veterinary workforce in the ASEAN region evaluated.

3.2 Training materials sourced and developed to strengthen workforce capacity.

3.3 Training programmes delivered to strengthen workforce capacity.

Outcomes

Outcome 1

The ASEAN region has enhanced coordination, legal and regulatory frameworks and resources for PPR early warning and rapid response

Outcome 2

The ASEAN region has enhanced capacity for early detection and rapid response to PPR incursions and other priority small ruminant diseases.

Outcome 3

The animal health workforce in the ASEAN region has enhanced capabilities for risk assessment, surveillance, PPR detection and emergency response

representatives from laboratory and epidemiology networks.

AT the country level, each AMS should nominate a National PPR coordinator to implement and coordinate PPR preparedness activities in their respective countries under the guidance of the Chief Veterinary Officer.

Output 1.2. *Enhanced communication and stakeholder engagement.*

PPR preparedness will benefit immensely from engaging with a range of stakeholders, including the private sector. A robust stakeholder engagement strategy will strengthen multi-partner collaborations and help build or strengthen networks at the regional level for tackling PPR and other priority small ruminant diseases. This will also enhance stakeholders' capability to advocate for PPR preparedness and help to get buy-in from governments and funding bodies to implement APPS.

The stakeholder mapping should be done by AMS in their country and ACCAHZ at the regional level to identify stakeholders involved in PPR prevention, detection, and response, assess stakeholder interests, requirements, and concerns, and develop and implement a stakeholder engagement plan, including developing communication materials on PPR tailored to the needs of the identified stakeholders. The key stakeholders should be engaged in decision-making regarding PPR preparedness to increase their trust and buy-in.

Stakeholders could be from a range of agencies and industry bodies. Stakeholders from the public sector have an essential role to play in PPR preparedness and could be from the agricultural ministries, veterinary authorities, biosecurity agencies, border control and other law enforcement agencies etc. Private sector stakeholders could be representatives of small ruminant farmers, farmer associations, traders, transporters, and other industry bodies. It would also be essential to liaise with international and regional agencies interested in preventing and controlling PPR and other small ruminant diseases.

Output 1.3. *A sustainable funding mechanism.*

Establishing a sustainable funding mechanism is crucial for implementing APPS as funds are required to strengthen capacities for early warning and prompt response to PPR outbreaks. AMS should identify funding requirements for PPR preparedness and response and recognise potential funding sources, including international and regional organisations, donors, governments, and private entities. These sources could be approached to identify their interest in providing funding, but it is worth noting that funding support from the national government is vital for preparedness. Therefore, it is important that PPR funding is documented in official national-level funding plans.

At the regional level, RAG/ACCAHZ should guide AMS in developing their national funding plans for PPR preparedness and help harmonise funding plans across member states. They should establish an emergency solidarity fund at the ASEAN level and develop mechanisms to release these funds. RAG/ACCAHZ should also advocate for PPR preparedness funding to animal health policymakers and other stakeholders.

Output 1.4. *A harmonised legal and regulatory framework.*

PPR GCES recommends harmonising the legal framework to control PPR at the regional level. Although PPR is not currently present in the region, it is essential to have a robust legal and regulatory framework to tackle any disease incursions, initiate response and implement containment procedures.

To achieve this, AMS should **review the legislation** related to animal disease control in their country and identify gaps in enforcing PPR preparedness and response procedures. They could seek support from WOAH's Veterinary Legislation Support Programme in reviewing legislation and consult Chapter 3.4 of the WOAH Terrestrial Animal Code.

RAG/ ACCAHZ should support the development of a **harmonised legal framework** outlining the roles and responsibilities of various stakeholders in PPR preparedness and response. In particular, they should help develop a consensus on actions for the cross-border movement of small ruminants and illegal trade, harmonise certification requirements for importing small ruminants into the region, and compensation plans for farmers if there is a need to implement depopulation or the test-and-cull approach.

RAG/ ACCAHZ should also coordinate the development of a **harmonised regulatory framework**, including guidelines, protocols, and standards for implementing their legal framework. They could also develop a coordinated enforcement mechanism to ensure compliance with the legal and regulatory framework. However, variations in legal structures across the region should be considered, and national sovereignty should be respected.

Outcome 2. **The ASEAN region has enhanced capacity for early detection and rapid response to PPR incursions and other priority small ruminant diseases.**

Output 2.1. *Strengthened surveillance systems in AMS.*

Effective animal disease preparedness requires efficient surveillance systems to detect outbreaks early, track their spread, and inform the appropriate response. A sound PPR surveillance system would ensure the prompt detection and reporting of pneumo-enteritis syndrome in small ruminants by efficient and timely data collection, analysis, and reporting. The surveillance system should be interoperable to ensure data sharing with other countries and stakeholders while maintaining confidentiality to ensure continued farmer participation and trust.

WOAH members are required to share information with WOAH via WAHIS through immediate notifications and six-monthly and annual reports. In addition, the ASEAN Regional Animal Health Information System (ARAHIS) has been developed for AMS to share animal health information among the AMS. Surveillance systems in AMS should strive to report any outbreak of PPR to WAHIS and ARAHIS within 24 hours. ACCAHZ/RAG should work closely with Veterinary Epidemiology Units (VEUs) in AMS to evaluate and strengthen their surveillance systems to achieve this. They could use PMAT and seek technical support and advice from the PPR Secretariat, the GF-TADs Global Secretariat and the Regional Steering Committee of GF-TADs for Asia and the Pacific and sub-regional GF-TADs.

ACCAHZ/RAG should also organise an annual epidemiology meeting involving VEUs and other relevant stakeholders in conjunction with meetings of other TADs. They should also organise training in epidemiology, disease investigation, surveillance and data analysis for VEUs to strengthen national mechanisms for notification of PPR and other priority small ruminant disease outbreaks

Output 2.2. *Strengthened laboratory diagnostic systems in AMS.*

Laboratory networks are critical in disease preparedness, enabling early detection, diagnosis, and response to emerging TADs. Therefore, developing and strengthening laboratory networks should be a key priority for animal health policymakers to ensure that the laboratories have robust PPR testing capabilities.

To enhance laboratory capacity and coordination in AMS for PPR, ASWGL should nominate one of the national laboratories as the ASEAN PPR Reference Laboratory (APRL) with specific terms of reference as recommended in PPR GCES. APRL should serve as a regional laboratory coordinator and help strengthen capacity to diagnose PPR in the region. The APRL should work with National Laboratories involved in PPR diagnosis to identify gaps in their PPR diagnostic capacity, organise regional training for laboratory techniques and quality assurance, and provide reference diagnostics to national laboratories as needed. The APRL should also be responsible for organising proficiency testing for PPR at least biennially to ensure the accuracy and reliability of national PPR laboratory results. APRL could also support national laboratories in achieving accreditation from external agencies. AMS should work with APRL and ALDF to strengthen their national laboratories so that they have the capacity to test samples for PPR and provide reliable results.

Additionally, APRL should organise annual meetings of representatives from national laboratories and other relevant stakeholders to encourage information sharing and strengthen the laboratory networks (in conjunction with meetings of other TADs). The capacity-building activities could be conducted in conjunction with the annual meetings.

Output 2.3. *Strengthened pre-border, border and post-border biosecurity.*

All three components of biosecurity need to be strengthened to prevent the incursion of PPR into the region and contain the spread of the disease.

Pre-border biosecurity would involve evaluating the risk of introducing PPR with the trade of animals and animal products. AMS should review their import policies and conduct risk assessments following the ASEAN PPR Risk Assessment approach for importing small ruminants and their products from PPR-affected countries and regions. They should establish national risk management strategies to minimise the risk of introducing PPR by imposing conditions on the import of live animals, such as pre-quarantine, the presentation of an international veterinary certificate, the testing of animals, etc., in accordance with the WOAH standards. They should also develop a communication program to communicate risk assessment findings and risk management strategies to stakeholders, including traders, importers, exporters, and trader partners.

Strengthening **border biosecurity** would help minimise the risk of PPR entering the country. AMS should strengthen national border inspection

procedures to prevent and detect the introduction of PPR-positive animals and their products. AMS should also increase awareness among the public, farmers, traders, transporters, and other stakeholders about the risk of PPR introduction with animals and their products, disease signs and actions to take if PPR is suspected. At the regional level, ACCAHZ/RAG should develop regional quarantine protocols to detect infected animals during quarantine. It should also enhance collaboration and coordination among ASEAN nations and neighbouring countries for sharing information about PPR and other priority small ruminant diseases.

Post-border biosecurity would involve developing emergency preparedness strategies, strengthening coordination and collaboration among various agencies and increasing education and awareness. AMS could conduct a census of farmers to enhance traceability and strengthen farm biosecurity to prevent disease between farms. They should develop and implement biosecurity plans to prevent the entry and spread of PPR and other TADs between farms and across the value chain. Farmers should be educated about farm biosecurity and the signs of PPR and other TADs for early detection and reporting. AMS should develop procedures for cleaning and disinfection of the equipment and sheds and train farmers to implement the procedures.

AMS should develop **national contingency response and preparedness plans**. They should develop SOPs outlining measures to tackle a suspected outbreak of PPR and work with ACCAHZ/RAG to develop harmonised protocols to control PPR outbreaks in the region and to develop national public awareness and communication strategies to inform key stakeholders and the public about the response measures. AMS should ensure the availability of resources, including equipment, funding and trained personnel required for disease response in AMS. They should define the chain of command, lines of communication and coordination mechanisms for PPR emergency response and establish a monitoring mechanism to evaluate the effectiveness of response measures.

ACCAHZ/RAG should coordinate **research** to better understand the risk of PPR introduction, spread and establishment in the region (including the epidemiology of PPR in wild animals), the socio-economic impact of PPR establishment, and the environmental stability of infectious PPRV under various conditions to facilitate risk-based trading. This information should feed into updating contingency plans and APPS. The regional risk assessment should be regularly updated based on new information generated.

Output 2.4. *Official WOAH recognition of PPR-free status by 2030.*

Given that PPR has not been reported from most of the ASEAN countries, APPS focuses on strengthening the region's capacity to prevent PPR introduction and rapidly contain outbreaks if the disease is introduced. In addition, the countries in the region should make efforts to achieve the official WOAH recognition of PPR-free status by 2030 in line with the PPR GEP to strengthen their disease-free status.

ACCAHZ/RAG should collaborate with WOAH to train AMS professionals in demonstrating disease freedom. AMS should ensure that their surveillance system meets WOAH standards, collate and generate evidence to prove freedom from PPR and notify WOAH of the intention to seek recognition of official PPR freedom. AMS should develop and submit applications to WOAH for the official recognition of PPR-free status, demonstrating compliance with WOAH guidelines in Chapter 1.6 of the Terrestrial Code, detailing procedures for self-declaration and official recognition.

Requirements to declare a country or a zone free from infection are outlined in Point 2a of Article 1.4.6 in Chapter 1.4 of the Terrestrial Code: (i) the infection or infestation has been a notifiable disease, (ii) an early warning system has been in place for all relevant species, (iii) measures to prevent the introduction of the infection or infestation have been in place: in particular, the importations or movements of commodities into the country or zone have been carried out in accordance with the relevant chapters of the Terrestrial Code; and (iv) the infection or infestation is not known to be established in wildlife within the country or zone.

In addition, disease surveillance should comply with the provisions of Chapter 14.7 of the WOAH Terrestrial Code. Detailed surveillance strategies for PPR are described in Article 14.7.29. Additional surveillance requirements for countries applying for the recognition of PPR-free status are outlined in Article 14.7.31 of Chapter 14.7 of the WOAH Terrestrial Code. Article 14.7.3 of the Code outlines that a country or zone may be considered PPR-free when the above provisions are complied with and when it can be demonstrated that there have been no cases of PPRV in the past two years, the Veterinary Authority conducts appropriate surveillance, measures to prevent the introduction of PPR are implemented, and no vaccinations against PPR are being carried out or vaccinated animals introduced since the cessation of vaccination in line with Article 14.7.3. of WOAH Terrestrial Code. Additional rules are described in this Chapter for retention on the

disease-free list that requires annual reconfirmation of compliance with the above requirements.

Outcome 3. **The veterinary workforce in the ASEAN region has enhanced capabilities for risk assessment, surveillance, PPR detection and emergency response.**

Output 3.1. *The capacity of the animal health workforce in the ASEAN region evaluated.*

The capacity of the veterinary workforce to prevent, detect and contain infectious disease threats should be evaluated to understand the current status and identify the gaps. However, before conducting new evaluations, it would be important to review the existing capacity and needs assessment evaluation reports of the ASEAN member countries conducted by FAO, WOAH and other agencies, including the national PVS reports.

FAO and WOAH can provide tools and resources for needs and capacity evaluation if evaluations have not been conducted in the past or if the evaluation reports are dated. These tools can be used to assess the performance of veterinary services, surveillance systems, laboratory capacity, emergency preparedness and response capacity, gaps in legislation, etc.

ACCAHZ/RAG should work with FAO and WOAH to identify gaps in AMS capacity to prevent PPRV incursion, tackle PPR outbreaks, and identify priorities for capacity development. The evaluation process should enable countries to determine the competencies required to fill the capacity gaps to prevent, detect and contain PPR and other TADs.

Output 3.2. *Training materials sourced and developed to strengthen workforce capacity.*

FAO, WOAH and other regional and international agencies have developed several training and capacity development materials. Before creating new resources, it is recommended to conduct a landscape analysis of the existing training programmes to identify available training materials and adapt them to the region's context after obtaining authorisation from the copyright owner. Training materials developed in various ASEAN countries could also be reviewed, refined and used in other countries in the region. New customised need-based training materials can be developed to achieve the identified competencies if the resources already developed are insufficient to accomplish the competencies identified for PPR preparedness. These training resources could be organised into modules, each containing learning outcomes, learning activities, assessment tasks and module evaluation surveys.

Output 3.3. *Training programmes delivered to strengthen workforce capacity.*

ACCAHZ/RAG should deliver capacity development programs in early detection and rapid response to PPR and other priority small ruminant diseases. They could work with National PPR Coordinators to provide training modules via suitable training approaches, such as eLearning, workshops, field visits, hands-on exercises, simulation exercises or laboratory exercises, as appropriate, depending on the competency, budget availability and the target audience. Paraveterinarians have a significant role in the early detection of PPR cases. Therefore, they should also be trained in outbreak investigation and diagnosing PPR. The training should have an inbuilt component to assess the achievement of learning outcomes and obtain feedback for making improvements. Training materials should be updated based on feedback received from the trainees.

Monitoring and evaluation

Monitoring and evaluation

The monitoring and evaluation framework for the strategy has been developed to provide guidance to monitor the efficiency and effectiveness in the implementation of the strategy.. Briefly, the framework includes the success indicators for all of the outcomes and outputs of the strategy, their means of verification and the assumptions made. The framework also includes values for baseline levels for each indicator (for 2023) and the mid-term and final targets (for 2026 and 2030, respectively). The values of baseline indicators are included if available or could be obtained by a survey of AMS if existing data are unavailable. Similarly, targets to assess the progress in 2026 (Mid term review) and 2030 (final target) should be set at the country and regional level in consultation with the AMS. The framework can be refined over time as the strategy is implemented and more information about PPR preparedness and response capacity in different countries becomes available. The M&E Logical framework for ASEAN PPR Preparedness Strategy is provided in Appendix 3.

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Appendix 1:
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Appendix 2:

Small ruminant production in the ASEAN region

Table 2. Goat populations in Southeast Asia (heads) in the last decade based on the analysis of the FAO STAT data (FAO, 2022).

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Brunei Darussalam	6101	6850	6950	6769	7283	8770	7589	6162	5851	6110
Indonesia	16946186	17905862	18500322	18639533	19012794	17847197	18208017	18306476	18463115	18689711
Lao PDR	430900	443799	470000	481000	533000	560000	588000	616325	647000	682000
Malaysia	476431	462510	435000	429439	431651	416529	385304	359200	312571	324355
Myanmar	3851919	4486000	4964542	5615439	6324762	7289158	8447700	1973820	2059989	2145200
Philippines	3881500	3715228	3694025	3695627	3674186	3663060	3710348	3724808	3755879	3813454
Singapore	670	670	670	670	696	686	687	702	716	727
Thailand	427567	461814	420354	447546	447869	450276	457843	458250	466822	477170
Viet Nam	1267800	1343642	1394608	1600275	1992656	2021003	2556268	2683942	2609198	2654573
Total	**27289074**	**28826375**	**29886471**	**30916298**	**32424897**	**32256679**	**34361756**	**28129685**	**28321141**	**28793300**

Table 3. Sheep populations in Southeast Asia (heads) in the last decade based on the analysis of the FAO STAT data (FAO, 2022)!?".

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Brunei Darussalam	4000	4000	4000	4000	4135	4080	4155	4172	4281	4378
Indonesia	11790612	13420439	14925898	16091838	17024685	15716667	17142498	17611392	17833732	17523689
Malaysia	126412	131923	141918	143138	147033	138479	130658	128298	121677	124674
Myanmar	854383	884000	1016461	1162318	1321424	1496476	1314300	404300	421900	439400
Philippines	30000	30000	30000	30000	30000	30000	30000	30000	30000	30000
Thailand	51735	54221	42040	43901	43153	41972	42461	42472	42132	41914
Total	**12857142**	**14524583**	**16160317**	**17475195**	**18570430**	**17427674**	**18664072**	**18220634**	**18453722**	**18164055**

Table 4. Goat meat (fresh or chilled) produced in Southeast Asia (tonnes) in the last decade based on the analysis of the FAO STAT data (FAO, 2022).

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Brunei Darussalam	32	37	36	33	28	24	11	16	18	30
Indonesia	66345	65216	65169	65142	64948	67845	70354	70155	72852	61711
Lao PDR	1666	1708	1806	1897	2141	2186	2298	2419	2550	2699
Malaysia	2269	3649	3259	2995	2930	3192	2368	2554	2171	1823
Myanmar	46766	52199	58472	66445	77000	79418	81410	9200	9500	9900
Philippines	55619	54257	54569	55323	56705	49047	41324	33859	33598	31556
Singapore	11	12	12	12	11	10	9	10	10	10
Thailand	1575	1815	1845	1833	1745	1766	1792	1905	1911	1942
Viet Nam	8055	8070	8070	10089	12820	13155	16431	18850	20990	21318
Total	**182338**	**186963**	**193238**	**203769**	**218328**	**216643**	**215997**	**138967**	**143598**	**130988**

Table 5. Sheep meat (fresh or chilled) produced in Southeast Asia (tonnes) in the last decade based on the analysis of the FAO STAT data (FAO, 2022).

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Brunei Darussalam	26	19	18	22	24	25	25	27	28	29
Indonesia	46793	44357	41487	43612	44525	45912	55112	82274	70073	54188
Malaysia	823	1157	1430	1551	1477	1799	2032	1880	2029	2094
Myanmar	7515	7662	7967	9670	11589	12360	11874	1880	1950	2000
Philippines	117	117	117	117	117	117	117	117	117	117
Singapore	27	27	27	27	23	19	15	23	23	23
Thailand	70	161	317	136	163	170	191	160	159	157
Grand Total	**55371**	**53499**	**51363**	**55135**	**57918**	**60401**	**69366**	**86360**	**74378**	**58607**

Table 6. Raw hides and skins of goats or kids produced in Southeast Asia (tonnes) in the last decade based on the analysis of the FAO STAT data (FAO, 2022).

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Brunei Darussalam	19	22	22	20	17	15	7	10	11	18
Indonesia	14116	13876	13866	13860	13819	14435	14969	14927	15500	13130
Lao PDR	363	373	394	414	467	477	501	528	556	589
Malaysia	740	1190	1063	977	955	1041	772	833	708	594
Myanmar	9353	10440	11694	13289	15400	15884	16282	1840	1900	1980
Philippines	12029	11735	11802	11965	12264	10608	8937	7323	7266	6825
Singapore	1	1	1	1	1	0	0	0	0	0
Thailand	214	246	250	248	236	239	243	258	259	263
Viet Nam	1360	1363	1363	1704	2165	2222	2775	3183	3545	3600
Total	**38195**	**39244**	**40454**	**42478**	**45324**	**44920**	**44487**	**28902**	**29746**	**27000**

Table 7. Raw hides and skins of sheep or lambs produced in Southeast Asia (tonnes) in the last decade based on the analysis of the FAO STAT data (FAO, 2022).

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Brunei Darussalam	5	4	4	4	5	5	5	5	5	6
Indonesia	9956	9438	8827	9279	9473	9769	11726	17505	14909	11529
Malaysia	206	289	358	388	369	450	508	470	507	523
Myanmar	1503	1532	1593	1934	2318	2472	2375	376	390	400
Philippines	26	26	26	26	26	26	26	26	26	26
Singapore	3	3	3	3	3	2	2	3	3	3
Thailand	12	27	54	23	28	29	32	27	27	27
Total	**11711**	**11319**	**10864**	**11657**	**12221**	**12752**	**14673**	**18412**	**15867**	**12513**

Table 8. Raw milk of goats produced in Southeast Asia (tonnes) in the last decade based on the analysis of the FAO STAT data (FAO, 2022).

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Indonesia	353270	353916	354761	363310	368589	352791	357585	359140	361482	364766
Myanmar	13049	14222	15063	16151	17276	18719	20091	9000	9220	9434
Total	**366319**	**368138**	**369824**	**379461**	**385865**	**371510**	**377676**	**368140**	**370702**	**374200**

Table 9. Raw milk of sheep produced in Southeast Asia (tonnes) in the last decade based on the analysis of the FAO STAT data (FAO, 2022).

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Indonesia	120329	120677	121245	155155	161101	152920	161222	164167	165606	163827
Myanmar	3300	3361	3618	3884	4157	4439	4111	2241	2292	2341
Total	**123628**	**124038**	**124863**	**159039**	**165258**	**157359**	**165334**	**166408**	**167898**	**166169**

Appendix 3
Monitoring and Evaluation Framework for the ASEAN PPR Preparedness Strategy

Desired result	Success indicator	Baseline 2023	Targets 2026	2030	Means of verification	Assumptions
Goal. To strengthen capacity in the ASEAN region to prepare, prevent, detect, respond to, and recover from outbreaks of PPR and other priority small ruminant diseases.	• Number of AMS achieving WOAH recognition of PPR-free status. • Number of AMS maintaining WOAH PPR-free status.	2 AMS have WOAH PPR-free status (Philippines and Singapore)			• WAHIS six-monthly reports. • Dossier for the official recognition of PPR-free status. • AMS annual reconfirmation reports.	• AMS are committed to maintaining and achieving the official PPR-free status. • ASWGL, SOM-AMAF and AMAF endorse APPS.
Outcome 1. The ASEAN region has enhanced coordination, legal and regulatory frameworks and resources for PPR early warning and rapid response.	Agencies such as ACCAHZ nominated to coordinate PPR preparedness and response activities in the ASEAN region.	0			• Terms of reference for the agency to coordinate PPR preparedness in the region.	• Sufficient goodwill, collaboration and coordination among AMS. • ACCAHZ agrees to take up PPR coordination roles in the region, gets endorsed by ASEAN and is fully functional. • Funding commitment from AMS and donors to implement APPS activities. • Stakeholders are interested in engaging in PPR preparedness activities. • Commitment by all AMS to implement APPS.
Output 1.1. Enhanced coordination among AMS.	• Number of AMS who nominated National PPR Coordinator to coordinate PPR preparedness activities. • Number of PPR preparedness and response initiatives implemented annually through regional coordination and cooperation.	? 3 (PPR training, Risk assessment workshop and PPR preparedness strategy workshop)			• Funding and human resources allocated by AMS for National PPR Committees • Annual reports and activity reports about APPS implementation. • Survey and interviews.	
Output 1.2. Enhanced communication and stakeholder engagement.	• Number of AMS conducting stakeholder mapping for PPR preparedness and response and other important small ruminant diseases. • Number of public-private-partnership events organised in the region per annum focussed on PPR preparedness and response and other priority small ruminant diseases.	0 0			• Stakeholder mapping and engagement reports. • Survey and interviews. • Agendas of stakeholder engagement events.	
Output 1.3. A sustainable funding mechanism.	• Number of AMS committing funds to implement APPS. • Number of AMS receiving financial support from donors and global / regional agencies to implement APPS	0 0			• Funds allocated by the AMS for PPR preparedness and response. • Funds secured by the National PPR Committees from AMS and development partners to implement APPS. • Survey and interviews.	
Output 1.4. A harmonised legal and regulatory framework	The number of AMS for which legal and regulatory frameworks related to PPR and other and other priority small ruminant diseases have been reviewed and harmonised.	0			• A report of the review of existing legislations and regulations related to PPR and other TADs in AMS. • Approvals for harmonised legal and regulatory frameworks in AMS. • Survey and interviews.	

Desired result	Success indicator	Baseline 2023	Targets 2026	Targets 2030	Means of verification	Assumptions
Outcome 2. The ASEAN region has enhanced capacity for early detection and rapid response to PPR incursions and other priority small ruminant diseases.	• Number of AMS with functional national PPR contingency and preparedness plans endorsed by their governments.	0			National PPR contingency and preparedness plans.	• AMS make funding and human resources available to implement APPS. • An AMS is willing to support the nomination of their laboratory as Reference Laboratory for PPR. • AMS surveillance systems are capable of generating evidence for disease freedom. • Human resources in AMS are capable of complying with the relevant provisions of the Terrestrial Code.
Output 2.1. Strengthened surveillance systems in AMS.	• Proportion of notifications of PPR and other priority small ruminant diseases to WAHIS and ARAHIS within 24 hours of their confirmation. • Number of AMS submitting six monthly and annual reports on time. • Number of samples submitted and tested for PPR.	To be estimated from WAHIS reports submitted by countries experiencing PPR outbreaks. To be obtained from WAHIS.			• ARAHIS reports • WAHIS reports • WOAH situation reports • Survey and interviews.	
Output 2.2. Strengthened laboratory diagnostic systems in AMS	• Designated a laboratory as the ASEAN Reference Laboratory for PPR. • Number of AMS capable of diagnosing PPR with molecular tests.	0 Baseline data to be obtained via a survey of AMS.			• Terms of reference for the designated Reference Laboratory for PPR. • Agendas of the capacity building programs.	
Output 2.3. Strengthened pre-border, border and post-border biosecurity	• Number of AMS conducting national PPR risk assessments and developing risk management strategies. • Number of AMS with border inspection procedures harmonised.	0 ?			• National PPR risk assessment reports. • AMS border inspection procedures.	
Output 2.4. Official WOAH recognition of PPR-free status by 2030	• Number of AMS applying for WOAH recognition of PPR-free status.	?			• Dossier for recognition of PPR-free status • WOAH WAHIS reports. • WOAH certificates of disease freedom.	

Desired result	Success indicator	Baseline 2023	Targets 2026	2030	Means of verification	Assumptions
Outcome 3. The veterinary workforce in the ASEAN region has enhanced capabilities for risk assessment, surveillance, PPR detection and emergency response.	Number of veterinary personnel trained in PPR preparedness and response disaggregated by country. Number of staff working on PPR.	Baseline data to be obtained from AMS via a survey.			PVS and FAO evaluation reports. PPR Preparedness and response training reports.	AMS are committed to strengthening their veterinary workforce. Support from international and regional organisations is available. Experts are available to conduct capacity development activities. Funds are available to organise training activities.
Output 3.1. The capacity of the animal health workforce in the ASEAN region evaluated.	Number of AMS conducted PVS, EMT, LMT, PMAT or other capacity evaluations of national veterinary services.	Baseline data to be obtained from AMS via a survey.			Recent evaluation reports. Landscape analysis report of existing training programs.	
Output 3.2. Training materials sourced and developed to strengthen workforce capacity.	Number of training modules developed for PPR preparedness and response in the ASEAN region.	1 (A PPR training module was developed by WOAH SRR-SEA in 2022 to train AMS).			Training modules development reports. Training modules.	
Output 3.3. Training programmes delivered to strengthen workforce capacity.	Number of training activities/ workshops organised annually. Number of candidates trained in PPR detection and emergency response	Baseline data to be obtained from AMS via a survey. Baseline data to be obtained from AMS via a survey.			Training programs and assessment reports Training evaluation reports. Post-completion qualitative interviews and surveys.	

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