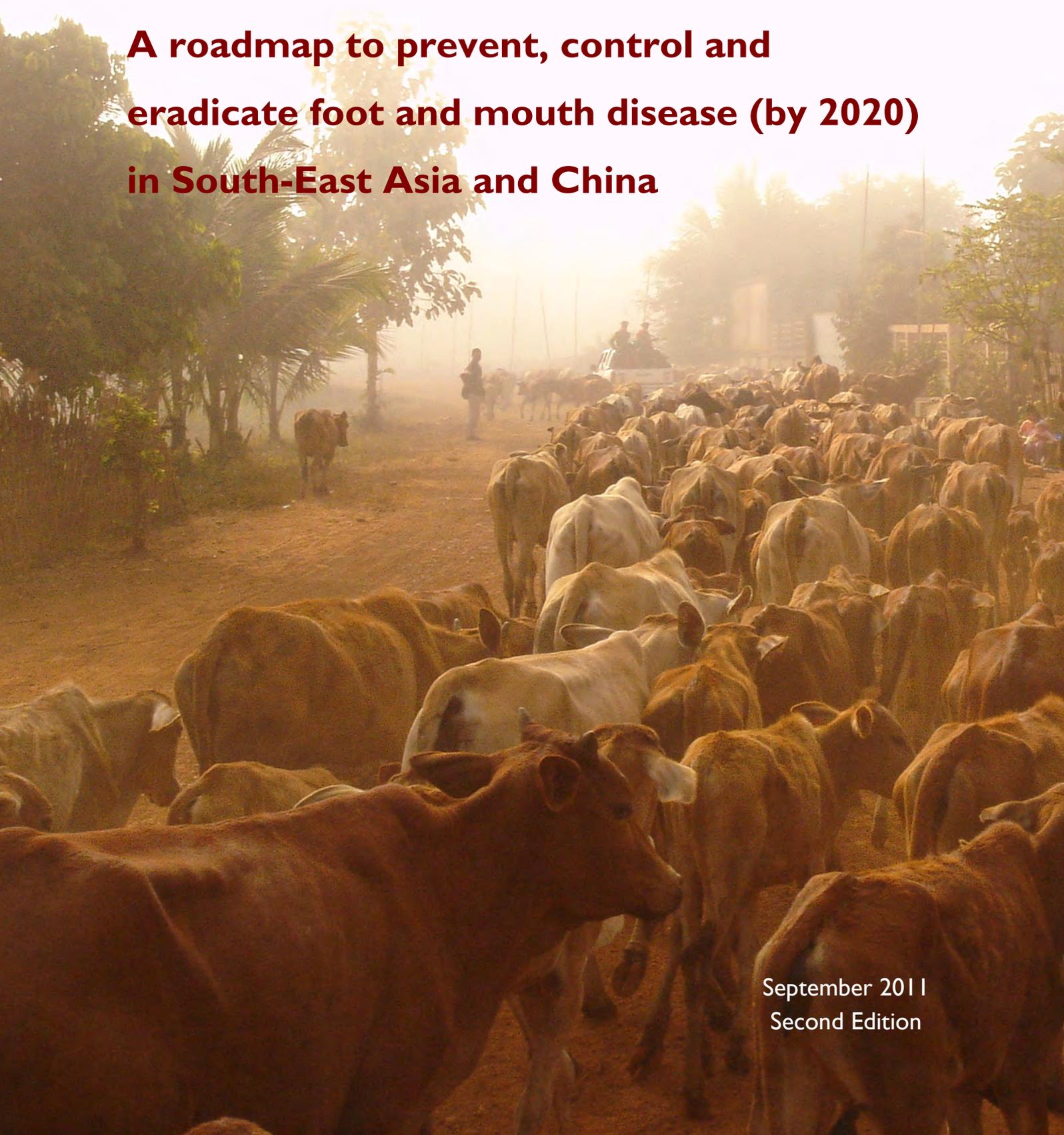


SEACFMD 2020

**A roadmap to prevent, control and
eradicate foot and mouth disease (by 2020)
in South-East Asia and China**



September 2011
Second Edition



Front cover image

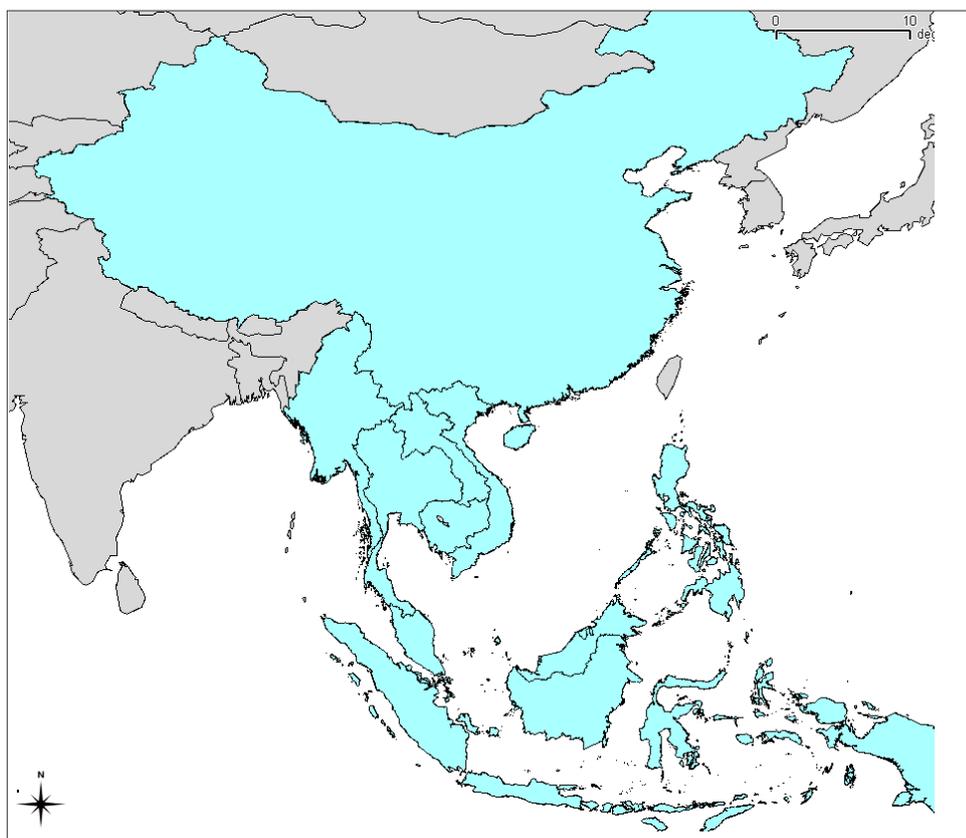
Farmers herding cattle in Tatchilek, Myanmar
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Back cover image

Cattle pulling cart in Mandalay, Myanmar
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SEACFMD 2020

A roadmap to prevent, control and eradicate foot and mouth disease (by 2020) in South-East Asia and China



The South-East Asia and China Foot and Mouth Disease Campaign (SEACFMD) coordination approach is directly applicable to the prevention and control of other transboundary animal diseases, such as highly pathogenic avian influenza (HPAI) and classical swine fever (hog cholera).

It is a programme that supports OIE policies of strengthening veterinary services in the region.

September 2011

The drafting and production of this document was funded by the Australian Government through Australian Agency for International Development (AusAID)

Vietnamese child tending to cattle that have recently recovered from FMD



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Myanmar farmer using cattle to transport farm produce



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Ronello Abila, OIE Sub-Regional Representative for South-East Asia and SEACFMD Programme Coordinator, and Peter Black, epidemiologist, Department of Agriculture and Fisheries, Australia, wrote major parts of the document.

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Stuart Hargreaves from Zimbabwe provided valuable commentary and insights. Gill Dilmitis kindly edited and prepared the final manuscript.

Gardner Murray, OIE Special Advisor, closely supervised the preparation of the Roadmap and wrote and revised key elements of the document.

Thanks are also extended to the Thai Department of Livestock Development for hosting the SRR at its Offices in Bangkok.

Calves in Xieng Kouang, Lao PDR



©Sharie Aviso

Preface

The second edition of the SEACFMD Roadmap, first produced in 2007, reflects lessons that have been learned over the last three years and takes into account a range of socio-economic factors that have and will impact on disease management systems in the foreseeable future. The accession of the People's Republic of China, Singapore and Brunei in 2010 attests to the critical importance of FMD in the Region and the value of the renamed SEACFMD in disease prevention, control and eradication. The purpose of the Roadmap is to provide strategic directions to achieve FMD freedom with vaccination by 2020 and to maintain freedom in free countries and zones. Ongoing political commitment and resources will be needed if the SEACFMD is to succeed. In this regard, those who have provided support since the inception of the programme should be acknowledged, with particular thanks to the Australian Government through AusAID, the Kingdom of Thailand for hosting the OIE Regional Coordination Unit in Bangkok and other donors and collaborators. I commend the Roadmap to you.



Bernard Vallat
Director General, OIE



Cambodian farmers bringing their cattle for vaccination



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Foreword

Foot and mouth disease (FMD), one of the most infectious livestock diseases known to man, is global in distribution, and is particularly difficult to manage and eradicate due to its complex nature. The social and economic impacts of FMD are significant, with outbreaks having disproportionate impacts on the least developed countries by reducing trade opportunities and inhibiting production.

The second edition of the SEACFMD Roadmap outlines approaches to achieve the objective of eradicating FMD through vaccination by 2020 while at the same time maintaining FMD freedom in designated 'free' countries and zones. It provides guidance to veterinary services and the OIE Sub Regional Representation in South East Asia on the development and management of programmes, and takes into account the changing socio-economic circumstances of the region and lessons learned over recent years. As a 'living document', it will be amended as new information comes to light in the context of an adaptive management framework.

The management and eradication of FMD will only be successful if risks are fully recognised and there is a long-term and properly resourced approach with full political and community support and recognition that both technical and non-technical strategies are necessary to achieve success at the global, regional and national levels. Enhanced approaches to biosecurity – the management of risks to the economy, environment and community of diseases entering, emerging, establishing or spreading – will support not only FMD control but also the control of a range of other emerging and re-emerging infectious diseases.

Key to success will be the application of sound governance practices including collaborative institutional arrangements and monitoring and evaluation. Approaches to coordination and advocacy will be enhanced with an increasing emphasis on in-country activities. Vaccination will play a pivotal role with improvements made in areas such as surveillance, early detection, reporting mechanisms, rapid response, monitoring and understanding livestock movements and international trade. Scientific reviews of the Programme will be encouraged as will socio-economic studies. Approaches taken will be consistent with the OIE/FAO Global Strategy for the Control and Eradication of FMD and will inform participants at the 2nd Global Conference on FMD in Thailand in June, 2012.

The SEACMD campaign is a major, difficult and highly ambitious activity covering 11 countries in which approximately 30 per cent of the world's population reside and where there is massive production of FMD-susceptible animals including pigs, cattle, buffaloes and small ruminants. Livestock free of disease will contribute to food security and the achievement of the Millennium Development Goals by ensuring that trade and production opportunities for rural smallholder farmers are not disrupted, thereby providing them with a greater chance of transcending poverty.

None of this would, of course, have been possible without the ongoing assistance of the Australian Government's Overseas Aid Program (AusAID) which has supported the programme since its inception and the contributions of member countries, particularly the Department of Livestock Development of Thailand that has played a key role in hosting the programme.



Gardner Murray

President, OIE Sub-Commission for FMD in South-East Asia and China





Cattle from Cambodia near the border in Vietnam



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Executive summary

Introduction

The SEACFMD 2020 Roadmap provides a broad strategic framework and direction to achieve FMD freedom with vaccination by the year 2020 and maintain FMD freedom in countries and zones that have attained FMD-free status.

The SEACFMD campaign seeks to coordinate animal disease control activities between countries, provide technical advice, ensure coherent regional strategies and enlist political and resource support to achieve its stated objectives. It serves as a model for regional coordination, not only for FMD, but for a range of other emerging infectious diseases (EID) of a zoonotic and transboundary nature.

EIDs are diseases that have recently increased in severity, incidence or geographic range, moved to new populations or are caused by newly evolved pathogens. The global approach to recent EIDs such as H5N1 is to support long-term, sustainable, integrated and adequately resourced biosecurity arrangements. This involves improved cooperation, inter-sectoral collaboration, timely and transparent communication and capacity building.

SEACFMD is a highly ambitious programme and, given its complexities, must be viewed as a long-term activity that requires ongoing political, community and funding commitments and professionalism to achieve success. Starting in June 2011, the SEACFMD is being managed by the OIE SRR Bangkok under its umbrella programme called “*Stop Trans-boundary Animal Disease and Zoonoses*” (STANDZ) Initiative, funded by the Australian Government through AusAID.

SEACFMD 2020 will be used as the basis for the development of annual work plans by governments and will inform project planning for the next phase of the campaign from 2011 to 2015.

Background and campaign phases

SEAFMD was formally established in 1997 by the following founding member countries: Cambodia, Lao PDR, Malaysia, Myanmar, the Philippines, Thailand and Vietnam. Under an agreement between the OIE and the Kingdom of Thailand, a Regional Coordination Unit (RCU) was established in Bangkok in 1997. Since its establishment, the RCU has been funded in the main by Australian Government’s Overseas Aid Program (AusAID) with in-kind assistance by the Department of Livestock Development (DLD) of Thailand. Other countries, including France, Japan, New Zealand and Switzerland, have provided support. Given the importance and success of SEAFMD, a number of national governments have invested strongly in FMD control. In addition, significant leverage has been obtained to support SEACFMD objectives from a range of regional and national projects funded by the EU, FAO, ADB and ACIAR for example.

Although free of FMD, Indonesia recognised the importance of understanding FMD in other parts of South-East Asia and the importance of working with the campaign to maintain its status of FMD freedom. It therefore became a member in 1999. In 2010, in the light of the overall benefits of SEAFMD, Brunei Darussalam, the People’s Republic of China (PRC) and

Singapore became members of the programme, thereby extending considerably its geographic range. Consequently, SEAFMD has been renamed the South-East Asia and China FMD campaign (SEACFMD).

The campaign has had three phases, namely:

Phase 1 from 1997-2001

Phase 2 from 2001-2005

Phase 3 from 2006-2010.

Although each phase has had similar overall objectives, the emphasis has varied from set-up, strategic planning and consolidation. It is planned that Phase 4 will commence in July 2011 for a four-year period. The project design will take into account changing socio-economic patterns, the nature of disease, animal health management systems, governance, country needs and synergies that can be obtained across a range of related programme activities.

Donors, such as AusAID and the EU, have entrusted the RCU with the management of a number of complementary projects dealing with capacity building, the prevention and control of emerging infectious diseases and enhanced approaches to support public health. Given the increased range of activities of the RCU, in 2010 the OIE reached an agreement through a memorandum of understanding with the Government of Thailand to formally establish a Sub-Regional Representation (SRR) in Bangkok. The SEACFMD now forms a discrete programme within the SRR.

Concept, achievements and developmental impacts

Due to its highly infectious nature, FMD can spread very rapidly. In the Asian region where countries generally have contiguous borders and regular cross-border movements of people and goods, it is very difficult for single countries to prevent the transboundary spread of FMD to other countries when outbreaks occur. Control and eradication planning of FMD therefore requires a coordinated approach, recognising that individual countries have the responsibility and accountability for managing their own programmes.

Coordination facilitates the development of coherent strategies, standards, disease control approaches, training, improved communications, the provision of advice and establishment of laboratory and epidemiological networks. More efficient linkages and working arrangements with other funded projects can be pursued to increase the prospects of achieving objectives. Coordination approaches are determined and monitored for effectiveness by the RCU in conjunction with member countries.

Both SEAFMD and now SEACFMD have achieved much with governments and others. Significant improvements have occurred in areas of risk analyses, outbreak investigations, laboratory and epidemiological networks and communication. Of particular note are the improvements in the understanding of livestock movements, 'hotspots' and disease patterns in South-East Asia which have informed future disease management options. The involvement of China, in particular Yunnan Province, has added a new dimension to FMD knowledge and control. Political commitment and ASEAN involvement remain strong with an ever-increasing engagement of industry and other stakeholders. Importantly, complementarities have been achieved with a range of other projects improving the efficiency and effectiveness of SEACFMD.

Progress can be measured as follows: Sabah and Sarawak were designated 'FMD-free without vaccination' in 2004; most of the territory of the Philippines was declared as a 'FMD-free zone without vaccination' in 2001, 2002 and in 2011, and the whole country received FMD free status without vaccination; Brunei, Indonesia and Singapore have remained free of the disease. Improved knowledge in the light of experience with approaches to zoning and standards, definitions and rules will assist in the establishment of free zones (for example Region 2 of Thailand). South-East Asia achieved its first OIE accredited FMD Reference Laboratory in Pak Chong, Thailand, in 2009 which has enhancing regional diagnostic, surveillance and response capacity.

Taken together, and given the accession of Brunei, China and Singapore in 2010, there is every indication that, if the strategic approaches outlined in this Roadmap are followed and managed as planned, the SEACFMD objectives will be met. However there will be an ongoing need for strong political commitment and funding supported by the effective use of resources. Funding will be essential to support major vaccination programmes in source areas of the disease as well as contingency vaccination in emergency situations.

The adverse socio-economic impacts of FMD are significant, particularly in developing countries where the livestock sector shapes prospects for economic growth, poverty alleviation and food security. FMD can prevent the access of a country's livestock and livestock products to higher value markets and this loss of trade opportunity can be significant. The impact of FMD falls disproportionately on the poor populations, in the form of production and marketing losses, reductions in household income and hinders the attainment of the *Millennium Development Goals*. Obviously, the distribution of costs varies across households and communities.

FMD is a most difficult disease to manage given the fact that the economic consequences of the disease are not always recognised. Studies have clearly shown that as the cost of prevention is far less than the cost of responding to disease. Consequently, investment in SEACFMD will provide significant benefits, not only in respect of FMD eradication, but also as it provides a framework for the control of a range of other diseases.

Context and strategies

The economic growth rates of a number of SEACFMD countries are exceptional. This has been and will be associated with increased trade, population growth, greater urbanised communities and improvements to major infrastructures, such as roads. The demand for meat will continue to increase with greater movements of livestock and livestock products between countries, thereby increasing the risk of spreading FMD. The changing trade patterns have and will continue to add challenges to disease management.

SEACFMD comes under the umbrella of the OIE/FAO global framework for the progressive control of transboundary animal diseases (GF-TADs) and has served as a model for two other GF-TADS priority diseases, namely: highly pathogenic avian influenza (HPAI) and classical swine fever (CSF or hog cholera). SEACFMD also contributes to the OIE/FAO global FMD strategy.

Key OIE and AusAID-funded SRR strategies that complement the SEACFMD include the initiative to strengthen veterinary services through the performance of veterinary services (PVS) pathway and through various capacity-building activities, such as training in

communications, education and legislation and governance. The EU funds are used for a programme devoted to highly pathogenic emerging and re-emerging diseases (HPED) and will also contribute to the PVS pathway and to the establishment of an FMD vaccine bank. In addition a set of national projects for Strengthening Veterinary Services for Livestock Diseases Control and for Smallholders Livestock Development (including animal health) funded by the EU in the region (Laos, Vietnam and Cambodia) have contributed to set or consolidate the basis for SEACFMD. Other programs such as the AusAID/DAFF Project in Indonesia and the USAID Identify Project provide additional complementarities, and close linkages with other programmes and agencies, in particular the FAO, will continue to improve the effectiveness and efficiency of the SEACFMD.

The annual frequency of FMD outbreaks has declined in South-East Asia in recent years. This can be attributed in part to good animal health management but also because a proportion of the livestock population is immune as a consequence of previous FMD outbreaks. The declining immunity poses a real risk of a major resurgence of FMD, particularly given the cyclical nature of the disease, unless countries take strong preventative steps to rapidly identify and manage outbreaks.

The lessons learned provide a framework for the development of strategies in three broad categories, namely: technical, advocacy and coordination. Given the changing biological and economic circumstances, the approach will be one of adaptive management where programme direction can be altered, depending on the circumstances if agreed by SEACFMD members.

At the technical level, improved surveillance, early detection, reporting and rapid response with the identification of foci of infection will be pursued, particularly at farmer and community levels. Biosecurity will be reinforced and disease management improved with the objective of eliminating the virus. Importantly, FMD incidence will be reduced by targeting FMD 'at source' and along risk movement pathways which will continue to be studied. Control zones will be established when the incidence of FMD has decreased to low levels and the likelihood of further outbreaks reduced. Zones or countries free of FMD will focus on quarantine and emergency disease preparedness in the event of an outbreak.

Vaccination will play a pivotal role in the SEACFMD programme. Key to success will be substantially increased vaccination in areas where FMD occurs and where animals are sourced for export, for example in the key area of central Myanmar. This should provide major benefits over the next five years. Vaccination will also be performed in emergency situations utilising the EU-funded OIE FMD Vaccine Bank, and in high-risk consignments of livestock. Existing vaccination programmes will be examined for effectiveness and revised in the light of findings.

Advocacy with the donor community and countries will be needed to obtain funding for vaccines in the resource-constrained countries and for general assistance with FMD activities. Ongoing efforts will be made to meet decision-makers and to prepare briefings for such meetings, and to enlist the support of governments, ASEAN and industry. Increased emphasis will be placed on public awareness activities and mobilising stakeholder and public support and engagement in SEACFMD. Public relations and effective communication form key components of SEACFMD strategies and their use will be particularly important support tools in free countries and zones.

Key issues will include the revision and implementation of SEACFMD research and development activities and the increase of effectiveness on programme monitoring and evaluation at the technical level through regular scientific reviews, and at the RCU coordination and management level. Research will include socio-economic projects at village/community levels, including gender studies.

Risk analyses tools to support disease control and surveillance and epidemiology networks will be enhanced and supported by improved data bases and scientific skills. This will improve the basis for judgments on zoning approaches and vaccination options. Training in outbreak investigations and management will be continued and greater emphasis will be placed on understanding and managing livestock movements and the minimisation of risk while facilitating trade. OIE standards will be used as a benchmark for activities.

Importantly SEACFMD activities will be consistent with the OIE/FAO Global Strategy for the Control and Eradication of FMD which will be discussed at the 2nd Global Conference on FMD scheduled to be held in Thailand in June 2012.

Roadmap timetable

The comprehensive range of technical and non-technical approaches raised in the Roadmap will form the basis for planning to ensure that the SEACFMD objectives are reached by 2020 and will comprise two phases, namely:

Phase 4 from 2011 to 2015

Phase 5 from 2015 to 2020

The Phase 4 goals will be to reduce the prevalence of FMD in 'hotspots' and critical points along animal movement pathways, thereby reducing overall prevalence and pressure on countries and zones with FMD-free status. It is anticipated that a number of zones will achieve FMD freedom from the OIE. Efforts will be made to maintain the freedom status of countries and zones.

Phase 5 will see the finalisation of the campaign and the extension of free zones and country freedom with or without vaccination. The key challenges will be to discover and manage key foci of infection and protect member countries from the incursion of new FMD strains.

Institutional arrangements

Policy development and overall guidance to the SEACFMD is provided by the OIE Sub-Commission for FMD which meets once a year and is chaired by OIE with membership comprising member countries, ASEAN, FAO and donors who provide US\$150 000 to the programme each year. The SEACFMD RCU provides the Secretariat to the Sub-Commission and each member is expected to assume key roles. For example, the OIE provides scientific and policy inputs, the FAO technical assistance and the mobilisation of resources, and members are responsible for developing and managing their national programmes.

The OIE and SEACFMD will work closely with ASEAN on future coordination and governance arrangements particularly given the need for country ownership and the sustainability of the regional programme. The Sub-Commission receives advice from a designated Steering Committee, national SEACFMD coordinators and the private sector consultative group.

Recommendations of the Sub-Commission are submitted to the OIE General Assembly and ASEAN for endorsement.

The minimum funding level for the RCU is US\$600 000 per annum. An additional contingency fund of \$500 000 is required to support resource-constrained countries in times of emergency. Finally, it is estimated that US\$40 million is likely to be required for vaccination activities over a five-year period.

List of abbreviations

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
AusAID	Australian Government's Overseas Aid Program
AVA	Agri-Food and Veterinary Authority (Singapore)
BBALITVET	<i>Balai Besar Penelitian Veteriner Bogor</i> (Indonesian Research Centre for Veterinary Science)
CSF	classical swine fever (hog cholera)
DAFF	Department of Agriculture, Fisheries and Forestry (Australia)
DAHP	Department of Animal Health and Production (Cambodia)
DLD	Department of Livestock Development (Thailand)
EIDs	emerging infectious diseases
EpiNet	epidemiology network
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FMD	foot and mouth disease
FMDV	foot and mouth disease virus
FTA	free trade agreements
GDP	gross domestic product
GF-TADs	global framework for the control of transboundary animal diseases
GMS	Greater Mekong sub-region
HPAI	highly pathogenic avian influenza
HPED	highly pathogenic emerging and re-emerging infectious diseases
JICA	Japan International Cooperation Agency
Lao PDR	Lao People's Democratic Republic
LP ELISA	liquid-phase enzyme-linked immunosorbent assay
MLF	Myanmar Livestock Federation
MONEV	internal monitoring and evaluation system (Indonesia)
NFMDTF	National FMD Task Force (Philippines)
NTS	non-traditional security
OIE	World Organisation for Animal Health (<i>Office International des Épizooties</i>)
PCP	progressive control pathway
PRC	People's Republic of China
PRRS	porcine reproductive and respiratory syndrome



PSCC	Private Sector Consultative Committee
PSVS	Programme for Strengthening Veterinary Services
PVS	performance of veterinary services (OIE)
RCU	Regional Coordination Unit (Bangkok)
RRL	Regional Reference Laboratory (Pakchong, Thailand)
SEAFMD	South-East Asia Foot and Mouth Disease Campaign
SEACFMD	South-East Asia and China Foot and Mouth Disease Campaign
SRR	Sub-Regional Representation (Bangkok)
STANDZ	Stop transboundary animal diseases and zoonoses
TADS	transboundary animal diseases
WAHIS	World Animal Health Information System (OIE)
WHO	World Health Organization of the United Nations

Vietnamese farmer



©Polly Cocks

Purpose

The 2020 Roadmap is a document which can be modified as appropriate in the light of experience and future developments. It seeks to provide strategic directions for 'FMD freedom with vaccination' in South-East Asia and China by the year 2020. Its purpose is to:

- inform policy makers and stakeholders of the nature of the programme;
- assist members when they develop national strategies and operational plans;
- emphasise the importance of veterinary services to support public health and economic development; and,
- demonstrate the applicability of SEACFMD as a regional coordination model for other diseases.

History

The control of FMD in the South-East Asian region gained impetus when Indonesia eradicated FMD in 1986 with the support of countries such as Australia. In 1990, Indonesia was recognised by the OIE as an 'FMD-free country without vaccination'. The country has since maintained its FMD-free status. These achievements have demonstrated the benefits of FMD freedom and proved that, with effort, coordination and determination, FMD can be eradicated from South-East Asia. In addition and, most importantly, FMD-free status can be maintained for several decades as illustrated by Indonesia.

It was the recognition by the OIE of FMD as a regional animal health and development issue that gave birth to SEAFMD in the early 1990s. Following agreement, the SEAFMD became a formal OIE programme in 1994 with the establishment of the OIE Sub-Commission for South-East Asia. The Sub-Commission is chaired by the OIE with members comprising participating countries, ASEAN, the Australian Government's Overseas Aid Program (AusAID), FAO and key donors. The founding members were Cambodia, Lao PDR, Malaysia, Myanmar, the Philippines, Thailand and Vietnam. Although free from FMD, Indonesia became a member in 2001, recognising the importance of participating in regional efforts to control the disease and to maintain freedom. All member countries belong to ASEAN.

The RCU was established in Bangkok in 1997 to coordinate and manage the implementation of SEACFMD. The operations and core activities of the RCU have been funded mainly by contributions from AusAID (1997-2011). The Government of Thailand through the Department of Livestock Production (DLD) provides offices and in-kind support to the RCU. Other donors, such as the governments of France, Japan, New Zealand and Switzerland have also provided support in various forms. Members have the responsibility of preventing and managing FMD within their own countries, have provided support for national programme activities and, by working with the FAO and other donors, have contributed to the reinforcement of SEACFMD in the region.

In 2010, the OIE and ASEAN supported the membership of the remaining ASEAN countries (Brunei Darussalam and Singapore) and China, which has resulted in a vastly expanded

programme that was renamed to the South-East Asia and China Foot and Mouth Disease campaign (SEACFMD). This was testimony not only to the overall value of the programme and the critical importance of FMD in the region, but also to the prospects of success using SEACFMD as the coordinating mechanism to promote practical approaches to regional disease control.

With the addition of China and the full membership of all ten ASEAN Member States, SEACFMD has further strengthened its regional significance and position. The prospects for cross-fertilisation of ideas and support are excellent. Given the fact that Brunei Darussalam, Indonesia and Singapore are free from FMD without vaccination, FMD has not been observed in the Philippines since 2005 and no vaccination has been practised since 2009, coupled with the fact that the OIE has recognised Sabah and Sarawak as free without vaccination, the 'Roadmap strategy' will place considerable emphasis on the retention of freedom while maintaining its focus on the control, management and eradication of disease in endemic countries.

To date, three phases of the SEACFMD programme have already been completed, as briefly described below.

Programme Phases

The SEACFMD programme was designed in three phases since the establishment of the RCU in 1997. Phases 1 and 2 have been completed and Phase 3 is scheduled for completion in June 2011. Phase 4 which extends from 2011 to 2015, is in the planning stage and this Roadmap will detail project development.

Phase 1 (1997-2001)

Phase I saw the establishment of the RCU. Political, senior and technical links were created with member countries and international agencies, and framework approaches for working relationships were established. Basic training was undertaken in areas such as diagnostics and strong scientific networks were developed. This was the 'set-up' phase and established the basic groundwork for the future of the campaign.

Phase 2 (2001-2005)

Following an independent study of Phase 1, strategic directions and programme components were revised to take into account developments since 1997. Importantly, improved knowledge and understanding of FMD in South-East Asia resulted in enhanced approaches to animal health management. Technical skills were upgraded, surveillance and laboratory diagnostics improved, progressive zoning introduced, links with the private sector developed and a public awareness programme introduced. The RCU was a catalyst in this 'consolidation' phase for the harmonisation of approaches to FMD control in member countries.

Phase 3 (2006-2011)

Phase 3 was designed as a 'development' phase to improve coordination and partnership efforts, engage in high-level consultations with government and industries and consolidate national control and eradication programmes and direction. Key activities included the development of national FMD strategies, providing support to efforts to harmonise legislation for FMD control in member countries, and the enhancement of laboratory,

epidemiology and public awareness networks. Scientific analyses provided improved approaches to disease management and zoning. Enhanced networking and links at the political and technical levels with organisations such as ASEAN, FAO, ACIAR and the Yunnan Province of China resulted in the introduction of improved synergies and greater efficiency of the campaign and saw the use of the SEACFMD approach as a model for the coordination of other TADs, such as HPAI. Brunei, China and Singapore were accepted into a renamed South-East Asia and China Foot and Mouth Disease campaign (SEACFMD) in 2010.

Proposed Phase 4 (2011-2015)

Phase 4 takes into account the lessons learned from previous phases, the needs of new members, scientific developments and the changing socio-economic patterns that will impact on disease control activities, not only for FMD, but for other emerging infectious diseases, including zoonoses. This Roadmap sets out a number of directions that range from disease prevention and management, including vaccination and zoning, to governance issues and engagement with ASEAN, and other related programmes that will be a feature of Phase 4.

Programme concept and key achievements

FMD is one of the most infectious livestock diseases known to man. It can spread rapidly within countries, between countries and across continents. As it is most difficult to prevent the spread of TADs when outbreaks occur, particularly between countries with contiguous borders and established trading patterns, the prevention, control and eradication of FMD requires a coordinated approach and the development of overarching disease management principles and strategies. This was the basis for the establishment of the RCU. The primary responsibility for animal health management and control within countries, however, resides with national governments which, in partnership with the RCU, plan and drive the programme forward.

A key achievement of the SEACFMD programme has been ASEAN political support and engagement and the mobilisation of resources, both in cash and in-kind, to support the campaign at the regional and national levels. RCU's engagement with members resulted in increased resource allocations from national governments. These achievements helped elevate SEACFMD as a common regional platform for regional and external donor support. In addition to AusAID and Thailand government support, SEACFMD has attracted funding from the governments of France, Japan, New Zealand and Switzerland, as well as the European Union, and strengthened collaborative work with technical international agencies such as the FAO and ACIAR.

SEACFMD's success encouraged donor agencies to entrust the RCU with a range of other projects that complement the programme. These include the AusAID-funded programme for the strengthening of veterinary services, the EU-funded HPED Programme and US-AID IDENTIFY project as part of its Emerging Pandemic Threat programme.

Given the growing scope of the RCU's activities, the OIE with the Kingdom of Thailand, signed a memorandum of understanding to formally establish an OIE Sub-Regional Representation (SRR) in Bangkok. The SEACFMD will be a flagship programme within the SRR and will retain its RCU in an enhanced manner.

Since freedom from FMD generates significant benefits to both private and public sectors, the RCU has also worked with the private sector. The private sector is supportive of the SEACFMD campaign but to achieve success it will need to become more involved as the campaign progresses.

With modest resources in terms of staffing and funding, RCU's overall achievements have been significant. They include the following:

- effective coordination of national and regional FMD activities, with a well-established network of FMD national coordinators who play a critical role in implementing recommendations from the Sub-Commission and other workshops and meetings
- a functional epidemiology network (EpiNet) and laboratory network (LabNet) that provide technical inputs to the programme
- an improvement of public awareness
- establishment of training and surveillance programmes that underpin the SEACFMD campaign
- high-level national and international liaison with donor agencies and other institutions
- the accreditation as an OIE Reference Laboratory of the Regional Laboratory in Pakchong, Thailand, the first OIE-accredited laboratory in South-East Asia
- the maintenance of Brunei, Indonesia and Singapore as FMD-free countries without vaccination and the recognised FMD-free zones without vaccination in the Philippines and eastern Malaysia (Sabah and Sarawak)
- the declaration of the entire Philippines as FMD-free without vaccination following the recognition of Zone 2 in Luzon Island as FMD-free without vaccination
- assistance in mobilising funds for member countries to strengthen and implement their FMD programmes.

Development impacts of foot and mouth disease control and eradication

The wellbeing of a developing country's livestock sector directly shapes its prospects for economic growth, poverty alleviation and food security.

The livestock sector accounts for a substantial 80% share in agricultural GDP of developing countries. About two-thirds of the world's domestic animals are raised in developing countries and over 90% of these are owned by rural smallholders. More importantly, the livelihoods of 600 million rural poor people in the world rely heavily on livestock, primarily as a source of income, food and agricultural input.

International and domestic trade of livestock presents an attractive opportunity, both for the commercial livestock industry and for rural smallholders. The demand of developing countries for meat products is projected to more than double in the next 20 years. In South-East Asia, this demand will be spurred by population growth and the continued economic prosperity of China and Vietnam.

A country's FMD-free status is a requirement for international trade. FMD prevents the access of a country to higher value export markets for its meat products. Importing countries, as part of their preventive measures, will block the entry of livestock products from FMD-

infected areas. This loss of trade opportunity presents a substantial loss for South-East Asian countries. Studies have predicted a combined gross benefit of US\$20 million per year for the Philippines and Thailand if both are able to export pork products in the absence of FMD.

Vaccination, deaths and FMD control measures, such as culling, are costly for both the government and private industry. The swine industry in the Philippines, for instance, suffered an estimated loss of US\$95 million during the FMD outbreaks in 1995. This cost is about 4.2 billion Philippine pesos for a single year, using current exchange rates.

A study commissioned by the OIE in 2007 provided evidence that investments made by countries to prevent disease occurrence far outweighed the costs related to outbreak response. The study, using HPAI as an example, estimated the global prevention and preparedness costs related to HPAI at US\$1 billion over three years or about US\$334 million per year. This annual investment on prevention pales in comparison to the estimated direct production costs and losses of HPAI-infected countries of US\$5.34 billion to US\$11.75 billion per year. As a specific example, the study found that, in Vietnam, investing in disease investigation and strengthening veterinary services would cost the government a total of US\$30 million against the annual total of US\$62 million incurred by direct production costs and losses due to HPAI during the 2004-2005 outbreak. For developing countries grappling with scarce resources, the message is clear – preventing TADs is less costly than reacting to outbreaks.

FMD outbreaks will have disproportionate impacts on least developed countries and will hinder their attainment of the *Millennium Development Goals*, particularly those concerning the reduction of hunger, poverty and child mortality.

When FMD occurs, poor farmers are unable to use their livestock to plant rice for their livelihood and are unable to sell infected livestock to augment household income. In this regard, FMD poses a direct threat to the food security, nutrition and income of rural communities that are dependent on livestock. This situation is compounded by limited animal reserves and resources of rural smallholders, including inadequate access to vaccination, compensation and re-stocking programmes.

Various studies have described the debilitating impact of FMD across South-East Asian communities. In Lao PDR, rumours of an FMD outbreak force farmers to sell animals at half the market price. In northern Vietnam, FMD outbreaks accounted for about 21% net loss of total annual household income. Farmers also spend less time on agriculture production and more time (an average of 3 hours per person per day), treating FMD-infected animals. In Cambodia, the average cost of FMD per affected family consumes 85% of total monthly rural household income.

The social and economic effects of FMD at household level require further investigation. The distribution of FMD outbreak costs and FMD prevention benefits is not gender-neutral and will vary across men, women, boys, girls, elder men and elder women. The distribution of costs and benefits will depend on a person's specific household roles in animal production and disease control. For instance, while the household as a unit suffers, an FMD outbreak will impose additional work on household members responsible for livestock rearing. If women and girls assume these roles in the community, FMD will have adverse effects on the time devoted to the rearing of a child, to girls' education or other productive endeavours. A deeper awareness of these micro-level issues, such as 'who does what, who controls what,

who knows what, and who is affected by what', will allow veterinary officials to design more effective and sustainable interventions in preventing, diagnosing and treating FMD at community levels.

There is, therefore, a strong case for investing in prevention and control of FMD, a particularly difficult disease to manage. In addition, to date, the SEACFMD experience has shown that systems implemented by the programme assisted in establishing a working model for the prevention and control of other serious diseases, such as HPAI and CSF, which are of global importance and cause debilitating losses to villagers and commercial industries. Minimising disease impact through the implementation of FMD systems will make significant contributions to alleviating poverty, ensuring food security and maintaining public health through the prevention of zoonotic diseases. Eradicating FMD and applying the framework and coordination mechanisms more broadly to livestock disease control and prevention will improve the overall wellbeing and development of nations and their communities, particularly those that are most vulnerable and economically disadvantaged.

Summary of foot and mouth disease situation

FMD has been eradicated from the island countries of South-East Asia. Brunei, Indonesia and Singapore have maintained their status as FMD-free countries without vaccination. East Malaysia (Sabah and Sarawak) was certified FMD-free without vaccination by the OIE in 2004. In the Philippines, the island of Mindanao obtained FMD freedom in 2000 and the islands of Visayas, Palawan and Masbate became FMD-free in 2002. Zones 1 and 3 of the Philippine island of Luzon were certified as FMD-free in 2010. In May 2011, OIE recognised Zone 2 of Luzon making the whole of the Philippines FMD-free without vaccination. (Table I, Figure 1).

Table I
Serotypes of foot and mouth disease virus reported in South-East Asia, 2003-2010

Country	2003	2004	2005	2006	2007	2008	2009	2010
Cambodia	???	O	O	O, A	O, A	O, A	???	O
Indonesia	No outbreak							
Lao PDR	O, A	O	O	A	O, A	O	O	???
Malaysia	O, A	O, A	O	O, A	O	O, A	O	O
Myanmar	O	O	O, Asia 1	O	O	O	O	O, A
Philippines	O	O	O	No outbreak				
Thailand	O, A	O, A	O, A	O, A	O, A	O, A	O, A	O
Vietnam	O	O, A	O, A, Asia 1	O, A	O, A, Asia 1	O	O, A	O, A

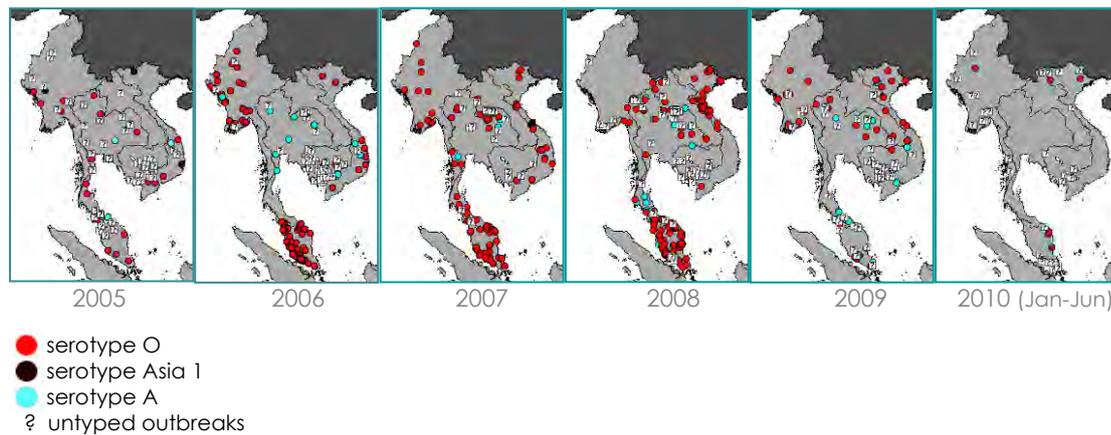


Figure 1
Foot and mouth disease serotypes in South-East Asia, 2005-2010

FMD remains endemic in mainland South-East Asia (Cambodia, Lao PDR, Malaysia, Myanmar, Thailand and Vietnam) and China and follows a cyclical pattern of epizootics. Increase in outbreaks were observed in the late 1990s and early 2000, followed in 2006, then the most recent one was in late part of 2010 that lasted until early 2011. In the first half of 2010, the overall incidence of FMD in South-East Asia was seen at its lowest compared to the previous three years. However, starting in September 2010 increased outbreaks were reported in Cambodia, Lao PDR, Thailand and Vietnam. The epizootics peaked in December until February 2011, and sporadic outbreaks were reported in the following months.

Over the past decade, three FMDV types have been identified in the sub-region, namely: O, A and Asia 1. Serotype O is the most common and three topotypes have been identified (South-East Asia, pan-Asia and Cathay or pig-adapted strain). The South-East Asia topotype is considered indigenous in the sub-region with distinct groups classified by the OIE Reference Laboratory in Pirbright, namely: Cambodia 94 and Myanmar 98. The pan-Asia topotype was probably introduced onto the mainland in the late 1990s. The pig-adapted serotype O was reported in Vietnam in 1997 and in Malaysia and Thailand in 2005.

During Phase 1 of the SEACFMD campaign, the greatest challenge faced at that time was the widespread occurrence of outbreaks of pan-Asia topotypes on the mainland. From 1999 until 2002, pan-Asia caused major epizootics in Cambodia, the southern area of Lao PDR, Malaysia and Vietnam. During that period, the South-East Asia topotype which caused major outbreaks prior to 1999 was replaced by pan-Asia. However, commencing in 2005, fewer outbreaks of pan-Asia were observed and none were detected between 2007 and 2010. On the contrary, an increasing number of serotype O South-East Asia Myanmar 98 topotype outbreaks were observed in Vietnam in 2006, affecting 56 out of the 63 provinces, with a historic record of 1 300 outbreaks in a single year. A relative increase of outbreaks from this virus strain was also reported in Cambodia and Malaysia during the same period. However, no major epizootic was observed in Lao PDR, Myanmar and Thailand in 2006.

Serotype A is the only serotype currently circulating on the mainland, although a few antigenic changes have been observed since 1990; these have led to replacement of seed virus strains for vaccines. In the 1990s, A22 Iraq was widely used as a vaccine strain, but the major outbreaks in the late 1990s revealed that A22 was not sufficiently effective to protect

against the prevailing serotype A. A new vaccine strain, the A Malaysia 1997, was developed by commercial vaccine producers and the vaccine conferred good protection against the prevailing strain. The government vaccine plant in Thailand also changed its seed virus using their own local isolate.

Serotype A has been detected every year in Thailand. In 2008, serotype A outbreaks were clustered in the northern and southern areas of Thailand where significant cattle and buffalo movements occur. From 2002 to 2008, sporadic outbreaks were also reported in Cambodia, Lao PDR and Malaysia. Vietnam reported its first outbreak of serotype A in 2004, which could have been due to cattle movement from neighbouring countries and from that time onwards sporadic outbreaks have been recorded.

Serotype Asia 1 has not been very active in the region for quite some time. It was last detected in Lao PDR in 1999, Myanmar in 2001, Malaysia in 1999, Thailand in 1998, Cambodia in 1997 and Vietnam in 1992. However, in August 2005, an outbreak of Asia 1 was reported in Kayah State, Myanmar. No further outbreak of Asia 1 was reported in Myanmar after that. In Vietnam, serotype Asia 1 was first reported in 2005 in the central and northern parts, and every year thereafter isolated outbreaks were detected but did not cause a major epizootic.

The predominant strains of FMD in China are serotypes O and Asia 1. However, in 2009, China reported outbreaks of serotype A that were similar to the strain circulating in the Mekong sub-region. In 2010, outbreaks of the Myanmar 98 strain of serotype O were also reported. A key facet of China's FMD control strategy is mass vaccination. It is estimated that 4.2 billion vaccines are used each year to protect 115 million cattle, 652 million pigs, 171 million sheep and 196 million goats. China is examining its vaccination options to deal with the new strains.

The recent outbreaks of FMD in the Republic of Korea and Japan caused by viruses closely related to viruses circulating in South-East Asia demonstrates that even countries with more developed veterinary services are not exempt from FMD incursions. FMD-free countries in the Region and in Oceania must remain vigilant and prevent entry of FMD into their countries. This applies equally to free countries and zones in the SEACFMD programme.

Changing dynamics

The second version of the Roadmap takes into account the lessons learned since the release of the first version in 2007. It seeks to be forward looking and anticipates some of the broader changes that are likely to affect the direction and delivery of strategies to meet the SEACFMD objectives.

At the broader level, the economic growth in a number of SEACFMD countries is exceptional. This has been and will be associated with increased trade, population growth, more urbanised communities and improvements to major infrastructures, such as roads. The demand for meat will continue to grow with greater movements of livestock and livestock products between countries. This will increase the risk of disease spread and add to the complexities of FMD management (Appendix 4).

The adverse socio-economic impacts of FMD are significant, particularly in developing countries where the livestock sector will continue to shape prospects for economic growth, poverty alleviation and food security. Attaining the *Millennium Development Goals* will be difficult, but will, in part, be achieved by effective management of animal diseases.

Key lessons

There are a number of key lessons that have been learnt in recent years that will help inform the future direction of the SEACFMD.

Political support

There is a continuing need to secure high-level engagement to confirm political support from member countries; this ensures the continued and active participation of countries in the regional eradication effort and sustains their respective national level commitments and resources in FMD control and eradication.

Animal movements

The understanding of the dynamics, extent and drivers of livestock movements has improved. This emphasises that to reduce disease incidence and spread, it will be more effective and efficient to focus efforts 'at source' and critical control points in production and supply chains. Enhanced risk assessment techniques will need to be used to identify critical control points.

The rapid and evolving changes in movement patterns emphasise the importance of managing disease within an eco-social context. Recognition of this aspect has been a driving force in reviewing the first Roadmap and in the formulation of amended strategies.

High-risk periods for FMD outbreaks are better understood and should be considered when designing and timing preventive strategies. For example, some countries have seasonal risks, whereas for others, the timing of festivals affects movement patterns that increase livestock movements and the likelihood of outbreaks.

In most part of the Greater Mekong sub-region, although movement management practices have improved, they are often inadequate for disease control purposes. The key challenge continues to be disease pressures brought about by the movements of animals from infected areas.

Vaccination

Vaccination approaches must be harmonised and expanded across the region to optimise effectiveness and efficiency. Vaccination needs to be complemented by a wide range of other strategies to create a robust approach to the prevention, control and eradication of FMD.

Zoning

Zoning is effective if there is political will and the provision of sufficient resources to control and eradicate FMD in designated zones and to maintain zones in which free status has been achieved. The Philippines, for example, has demonstrated that effective livestock movement controls are a prerequisite to effective zoning.

In the past, it was planned that working groups would recommend and assess zone boundaries and provide advice on zone strategies. Efforts in this regard have been hampered by continuing exposure to infection. Furthermore, resources to undertake this function have been limited. Consequently, there is a need to re-consider and strengthen approaches to recognising, establishing and expanding control zones which, over time, is an essential animal health measure but it needs to take into account an improved understanding of the dynamics of FMD in SEACFMD countries.

Biosecurity and traders

Although there have been closer relations with traders and their workers (truck drivers, animal handlers, local buyers), these have not always translated into changes regarding improved biosecurity-focused behaviour. Biosecurity is critical to eradication efforts as demonstrated for example in the Philippines.

Investment in maintaining freedom

Although much effort has been devoted to the control of disease in a number of SEACFMD countries, the campaign needs to support all member countries – including those that are FMD-free. An increased focus on activities to support member countries to maintain FMD freedom is warranted. As the costs of achieving zone or country freedom are high, it is critical that free areas be protected as the programme evolves. As more zones approach and achieve the status of ‘free with vaccination’, extra support will be required to help them maintain that status.

The provision of technical, financial and in-kind assistance from better resourced countries to other member countries is valuable and will contribute to the improved progression of disease control activities. This practice should be further encouraged and facilitated by the RCU.

Stakeholder engagement

The support and commitment of all stakeholders is critical to the success of the programme to achieve FMD freedom with vaccination by 2020. However, the lack of appreciation by some stakeholders of the relevance of control and eradication measures continues to hinder progress.

Public/private partnerships need to be further refined in terms of investment levels and cooperative arrangements.

It is particularly important that farmers, communities, livestock traders, abattoir processors and the like be committed and that improved and more effective communications systems are introduced.

Legislation and expertise

In South-East Asia, efforts devoted to the improvement of the legislative basis for disease control efforts have increased as part of the AusAID-funded Programme for Strengthening Veterinary Services (PSVS). This flows from OIE initiatives in modernising veterinary legislation and the development of veterinary legislative guidelines. All member countries have legislation that addresses disease control.

However, in the light of experience within and beyond the region, some legislation will need to be updated to provide a more effective tool for the SEACFMD campaign. This could apply to compensation strategies, particularly if partial or full stamping-out exercises are undertaken in eradication and free zones.

It is important that professional and para-professional expertise be developed and improved. This can be implemented as part of the SEACFMD campaign and can include other related capacity building activities through the modernisation of the veterinary curriculum and the development of short-term training modules for field staff.

Research and development

Although many technical challenges can be managed or adapted using existing skills and knowledge, research requirements should be identified in consultation with partner agencies. There is a clear and ongoing requirement to understand and apply new developments in diagnostics, vaccines and pharmacology and to improve epidemiological techniques, risk analysis and informatics systems.

It is important to examine the socio-economic aspects of biosecurity including, at village and community levels, areas such as the role of gender and cultural characteristics, to support the transfer knowledge on disease management, effect behavioural change and improve communication approaches. An improved knowledge and understanding of the dynamics of market chains and livestock movements will provide key information to the development of practical measures to support biosecurity.

Research and development strategies need to be developed in consultation with partners. The information that will result from well-focused research and development will provide valuable information to a wide range of stakeholders (e.g. policy makers, traders, community workers and households) and will support not only SEACFMD programmes, but also livestock production and health in general.

Global disease control issues

Global framework for the progressive control of transboundary animal diseases

The OIE/FAO Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) provides a platform to enhance collaboration between the OIE and FAO and other organisations such as ASEAN and WHO in synchronising programmes on animal health, including zoonoses.

In South-East Asia, three priority diseases were identified for collaboration, namely: FMD, HPAI and CSF. The GF-TADs Regional Steering Committee recognises the SEACFMD as a key programme under GF-TADS Asia and that it serves as a model for regional coordination and collaboration for the other two priority diseases.

Global strategy on foot and mouth disease

Efforts to initiate a global programme to control and eradicate FMD were launched during the first OIE/FAO global conference on FMD control held in Asuncion in June 2009. The conference recommended that a global strategy be developed to control and eradicate FMD, taking into account the experience of various regional and sub-regional cooperation arrangements designed to control FMD control, in particular the SEACFMD as well as pan-hemispheric approaches in South America and Europe.

The global strategy is at the drafting stage and will seek to maintain OIE-recognised FMD-free zones (with and without vaccination) and gradually reduce FMD prevalence in endemic countries progressively working to achieve FMD freedom in accordance with the OIE *Code*. The strategy involves following a progressive control pathway (PCP) towards FMD control and eradication in infected territories (Figure 2).

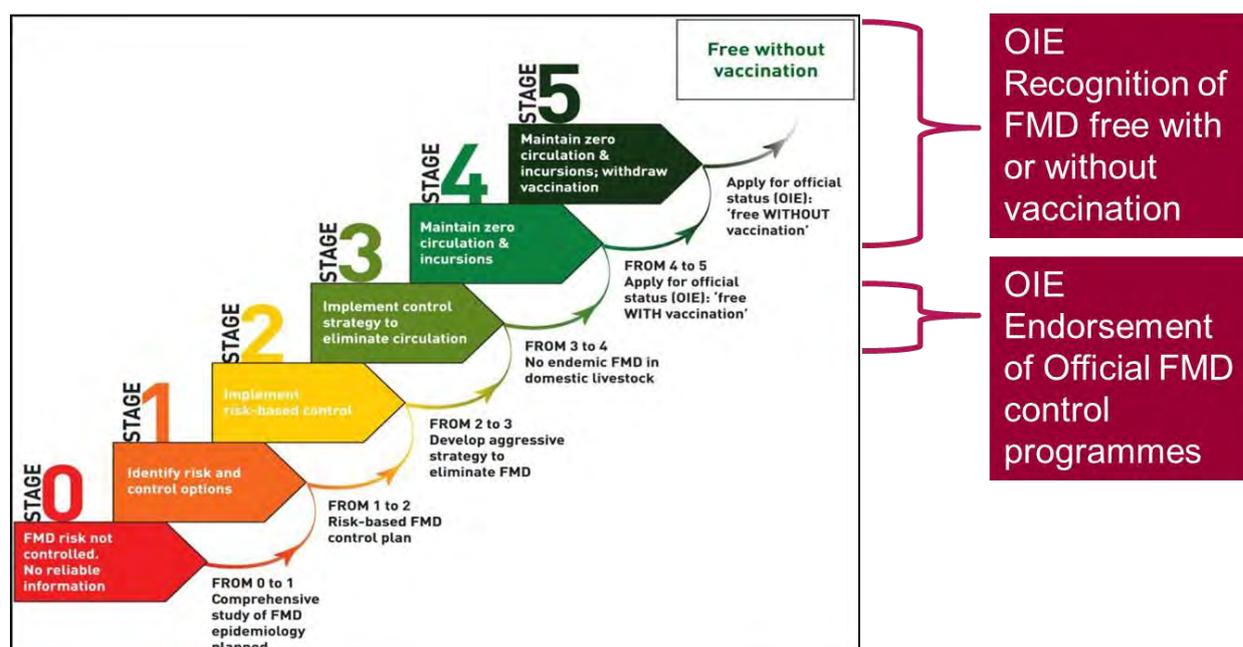


Figure 2
FMD progressive control pathway

Since its inception, SEACFMD has sought to ensure that the roadmap is compatible with the global strategy to protect FMD-free zones and to apply intervention measures in infected countries to reduce FMD prevalence. In 2004, it has developed the minimum Standards, Definitions and Rules (SDR) for the setting up of FMD control and eradication zones, following a progressive zoning approach. SEACFMD strategic directions are therefore consistent with the proposed global strategy. The SRR Bangkok and SEACFMD members will continue to provide inputs for the development of the global strategy based on experience and expertise, and ensure there is compatibility of approach.

OIE performance of veterinary services pathway

As described earlier, the key to sustainable prevention, control and management of animal diseases is investment in animal health systems. Countries with adequate veterinary services will always be at risk from countries with inadequate veterinary services; and are often better able to deal with outbreaks.

With AusAID support, the OIE has initiated a major programme in South-East Asia that is devoted to the strengthening of veterinary governance through the PVS pathway. The pathway comprises the following steps:

- PVS evaluation
- PVS Gap Analysis
- intervention, including strategic planning and modernisation of legislation.

The first step in the pathway is the evaluation of the veterinary services using the PVS tool to evaluate the quality and effectiveness of national veterinary services and identify weaknesses. This step is considered the 'diagnostic' part and identifies constraints and weaknesses within the veterinary services. After the initial evaluation, the second step is an in-depth analysis of the weaknesses using the OIE PVS Gap Analysis which is dubbed the 'prescription' phase (Figure 3).

The third step in the process involves the development of national strategies based on findings and the articulation of national priorities. It is the 'treatment' phase and forms the basis for interventions to address the gaps, such as the modernisation of veterinary legislation, improvement to veterinary education, laboratory twinning, etc.

The PVS pathway forms a basis for eliminating deficiencies and providing objective and scientific advice to support resources allocations by governments and funding bodies.

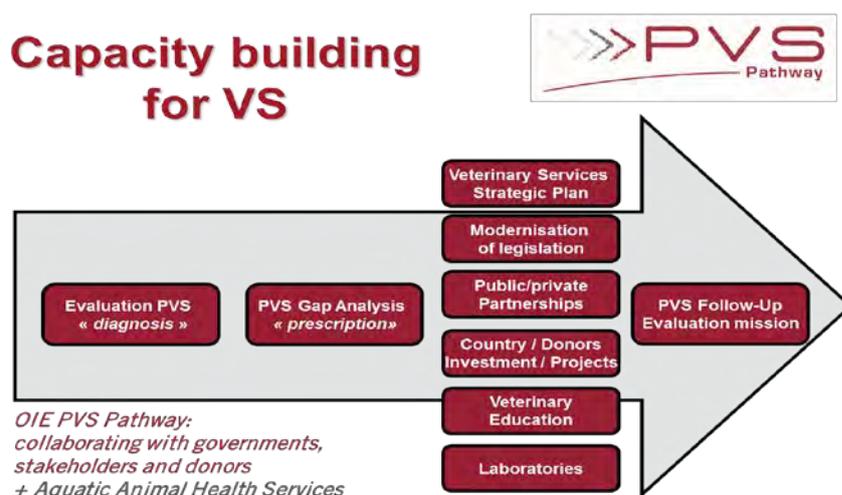


Figure 3
Performance of veterinary services pathway

Analysis of foot and mouth disease trends in the region

The annual number of FMD outbreaks that occurred in mainland South-East Asia between 2001 and 2010 is given in Table II and the annual frequency distribution of outbreaks in Figure 4.

Table II
Annual number of foot and mouth disease outbreaks in mainland South-East Asia

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cambodia	3	46	20	40	43	45	4	39	41	139
Lao PDR	66	12	35	49	4	103	60	55	18	10
Malaysia	26	12	15	18	41	59	70	137	98	65
Myanmar	30	28	7	28	18	43	14	11	21	11
Thailand	145	81	209	119	92	44	34	52	47	35
Vietnam	11	18	13	20	23	1 073	44	61	211	281
Total	281	197	299	274	221	1 367	226	355	436	541

The FMD epizootics in mainland South-East Asia follow the classic cyclical pattern. After massive outbreaks in late 1990s due to the incursion of the pan-Asia strain of serotype O, outbreaks started to decline in 2002. However, a resurgence of serotype A in Thailand in 2003 increased the cumulative outbreaks in the sub-region that year. Another epizootics happened in 2006 when the Myanmar 98 strain of serotype O caused massive outbreaks in Vietnam and other countries, and the outbreaks became sporadic from 2007 to 2009.

The most recent epizootics was again observed in 2010/2011 that peaked from December 2010 until February 2011. As expected, sporadic outbreaks continued to decline in the following months. If this trend continues, it appears that 2012 may be a good year to launch a massive campaign to identify the foci of FMD infection and reduce the virus load in the environment. The situation is very volatile. If no active campaign is launched by 2012, the risk of another epizootic occurring will increase as the natural immunity from previous

outbreaks wanes and more new susceptible animals enter the population from new stock. It is critical that early detection and immediate control of isolated outbreaks be actively pursued to prevent any outbreaks being propagated that could develop into a full-blown epizootic. This means that 2012 to 2013 will be a critical period for the SEACFMD campaign.

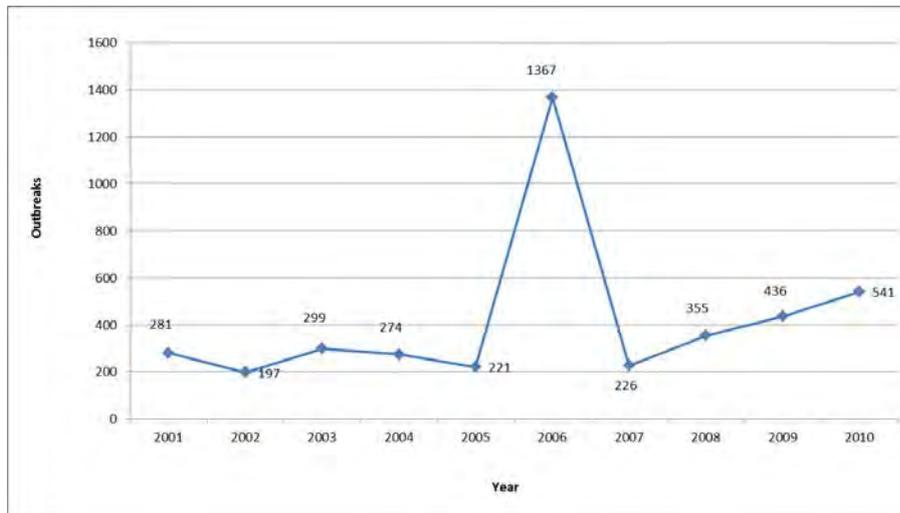


Figure 4
Annual frequency distribution of foot and mouth disease outbreaks in mainland South-East Asia
Source: SEACFMD database

After massive outbreaks, a significant portion of the livestock population is naturally immune to the virus and consequently a decline will be observed in the number of outbreaks over the next two to three years. It is during this period of declining outbreaks that the best opportunity is provided to control and possibly eradicate FMD. This is how the Cathay strain of serotype O was eradicated from the Philippines. As indicated in Figure 5, the FMD outbreaks in Luzon Island were declining in 2004 and the Philippines seized that opportunity to launch a massive campaign to seek the foci of infection and destroy the virus in those areas. By 2006, FMD had been eradicated.

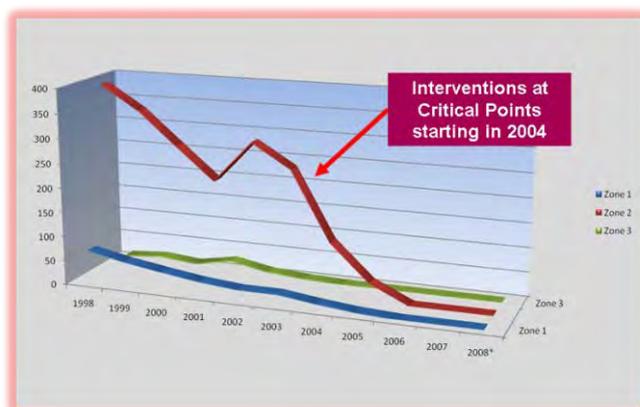


Figure 5
Foot and mouth disease outbreaks in the Philippines, 1998-2005A detailed description of the FMD status in the region is found in Appendix I.

Livestock production and marketing

The total cattle and buffalo populations in countries in the sub-region are given, with unit price rankings for each country, in Table III. The movement patterns between countries are illustrated in Figure 6.

Movement of livestock and livestock products across countries in the Greater Mekong sub-region is influenced by animal population, demand and price. It is these movements that pose the highest risk of FMD spread. Movement patterns depend on supply and demand factors and are therefore not 'fixed'.

Myanmar has the highest population of ruminants and low relative domestic demand, and can offer the cheapest prices for livestock. Logically, this country serves as the major source of livestock traded to many countries.

Thailand has the second largest number of cattle and buffalo and is also a major source of FMD. Cambodia and Lao PDR have smaller cattle populations compared to, for example Vietnam, but as the demand is not high in these countries, movements are all directed to Vietnam where the price is higher and is driven by increasing demand.

Table III
Cattle and buffalo populations in mainland South-East Asia

Country	Cattle (millions)	Buffalo (millions)	Import	Export	Comparative unit price ranking
Cambodia	3.34	0.72	–	+++	** Average
Lao PDR	1.35	1.16	–	+++	** Average
Malaysia	0.8	0.14	+++	–	***** High
Myanmar	12.63	2.84	–	++++	* Low
Thailand	9.34	1.58	++	+++	*** Moderate
Vietnam	6.88	3	+++	–	**** Moderate to high

– no imports
+ few imports
++ average import
+++ high imports
++++ very high imports

* low price
** average price
*** moderate price
**** moderately high price
***** very high price

Traditionally, Malaysia has been a net importer of ruminants because of low supply and high demand, particularly during religious festivals. The movement of ruminants towards China has been also observed as being on the increase since 2008 due to attractive prices brought about by increasing demand from China.

The movement of pigs follows the reverse direction. Vietnam has the highest population of pigs and serves as the main source of live pigs and frozen suckling piglets that move to Cambodia, Lao PDR and even to Thailand as well as other parts of the region, for example Hong Kong.

Socio-economic issues

The economic growth rates of some countries in the Greater Mekong sub-region are exceptional. Of particular note is China which has been experiencing growth in excess of 10% per annum in recent years and despite the fact that this rate is decreasing, China has since established itself as a major trading partner of South-East Asian countries, thus cementing its

growing economic influence in the region. This overarching dominance of China in terms of market size and economic growth is likely to continue. Although the rate of economic growth in Vietnam is less than in China, the country has a fast growing population of over 80 million with many consumers having more money to spend on food. Both countries will exert strong influences over a range of socio-economic issues in the region that will be relevant to FMD control.

The urbanisation process is forecast to continue across all mainland SEACFMD member countries with the fastest rate being anticipated in Lao PDR (from a low base). Urbanisation is linked to economic growth and industrialisation. People are attracted to cities in the hope of improving their lifestyles by essentially earning more money for less strenuous work. Indeed, the incomes of those who are urbanised are generally higher than those who continue to live in rural environments. This overall increase in urban populations and their disposable income fuels the increasing demand for animal protein. However, with the exception of China and Malaysia, the forecasts suggest that in 2020 most people will still be living in rural areas and many will be raising livestock. Livestock production systems and practices will change, at least for a portion of the population, to meet the increasing demand for protein in the region. In addition to urbanisation, there is also migration of labour between countries to satisfy new demands for labour in rural areas (e.g. new rubber plantations in Lao PDR attracting labour from China) or in rapidly expanding urban areas.

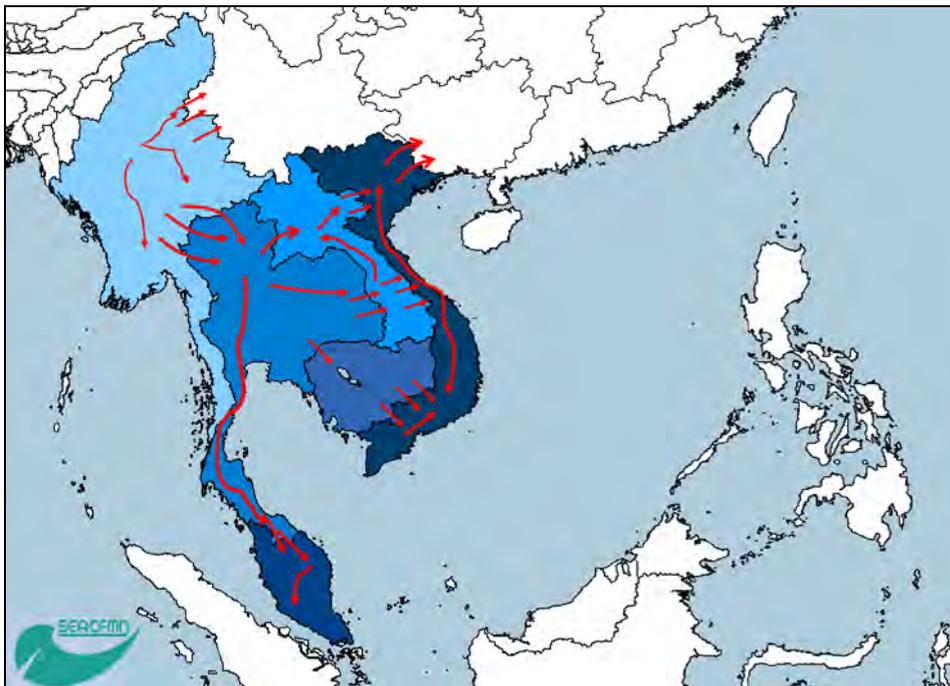


Figure 6
Cattle and buffalo movement patterns in the Mekong

In the SEACFMD countries, a number of very large infrastructure programmes are currently being planned. The largest are located in China and include large investments in rail – including fast 350 kph trains – and road infrastructures so that the improved transport arteries extend into the western provinces and provide the backbone for future economic

growth (Figure 7). Other developments in the region include the Singapore to Kunming railway line and extensive improvements in roads in Vietnam with better links into China. In other countries, the investments are not as extensive, but shorter travelling times across the entire mainland SEACFMD region are expected. In tandem with these improved transport facilities are plans to make cross-border trade much easier and more harmonised between countries in the Greater Mekong sub-region.

All of these factors contribute to a greater level of interconnectedness between mainland SEACFMD member countries. This will also increase the rate and extent of movement of FMD-susceptible animals and animal products in the region with an accompanying increase in the likelihood of FMD spread. It is critical to appreciate these issues as a precursor to developing strategies to control and eradicate FMD in this region.

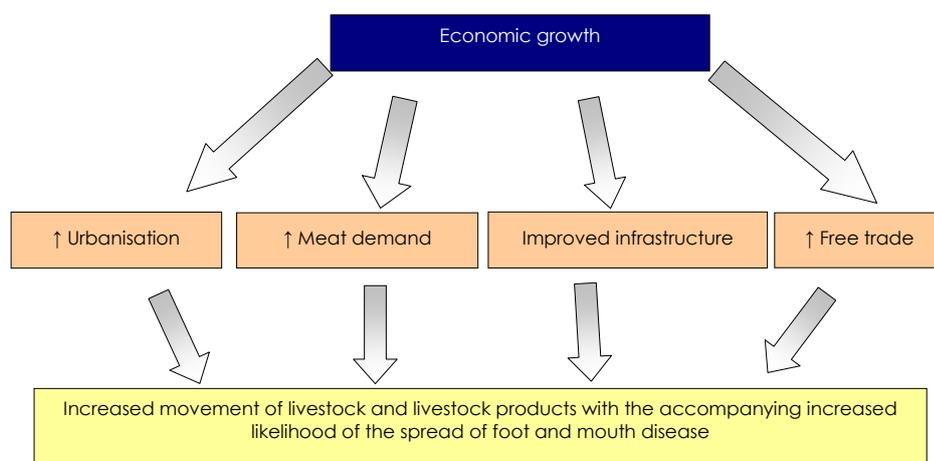


Figure 7
Risks associated with regional development

Additional details on these issues are included in Appendix 4.

Goat farm in Thailand



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Principles of foot and mouth disease control

The series of strategies designed to achieve FMD freedom by 2020 fall into three broad categories, namely: technical, advocacy and coordination. Strategies are not mutually exclusive but rather complement each other to create a transparent, interactive and comprehensive framework. Focusing on any one component without giving due consideration to other components should be avoided. Experience clearly shows that the overall effectiveness of the framework can be diminished if any of the strategies are underperforming. Hence the critical importance of introducing monitoring and evaluation programmes to assess performance and to formulate recommendations on future direction, as appropriate.

From a technical perspective, the major principles involved in controlling TADs, such as FMD, are listed below.

Rapid identification of the foci of infection

Rapid identification requires an effective surveillance and reporting system which ensures early detection of infection by member countries. Surveillance includes both active and passive surveillance activities. In many cases, passive surveillance is dependent on the initial recognition by farmers that an animal is sick. The likelihood of recognition and subsequent reporting is directly influenced by factors such as the level of awareness of farmers, how FMD is perceived by livestock owners and economic incentives for reporting related to compensation. Active surveillance activities should be implemented as part of rigorous outbreak investigations and whenever a recognised change is observed in the risk profile within an area or livestock sector.

Prevention of infection of susceptible hosts

Preventing infection of susceptible hosts is achieved by avoiding contact between infected and susceptible animals and herds through quarantine and movement management practices supported by on-farm biosecurity. Prevention activities include the isolation of newly introduced animals for a certain period before mixing them with the rest of the herd.

Elimination of the source of foot and mouth disease virus

Eliminating the source of FMDV involves disinfection, proper biosecurity measures and the use of acceptable husbandry methods to prevent the infection of susceptible animals by contaminated objects and infected premises. The disinfection of transport vehicles, holding yards, livestock markets, abattoirs and other premises where livestock are gathered, are important activities that help to eliminate FMDV in areas of high animal densities.

Increasing herd and animal immunity to foot and mouth disease

Effectively vaccinating animals will contribute to an increase in immunity levels of animals and herds. Issues such as selecting the right vaccine, vaccine delivery and post vaccination monitoring are covered in detail in the vaccination strategy.

Technical activities

The overall picture is one of rapid population and economic growth, increasing demand for animal protein, particularly in China, Malaysia and Vietnam, rapid urbanisation with the formation of megacities (but still with a very large percentage of the total population living in rural areas), rapid and extensive infrastructure developments and a more liberal and facilitated trade environment between SEACFMD member countries. Taking these general issues into account and combining them with the lessons learned about FMD control, it would seem that the movements of FMD-susceptible livestock and their products will increase and this will present a challenge to developing the capacity to adequately manage these movements.

This issue is one of the principal characteristics of the future strategy, namely: the need to facilitate movements while at the same time decreasing the incidence of FMD. This challenge will be addressed in three ways, as follows:

- decreasing the incidence and prevalence of FMD by targeted activities: in endemic countries, resources will be focused to combat FMD 'at source' and along the animal movement pathways at critical control points¹
- control zones will continue to be established in areas once the incidence of disease has been decreased to low levels and the likelihood of recurrence is reduced; due to limited resources, decisions on which areas to establish and extend will be made on the basis of rigorous risk assessments
- zones that are currently FMD-free will be protected by increasing the focus on quarantine and movement management at zone or country borders.

The three strategies are synergistic and self-reinforcing. This means that reducing the incidence of FMD at source should also lead to decreased incidence along the risk pathways and improve the capacity to maintain FMD-free areas (Figure 9).

Intervention at critical points

Decreasing the incidence of FMD at source will include intensive vaccination combined with intensive surveillance and strict animal movement control in areas with high population density that consistently participate in the trade of live animals in the region such as central Myanmar, northern Thailand, the Lao-Vietnam and Cambodia-Vietnam borders. Vaccination in such areas is designed to increase herd immunity in both the source population and the individual consignments that are derived from such source populations. Concentrated efforts in this area are likely to provide the greatest cost benefits for the SEACFMD.

Along the movement pathway, other animals with variable FMD status often join the consignments, but the likelihood of FMD being further transmitted is decreased – although not totally eliminated – due to the higher level of herd immunity in the consignment. Animals from the consignments do become mixed over time and infected FMD animals may be disposed of along the movement pathway. In some cases, these animals are the source of

¹Critical control points – a point wherein control can be exercised to prevent, control, prevent or eliminate infection.

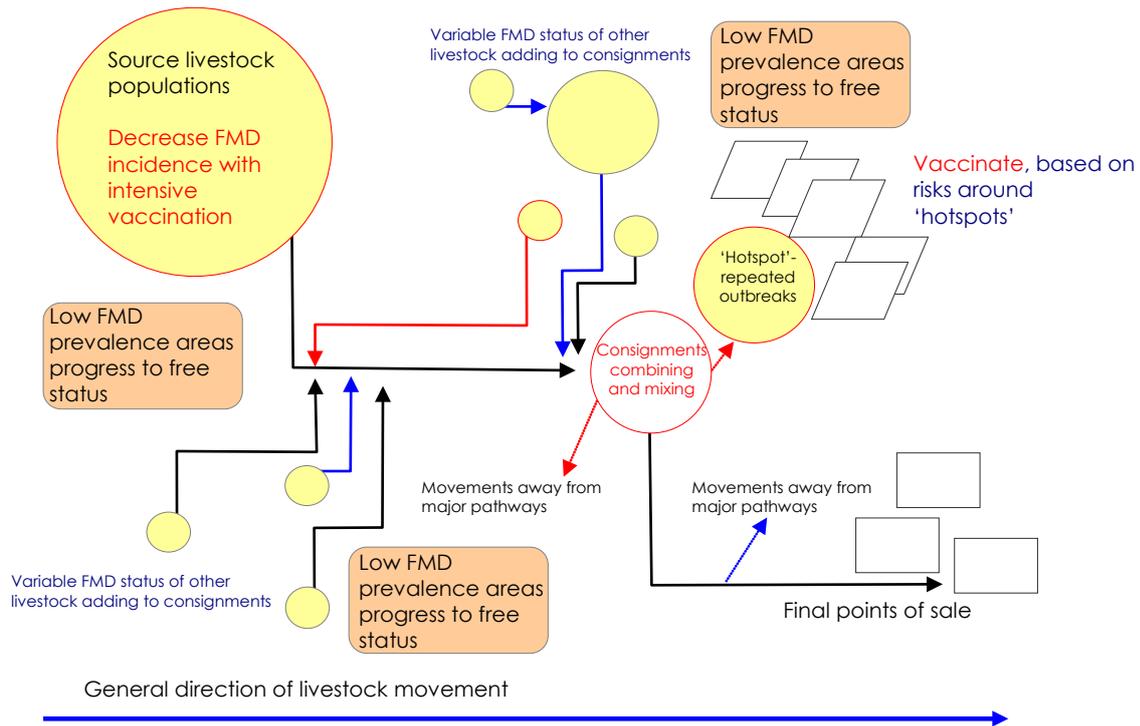


Figure 9
Flow of livestock showing some areas of strategic intervention

FMD which create ‘hotspots’² of infection along these pathways. Emergency vaccination around hotspots needs to be supported by a rigorous risk assessment to show that this activity will decrease the incidence of FMD in the area over the long term (Figure 10). In general terms, interventions should take into account the dominant direction of animal movements. Naturally, timing issues relating to season and festivals which have been shown to alter the likelihood of outbreaks should be combined with this directional information when developing intervention plans.

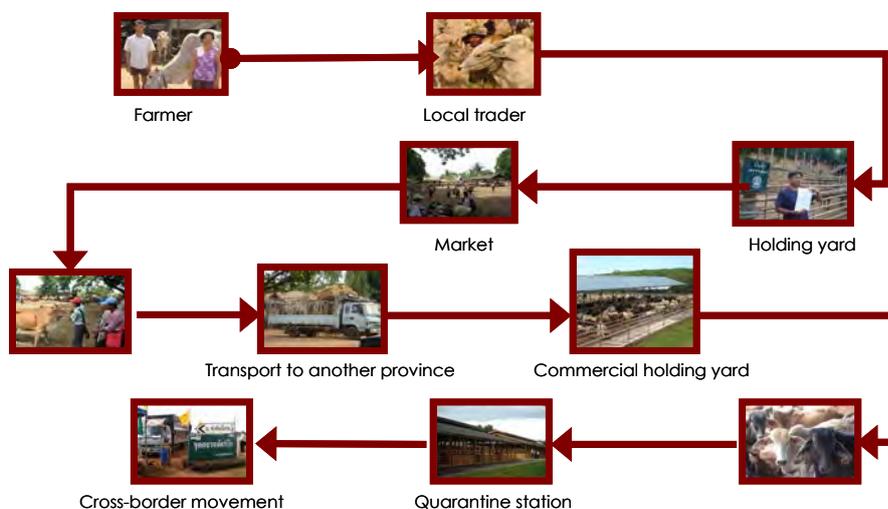


Figure 10
Critical phases along the animal movement pathway

²Hotspots – areas wherein disease is endemic; where risk continuously exists due to contact between susceptible species.

Zoning

There are three distinct levels of activity that clarify zoning approaches, as follows:

- zones that meet OIE standards: within the SEACFMD, these include Zone 2 of Luzon in the Philippines which was recognised as FMD Free by OIE in 2011; there is the intention that Region 2 of Thailand will also progress to meet OIE standards in a couple of years
- zones meeting the standards, definitions and rules as explained in the SEACFMD documentation as endorsed by the Tristate Commission for Malaysia-Thailand-Myanmar. This is the southern area of Myanmar which has progressed from the status of 'eradication zone' to 'control zone'
- cross-border cooperation areas such as those that exist in the Upper Mekong and Lower Mekong; these areas should not be referred to as zones at this stage; these areas may follow the standards, definitions and rules and eventually the OIE guidelines, but at present they represent areas of activity centred on cross-border cooperation rather than formal zones.

It should be noted that, in broad terms, it is more desirable to establish control zones taking the movement patterns of livestock into account. Zoning to meet OIE requirements is more likely to be achieved in source areas rather than in transit and end of pathway sale areas. However, it is also important to recognise that certain activities that facilitate and monitor livestock movement should be maintained, such as cross-border cooperation.

In areas with effective surveillance and where there is consequently a high level of confidence that the incidence of FMD is very low, efforts can be justified in revising the FMD status. Naturally, good movement management will be a prerequisite before any area can be considered for zoning and zoning progression.

Maintenance of foot and mouth disease-free zones

For FMD-free countries, such as Indonesia and zones within Malaysia and the Philippines, extra efforts need to focus on maintaining the free status. Formal border quarantine procedures need to be reviewed and formally assessed. In addition, emergency preparedness and response plans need to be kept current and tested. An outbreak of FMD in any of these areas with totally naive animal populations would be a social and economic disaster. The recent outbreak in Japan and the Republic of Korea show how quickly FMD can spread and how difficult and expensive eradication efforts can be. The SEACFMD will assist member countries to provide formal assessments of quarantine and emergency response procedures. This is a key function of the SEACFMD programme in Phase 4 and beyond.

Advocacy for political and stakeholder support

Political support

SEACFMD will falter unless there is strong political support and endorsement at the highest levels, accompanied by the provision of resources. A number of countries in the SEACFMD campaign have well-developed programmes in place and probably have sufficient resources to fund their national activities but may need political support. Others, such as Cambodia, Lao PDR and Myanmar, continue to require external funding to undertake a national FMD control and eradication programme.

Financial support

The best indicator of support is the availability of resources to deliver the programme. Development of policy briefs and short economic papers to justify investment for FMD control and eradication is considered essential. These economic papers need to clearly identify how FMD control and eradication benefit the macro economy, livestock industry development, poverty alleviation and food security at community and household levels. In addition to country level support, there is a need for international financial support, particularly for resource-deficient countries, such as Cambodia, Lao PDR and Myanmar.

Mobilising stakeholder and public support

Increased emphasis will be placed on public awareness campaigns and the updating and refinement of regional and national communication plans. Given the importance of the private sector in preventing and controlling disease, efforts will be made to build on the SEACFMD initiative to engage industry and strengthen and enlarge the SEACFMD Private Sector Consultative Committee.

Coordination

Essential to effective control of FMD and other TADs is a well-oiled organisational mechanism capable of coordinating the implementation of FMD control activities at various levels. Given the highly contagious nature of FMD and the potentially rapid spread of the disease within and between countries, it is important that countries with shared borders or those at high risk adopt common policies on FMD prevention and control and work together using an agreed strategy to control the disease. Countries need to continue to share information, identify weaknesses in animal health service delivery and correct deficiencies to enhance control programmes.

Regional coordination is a key to the management of not only FMD but also other TADs in South-East Asia. The setting up of the RCU in 1997 provided the key to the success of the SEACFMD campaign at the sub-regional level. The RCU serves as a lynchpin to ensure coherent implementation of FMD control activities by members. Regional coordination requires the full support of participating governments and contributory support, in cash and in kind.

The effective coordination mechanisms introduced during Phases 1 to 3 need to be further consolidated and enhanced. In recent years, the RCU has sought to work with other international organisations that work in areas consistent with SEACFMD objectives. This avoids duplication of efforts and creates complementarities. This work will remain a priority area for the RCU.

Regional coordination

Concept

The basic concept is that FMD can be prevented and managed at the sub-regional level if there are sound veterinary services and professional coordination of animal health activities between countries. Member countries are responsible for their own disease management systems, but coordination and support is provided by the modestly funded RCU in Bangkok. The campaign against FMD will lead to control of outbreaks, minimise the debilitating impacts on communities and will contribute to poverty alleviation, improve prospects of

trade by bolstering the growth of industry and the national economy, improve skills in countries which can later be utilised to deal in other areas and with other major diseases.

Role and function of the Regional Coordination Unit

The RCU facilitates the development of strategic policy for FMD control in the region and coordinates animal disease activities between countries, helps identify programme weaknesses, supports corrective action and ensures that coherent strategies and agreed outcomes are in place.

The RCU has a central role in the overall coordination of the SEACFMD campaign. This involves, *inter alia*:

- supporting annual meetings of the national coordinators of member countries
- assisting with rigorous reviews of national FMD plans and programmes
- arranging and providing expert support for epidemiological and surveillance programmes
- assisting member countries to help each other in a synergistic manner
- maintaining the link between OIE and ASEAN
- providing leadership in attracting funding for member countries
- managing and updating the FMD database for the region and links to animal health information systems
- providing public awareness and training
- ensuring productive relationships with complementary programmes
- facilitating and identifying priority research studies.

In addition, the RCU is well placed to provide rapid response support to FMD emergencies in member countries. The technical monitoring and evaluation role of the RCU is an essential tool in determining the progress of the SEACFMD campaign and recommending new directions where necessary.

With the support of member countries and the OIE, the RCU will continue to access new technology relevant to the SEACFMD campaign. The RCU has collected a wide range of material and provides a database that can be used by member countries for public awareness, training and management of disease control activities. It is also the catalyst for the formalisation of memoranda of understanding between member countries on matters relating to FMD in South-East Asia.

The SEACFMD RCU is currently staffed by the regional coordinator (who is also the OIE Sub-Regional Representative for South-East Asia; a project officer, a part-time secretary and an office assistant. The RCU is also supported by short-term member country secondments and has benefited from the expertise and assistance of a number of externally funded post-graduate students from Australia and France. Consultants are hired to provide specific services from time to time and an OIE special advisor provides strategic, policy and programme advice.

Two programmes managed by the SRR complement SEACFMD activities. These are the PSVS programme funded by AusAID which is staffed by a programme manager and a project officer and the OIE component of a regional EU cooperation programme – the HPED

programme which is also staffed by a programme manager and a project officer. However, it is clear that to achieve success, more dedicated staff arrangements will need to be made for SEACFMD.

AusAID has been the primary source of funding for core activities of the RCU that orchestrate FMD control in the sub-region. The support of Thailand in hosting the RCU in the Department of Livestock Development (DLD) in Bangkok has been vital. The RCU has also been instrumental in building privileged relationships between the OIE and agencies, such as Department of Agriculture, Fisheries and Forestry (Australia), EU, FAO, Japan International Cooperation Agency (JICA), other agencies and member countries. Training programmes for staff in member countries has been an important component of RCU activities. The RCU has been working on improved relations with ASEAN in terms of strategic alignment, management and funding, with the OIE providing continued technical support.

The RCU has facilitated a steady, progressive advance in FMD control and eradication. There have been considerable achievements across the region on the harmonisation of legislation, laboratory testing and networks, animal health management, surveillance and epidemiology. However, there is no doubt that additional work is required.

National and sub-national coordination

Dedicated functional arrangements at national and sub-national levels are essential to coordinate disease control and eradication activities at both national and local levels. Structures could assume forms such as a task forces, inter-agency committees and national or local disease committees. The experience in the Philippines has shown that dedicated national and provincial task forces involving industry played vital roles in eradicating FMD.

Member country responsibilities

Member countries are responsible for implementing activities to control FMD within their jurisdiction. Resources are mainly derived from government budgets and, in some cases, donors provide funds for bilateral projects to control the disease. The implementation of the various strategic components of the SEACFMD campaign are implemented by the country from the national level down to the field level. One critical responsibility of members is transparency in disease reporting, particularly outbreaks of FMD near country borders. The RCU routinely provides alert notices to all members to warn them of possible risks to their territory.

Buffaloes for sale in Myanmar



© Polly Cocks

Several essential tools for the action plans to support the SEACFMD are described below.

Risk analysis

Risk analysis comprises hazard identification, hazard characterisation, risk assessment, risk management and risk communication. The general SEACFMD approach is based on a risk analysis framework.

Phase 4 will emphasise explicitly the application of rigorous risk assessment processes to support disease control. This will support sound decision-making. Risk factors are now reasonably well defined for FMD incidence and geographic spread. Animal movement remains the major concern but has proved exceptionally difficult to manage well. Risk analysis will continue to be used to aid member countries to develop strategic policies to support effective FMD prevention and control.

Surveillance and epidemiology network

A sound surveillance system is an essential tool that provides guidance in the overall disease control strategy. It is the backbone for early detection and response. Surveillance is the method used to determine the FMD status of a zone and regular surveillance surveys and prompt follow-up analysis will need to be undertaken in order to meet OIE standards for any established zones, except of course for infected zones.

Additional efforts will be dedicated to strengthening the epidemiology network (EpiNet) to provide the necessary technical input to policy decision-making. This tool will strengthen epidemiological skills and the sharing of information in the region. The RCU provides a Web-based information system in which maps are displayed and tables of FMD outbreaks presented. Information systems will be of increasing importance as the SEACFMD campaign progresses to eradication and freedom. Eradication of FMD by 2020 will rely on the improved epidemiological skills mentioned above and EpiNet will provide a mechanism to build quality databases and analysis to guide the campaign. The RCU will work with ASEAN and China to develop a platform to enable the sharing of disease information. A possible option is to expand the FMD component of the ASEAN Regional Animal Health Information System (ARAHIS), which serves as the OIE World Animal Health Information System (WAHIS) Regional Core for ASEAN, to serve this purpose.

Surveillance will need to continue until 2020. The demand for surveillance programmes will increase as the zones upgrade and expand and then, once consolidated, decrease to a monitoring profile. Unexpected outbreaks will also make demands on field and laboratory capacity for surveillance. The surveillance capacity of member countries varies and some upgrading of human resource capacity is still required for countries such as Cambodia, Lao PDR and Myanmar.

Zoning

Criteria for zoning have been developed as part of the overall standards, definitions and rules for zones and zone progression. However, from the lessons learned, it is apparent that

zone progression requires a level of resources that has not been routinely available to date. This highlights the importance of reducing the incidence of FMD in the region with risk-based vaccination and targeted disease control efforts.

In addition, the standards, definitions and rules have been revised and are consistent with the OIE *Code*. The initial standards, definitions and rules were written before the emergence of HPAI and porcine reproductive and respiratory syndrome (PRRS) in the region and these diseases have diverted resources away from FMD. As a consequence, the resources available to establish and maintain control zones are often inadequate.

In areas with very effective animal movement management and good supporting evidence that FMD outbreaks (if any) are very rare, resources can reasonably be allocated to support FMD zone progression. In many cases, this will mean that zone progression is more likely in areas that supply livestock. Areas that tend to receive livestock – either as a collection point along a movement pathway or as a sale destination – will be the very last to apply or achieve zone freedom. These principles are consistent with the OIE *Code* that recommends surveillance strategies for FMD.

Zones that are likely to achieve free status in the near to medium term include the Red River Delta and parts of Lao PDR.

Outbreak investigation and management

Early detection and response is a key factor in controlling FMD and other TADs. The SEACFMD has launched training on outbreak investigation and management to build the capacity of field veterinarians and veterinary paraprofessionals to respond to outbreaks. A manual that describes the basic epidemiological principles has been developed and is based on contributions from members. It is expected that once a significant number of field staff has been properly equipped with the basic tools for outbreak investigation, this should translate into better management of outbreaks in the future and, over time, to a decrease in annual incidence of FMD in the region. Field staff from districts identified as critical points and FMD hotspots should be prioritised to undertake this training initiative.

Diagnosis and laboratory network

The FMD Regional Reference Laboratory (RRL) in Pakchong, Thailand, provides the backbone and sets standards for the considerable laboratory inputs required in the SEACFMD campaign. The RRL has a major task in assisting with quality control of the diagnostic tests and in providing specialist diagnostic tests to back up the campaign. It also provides the link to the World Reference Laboratory.

There will be increasing demands for laboratory testing for surveillance and analysis, diagnosis, FMDV strain identification and quality control in the region as the SEACFMD intensifies its programme and expands the FMD-free zones. In this context, the importance of collecting high quality samples will become more critical as the programme progresses and accordingly extra efforts will need to be allocated to this task.

The RRL is the hub for FMD quality control and acts as a reference laboratory for national laboratories in the region. Most national laboratories can undertake a range of FMD diagnostic tests and, through the network for laboratory testing, are able to provide agreed quality standards that are consistent with OIE guidelines. Through the network, the RRL can

provide support to national laboratories during emergencies and resolve the majority of unusual diagnostic problems. This is a powerful tool for the SEACFMD campaign. The network provides the opportunity for member countries to have FMD isolates confirmed and typed.

Vaccination

Vaccination is an essential component of FMD control. The quality and availability of vaccine and level of vaccine coverage are critical elements of any vaccination strategy. Vaccines, however, must be effective and correctly selected to protect against the circulating strains, otherwise vaccination failures will occur. Even the best vaccines will not protect every animal; 80%-90% immunity levels in cattle and buffalo are the norm, but the protection rate is much lower in pigs.

The choice of a vaccine should involve expert advice in most cases. For example, issues such as whether it is necessary or justifiable to choose a 6PD₅₀ vaccine instead of a less expensive 3PD₅₀ vaccine for a certain vaccination intervention or programme are complex. A SEACFMD vaccination strategy supported by member countries provides a reference for Roadmap activities (Appendix 6). For countries with inadequate resources and where mass vaccination outside the priority zone is not implemented regularly, it is essential to create an emergency vaccine stock that can be used to respond to FMD outbreaks. This is to ensure that any impending FMD epizootic can be averted.

When vaccination is used, it is important to achieve herd immunity of at least 80% of large ruminants; this can be validated through post-vaccination monitoring using a structured survey and testing with a liquid-phase enzyme-linked immunosorbent assay (LP ELISA). Most vaccination activities will include a monitoring component to ensure that vaccination practices result in protective antibody levels in the population targeted. This is part of the monitoring and evaluation philosophy that underpins all activities within the SEACFMD programme.

One of the thrusts of the strategy is to implement a risk-based vaccination approach recognising that it is the most cost effective approach. The risk-based approach, in combination with regular reviews to assess the effectiveness of the strategy, may identify areas where more extensive or intensive vaccination would be desirable. In these cases, access to greater quantities of vaccine and additional resources would be desirable.

Vaccination also includes vaccine use in emergency situations. The development of a vaccine bank under the EU-funded HPED programme will complement SEACFMD vaccine strategies. The choice and quality of antigens will also require detailed scientific consideration.

Animal movement management

Animal movement has been considered the predominant cause of FMD outbreaks. This is a difficult issue for all member countries. Given the economic value of the livestock trade, there is considerable animal movement in the region. This is also an indication of the importance of the livestock sector.

The directions of animal movements fluctuate, reflecting changing economic circumstances in the region. During the last three years, with the assistance of member countries, the RCU

has developed a much better appreciation of the direction, nature and extent of livestock movements in the region. Although the overall general movement pattern seems well established for cattle and buffalo, it is recognised that over shorter time frames, movement patterns can change rapidly in response to changes in demand and price signals. For pigs, the movement patterns are more dynamic over short periods, thus often reflecting demand and supply imbalances that are sometime due to disease outbreaks (e.g. PRRS). In recent years, there has been a marked increase in movements of cattle into Vietnam and north into China. These changes have highlighted the need to be more flexible in developing a control strategy for the future. Although the major markets for cattle, buffalo and goats are still likely to be China, Vietnam and Malaysia and movements in these general directions can be anticipated with some confidence, it would seem prudent to undertake periodic reviews of the trends that stimulate animal movement. For pigs, the dominant pathway is from Vietnam to Lao PDR, Cambodia and sometimes to Thailand (frozen suckling piglets). Some pigs are moved from Thailand to Cambodia and Lao PDR for slaughter.

The changes in livestock movement patterns have been the motivating force behind the re-evaluation of the progressive zoning strategy. Movements are exceptionally difficult to control and it now seems wiser and more appropriate to simply facilitate movements in the direction that the market demands dictate. Trying to alter or slow livestock movements only encourages increasing rates of illegal movement.

The strategy for more effective controls of animal movement is to attempt to reduce costs, improve the efficiency of legal animal movements and encourage traditional movements to conform in part at least to some manner of inspection. Reduced costs and free FMD vaccination for border traders would encourage more legal animal traffic. The range of animal movement management processes needs to be examined annually to identify risks and opportunities for a more efficient system. Traceability using ear tags, brands and ear notches help and are starting to gain popularity. This should be encouraged.

Improved inspection techniques for livestock movements across the supply chain will be developed.

The patterns of animal movement remain a critical element in designing future strategy.

Biosecurity

The destruction of the FMDV in the environment can be achieved by proper cleaning and disinfection. Good sanitary practice in different production and processing facilities will decrease the likelihood of virus contamination and transmission. Transport vehicles should also be properly cleaned and disinfected. In addition, field personnel involved in disease control and investigation should observe biosecurity measures at all times, including when visiting livestock establishments and smallholder farms.

Maintenance of foot and mouth disease-free status

A major platform of the Roadmap is to ensure the maintenance of FMD-free status of countries and zones. This will be achieved by surveillance and analysis of results to prove freedom of disease, effective public awareness, annual risk assessments of FMD outbreaks, the establishment of an emergency FMD task force, continuous updating of legislation to facilitate FMD-free status and rigorous controls of animal movements into FMD-free zones.

This vigilance will also help the FMD-free countries, such as Indonesia, Brunei Darussalam, Singapore and the Philippines and parts of Malaysia, to retain their status. To support the public awareness programme in FMD-free areas, the economic benefits of freedom from FMD need to be widely publicised, as do the economic and social costs of a permanent breakdown of FMD-free status. It is expected that the current FMD-free areas will remain free until 2020 and contribute to the other member countries through consolidation of the socio-economic benefits of FMD freedom in the region.

Emergency preparedness and response planning

It is critical that SEACFMD countries implement systems that will rapidly detect disease, report incidents to the authorities with the utmost speed and urgency so that action can be taken to quarantine problem farms and areas and prevent the spread of FMD.

Rapid detection and reporting are critical elements in FMD control given the highly infective nature of the disease. A number of major FMD outbreaks in SEACFMD countries have resulted from failures in these areas.

Countries need to have response arrangements to rapidly isolate outbreaks, prevent spread through movement controls, including disinfection, and implement national policies ranging from slaughter to vaccination; these activities need to be combined with communication to the public.

Policies will vary from country to country, depending on disease status, for example, country- or zone-free status and their economic circumstances. However, the principles of rapid detection, reporting and action apply to all situations.

Response planning on emergency preparedness activities are key animal health activities. Plans should be fairly simple, capable of implementation and developed by animal health staff so they are not only familiar with the content but also 'have ownership' of the ideas. Plans should be tested regularly and updated as necessary.

The importance of contingency plans for FMD-free countries cannot be over emphasised. With the increasing relative ease and rate of movements of risk products from FMD-infected countries in the region, the likelihood of virus breaching current quarantine barriers will increase. The complete pathway from an infected country to a susceptible animal is of course complex, but the overall threat is assessed as increasing. Areas such as east Malaysia and countries like the Philippines and Brunei Darussalam must be ever vigilant to prevent the entry, establishment and spread of FMD.

Research and development

Research and development activities should deliver findings that underpin strategy development, i.e. the technical validity of proposed interventions to control and eradicate FMD must be well understood and based on good science. Relevant social and economic research will also be needed to understand the motivations of stakeholders at all levels along the market chain, from the smallholder scale to the provincial scale to national and international levels. The research findings will inform FMD activities in countries at these levels. A revised research and development strategy will be developed and implemented in collaboration with member countries and research institutions.

Public awareness and communications

Public awareness and communications require all the support and tools available because good communication plays an essential role in achieving a successful outcome. The expansion of the network created by the RCU will provide a useful tool for engaging the public and private sectors in the progress of the SEACFMD campaign. The RCU is the focal point of the network and can assemble 'packages of information' on the SEACFMD website, thereby enhancing the global network and communications between member countries throughout the SEACFMD campaign. Emergency plans, with regular practice runs in communications, should be established in all member countries, including FMD-free members.

Throughout the SEACFMD campaign, a strong and active public awareness programme from today to the end of 2020 and possibly beyond is essential. Experience from the Philippines will assist in consolidating the programme. Using all forms of media, targeted public awareness communications to a wide range of stakeholders in the public and private sectors will be needed.

Standards

Clear, achievable sets of defined systems and activities are valuable tools that are essential for an integrated SEACFMD campaign. The campaign will conform to the OIE standards as set out in the FMD *Code* chapter in terms of surveillance requirements to achieve FMD freedom with vaccination by 2020. These standards are the benchmarks of the SEACFMD campaign and provide good guidelines for the control and eradication programme.

In addition, the OIE *Code* contains a chapter with agreed international standards on the quality of veterinary services. This is the basis of the OIE PVS pathway which assists countries in strengthening their veterinary service systems for the effective control of TADs, including FMD.

Training

Training will upgrade the skills of participants in the SEACFMD campaign and is another essential component for the successful outcome of the SEACFMD campaign by 2020. Substantial training has been planned and provided by the RCU, with support from other agencies such as the FAO, JICA, EU and OIE. Between 2011 and 2020, training requirements will evolve in line with progress achieved in the campaign. In addition to a lack of funds, one factor that may hinder training is the lack of available candidates for training in some member countries. In addition, competition from other duties, such as HPAI, limits the application of the training acquired. All components of the strategy need training inputs. Specific training modules for farmers and communities will be developed in areas such as disease recognition and emergency management in cooperation with experts in this field taking into account matters such as gender and the outcomes of research. The development and implementation of training will be conducted in consultation with organisations such as the FAO.

Introduction

Current institutional arrangements for the SEACFMD regional programme reflect the fact that it is an AusAID-funded OIE programme and works in close cooperation with member countries, ASEAN, international organisations and donor bodies to ensure progress of the overall campaign.

The SEACFMD falls within the GF-TADS umbrella. GF-TADS participants include ASEAN and WHO, and donors such as AusAID and the EU. The SEACFMD will continue to participate in the future activities of GF-TADS. The Regional Steering Committee of GF-TADS for Asia has recognised the leading role of SEACFMD in the control of FMD in the ASEAN sub-region.

The SEACFMD Sub-Commission

Overall guidance, policy development and review are provided by the OIE Sub-Commission for FMD in South-East Asia chaired by the OIE with membership comprising member countries, ASEAN, FAO and donor organisations that provide significant annual contributions (US\$150 000) to the programme. Policy and programme guidance to the Sub-Commission is provided by a steering committee comprising the president and vice-presidents of the OIE Sub-Commission, member country representatives, the OIE regional representative, the ASEAN secretariat, FAO and donor agencies. National coordinators who meet at least twice yearly, play pivotal roles in reviewing and guiding the implementation of the SEACFMD.

The Sub-Commission meets annually on a rotating basis in member countries and reports to the OIE general assembly in May each year. Reports on the outcome of Sub-Commission meetings are provided to ASEAN for information and endorsement. Following the formal Sub-Commission meeting, directors general of member countries and the OIE director general or his representative meet to discuss a range of key regional and global animal health issues.

Appendix 9 expands on these arrangements in the Terms of Reference for the Sub-Commission and Steering Committee.

The success of the regional SEACFMD campaign is dependent on cooperation between its members, support from Thailand, funding from AusAID, other donors and member countries, and the quality of professional staff. More importantly, at the national level, the continued political and resource commitment of the governments of SEACFMD member countries to FMD control and eradication is vital. Institutional management will be further refined in Phase 4.

OIE

The OIE will continue to play the lead role by providing scientific and policy input to ensure the success of the SEACFMD programme. The OIE will chair the OIE Sub-Commission for FMD with the chair nominated by OIE director general. The OIE will harness the benefits from other regional FMD and TADS control programmes on a global scale and help secure funds for the programme.

ASEAN

The objective of Phase 4 is to secure and enhance ASEAN involvement in SEACFMD activities. This move is aimed at facilitating member country ownership and sustainability of the regional SEACFMD campaign. It is proposed that ASEAN will, *inter alia*, manage and be accountable for funds in the ASEAN animal health trust fund. SEACFMD will actively work with ASEAN on its future regional coordination mechanisms following the review funded by AusAID, the OIE, FAO and EU.

FAO

The FAO through its various technical facilities will partner with OIE in providing technical assistance and helping to mobilize resources to meet the SEACFMD objectives. The FAO will continue to be an active member of the Sub-Commission and the Steering Committee by sharing information on current FAO thrusts in the control of transboundary animal diseases such as FMD and providing advice on the design and implementation of the FMD SEACFMD Roadmap given the global direction to control FMD. On the ground technical support will be provided especially to countries needing assistance to respond to disease emergencies and will be channelled through its FAO country offices.

Member countries

All member countries will be responsible for their roles in the SEACMD campaign and for developing national FMD programmes based on agreed strategic directions. The RCU has assisted in the preparation of a number of national programmes. Each country may have different target dates for FMD freedom consistent with the overall target of the 2020 Roadmap.

Member countries should review their human and financial resource allocations up to 2015 and projections to 2020, particularly those countries with limited resources. A long-term funding perspective is essential. Each national FMD plan should be reviewed on an annual basis. In some situations, the RCU will be able to assist member countries and they in turn and on their own initiative can assist those countries with lesser resources.

The RCU will design and make available to member countries a 'dashboard' reporting format that will enhance monitoring and review activities across all the elements of the SEACFMD programme. Early warning mechanisms that draw attention to deficiencies in programmes will assist the RCU in re-assessing and, in some cases, redesigning appropriate strategies for FMD control. This is a core part of the adaptive management process which will contribute to progress towards the 2020 goal.

In addition to its comprehensive national FMD plan, China will provide support in areas such as surveillance, vaccination, training and laboratory capacity building in countries bordering China. China has identified the national FMD reference laboratory as the contact office for exchange of technical information with other SEACFMD members.

Regional Coordination Unit

The RCU is the centre of all SEACFMD coordination, monitoring and evaluation of progress on a regional scale. The RCU will support member countries and play a critical role in the coordination of activities designed to reduce FMD prevalence and protect FMD-free zones. It

will provide a reservoir of skills, knowledge and data banks on FMD and also link member countries, where necessary, to the regional information systems.

Private sector and communities

The Sub-Commission has established a Private Sector Consultative Committee (PSCC) which suggests improvements to FMD control at the regional level and, to some extent, provides resources for the programme. The PSCC is chaired by industry. It is anticipated that the role and membership of the PSCC will expand. Efforts will be made to engage communities, enlist support and receive advice. Of importance will be consideration and implementation of contemporary gender practices.

Monitoring and evaluation/evidence-based approaches

The SEACFMD monitoring and evaluation framework for the RCU was revised in Phase 3 to improve the efficiency and effectiveness of its activities. This sub-regional monitoring and evaluation system will be improved progressively to provide clearer definitions of targets and indicators, more explicit descriptions of achievements; systematic data collection methods and support the proper allocation of resources. Monitoring and evaluation approaches will be developed specifically for the technical and scientific aspects of the SEACFMD.

Consistent with the overarching adaptive management approach, all activities will be monitored to assess that they are achieving the desired outcomes. For example, intensive vaccination efforts should lead to coverage of 80% of the target population (i.e. 80% of the population with protective antibody levels). To ensure that this is being achieved, regular sampling of groups of vaccinated animals will need to be performed as a core component of the vaccination strategy. Similarly, the vaccination process, in combination with improved disease detection and control procedures, should lead to a decrease in the annual incidence of FMD outbreaks over time in specified areas. An independent scientific review of progress will be implemented to provide a regular record of progress.

Ideally, disease control activities should simply be an integral part of the package of interventions that become embedded within improved livestock production and health approaches that together lead to higher incomes and opportunities for stakeholders. To be truly sustainable in the long term, these improvements should feed directly into the development pathway of the member country. In attempting to ensure that the interventions are socially acceptable and actually benefit stakeholders at the producer level (at either the smallholder level or a more commercial level), it will be essential to undertake social impact studies and micro-economic studies to assess whether the planned control measures are appropriate. If these outcomes are not being achieved, feedback from an independent review will be sought to identify the areas that require attention. Advice would also be sought as to whether the relevant strategy needs to be readjusted or substantially changed. In short, a process of continual monitoring and review will inform the development and delivery of strategy.

Cattle used for milling grains in Myanmar



© Polly Cocks

AusAID has been the principal donor for SEACFMD since its inception in 1997. Most of the funds are dedicated to the maintenance of the RCU, coordination activities, such as organising the annual meeting of the Sub-Commission and national coordinators, workshops, meetings in the various countries, training sessions and the provision of emergency assistance in times of outbreaks. From 2011 to 2016, the AusAID has committed to continue its support to SEACFMD under the new STANDZ programme.

In addition, certain member countries have received funds from multilateral and bilateral donors. Other contributors include:

- ADB: Control of trans-boundary animal disease in the Mekong sub-region
- AusAID: Sanitary/phytosanitary capacity building project for the Malaysia-Thailand-Myanmar zone
- AusAID/FAO: FMD eradication project in the Philippines
- Australian Centre for International Agricultural Research (ACIAR): Project in Cambodia and Lao PDR
- EU: FMD Vaccine Bank; previous Projects for Strengthening Veterinary Services in Lao PDR and Vietnam; project for Smallholders' Livestock Development in Cambodia
- FAO: Greater Mekong Sub-Region TADs Project
- France: Surveillance Project for Upper and Lower Mekong regions
- New Zealand: Red River Delta Project in Vietnam.

Bilateral support for resource-deficient countries is required to achieve the long-term goal of FMD freedom by 2020.

The RCU will need US\$600 000 a year to operate at a minimum level to enable it to continue to fulfil its basic functions. As the SEACFMD campaign progresses more rapidly, an additional sum of US\$500 000 is required to support members in the case of an emergency to prevent the resurgence and spread of epizootics similar to the 2006 situation when over 1 300 outbreaks occurred.

The bulk of resources for national FMD control are provided by member governments. Partly as a result of RCU and member efforts, governments have progressively increased their investments in FMD control. Vietnam allocated US\$35 million to support FMD control over a five-year period from 2006 to 2010. Thailand has invested an additional US\$2 million per year to establish an FMD-free zone in Region 2. Even a resource-deficient country like Lao PDR has allocated an initial amount of US\$60 000, commencing in 2010, to support FMD control and the implementation of a SEACFMD zoning initiative.

The Roadmap emphasises the critical importance of increasing vaccination coverage to meet programme objectives. It is estimated that a minimum of US\$40 million will be needed for satisfactory vaccination coverage over a five-year period until 2016. This resource is essential to the success of SEACFMD in achieving FMD freedom with vaccination by 2020.

Collecting blood samples from a piglet



© Jim Caro

The comprehensive range of technical and non-technical issues raised in this Roadmap will form the basis for planning to achieve SEACFMD 2020 objectives. They will create the foundations for more detailed strategic and project planning activities by the RCU and member countries in consultation with stakeholders and the international community. It is planned that there will be two phases that will lead to the finalisation of SEACFMD in 2020.

Phase 4 (2011-2015) will expand the scope and coverage of SEACFMD. It is planned that some zones in mainland South-East Asia will gain recognition of 'FMD-free zone', such as Region 2 in Thailand, certain states of Peninsular Malaysia, etc. As indicated in the technical strategy, the focus of Phase 4 is to reduce the prevalence of FMD in hotspots and critical points along animal movement pathways. By reducing the prevalence in these areas it is expected that the overall prevalence of FMD in the region will be reduced dramatically, resulting in some zones achieving FMD freedom status. This will also reduce the risks of FMD pressure from those zones that have gained freedom.

Phase 5 (2015-2020) will see the finalisation of the campaign with planning and activities geared towards ensuring a sustainable approach to FMD prevention and control. Key areas that will be addressed are maintenance of the FMD-free zones. The most difficult challenge in this phase is finding the remaining foci of infection to totally eradicate FMD from the region. Protection of the entire region against the incursion of new FMDV strains from other regions will also pose a challenge.

The SEACMD campaign is an extraordinarily complex one and will have to be managed professionally and with considerable enthusiasm with long-term strong political and funding support. It will require regular evaluations to ensure that it meets the desired outcomes. Member countries and the RCU will need to adopt adaptive management practices to accommodate changing technical and socio-political events. If these tests are met, the SEACFMD campaign can be successful.

Cattle for transport in Thailand



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Country profiles

Country profile: Brunei Darussalam

Brunei Darussalam has never reported FMD. The livestock number in the country assists its effort to remain FMD-free. Since 1993, pig farming and importation have been banned.

In line with the objective to ensure food sufficiency, cattle (beef and dairy), both buffalo and goat production are being promoted. At present, the local production of beef, for example, covers 4% of beef consumption, while mutton and fresh milk production cater for 17.7% of the consumption of these products. There is therefore a need for the country to rely on imports.

The Animal Quarantine Unit of the Department of Agriculture is responsible for preventing the introduction of exotic diseases and disease agents into the country, as well as to facilitating transborder movement of animals and animal-based food products. The relevant legislation is the Quarantine and Prevention of Disease (Animals) Regulations, Sections 91 and 92 in Chapter 47 of the laws of Brunei Darussalam. Buffalo, cattle, deer, sheep and goats are not subjected to quarantine, but are only allowed to be imported from countries which are free from FMD.

Country profile: Myanmar

FMD is endemic in Myanmar and has been recorded in all states and regions of the country. The outbreaks are mainly caused by serotype O but in 2005, serotype Asia 1 was reported in Kayah State and Magway Region although it has not resurfaced since then. In 2010, serotype A was again reported in Rakhine State situated close to the border with Bangladesh, after its last report in 1999 in Tanintharyi Region. Myanmar plays a crucial role in the SEACFMD campaign as it is one of the major suppliers of livestock, particularly cattle, to the region, with approximately 13.1 million cattle, 2.9 million buffalo, 8.3 million pigs and 3.5 million sheep and goats.

Myanmar is implementing a new national FMD control programme which is linked to the SEACFMD Roadmap for FMD freedom with vaccination by year 2020. There are three phases of the national FMD control programme, namely: Phase 1 (2008-2010), Phase 2 (2011-2015) and Phase 3 (2016-2020). The staff from the states and regions, the Myanmar Livestock Federation (MLF), and private veterinarians were consulted when drafting the national plan. The Director General, Deputy Director General, Director of Research and Disease Control and Head of the National FMD Laboratory are those responsible at the headquarters, while the Deputy Directors of the states and regions are responsible for the implementation in the 14 states and regions. An evaluation meeting is held every four months, as well as at the end of the year to plan the strategies for the following year. The estimated budget from the Government of Myanmar is US\$18 000 to support the existing FMD laboratory and US\$200 000 to construct a new FMD laboratory. The National FMD laboratory currently produces 150 000 doses of FMD monovalent vaccines (serotypes O and Asia 1) per year,

which is insufficient to cover vaccination of FMD-susceptible animals in the country. The construction of the new FMD laboratory is expected to improve FMD diagnosis and increase the production of FMD vaccine.

With the assistance of international funding agencies, Myanmar is able to conduct serological surveillance and public awareness activities in selected areas. There is also an ongoing foreign funded programme to strengthen national capacity in the production of veterinary vaccines and a study devoted to the effectiveness of local vaccine for FMD control in Myanmar. Despite the present assistance, the country still requires additional guidance in conducting public awareness and surveillance programmes and establishing a reporting system from the grassroots level. Constraints are also encountered in the control of illegal movements of animals.

Country profile: Cambodia

FMD remains endemic in Cambodia, with outbreaks reported every year, mainly caused by serotype O and, to a lesser extent, serotype A. Serotype A outbreaks were reported as of 2006, which was the peak of outbreaks in the country and has been isolated consistently since then. Although the outbreaks in the following years have decreased compared to 2006, there is no continuous downward trend of the yearly outbreaks from 2007 to present.

The livestock production of Cambodia is adequate to meet domestic demand thus there is limited demand to import. The risk of introducing FMD comes from livestock that transit in Cambodia en route to Vietnam. Controlling the infection that has been endemic in numerous provinces and its lateral spread has been and continues to be a big challenge for the country.

In close coordination with the OIE SEACFMD campaign and SEACFMD member countries, Cambodia foresees an effective FMD control campaign through the strengthening of the national FMD surveillance and information system, controlling animal movements and accreditation of veterinary services. The Department of Animal Health and Production (DAHP) is seeking support from funding agencies and other bilateral programmes in the area of animal health research and veterinary services to protect national herds and flocks from the intrusion of disease, protect consumer health and facilitate animal trade.

The DAHP is still working on the veterinary law of Cambodia, with support from international agencies like the OIE and FAO. DAHP is working with the OIE SEACFMD RCU to develop the national plan for FMD control for implementation in 2011-2015. The disease risk management function in place is managing animal health at the village production level and supporting the Animal Production Service in developing sustainable livestock production. To achieve this, it is necessary to strengthen national and international coordination and cooperation. For animal disease risk management, DAHP is seeking support in the form of human resource development in animal health risk management and development of veterinary law, disease control legislation and disease control programmes. There are sufficient human resources in Cambodia but the problem is a lack of funding support for staff and for the animal health activities that need to be undertaken.

Country profile: Philippines

No FMD was reported since the last outbreak in late December 2005. The Philippines gained first recognition of FMD-free zone without vaccination when the OIE recognised the island of

Mindanao in 2001. This was followed by the Visayas, Palawan and Masbate in 2002. And in 2010, zones 1 and 3 of Luzon Island were also recognised by the OIE as FMD-free without vaccination. The remaining area of Zone 2 of Luzon was recognised by OIE in 2011 making the whole Philippines FMD-free without vaccination.

The last FMD strain eradicated in the Philippines was serotype O Cathay topotype, which mainly affected pigs. It was introduced in late 1994 and caused a major epidemic in 1995 which cost the nation Php2.1 billion (approximately US\$83 million). This epidemic caught the attention of the highest authority of the land prompting the issuance of a Presidential Executive Order to eradicate the disease. Through AusAID, the Australian Government provided support to the programme that led to the final eradication of FMD in the country. Previous FMD strains that have been eradicated in the country are A₂₄, C₃ and O₁ in 1983, 1995 and 2005, respectively.

Given the status of FMD-free without vaccination, the compulsory cessation of vaccination of FMD-susceptible animals has been imposed since August 2009 through an Administrative Order issued by the Department of Agriculture. However, many farms, especially smallholders, stopped vaccinating even before the issuance of the Administrative Order. The maintenance of free status will depend on enhanced quarantine activities to prevent the illicit entry of risk materials into the Philippines. Key components of quarantine are prohibition of entry of animals and animal products from infected countries and capacity building of quarantine officers. A major surveillance programme is being undertaken through documentation of monitoring reports, regular serological surveillance in Visayas, Palawan, Masbate and Mindanao, and targeted surveillance in Luzon. In addition, training and contingency planning, including a vaccine bank in the case of the introduction of FMD, are part of national strategies. Communication has been recognised as one of the strengths of the National programme, especially through the utilisation of 'Super Pig,' which is the official mascot of the National FMD Task Force (NFMDF). Public awareness activities and stakeholder consultations are conducted on a continuous basis. The NFMDF reviews developments and works closely with industry, national and provincial authorities through government/ industry partnership arrangements. It is intended that periodic audits be performed to assess the health of FMD prevention and preparedness. Maintenance of FMD freedom is seen to support producer profitability and the export potential of pork products.

Country profile: Indonesia

Indonesia has been free from FMD since 1986 and was recognised by the OIE as a FMD-free country without vaccination in 1990. The programme to maintain the FMD-free status is mainly focused on surveillance, emergency preparedness and public awareness.

Internal monitoring and evaluation (MONEV) of overall animal health programme are mainly conducted by routine MONEV activities by the Directorate General of Livestock Systems, Provincial and District Livestock Services. Indonesia has undertaken the PVS evaluation conducted by the OIE as part of its external assessment of veterinary services.

There are sufficient resources and funding for programme management. The Indonesian government agreed to contribute a total amount of US\$300 000 to be paid over six years at US\$50 000 starting from 2006. Policy, legislation and standards to support disease control

and zone establishment are in place. Act No. 18/2009 relative to Animal Husbandry and Animal Health, has been approved by the Legislative and replaced Act No. 6/1967.

The National Centre for Veterinary Biologics (Pusvetma) in Surabaya spearheads disease surveillance, diagnosis, reporting and control. It collects samples from targeted areas. Applied research was initiated by The Indonesian Research Centre for Veterinary Science (BBALITVET: *Balai Besar Penelitian Veteriner Bogor*). Other regional research and technology transfer activities are conducted as part of degree studies in collaboration with Australia.

To increase public awareness, a handbook on FMD has been prepared, as well as the INDOVET Plan on FMD, both of which are distributed to target persons/institutions. The INDOVET Plan on FMD has been revised and internalised within local government of both provincial and district governments. The involvement of the private sector in disease control is evident. A number of private companies have been actively participating in avian influenza (HPAI) control. This is also expected to work for FMD.

Indonesia has participated in a number of FMD meetings as well as for other TADs in South-East Asia.

Country profile: Singapore

Singapore is recognised by the OIE as FMD-free without vaccination. Since 1935, the country has been free of FMD except in 1973 when a batch of imported cattle at an animal quarantine station tested positive. All affected and in-contact animals were culled which meant that the disease was contained and eradicated within the quarantine station.

Singapore has a very small livestock population, is an island country and imports most of its food. As part of its mandate to ensure safe food and healthy animals in the country, the Singapore Agri-Food and Veterinary Authority is responsible for the implementation of the FMD prevention programme. The enforcement of strict import control procedures and, where appropriate, bans on the importation of animals and animal products from FMD-infected countries or areas are part of the strategies to maintain the national FMD-free status. The emphasis on FMD is to ensure that meat and meat products can be processed and re-exported to high value markets, while at the same maintaining Singapore's high reputation for biosecurity and food safety.

Import controls comprise three levels, namely: pre-export conditions, including accreditation of source, point of import (health and certificate) inspections and post-arrival (ante- and post-mortem inspection) for live pig imports for example. Regular inspections of farms for clinical examination and biosecurity are supported by serological tests that are conducted by the Animal and Plant Health Centre which undertakes rigorous quality assurance activities, including international inter-laboratory proficiency testing. Populations on ruminant farms are also monitored to ensure there is no illegal movement of animals.

Country profile: Thailand

FMD is endemic in Thailand with an annual occurrence of outbreaks caused by serotypes O and A, although O is more predominant. The circulating serotype O belongs to the South-East Asia topotype, while serotype A belongs to the Asia topotype. Animal movements from other countries, such as Myanmar and movements within Thailand are considered to be the major factor associated with the occurrence of FMD. With approximately 0.48 million dairy

cattle, 8.59 million beef cattle, 1.38 million buffalo, 8.53 million pigs and 0.42 million sheep and goats, Thailand is one of the major suppliers of livestock (especially cattle) to the region. There is generally a high demand of Brahman breed from Thailand.

The Department of Livestock Development (DLD) of the Ministry of Agriculture implements FMD control activities for the country. The DLD has FMD control strategies in accordance with the SEACFMD campaign and the 1956 Animal Epidemic Act (B.E.2499) that was amended in 1999 (B.E.2542) which gives DLD the authority to control FMD in the country. The overall fiscal budget allocated in 2009 for FMD amounted to US\$2.35 million. One of the major activities is the implementation of the national livestock identification system (NID) to identify animals and facilitate traceability in case of outbreaks. Red ear tags are used for imported animals, yellow tags for normal zones and green tags for the southern and eastern parts of the country which are approaching FMD-free zone status. Currently, more than 90% of cattle in Region 2 have been ear-tagged, 70% of which are recorded in the on-line registration system. FMD vaccination is also conducted yearly and national policy is that all cloven-hoofed animals in risk areas should be vaccinated twice a year. The Bureau of Biologics of the DLD produces millions of doses of trivalent FMD vaccines for ruminants and pigs every year.

As animal movements are a critical factor in the occurrence of FMD in Thailand, bilateral cooperation with Cambodia and Lao PDR was established to collaborate on animal health and animal production and also to agree on animal movement protocols across the borders.

Thailand hosts the Regional Reference Laboratory (RRL) for FMD in Pakchong, which was recently recognised as an OIE Reference Laboratory for FMD. RRL tests samples from Thailand and other SEACFMD members that submit samples for confirmation. The RRL also conducts training sessions for laboratory staff those member countries that request such training.

An annual review of FMD control activities is conducted to evaluate progress of the plan and to serve as basis for the formulation of the detailed work plan and budget for the following year.

Country profile: Lao People's Democratic Republic

FMD remains endemic in Lao PDR, with outbreaks reported every year, mainly due to serotype O and, to a lesser extent, serotype A. Since 2008, no serotype A outbreak has been reported and a decreasing trend of outbreaks has been observed.

The National Animal Health Centre of the Department of Livestock and Fisheries is responsible for promoting animal health and for the control of animal diseases, and is consequently responsible for implementing the national FMD control programme. As funds for animal health programmes and specifically FMD control activities are limited, support from donor agencies in the form of bilateral or regional veterinary services projects is essential. Through the support of donor agencies and other countries, such as China and Vietnam, Lao PDR conducts strategic vaccination of animals in high-risk areas, public awareness campaigns are implemented before the actual vaccination activities and capacity building of field and laboratory staff is organised.

The biggest risk for Lao PDR is livestock movement from other countries, such as Thailand, as the country serves as a transit area for livestock that is transported to China and Vietnam.

Production levels in Lao PDR is not high enough to meet local demand thus imports are necessary. Given of this situation, regional cooperation is a high priority for FMD control in Lao PDR and is achieved through collaboration projects between the Government of Lao PDR and the Governments of Thailand, Vietnam and Yunnan Province of China. Annual meetings are organised to develop and implement control strategies, discuss policies for possible future trading opportunities, reduce illegal animal trading and implement FMD control programmes along common borders.

To effectively control outbreaks, early reporting, submission of samples and implementation of control measures are critical. Unfortunately, field reports are often received too late, sometimes with a delay of 2 or 3 months. A big challenge for the country is the limited human resources in the veterinary services. At present, only approximately 30 veterinarians work in the National Animal Health Centre. There is also a need to improve the knowledge of farmers on the economic effects of FMD to harness their support of the national programme.

Country profile: Vietnam

Although decreasing in occurrence, FMD remains endemic in Vietnam, which is predominantly caused by serotype O. Serotype A is also found in several provinces although not on a yearly basis. Serotype Asia 1 reported in 2005 and 2007 has not re-appeared since then. In 2006, the country experienced an epidemic of serotype O (South-East Asia Myanmar 98 topotype), which was a major epidemiological event as the previous circulating topotype was pan-Asia. In 2009, the northern provinces of Vietnam reported the first occurrence of outbreaks due to serotype A. The main risk for the country is animal movement from neighbouring countries.

Since 2006, Vietnam has implemented a national programme for the control and eradication of FMD with a budget of VND527 billion, equivalent to US\$36 million. Annually, the Ministry of Agriculture and Rural Development approves the plan for strategic vaccination based on the results of post-vaccination monitoring. The current strategy is 100% vaccination coverage in control zones (146 districts) and 80% coverage in buffer zones (102 districts). The next phase of the programme for implementation from 2011 to 2015 is under review, which could suggest modifications to the current vaccination strategy.

The national strategy for animal production development to 2020 focuses on encouraging the development of intensive commercial farming systems; hence policies will be developed to attract more investment to the sector. The OIE and FAO, through veterinary legislation missions and OIE through its PVS missions (PVS evaluation and gap analysis) are assisting the country in its endeavour to have a roadmap for the development of veterinary services, which would directly affect its capacity to manage and eventually control FMD and other diseases in the country.

The constraints currently faced are the high cost of vaccines and the outbreaks of other major animal diseases.

Country profile: Malaysia

The States of Sabah and Sarawak have been recognised by OIE as FMD-free zones without vaccination since 2003. Peninsular Malaysia remains endemic with outbreaks caused mainly by serotype O and, to a lesser extent, serotype A. The main species affected is cattle, with

the last outbreak in pigs reported in 2008. Outbreaks have declined compared to previous years due to better management of imported animals. In Malaysia, private quarantine stations licensed by the Department of Veterinary Services are utilised, which significantly reduce illegal movements of animals across the border and have facilitated strategic vaccination. There is also better reporting of outbreaks from the field.

FMD is a notifiable disease in Malaysia thus there is a national FMD control and eradication programme and annual federal budget provided by the Ministry of Agriculture and Agro-based industry for implementation of control and eradication measures. The present national programme includes strategic vaccination, implementation of the relevant legislation, disease investigation, surveillance, reporting, emergency preparedness and public awareness. The Animal Ordinance 1953 (Revised: 2006) provides the principal legislative framework for animal health including disease control.

A new livestock importation policy has been implemented which aims to meet the shortfalls in imports from Australia and provide better risk management measures for live animal imports from Thailand. Despite this situation, the illegal movement of cattle still poses a great risk to the FMD status of the country.

The new national FMD control and eradication strategy has been approved and the budget proposal for its implementation has been prepared for approval by the Economic Planning Unit in line with the 10th Malaysian Plan 2011-2015. The new strategy aims to achieve the status of FMD freedom with vaccination for Peninsular Malaysia by 2015.

Country profile: People's Republic of China

Adhering to the policy of 'strong leadership, close cooperation, reliance on science and law, participatory approach and decisive intervention', China has adopted a comprehensive measure of vaccination and culling for the control of major animal diseases.

The Ministry of Agriculture, together with other departments concerned, develops a national vaccination plan for FMD every year, according to which compulsory vaccination shall be performed on all swine against FMDV type O, all cattle, sheep, goats, camels and deer against FMDV types O and Asia 1, and all dairy cattle and breeding bulls against FMDV type A. In addition, it is also compulsory for cattle, sheep and goats of Guangxi Province, Yunnan Province, Tibet Autonomous Region, Xinjiang Autonomous Region and Xinjiang Production and Construction Corps to vaccinate against type A. It is required that the vaccination rate of the entire population remains above 90% throughout the year, the vaccination rate of the targeted population must reach 100%, while the percentage of the vaccinated population that becomes resistant must remain above 70% all year round. A total of 900 million animals were vaccinated against FMD in 2010.

Furthermore, the Ministry of Agriculture also develops and issues an annual national programme for animal disease surveillance and epidemiological surveys, to guide control and survey activities for the year. In conducting surveillance of FMD and other major animal diseases, the Ministry follows the principle of combining national surveillance with local surveillance, intensive surveillance with regular surveillance, surveillance with vaccination, and surveillance with emergency response. The results of FMD surveillance are published in the monthly *Veterinary Bulletin*. The Ministry of Agriculture, while organising and

implementing epidemiological surveys at regular intervals, also conducts emergency epidemiological surveys for all suspect or confirmed cases of FMD.

In addition to disease surveillance and epidemiological surveys, efforts are also made to reinforce law enforcement and supervise animal health, including promotion of quarantine measures at places of origin and slaughtering houses, and the improvement of material reserves for emergency purpose, emergency drills and disease response.

In 2001, China launched the creation of five FMD-free zones with vaccination in Songnen Plain, Liaodong Peninsula, Jiaodong Peninsula, Sichuan Basin and Hainan Island, covering part or total areas of Jilin, Liaoning, Shandong, Sichuan and Hainan Provinces and Chongqing Municipality (Figure 11). Hainan Province underwent the inspection of the national authority in 2009, and the entire province was recognised as being FMD-free zone with vaccination.

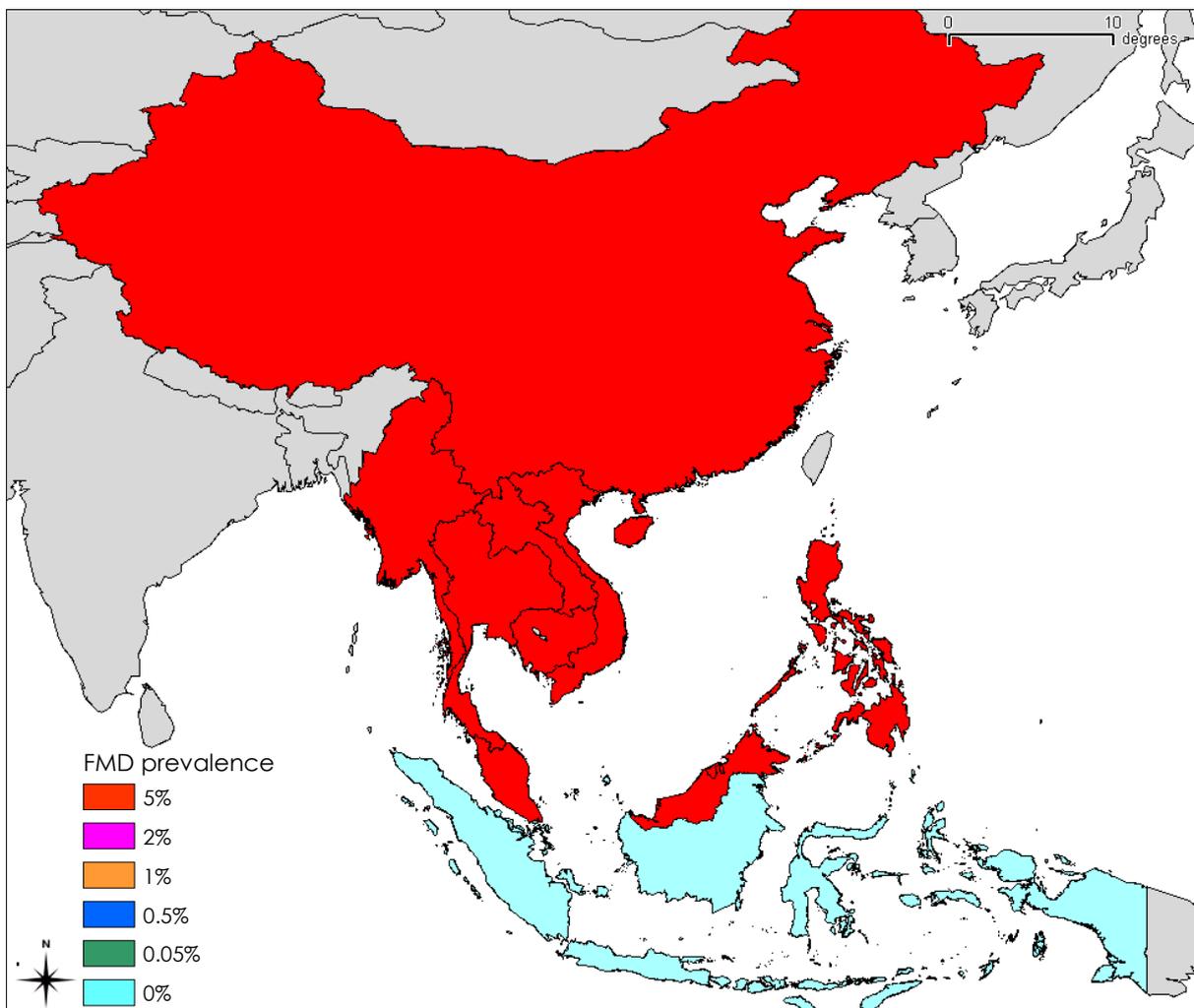
To date, there have been 20 outbreaks of FMD in nine provinces/autonomous regions in mainland China and two provinces reported positive surveillance samples. A total of 18 were type O outbreaks in nine provinces/autonomous regions of Guangdong, Gansu, Shanxi, Jiangxi, Guizhou, Ningxia, Xinjiang, Tibet and Qinghai where 3 983 animals were affected, 26 died and 29 193 were culled. The pathogen, according to the results of the national FMD reference laboratory, was Myanmar 98 lineage virus, which shows a high homogeneity to the strain that is widespread in South-East Asian countries. Two samples were type A that affected the counties of Kuerler and Baicheng in the Xijiang Autonomous Region, where 54 cattle were infected and 206 animals were culled. In Daxing county of the Beijing Municipality, 23 surveillance samples were detected as being positive to FMDV type A and 575 dairy cattle were culled. In addition, 7 samples were recorded as being positive in Shizuishan, Wuzhi and Yinchuan in the Ningxia Autonomous Region; the infected cattle and in-contact herds were culled and safely disposed of.



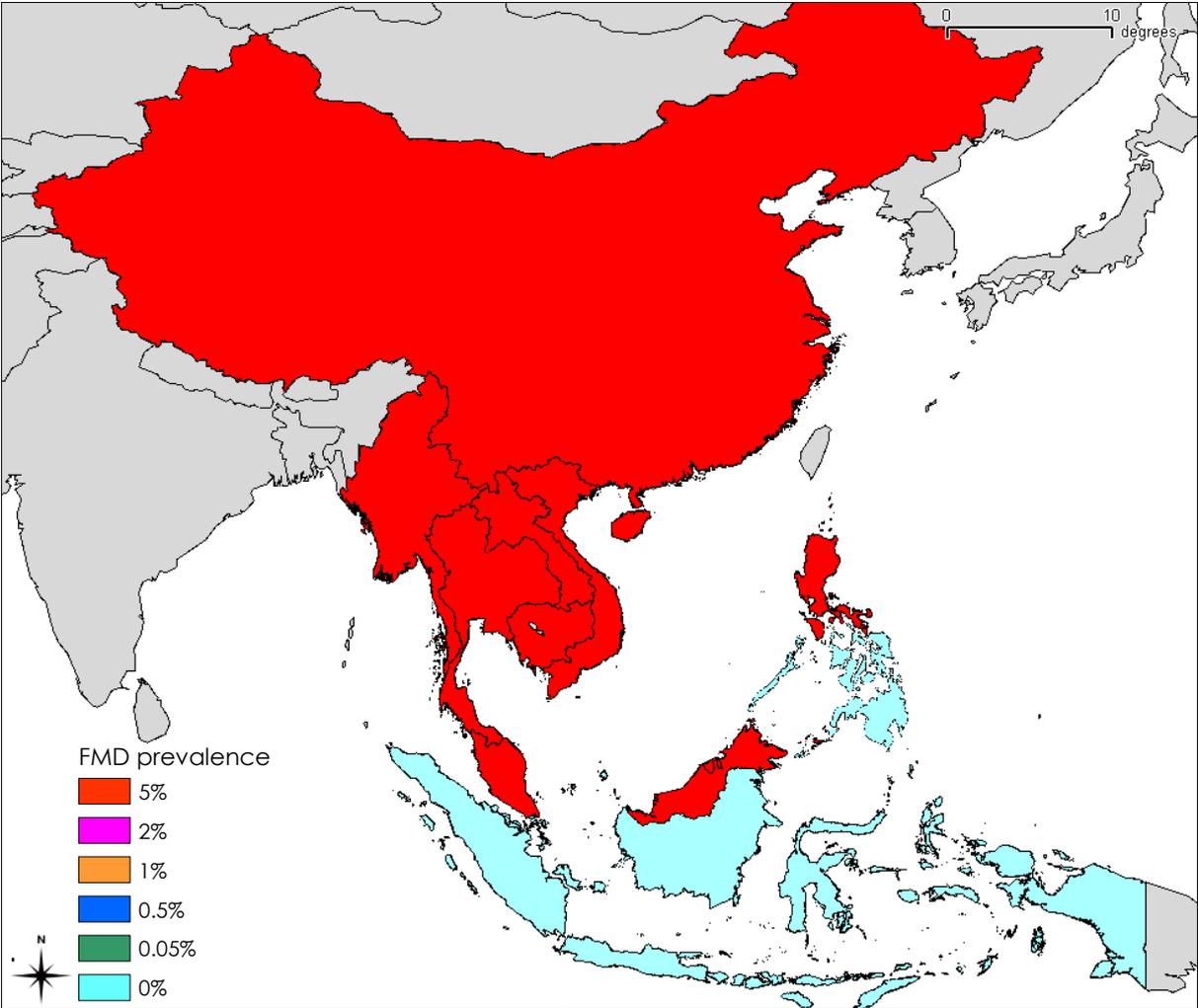
Figure 11
Creation of five FMD-free zones with vaccination in 2001
(Songnen Plain, Liaodong Peninsula, Jiaodong Peninsula, the Sichuan Basin and Hainan Island)

Progressive reduction in prevalence

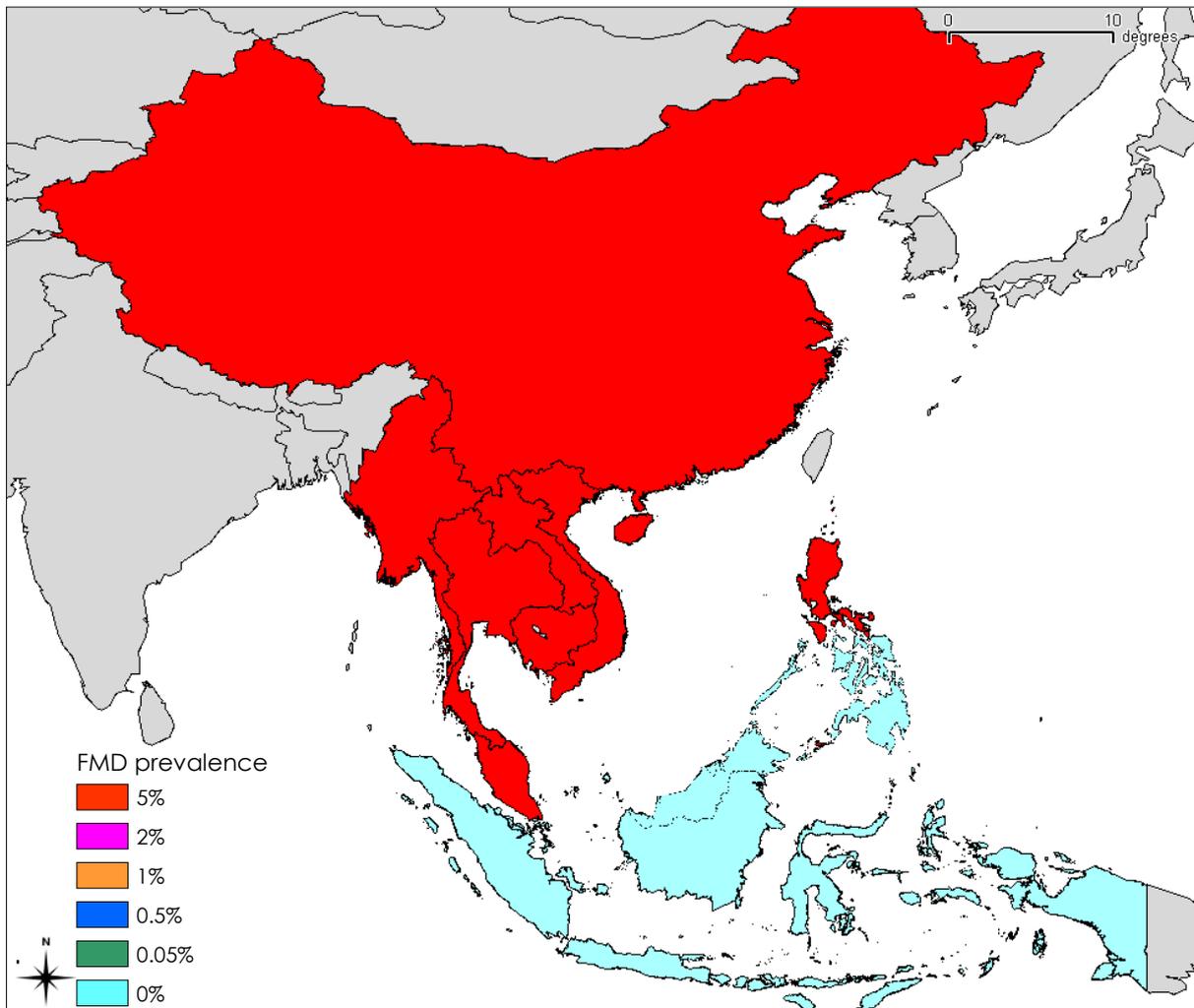
SEACFMD 1997



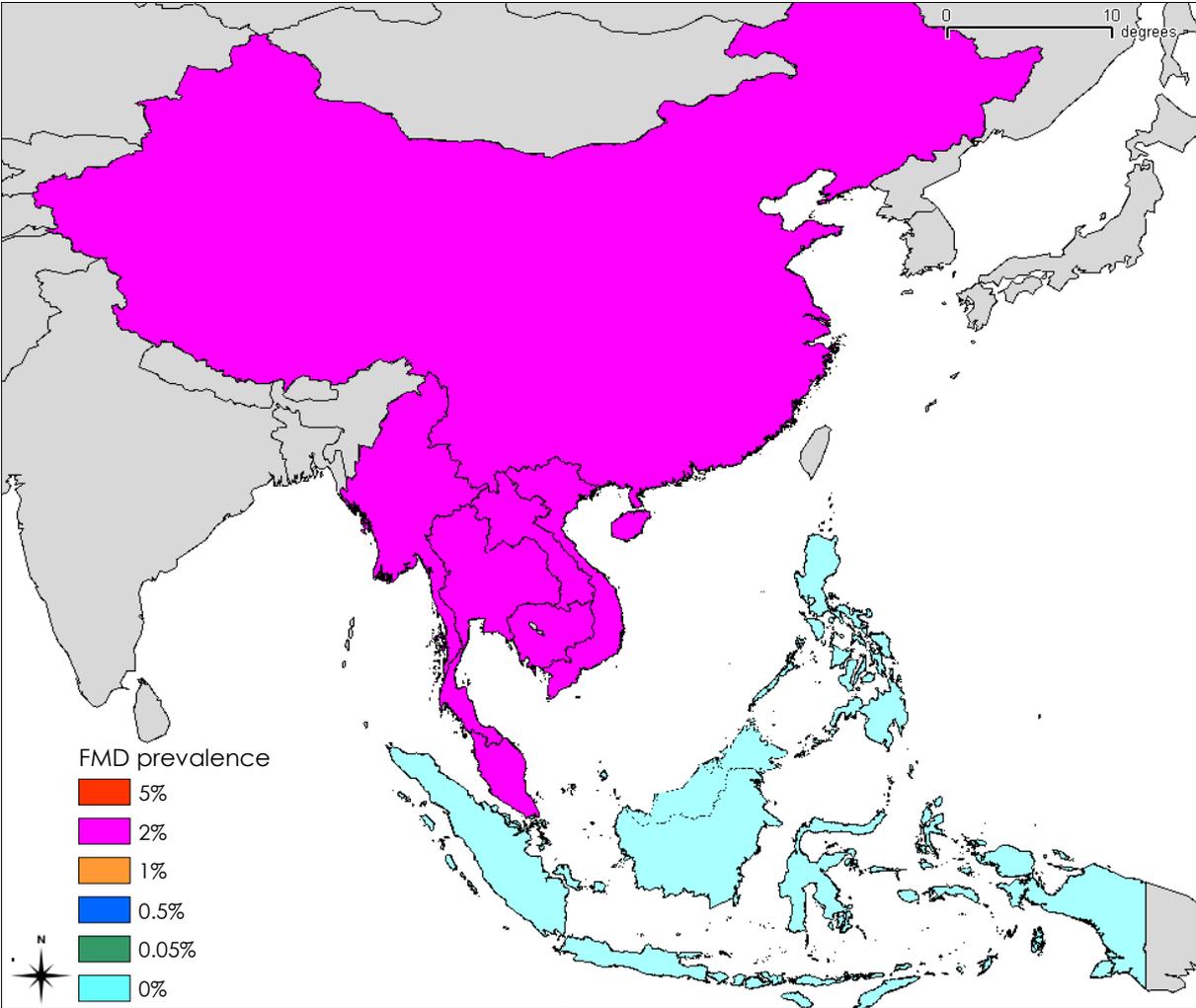
SEACFMD 2002



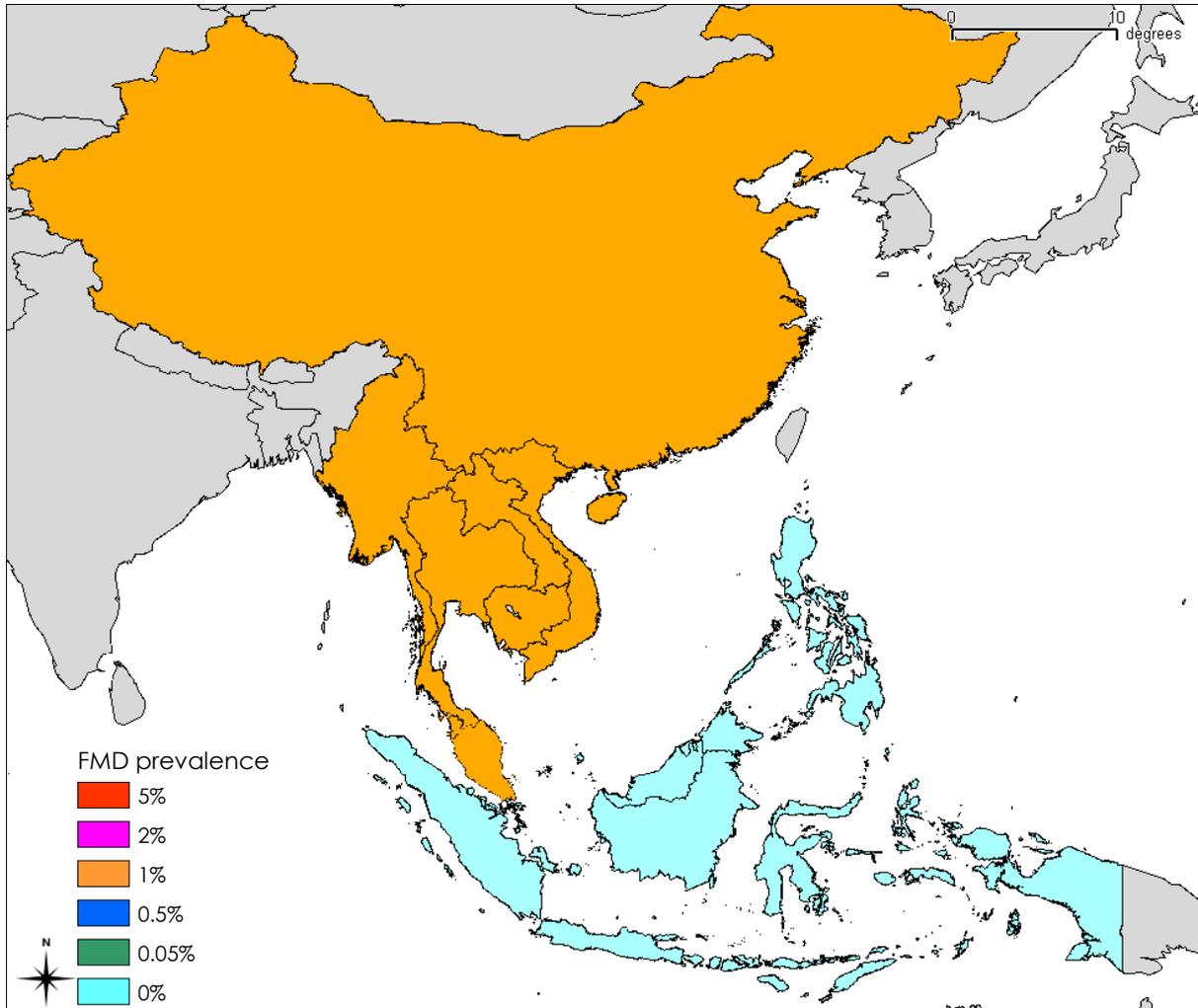
SEACFMD 2004



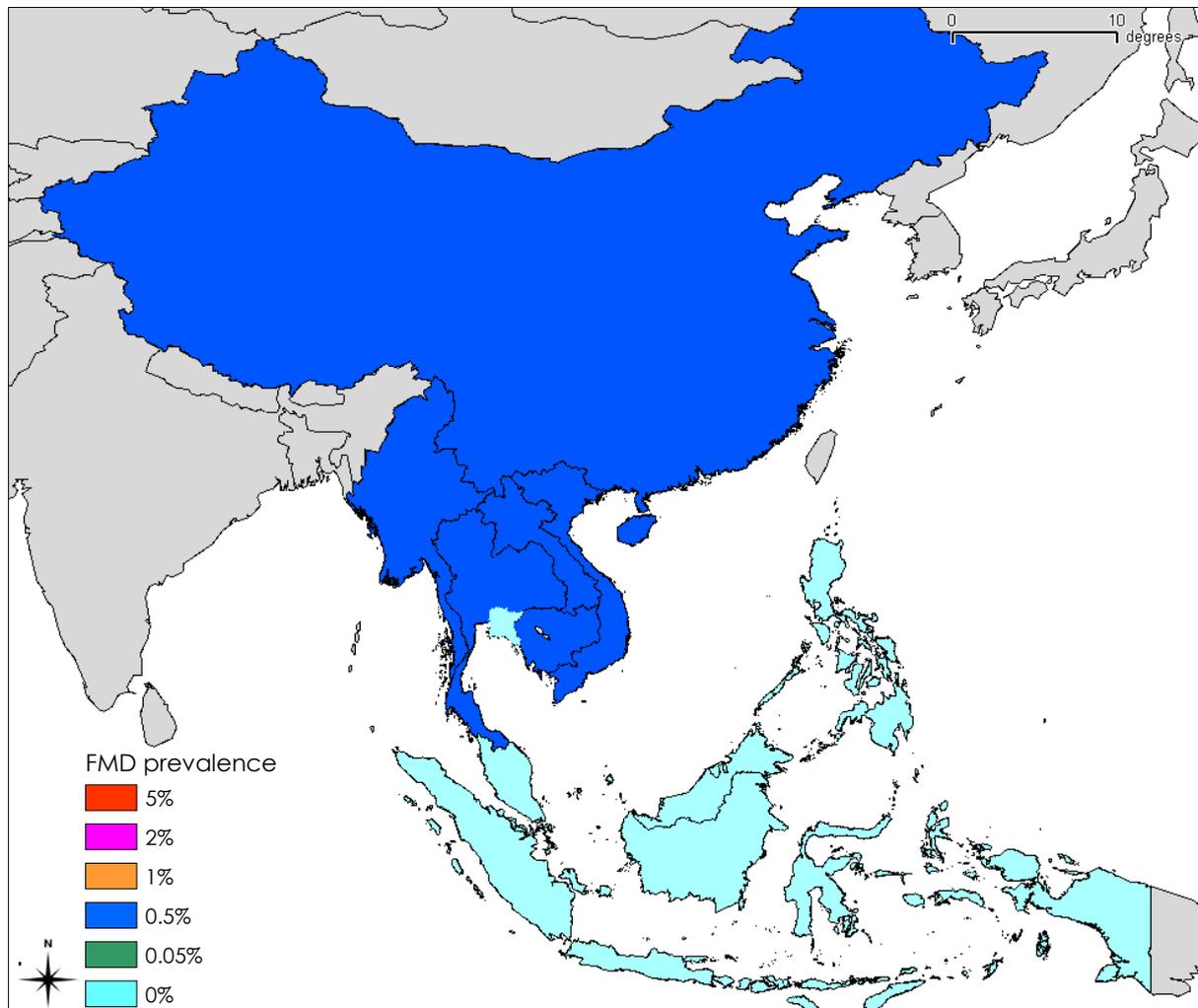
SEACFMD 2010



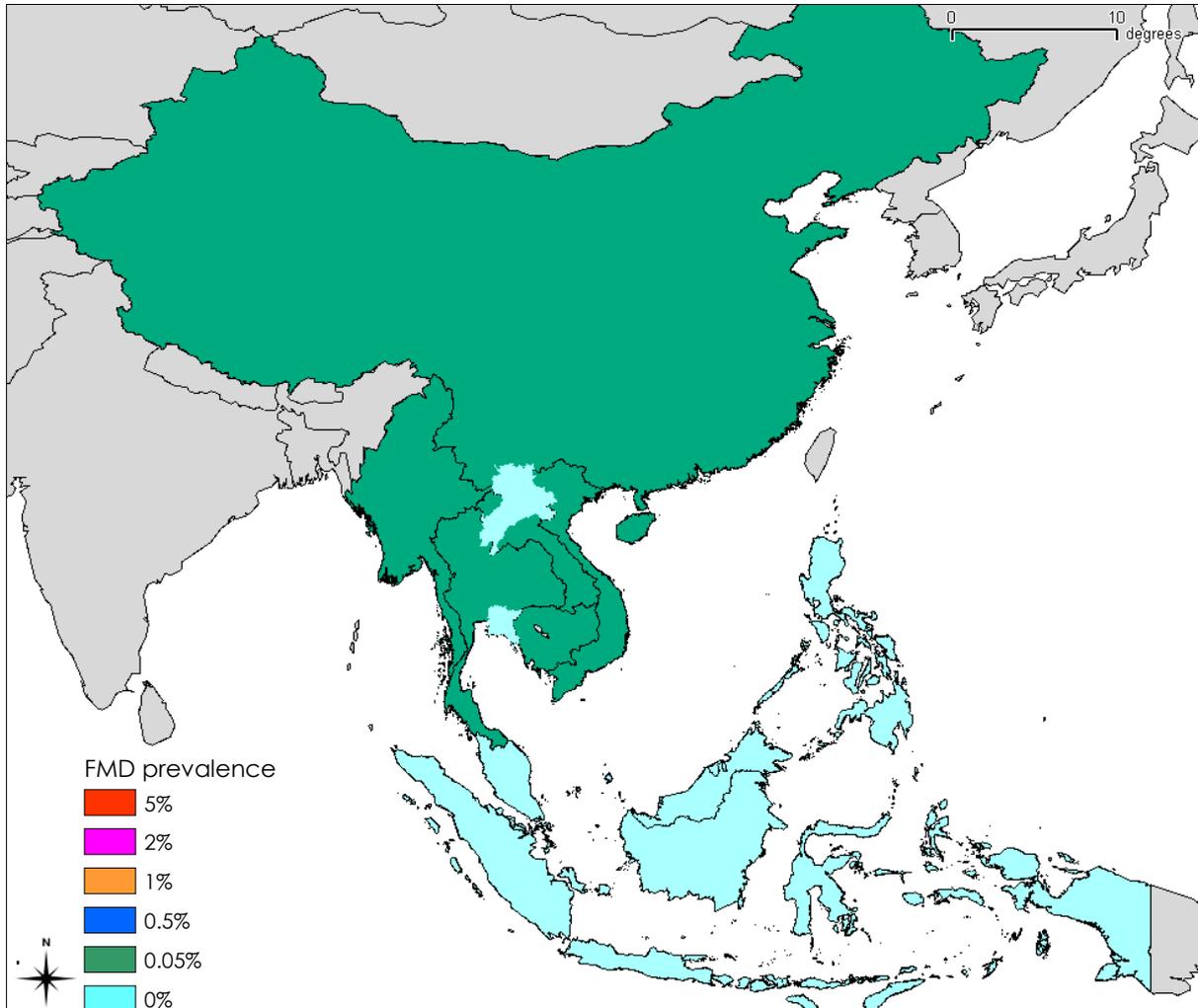
SEACFMD 2013



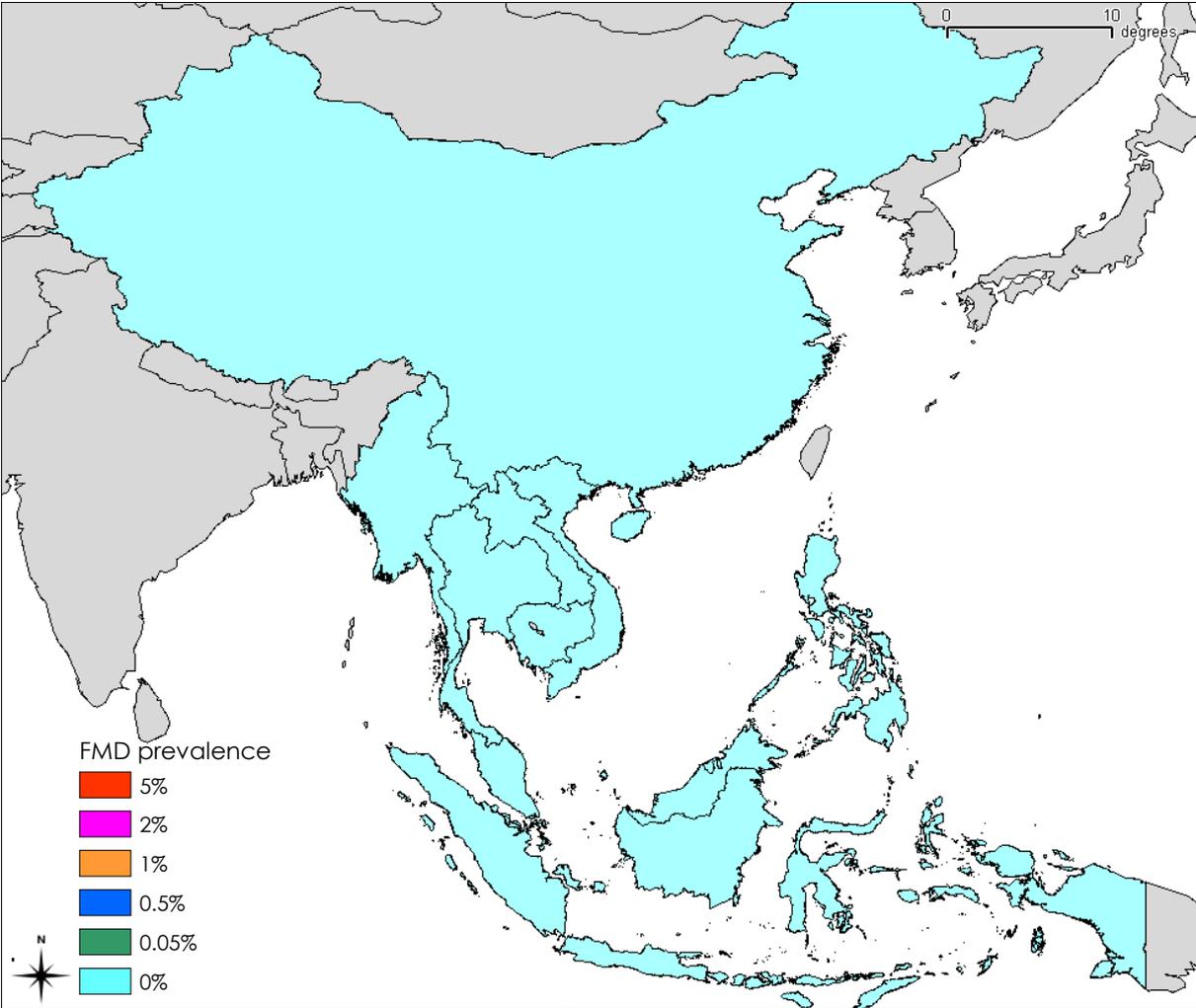
SEACFMD 2015



SEACFMD 2017



SEACFMD 2020



A woman farmer in Cambodia



© Nichola Hungerford

Socio-economic issues

Urbanisation and migration

Urbanisation and migration are global phenomena and SEACFMD member countries are affected to varying degrees. The anticipated changes in urban human population densities in mainland SEACFMD countries from 2010 to 2020 are listed in Table IV.

Table IV
Percentage of total human population classified as living in an urban environment in mainland SEACFMD member countries, 2010-2020

Country	2010		2020	
	Number in millions	Percentage	Number in millions	Percentage
Cambodia	3.03	20%	4.21	24%
China	635.84	47%	786.76	55%
Lao PDR	2.136	33%	3.381	44%
Malaysia	20.15	72%	25.13	79%
Myanmar	16.99	34%	22.57	41%
Thailand	23.14	34%	27.8	39%
Vietnam	27.05	30%	36.27	37%

The major changes are primarily due to people moving from rural areas to towns and cities. By 2020, apart from China and Malaysia, all other countries will still have over 50% of the population living in rural environments. Many of these rural-based people will be keeping livestock and many will still be raising FMD-susceptible livestock. What proportion of these livestock owners will still be subsistence farmers is debatable, but the livelihoods of these people need to be protected and their quality of life improved. FMD control will contribute to this goal.

In addition to the urbanisation trend, there are also increasing movement patterns of people between countries within the Greater Mekong sub-region (permanent and temporary migration). For example, in northern Lao PDR there has been a rapid increase in the number of rubber plantations and these plantations have a high labour demand. To meet this demand, there has been an influx of workers from China. Irrespective of whether people migrate permanently or temporarily, these people are still likely to visit their country of birth. Movements of people from one country to meet labour demands in another country are likely to increase in the next ten years. Movements of people backwards and forwards between countries for any reason increase the likelihood of FMDV movement.

Environmental issues

Environmental issues, such as climate change, water scarcity and land use change, will interact and encourage a move towards new production systems. Some of these production systems will be more intensive and/or more commercial in nature. The interconnected

nature of environmental issues and production and disease issues has been well described in the literature. For FMD, intensification of production systems can lead to more extensive disease outbreaks once the disease enters the production system of both ruminants and pigs. This highlights the increasing importance of sound biosecurity measures to better protect animal production systems.

In addition to the increasing intensification of production systems, as the economies in the region grow, some of the people living in rural environments will become more commercial and larger scale cattle producers, such as in the 'ranching sector', will emerge. As farmers shift away from subsistence and draught-based cattle ownership, larger scale and higher input production systems (such as cattle fattening activities), the implications of FMD outbreaks become far more damaging. Both the smallholders engaging in fattening activities and the larger commercial livestock producers will respond to the market demands for livestock in the region. The major markets are still likely to be China, Malaysia and Vietnam and movements in these general directions can be anticipated with some confidence. However, the type of product required may change (e.g. less emphasis on live animals with an increasing penetration of supermarket purchasing by those entering the middle class with higher disposable incomes). This could see a resurgence of the larger and more sophisticated slaughterhouses with higher throughput rates and greater attention devoted to food safety. The growth of white good consumption, including refrigeration in China, is already changing consumer purchase patterns and this trend may be evident in a number of countries, such as Vietnam, by 2020.

Food security and livelihoods

The food security issue has re-emerged on the international agenda, due mostly to the reinvestment of some countries in biofuels and the global food crisis which occurred at about the same time. Globally, livestock contribute over 40% of the value of agricultural output and support the livelihood and food security of about 1 billion people. Within this context, it is important to note that livestock not only generate food, but are valuable assets, serving as a 'bank' and source of draught power and an essential safety net for many in times of crisis. Animal diseases such as FMD reduce productivity and production and can disrupt trade. The food security lens has again attracted attention to the important role that livestock play in developing countries.

Changing trade relationships

A number of free trade agreements (FTA) have been signed by member countries and these will materially affect the trade flows of animals and animal products in the region. The trade agreements include the ASEAN FTA, the ASEAN-China FTA and free trade agreements between the ASEAN and other countries in the Asia/Pacific region.

Non-traditional security issues

Non-traditional security (NTS) issues are those that challenge the survival and well-being of peoples and states and that emerge from non-military sources. NTS issues include climate change, resource scarcity, infectious diseases, natural disasters, irregular migration and famine. The particular characteristics of these NTS issues are that they can arise without much warning and can often spread very rapidly due to the increasing interconnectness of

societies. In addition, these NTS issues are extremely difficult to avert completely so that it is essential to develop resilient and robust strategies at both national and regional levels. This means that regional and multilateral cooperation is critical. The SEACFMD is in fact a regional institution addressing a non-traditional security threat – FMD – that has the characteristics described above.

There is also an increasing interest in improving animal health systems as a ‘global good’ – not only to reduce poverty and provide food security – but also as a key component to protect human health by improving the systems that will reveal and respond to emerging infectious diseases of humans. This work is clearly a component of the ‘one health’ approach that is increasingly being adopted globally and fits neatly within this NTS theme.

ASEAN has an interest in all of these issues and has recently focused on connectivity, including a focus on institutional connectivity, which encompasses trade liberalisation and facilitation which is an issue which will affect FMD control in the region.

Economic growth

SEACFMD member countries include those with some of the fastest economic growth rates of any nations on the planet. Such rapid growth rates are manifest not just in economic performance figures, but also in changing dietary preferences. Indeed, South-East Asia has the most rapid increase in per capita intake of energy derived from livestock products of any region. The increasing population, coupled with this change in dietary preferences, translates into very rapid increases in demand for meat in the region. Based on current projections, the demand of most countries in the region will exceed supply and, in some cases, by a considerable margin. The increased demand for meat has direct effects on the movement of FMD-susceptible animals and livestock products and therefore FMD control.

Supporting infrastructure

The speed and extent of movements of FMD-susceptible livestock and livestock products over the next ten years will be staggering. The main reason is that although the rates of economic growth in the region – most particularly China – are expected to decline slightly, the levels of investment in infrastructures for road and rail transport in the region will still be massive. For example:

- In China alone, the stimulus package designed in response to the global food crisis focuses very heavily on investments in rail and road transportation. The Chinese expect to expand the current 86 000 km rail network to 120 000 km by 2020 and some portions of this will be built to cater for trains that can travel at 350 km per hour. The total mileage of China’s highway network will reach 3 million km by 2020 and form a high-speed goods communication network. This expansion is apparently driven by the dual motives of catering for growing urban populations and integrating the underdeveloped central and western provinces of the country (this includes the Yunnan Province) so that developing an appropriate transport system will become the backbone of the Chinese economy.
- In Vietnam, plans include the development of a north-south road that extends 3 262 km, construction of seven roads in the north (1 099 km) central and highland areas (264 km) and seven routes in the south (948 km). There will also be improvements in rail infrastructures to improve the speed of freight and passenger

lines. Road links with China will be improved with two expressways from Vietnam to the southern province of Guangxi.

- The Singapore to Kunming railway is expected to be completed between 2015 and 2020, depending on international agreements and funding.
- An bridge spanning 11.6 km is planned to connect the northern Thai province of Chiang Rai with Huai Sia in Lao PDR and further to Yunnan Province in southern China.
- In Myanmar, a crude oil terminal in Myanmar that is designed to be the starting point for the Myanmar-China oil pipeline is to be constructed. The terminal located in the port of Kyaukphyu in Rakhine State, will be the beginning of a 771 km pipeline running from Kyaukphyu to Kunming City in Yunnan Province.

Add to this list is the desire to actually facilitate trade across borders with the Greater Mekong sub-region cross-border transport agreement that seeks to integrate the trade practices of the countries in this sub-region (Cambodia, China, Lao PDR, Myanmar, Thailand and Vietnam). The aims of this agreement include having a single-stop customs inspection, establishing minimum standards for the design and reliability of infrastructures, providing cross-border visas for those engaged in transporting goods and instituting transit traffic regimes.

The main conclusion from the above is that these developments will most likely alter the ability to move FMD-susceptible animals and animal products long distances quite rapidly in comparison to 2010. This scenario presents a number of challenges relevant to the 2020 Roadmap and FMD control strategy direction in general.

Rate of livestock population growth, 1996-2008

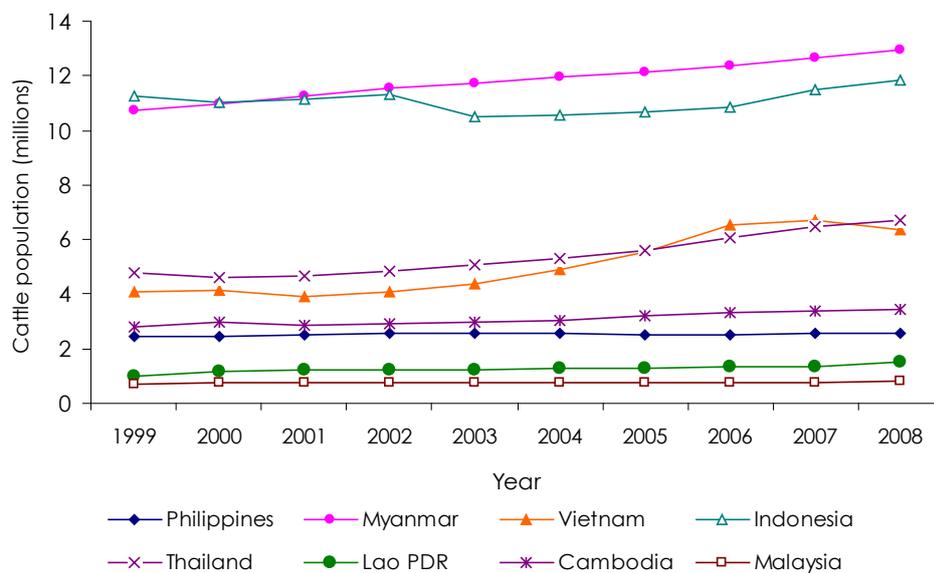


Figure 12
Cattle populations for selected ASEAN countries, 1999-2008
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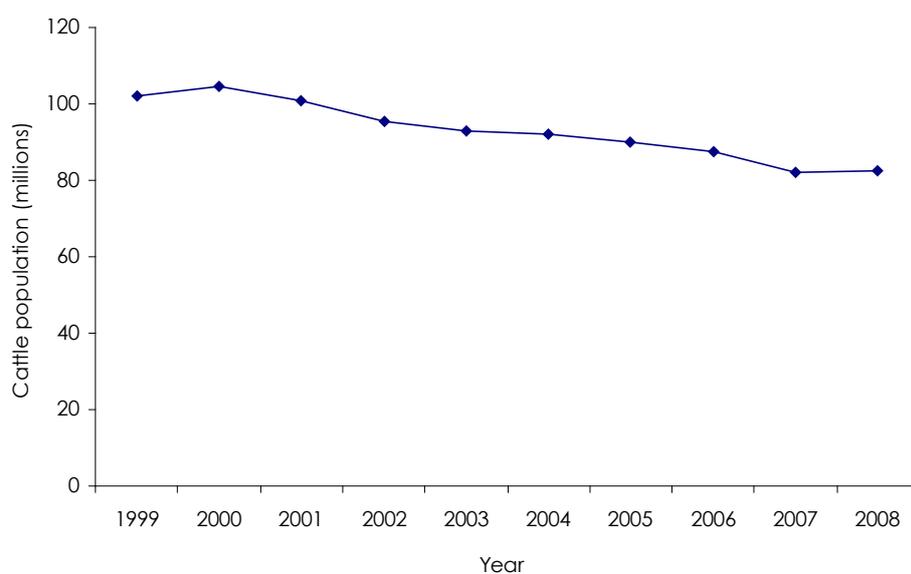


Figure 13
Cattle population on the People's Republic of China, 1999-2008
© FAO Statistics Division 2010, FAOSTAT, 01 July 2010

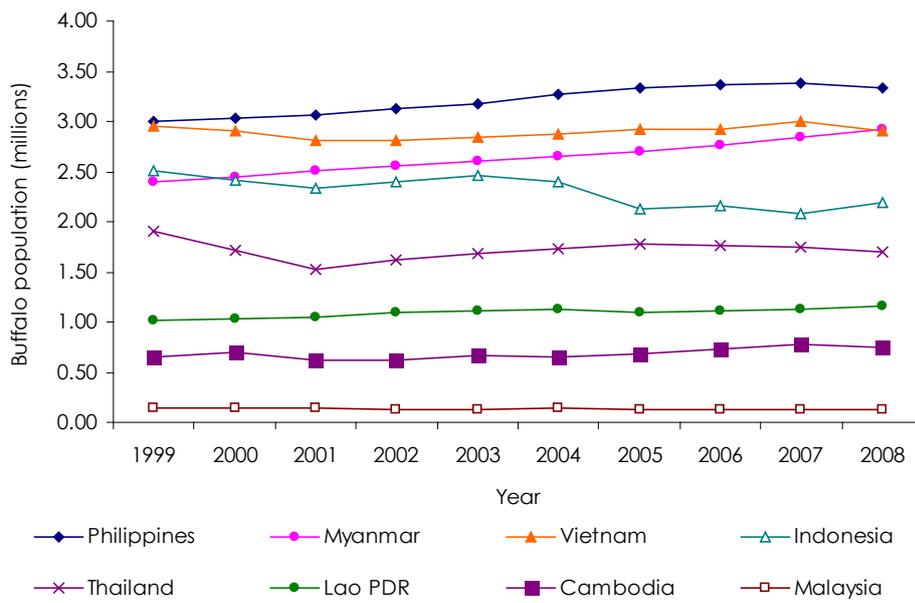


Figure 14
Buffalo populations for selected ASEAN countries, 1999-2008
© FAO Statistics Division 2010, FAOSTAT, 01 July 2010

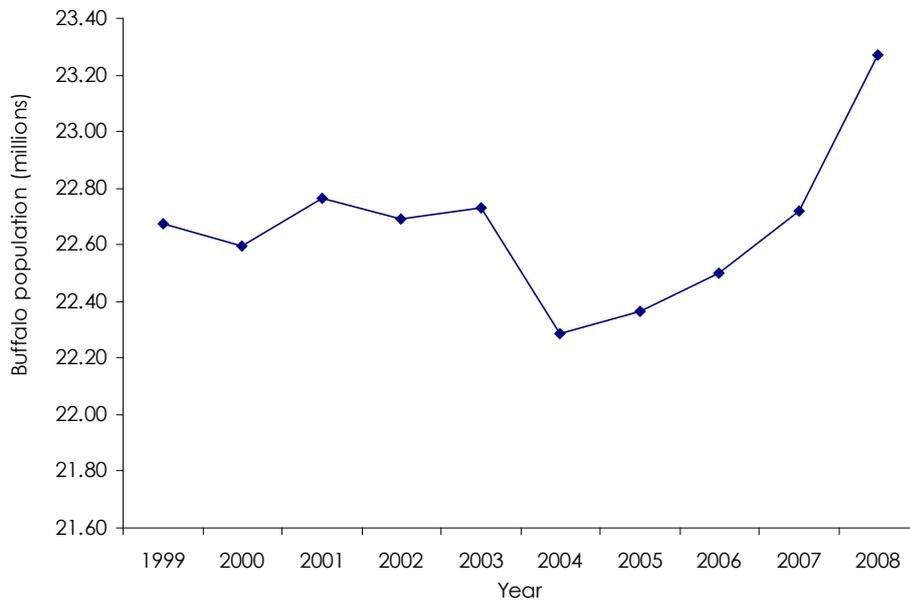


Figure 15
Buffalo population in the People's Republic of China, 1999-2008
© FAO Statistics Division 2010, FAOSTAT, 01 July 2010

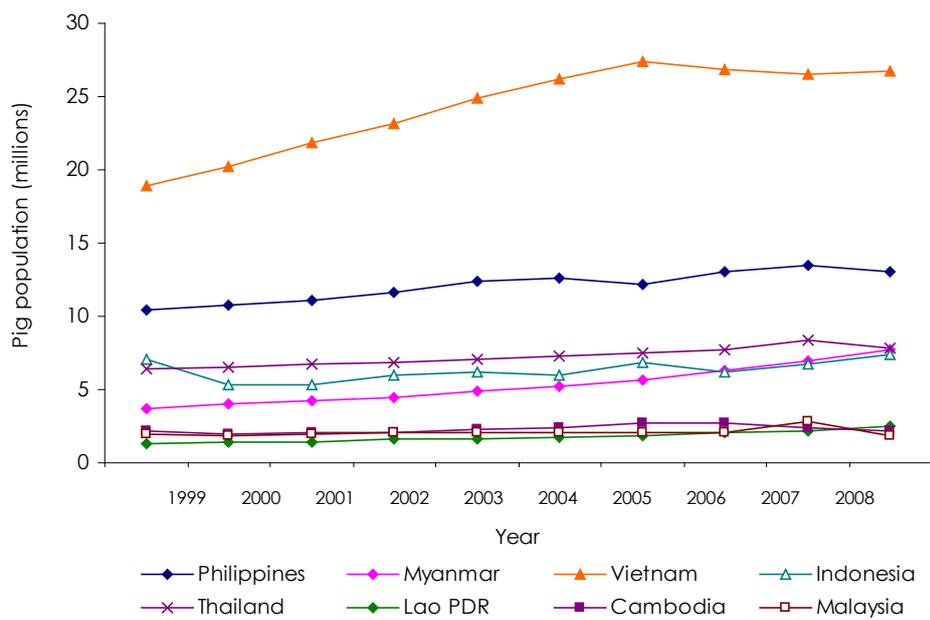


Figure 16
Pig populations for selected ASEAN countries, 1999-2008
© FAO Statistics Division 2010, FAOSTAT, 01 July 2010

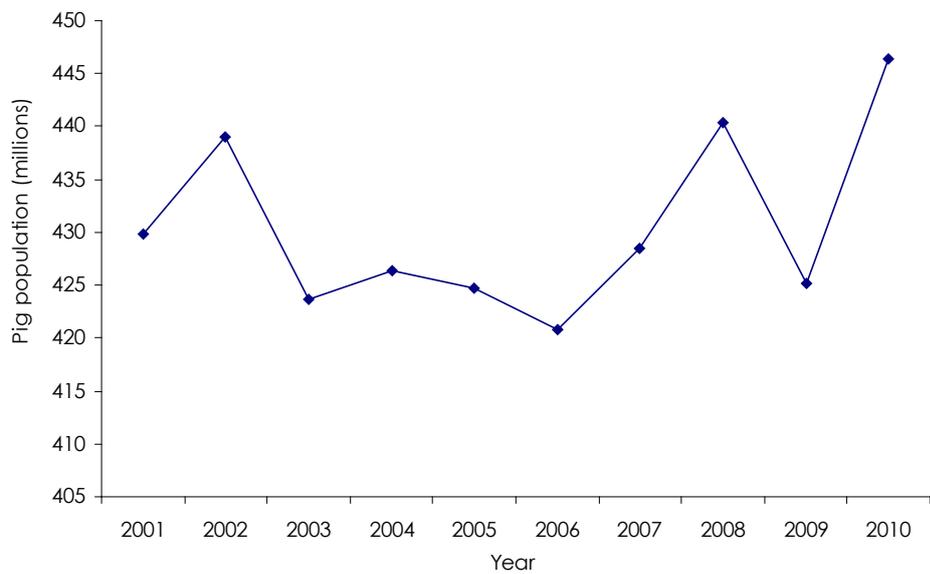


Figure 17
Pig population on the People's Republic of China, 1999-2008
© FAO Statistics Division 2010, FAOSTAT, 01 July 2010

Cattle draught power in Myanmar



©Polly Cocks

A vaccine policy and strategic directions for foot and mouth disease control

Introduction

It is important to keep vaccination strategies under on-going review and study. Based on lessons learned since the 2007 Roadmap was published, key to overall success of the programme is the establishment of a livestock population with decreased FMDV circulation and with less risk of disseminating the disease within the South-East Asia mainland and to those countries or zones already officially recognised as being free from FMD.

It is also important that the supply of vaccine for use in emergency situations be enhanced. In this regard the EU funded vaccine bank under the OIE component of the HPED programme will be particularly useful.

The proposed approach recommends a revised vaccination policy aimed at decreasing the incidence of disease outbreaks and risk of FMDV circulation through a revised vaccination policy as a first priority. When this ideal is achieved at an acceptable threshold value, it will be possible to move towards consolidating risk mitigated areas into zones/countries free from FMD with vaccination.

For the purpose of this document, it is accepted that the status of FMD within the SEACFMD countries is known to member states as well as the aims and objectives of SEACFMD which are well documented. The aim of this appendix is not to relate too much technical detail or to provide a detailed overview of relevant scientific references or relevant research findings already documented but approach to best achieve the aims and objectives of an attainable FMD vaccination policy for SEACFMD member states. The focus is restricted to the current position in the previous eight member states of SEAFMD as the key role to be played by China as a new member of SEACFMD has yet to be discussed in detail, noting however that China utilises vaccination as a critical component of its FMD programme.

Background for consideration of a vaccination policy

Vaccination of susceptible animal species against FMD is primarily performed to establish an immune animal population at such a threshold value as to withstand a challenge against infection of the circulating field isolates of the virus. This principle holds true irrespective if a strategic/targeted/emergency or systemic/routine vaccination regime is applied. Other complimentary or additional reasons for performing vaccination can be added, such as decreasing or minimising the rate of virus excretion, enforcing a lower reproductive ratio of the circulating virus or enhancing the effectiveness of an immune buffer around a known infected area (ring vaccination). It is important to remember that FMD vaccine protects against clinical disease, but not necessarily infection. Therefore, vaccinated animals can still be infected and shed low levels of virus and it is not a sterile immunity. However, irrespective of the strategic purpose of a vaccination regime, the main two-way causative

effect should always be the primary consideration – to lessen the chance of animals becoming infected but also to lessen the chance of animals transmitting the disease.

Proposed vaccination strategy

Taking into consideration the cattle movements in South-East Asia, identified hotspots and the established foci of FMD outbreaks, it can be reasonably postulated that:

- Most cattle (infected and non-infected) movements are in a southerly, south-eastern and south-westerly direction
- Most movements originate from the Central Mandalay Plateau in Myanmar which has the largest cattle population and can satisfy the demand of neighbouring countries
- According to available data, the vaccination coverage in Myanmar is far below the accepted threshold value, therefore increasing the probability of non-vaccinated and even infected animals being moved; in 2009 314 500/13.1 million cattle were vaccinated (2.4%)
- Movements take place to the identified hotspots and then from there onwards
- The identified hotspots of FMD outbreaks remain within the identified FMD progressive zonal areas in spite of the progressive zoning policy
- Little movement of either uninfected or infected cattle takes place in the opposite direction
- Judged superficially on the available data of movement patterns, the probability of Myanmar becoming infected or reinfected, is higher from endemic foci from within than from beyond its borders. Between 2008 and 2010 only 559 cattle were imported into Myanmar
- The 'direction' of the progressive zoning policy is in the opposite direction of the major thrust of animal movement for trade purposes – i.e. to protect the animals on the receival side rather than to ensure that animals moving into high risk areas have a reasonable chance of being immunised.

Following this postulation, a twofold vaccination strategy could be considered:

- A **systemic vaccination strategy** to progressively establish an immune cattle/buffalo population that coincides with the major thrust of animal movement. The rationale being that animals that are likely to be moved and originating from the current low vaccinated areas, should be subjected to blanket vaccination – before the movement takes place.
- A **strategic/targeted vaccination** policy complimentary and in support of the systemic strategy to protect the hotspot areas while the immune status of the national cattle population is being established through systemic vaccination.

The rationale for such a twofold vaccination strategy is to ensure that all cattle moved for trade purposes (whether legally or illegally) are at least protected through vaccination while the targeted/strategic strategy would protect the cattle within and surrounding the hotspot areas from becoming infected by unvaccinated and infected animals that might have slipped the systemic vaccination campaign.

Should the six countries be regarded as one geographical epidemiological unit for the purpose of formulating and applying a regional vaccination strategy, the place of choice to commence with a systemic vaccination campaign would be from those countries/areas where the majority of cattle for trade purposes originate and due to the current reported low vaccination coverage, pose a threat to those animals in the areas of destination. With the current policy, animals are moved into areas such as Thailand where mass vaccination is applied but they are then continuously challenged through the introduction of possible infected/low immune status cattle.

Systemic vaccination

The suggestion is that Myanmar be the country of choice for commencing with such a systemic vaccination policy with the aim of establishing a blanket coverage at an acceptable threshold value of at least 80% vaccinated and protected animals based on the immune status of the national population.

Where systemic vaccination is considered, the following should at least be included in planning a massive blanket vaccination campaign:

- Dividing the country into sub-epidemiological units or vaccination blocks and commencing vaccination in the Central Mandalay Plateau of Myanmar.
- The direction of vaccination should follow the thrust of direction of cattle movement patterns and should aim to progressively link areas until total blanket coverage is achieved – i.e. not an approach of ‘hotspot’ vaccination but systematically moving towards total vaccination coverage.
- Use of a high potent trivalent vaccine (oil adjuvant) inactivated with binary ethylenimine (BEI) to cover at least the circulating field strains of serotype O (covering South-East Asian and pan-Asia topotypes) and serotype A. The vaccine should comply with OIE standards in terms of manufacturing, sterility, safety, stability and potency (for blanket coverage the vaccine should have at least a 3 PD₅₀ – 50% protective dose)
- Blanket coverage – i.e. assuming that a low maternal immunity exists all cattle from age 3 months should be vaccinated.
- Establishment of well-trained vaccination teams with sufficient logistical support
- Establishment/identification of sufficient vaccine holding points to ensure maintenance of a cold chain and uninterrupted supply of vaccine.
- Planning and execution of an aggressive and convincing communication strategy that should commence before the campaign is launched and should continue at a high level during the full duration of each vaccination campaign.
- Implementation of a cheap and cost-effective identification method for vaccinated animals that would be easily visible and identifiable – a good quality long-lasting paint would suffice.
- Establishment of standby teams to assist livestock owners to have their cattle vaccinated should the need for movement arise before their animals have been vaccinated during the systematic process.
- Availability of standby teams to react immediately in the event of identification of foci of infection. Their main task will be to isolate the infection, perform ring

vaccination and prevent at all costs dissemination of virus from the outbreak foci. These should be dedicated teams and only used for infected foci to minimise the risks of the teams themselves spreading the infection.

- Any of the vaccination teams becoming infected during the period of systemic vaccination should be moved to the outbreak teams until they are cleared.
- Post-vaccination monitoring to establish the percentage coverage achieved, the success of vaccination and lessons learnt. Laboratories in the region would obviously perform an important supporting role. Countries should embark on a plan to generate and provide reagents for serological testing at low cost within the region. As the main aim would be to establish blanket immune coverage, the costly exercise of discriminatory NSP testing would not be that important – this could wait when progressing to the pathway for official recognition of free status with vaccination.

Depending on the availability of funds and resources, the systemic approach can simultaneously commence in adjoining countries to progressively move into a southern, eastern and western direction towards Lao PDR, Thailand, Cambodia, Vietnam and Malaysia.

Should it be possible to apply a systemic blanket vaccination campaign in Myanmar using a high potent oil adjuvant vaccine, it could mitigate the risk of potential viral shedders entering the hotspot areas in neighbouring countries. It would however be necessary to consider enforcement of legislation to ensure that only vaccinated animals be allowed to move outside the borders of Myanmar for trade purposes. However, experience has shown that if movements are restricted through legislation, illegal movements still continue – thus, rather than to restrict movements, it would be more feasible to assist the movement of vaccinated only animals through the application of a blanket systemic vaccination regime and through the availability of standby teams as listed above.

The funding and regional/international support mechanisms will not be described or suggested as this could best be done through SEACFMD and its collaborators. It follows logically that such a plan must be supported by full political and in-country commitment and support – financially, logistically and basic resource requirements.

Targeted/strategic/emergency vaccination strategy

The general perception of such a vaccination strategy is that its main aim would be to locally control outbreaks (extinguish fires) or prevent outbreaks from spreading. It must be accepted that the hotspot areas will remain until such a time that they are diminished through ensuring that the origin or cause of the hotspots are mitigated to an acceptable risk level through aggressive systematic vaccination. There should, however, be clarity on how these hotspot areas are identified or defined. Hotspot areas should, for the purpose for which a systemic approach is applied and adopted, not remain to be accepted as a given and continuous threat but the aim should rather be to gradually diminish the threat and thus these hotspots – i.e. less FMDV introduction and less FMDV transmission.

If a system can be applied and enforced to ensure that only vaccinated animals are allowed for trade purposes or moved to and from trading points, then targeted vaccination should ideally focus on the areas immediately surrounding or adjoining these hotspots to create a protective barrier/buffer against further possible virus escape. An important consideration should always be not to lift the restrictions too quickly from where hotspots are identified,

isolated and ring vaccinated – i.e. there should be no remaining circulating virus when the restrictions are lifted as it will make the vaccination attempts fruitless and not serving any purpose. For such an application, the use and availability of a vaccine bank could be of assistance and greatly enhance the speed of action and reaction.

Conclusion

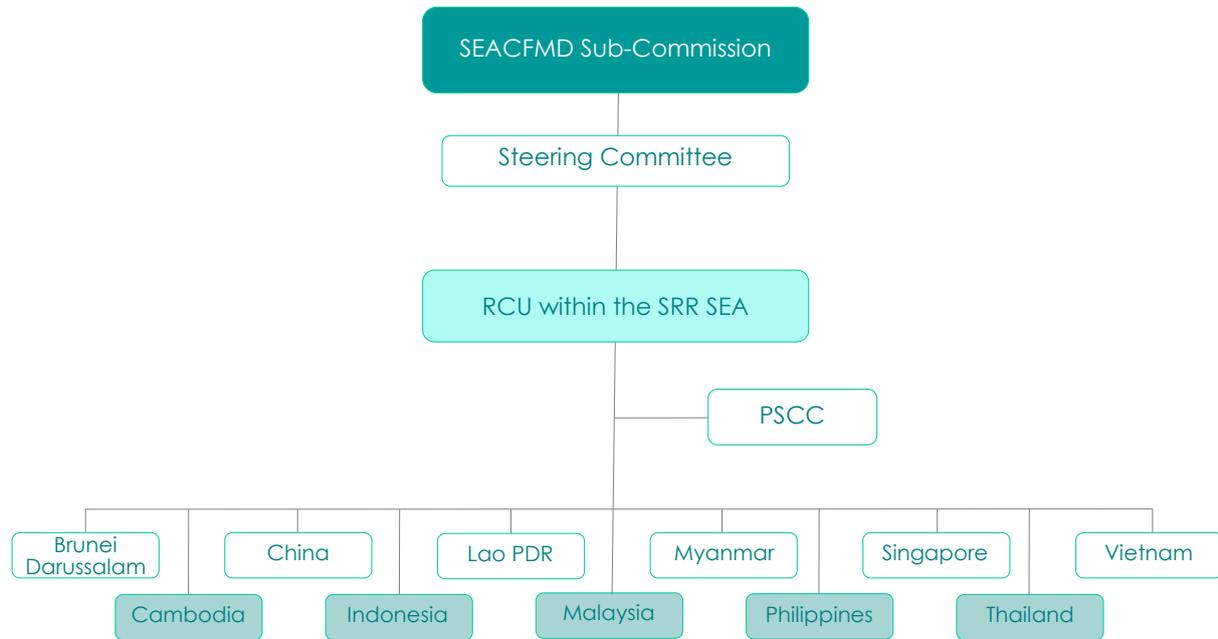
The draft strategy proposed for a vaccination programme for South-East Asia with particular emphasis on the vaccination of cattle and buffalo in the South-East Asia mainland is based on information available from surveys, observations and epidemiological studies conducted by SEACFMD and international collaborators, such as the FAO, OIE and EU. The draft proposal took into account very valuable and valid data on the locations and spread of FMD outbreaks in the SEACFMD region, the identified hotspots for FMD outbreaks, established pathways of cattle movement for trade purposes. These identified risk contributing factors were for the purpose of the draft proposal, measured against the concepts and assumptions of the 2020 Roadmap. It is unfortunate that important data on for example trace-back investigations are not available. Although it is accepted that very often the origin of outbreaks can never be traced for certain, it still remains an important exercise in any outbreak investigation to try and establish the source of outbreaks.

The draft proposal suggests the consideration of a systemic vaccination policy by taking into account the established risk factors. The proposal aims at mitigating the identified, real and ever present risk factors currently favouring not only the spread of FMD within the South-East Asia mainland, but also the reintroduction of FMDV into areas already subjected to routine/systematic vaccination strategies.

It is fully realised that the acceptance and implementation of such a strategy would require regional consensus and political commitment from governments and would rely heavily on the support and help of international and donor institutions.



Diagram of the SEACFMD Sub-Commission





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A field trip in Vientiane, Lao PDR during the SEACFMD Sub-Commission meeting



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Terms of reference of the OIE Sub-Commission for foot and mouth disease in South-East Asia and China

1 The OIE Sub-Commission for foot and mouth disease in South-East Asia and China

1.1 The role of the OIE Sub-Commission for foot and mouth disease in South-East Asia and China

- The role of the Sub-Commission is to provide strategic direction to the SEACFMD campaign and the Regional Coordination Unit and to promote the prevention, control and eradication of foot and mouth disease in the region
- To foster a spirit of cooperation between member countries, to coordinate activities and to provide advice and assistance whenever possible
- It is usual for a wide range of observers from other countries and organisations to attend meetings of the Sub-Commission

1.2 Duties and responsibilities of the Sub-Commission and its members

- Advise on the coordination and management of the SEACFMD campaign
- Advise on the SEACFMD annual work plan
- To assist the OIE, ASEAN and major donors with monitoring, audit and evaluation of the SEACFMD campaign
- Member country delegates to provide reports and to coordinate the implementation of agreed actions within their country
- Members to contribute to conducting business by correspondence between meetings
- The Regional Coordinator shall provide reports to the Sub-Commission (1), the OIE Regional Commission (1), ASEAN (1) and major donors (2) or as required
- The Secretary shall be responsible for preparing agendas, invitations, recommendations and reports for the annual meeting. He/she shall also conduct correspondence between the Sub-Commission and its stakeholders

1.3 Frequency and location of meetings

- The Sub-Commission shall meet at least once a year in February or March
- Meetings will be held in one of the member countries and the order of rotation shall be agreed upon by member countries
- An extraordinary meeting can be convened with agreement by the President and Director General of the OIE
- Between meetings, business will be conducted by the Steering Committee or by correspondence with members

1.4 Membership of the Sub-Commission

- A President nominated by the OIE Director General

- Two Vice-Presidents shall be elected from within the Sub-Commission for a period of three years. Their mandate may be renewed
- One official delegate per member country
- Regional Coordinator of the SEACFMD Campaign as the Secretary
- Representative from FAO
- Representative/s from donor organisations
- Any person whose presence the President deems useful shall also be eligible to participate in the work of the Sub-Commission. Such persons shall have no voting rights

2 Steering Committee to the Sub-Commission

2.1 Role of the Steering Committee

- Act as the executive for the Sub-Commission
- Provide policy and strategic advice to the Sub-Commission during and between meetings of the Sub-Commission
- Assist in promoting the SEACFMD campaign

2.2 Duties and responsibilities of the Steering Committee and its members

The specific tasks of the Steering will be to:

- Provide high-level policy and strategic advice to the Sub-Commission on FMD control in South-East Asia and the Regional Coordination Unit
- Advise the Sub-Commission on development of the programme for the meetings of the Sub-Commission
- Attend meetings of the Steering Committee and contribute to business out of session as required
- The secretariat to produce minutes of meetings for the information of the Sub-Commission and other stakeholders

2.3 Frequency of meetings

- The Steering Committee will meet immediately before and as required during the annual Sub-Commission meeting
- At other times business will be conducted by correspondence (email, fax etc.) or telephone
- Meetings by telephone or in person can be initiated with agreement by the President

2.4 Rules of the Steering Committee

- The Steering Committee will have a quorum of five (5) of its seven (7) members
- Decision-making will be by consensus. The Secretary to the Steering Committee shall circulate a provisional agenda at least two weeks before the annual meeting
- Brief, action-oriented minutes of each meeting shall be available within one week of the completion of each meeting
- Subject to obtaining the prior agreement of the Chairperson, the Secretary may invite observers or advisors to meetings. Such observers and advisors shall have no voting rights

- The costs of the Steering Committee will be met from provisions in the budget of the SEACFMD Regional Coordination Unit

2.5 Membership of the Steering Committee

- The President of the Sub-Commission (Chair)
- The Vice Presidents (2) of the Sub-Commission
- The Director-General/Director of the host country and he/she will serve until the next meeting of the Sub-Commission
- Representative of the Director General of the OIE, Paris
- The OIE Regional Representative for Asia and the Pacific
- Representative of the ASEAN Secretariat
- Representative of FAO
- Representative from donor/s
- Regional Coordinator for the SEACFMD campaign (Secretary)

Useful websites

Advanced Veterinary Information System

www.aleffgroup.com/avisfmd/about.html

Asian Development Bank

www.adb.org/

Association of Southeast Asian Nations

www.aseansec.org/

Australian Agency for International Development

www.usaid.gov.au/

Australian Centre for International Agricultural Research

www.aciar.gov.au

Cambodia: Department of Animal Health and Production

www.maff.gov.kh/eng/depts/dahp.html

European Union

www.eeas.europa.eu/health/

www.ec.europa.eu/europeaid/what/

Food and Agriculture Organization of the United Nations

www.fao.org/

Indonesia: Ministry of Agriculture

www.deptan.go.id/index1.php

Japan International Cooperation Agency

www.jica.go.jp/english/

Joint FAO/IAEA Research Project on FMD

www.iaea.org/programmes/.nafa/d3/index.html

Malaysia: Department of Veterinary Services

www.jpvpk.gov.my/

Myanmar: Ministry of Livestock and Fisheries

www.modins.net/myanmarinfo/ministry/livestock.htm

OIE Regional Representative for Asia and the Pacific

www.oie-jp.org/

Panaftosa – Centro Panamericano de Fiebre Aftosa
www.panaftosa.org.br/

Philippines: Department of Agriculture
www.da.gov.ph/

SEACFMD campaign
www.seafmd-rcu.oie.int/

Thailand: Department of Livestock Development
www.dld.go.th/webenglish/

The European Commission for the Control of FMD
www.fao.org/ag/againfo/commissions/en/eufmd/eufmd.html

Vietnam: Ministry of Agriculture and Rural Development
www.agroviet.gov.vn/en/Pages/default.aspx

World Organisation for Animal Health (*Office International des Épizooties*: OIE)
www.oie.int/

World Reference Laboratory for FMD
www.wrlfmd.org/

On their way to pastureland in Mandalay, Myanmar



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