Research Priorities
2017 - 2020
1. Background and Description

**PRIORITISING RESEARCH NEEDS BASED ON THE THIRD SEACFMD ROADMAP 2016-2020**

After the successful implementation of four phases, the SEACFMD campaign has entered its 5th phase since 2016. To maintain its achievements and to address the increasing challenges of FMD posed by increased livestock trade-driven movements, a new SEACFMD Roadmap has been developed, which guides Member Countries to progressively decrease FMD prevalence and expand FMD-free zones in the SEACFMD region. The new SEACFMD Roadmap (2016-2020) is the third edition and has been endorsed by OIE 22nd SEACFMD Sub-Commission in March 2016. The roadmap elucidates the updated regional strategy which focuses on the science- and risk-based approach of the technical component, the harmonization of the SEACFMD Campaign strategy with the FAO/OIE Global FMD Control Strategy and OIE standards, the enhancement of regional and national coordination and private stakeholders engagement, and the development governance and policy mechanisms to ensure the smooth implementation of the FMD control strategy.

Previous phases of SEACFMD have built up a significant regional knowledge base through outbreak investigations, animal movement studies, and socio-economic analyses of animal production systems. Enhanced understanding of the epidemiology of FMD, and of risk pathways for disease dissemination, have been used in Phase 4 of the SEACFMD Campaign to undertake pilot vaccination projects in endemic areas. Analysis of the results of these studies, as well as ongoing outbreak investigations and animal movement studies, shall be continued and expanded throughout Phase 5 of SEACFMD. In addition, risk-based approaches to identify key areas for intervention are required.
2. Technical

2.1 STUDIES TO IMPROVE KNOWLEDGE ON REGIONAL FMD EPIDEMIOLOGY

Currently, there are several areas of knowledge and information gaps that need to be addressed in order to reinforce the process of translating this framework into action. It is by these recognized gaps that the SEACFMD research directions and priorities were identified, in accordance with strategic objective of facilitating regional efforts to continuously progress FMD control and eradication. The purpose of this document is to present an outline of the identified key research priorities for the region that will build upon each other and collectively support the implementation of the 3rd SEACFMD Roadmap. As many gaps are interdisciplinary, research priorities identified herein call for multiple supports from various expertise groups. Collective research efforts, be it through collaborations or separately independent initiatives, will be ultimately additive and consistent with the regional objectives.

A full understanding of FMD epidemiology and evidence-based policy developments will be necessary to assist endemic countries to control FMD. Significant advances in the understanding of regional FMD epidemiology were achieved during the previous four phases of SEACFMD, including a better knowledge of the molecular epidemiology, spatial modelling of outbreaks in FMD control priority areas, etc. However, gaps still exist, given the significant under-detection and under-reporting of FMD outbreaks makes it difficult to depict a full picture of FMD situation and develop risk-based control strategies. Further developments are required in refining appropriate surveillance methods, including basic field epidemiological approaches and molecular and genetic techniques.
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RESEARCH IMPROVING TYPING OF FMD OUTBREAKS

Knowledge of the regional FMD epidemiology is hindered by the limited FMD viruses (FMDVs) isolated from field outbreaks. This is frequently due to the low quantity/quality of samples collected that are insufficient for virus isolation and characterisation. To address this challenge, research to improve and simplify samples collection and transportation as well as more sensitive laboratory diagnostic techniques is highly desirable.

POTENTIAL RESEARCH TOPICS

- Research to develop alternative methods of sampling from animals with healed lesions such as mouth and nasal swabs, probangs and ropes for pigs
- Research to test more convenient methods of samples transportation, including the use of swabs and filter paper to transport samples and the condition (temperature and humidity) during sample shipment
- Research on more sensitive testing methods, such as real-time serotyping PCR
- Research on improved technologies for sequencing low titre samples
- Research on the development of a regional FMDV database, to link samples/virus information with field epidemiology and promote information sharing
SEACFMD Research Priorities
2017-2020

RESEARCH ON MOLECULAR EPIDEMIOLOGY OF FMDV

The application of the molecular biological techniques of polymerase chain-reaction (PCR) amplification and nucleotide sequencing has greatly contributed to the understanding of FMD epidemiology in the past decades. The implications of these techniques are that transboundary spread of viruses can often be easily recognised and any evolutionary changes which subsequently occur can be monitored. Using these techniques, we have been able to show the incursion of a new FMDV strain – O/ME-SA/Ind-2001d – into South-East Asia (SEA) from the Indian Subcontinent in 2015. This type of surveillance will become increasingly important as further globalisation of markets occurs and increased risks of FMDV transregional spread along with animal movements. Whereas the currently used partial sequencing of the gene encoding the main antigenic determinant of the virus (VP1) provides sufficient information about general relationships between virus isolates, full genome sequencing can increase the power of these analyses significantly, facilitating more detailed comparisons between individual isolates, which could be used to trace outbreaks from farm to farm.

POTENTIAL RESEARCH TOPICS

- Research on the development and application of viral full genome sequencing
- Research on the development and application of viral next generation sequencing
- Research to develop models to trace FMDV transmission pathways based on genetic data

RESEARCH INVESTIGATION SERO-PREVELANCE OF FMDV ANTIBODIES IN LIVESTOCK

Sero-survey is a powerful tool to identify areas with low protection and to determine the disease prevalence in regions where control plans are to be implemented. However, in the SEACFMD region, FMD sero-prevalence studies are undermined by a lack of consistent and rigorous sampling and testing methods. This leads to the estimates of disease prevalence being confounded. A standardized design and analysis would allow clearer estimation of the burden of disease and accurate comparison of that burden between different sero-surveys.

POTENTIAL RESEARCH TOPICS

- Project to compare different systems of serological assays and formulate recommendations on the best option
- Development and validation of virus-neutralisation assay as a golden standard to measure antibody responses against structural proteins
RESEARCH INVESTIGATING THE PREVALENCE AND MAINTENANCE OF FMD IN SMALL RUMINANTS

In the SEACFMD Region, the surveillance and control strategies for FMD mainly focus on large ruminants and in some areas also in pigs. Despite representing a larger part of FMD-susceptible domestic livestock, sheep and goats have generally been neglected with regard to their epidemiological role. This is partly due to the often unapparent nature of the disease in these hosts. Nevertheless, their ability to become carriers represents a reservoir for further infection and spread of disease, and so trade of live sheep and goats present a major risk of transboundary spread of FMD. Research and epidemiological studies continue to be necessary in order both to prevent the entry of the virus and to assist in control should the disease reoccur.

POTENTIAL RESEARCH TOPICS

- Research to enhance FMD surveillance and outbreak reporting in goats and sheep
- Research to enhance sampling from FMD affected goats and sheep
- Research to study the prevalence of FMDV antibodies in goats and sheep
- Research to study the serotypes and strains of FMDV circulating in goats and sheep
RESEARCH INVESTIGATING THE ROLES OF WILDLIFE IN THE MAINTENANCE AND SPREAD OF FMDV

The role which wildlife populations might play in the transmission dynamics of FMD in the SEACFMD region is not known nor have studies been performed in order to assess the distribution and prevalence of FMD in wild animal species inhabiting in this region. A better understanding of the role of wildlife in FMDV maintenance and transmission is required in various endemic settings. This knowledge would allow better prediction, detection and management of the risk of FMDV transmission cycle, which is essential in countries target on FMD control and eradication.

POTENTIAL RESEARCH TOPICS

- Project to identify the role of wildlife in FMDV maintenance and circulation cycle
- Projects to identify the risk factors for bidirectional transmission of FMDV between wildlife and livestock
2.2 STUDIES TO IMPROVE FMD SURVEILLANCE

A sufficient and effective disease surveillance system will be necessary to assist endemic countries to control FMD as well as other important animal diseases. Robust surveillance is highly desirable in key FMD control areas, suspected free areas, or vaccination areas to evaluate the FMD risks/status or the effect of control strategies.

RESEARCH IMPROVING SURVEILLANCE EFFICIENCY

Good surveillance is needed for early detection of outbreaks and to provide knowledge of the distribution of disease in order to optimise control measures. Due to the limited resources, passive surveillance is the most widely used strategy in this region. However, it has many weaknesses, given many cases are not reported due to farmers’ paucity of knowledge about FMD. Also, some cases may only exhibit very mild symptoms which easily go undetected. Moreover, there are common logistical problems in reporting in many parts of the region: overworked and underpaid veterinary staff, lack of motivation for reporting when no feedback is provided, and a need for further training. Overall, there is considerable variation in the quality of reporting systems from country to country, reflecting economic, social, cultural and epidemiological differences. Research is needed to better identify the factors that barrier the passive surveillance efficiency as well as approaches to overcome these problems. Developments are also desirable to explore the possibilities to combine passive surveillance with targeted (risk-based) surveillance and sentinel surveillance. Moreover, for a more comprehensive assessment of the system’s performance, studies are needed towards an eventual quantitative evaluation of the sensitivity of the surveillance component, with data collected from other information sources such as laboratories.

POTENTIAL RESEARCH TOPICS

- Research on the key factors involved in the passive surveillance system
- Research on the development of combined passive and active surveillance strategies
- Advanced surveillance projects to confirm “free from FMD” status in a country or zone
RESEARCH ON IMPROVING THE RELIABILITY OF PARTICIPATORY DISEASE SURVEILLANCE

Participatory Epidemiology (PE) is considered as an easy, faster and cheaper approach to collect reliable information about the epidemiology of FMD at a village level. Results from a successful PE study can be used to plan better animal health projects and delivery systems, more successful surveillance and control strategies or as new perspectives for innovative research hypotheses in ecological epidemiology. However, the effectiveness of PE heavily relies on the study design, the sampling frame, the skill of investigation team, the selection of respondents, etc. Further studies are required to optimise and scandalise the PE procedures to make results more reliable and comparable. In addition, development of validation studies, such as collecting data from secondary information sources and laboratory diagnostics, are required to cross-check the PE findings.

POTENTIAL RESEARCH TOPICS

- Research on the key factors involved in the passive surveillance system
- Research on the development of combined passive and active surveillance strategies
- Advanced surveillance projects to confirm “free from FMD” status in a country or zone
Identification of the factors/pathways involved in the introduction and spread of FMD is a crucial first step to assist countries to combat FMD at source. This will involve identifications of FMD foci and high-risk areas as well as risk factors associated with FMD outbreaks and transmission. In addition, the risks of trans-regional/boundary spread of FMD have become more and more prominent, in line with the increasing international trade of animal and animal products. Approaches for identifying high-risk strains for incursion from other region/FMDV pools and estimating their impact should be developed. Similar approaches are needed for FMD free countries to be prepared for any risk of incursion of FMD from endemic areas. These studies will form the basis for further efforts to improve outbreak preparedness, including training, planning of control strategy and resource requirements.

OIE SEACFMD defines hot-spots as areas wherein the disease is endemic, where risk continuously exists due to contact with susceptible populations. The high-risk areas are defined as areas have significant higher risks of incursion of the virus from endemic areas. Given the widely spread and highly contagious nature of FMD, identifying FMD hot-spots and high-risk areas will significantly contribute to using the limited available resources more efficiently and maximizing the potential benefits.

**POTENTIAL RESEARCH TOPICS**

- Research to profile and validate suspected FMD hot-spots in the region
- Research to develop quantitative models/risk maps to identify FMD high-risk areas in the region
- Research to develop cost-effective interventions based on the FMD risk map
RESEARCH IDENTIFYING RISKS FACTORS ASSOCIATED WITH FMD OUTBREAKS

The identification of high-risk or hot-spot areas of FMD outbreaks is a priority for progressive FMD control program in endemic countries. Also, risk factor analysis to identify and quantify putative risk factors associated with an outbreak of FMD is needed to better control FMD outbreaks and prevent further spread. Putative risk factors to be examined may include the coverage rate and effectiveness of vaccination, herd size, economic conditions and the primary subsistence source of the farmers, type of production system, intensity of trade and distance (time) to a border, local husbandry practices and other local anthropological, social, economic and religious factors.

In addition, high-risk periods for FMD outbreaks should be better understood. Some countries experience seasonal risks, whereas for others, cultural festivals create market drivers that influence movement patterns and, therefore, the risk of outbreaks. An in-depth investigation is desired for designing and timing preventive strategies.

POTENTIAL RESEARCH TOPICS

- Research to set up validated approach to identify FMD high-risk areas
- Research to identify high-risk periods for FMD outbreaks and the underlying socio-economic factors
RESEARCH ON REGIONAL RISK ANALYSIS FOR INCURSIONS OF EXOTIC FMDV STRAINS

With globalization of markets and the increased international trade of animals and their products, the risks of FMDV transregional spread have become more and more important. This raises significant concern as exotic FMDVs may have the potential to cause disastrous outcomes once introduced, especially in the absence of suitable vaccines. To better prepare for the exotic FMDV incursion and ensure timely implementation of control/prevention measures, a risk analysis study of incursion and spread of new FMDVs into this region along with importing livestock and commodities is highly desirable. The outcomes will support decision making on the regional and national FMD control strategies.

POTENTIAL RESEARCH TOPICS

- Research on identifying high-risk exotic FMDV strains for incursion into the SEACFMD region
- Risk assessment study to identify the risk pathways for exotic FMDV incursion
- Research on vaccine matching to identify potential vaccine strains that would confer protection against exotic FMDVs that are likely to be introduced to the SEACFMD region
- Research on optimising the FMD detection and reporting systems for early identification of outbreaks due to exotic FMDV strains
RESEARCH IDENTIFYING RISKS OF FMD INTRODUCTION INTO FREE COUNTRIES

Research on identifying high-risk strains for incursion and impact in FMD-free countries/zones should be further developed for contingency planning. This would provide evidence for more focussed and efficient policies on the safe trade of livestock and their products from affected regions.

POTENTIAL RESEARCH TOPICS

- Research on identifying high-risk FMDV strains for incursion and impact in FMD-free countries/zones.
- Risk assessment study to identify the risk pathways for FMDV incursion into free countries or zones.
- Research on optimising the FMD detection and reporting systems to ensure early alerting in free countries/zones.
Vaccines play a vital role in FMD control, used both to limit the spread of the virus during epidemics in FMD-free areas and as the mainstay of disease management in endemic areas. Improvements in the performance or cost-effectiveness of FMD vaccines will allow more widespread and efficient disease control. The importance of evaluating vaccination programme effectiveness and impact is increasingly being recognized.

FMD vaccines have changed little in recent decades, typically produced by inactivation of whole virus, the quantity and stability of the intact viral capsids in the final preparation being key for immunogenicity. However, the current vaccines require using live virulent FMDV for manufacturing, fail to prevent infection resulting in the establishment of carrier animals, require multiple vaccination schedules (every 4-6 months) and have limited coverage to the specific serotype and in many cases subtype of FMDV. Novel FMD vaccines that can overcome the current challenges and have greater efficacy are highly desirable.

**POTENTIAL RESEARCH TOPICS**

- Improving the potency of FMD vaccines
- Improving the onset and duration of immunity of FMD vaccines
- Developing next generation FMD vaccines such as sub-unit and peptide vaccines, DNA vaccines, empty capsid vaccines (directly delivered or vector delivered), novel inactivated antigen production platforms
- Discovery of new adjuvants to improve the efficacy and safety of current inactivated FMD vaccines
- Optimising vaccine components and vaccination strategy to improve cross-strain protection
RESEARCH IMPROVING THE PREDICTION OF VACCINE FIELD PERFORMANCE BASED ON VACCINE MATCHING RESULTS

In vitro vaccine matching tests are considered as valuable tools to understand vaccination-mediated protection during outbreaks of divergent strains, and the most widely used assay is the traditional r1 value test. However, in recent years it has become increasing challenging to predict or interpret field protection solely based on the r1 values. Alternative tests with improved reliability and accuracy, such as in vitro matching using IgG subtypes and avidity tests, would be explored for a better prediction of virus antigenic difference.

In addition, in some laboratories of other regions, genetic sequencing has been used to predict antigenic similarity and therefore vaccine matching. Further studies are required to validate this technique in the SEACFMD region which has its specific FMDV pools.

RESEARCH IMPROVING EVALUATION OF VACCINE FIELD PROTECTION

There has been increasing significance to evaluate how well a vaccination programme is protecting animals in the field. In this region, using antibody level against FMDV structural proteins as a proxy for protection is most frequently used, which allows easy comparison of different vaccine groups and schedules. Meanwhile, basic field epidemiology has been largely under-utilised in the evaluation of the vaccination campaigns. Limited information is available on the information of causative FMDVs in previously vaccinated animals/villages. Further developments are required in defining appropriate clinical, virological and serological surveillance methods for the purpose of better monitoring vaccine field performance.

POTENTIAL RESEARCH TOPICS

• Developing alternative in vitro vaccine matching tests
• Exploring the prediction of vaccine matching based on the genetic analysis of viral antigenic sites

POTENTIAL RESEARCH TOPICS

• Cohort studies to examine vaccine field performance in target areas. This approach can be utilised if outbreaks are identified early and followed up, or if outbreaks occur in herds with good records (e.g. large dairy farms), providing details of incidence of disease in animals of known prior vaccination status.
• Case-control studies to evaluate vaccine field performance. This approach can be used to compare differences in disease incidence and protection among different herds with distinct vaccination histories.
2.5 STUDIES TO IMPROVE THE APPLICATION OF BIOSECURITY MEASURES IN FMD CONTROL AND PREVENTION

The 5th phase of the SEACFMD Campaign recognises that good biosecurity measures should be more encouraged and practised to better prevent the introduction and spread of FMD as well as other important livestock diseases.

RESEARCH SUPPORTING EFFECTIVE MANAGEMENT OF LIVESTOCK BIOSECURITY

Livestock biosecurity is a set of measures for protecting a population from infectious diseases at the national, regional and farm level. Biosecurity is practiced as a preventative approach to herd health to minimise frequency of disease. A common challenge for the FMD endemic countries is the difficulty in improving biosecurity, given animals are often free-ranging in common grazing areas.

RESEARCH SUPPORTING EFFECTIVE TREATMENT OF INFECTED ANIMALS

In the SEACFMD region, traditional treatments using herbal medicine and antibodies are widely practiced by animal owners and village animal health workers to treat infected animals during FMD outbreaks. Although these treatments cannot effectively eliminate the virus, they are often viewed as effective, given the self-limiting nature of FMDV infection. In other regions of the world, biotherapeutics such as use of adenovirus to vector interferon into hosts and induce short-lived non-specific protection against FMDV have shown promising results. In addition, RNA interference-based strategies are also being explored, though their suitability for upscaling to the levels required in outbreak situations remain to be further assessed.

POTENTIAL RESEARCH TOPICS

• Identifying potential risk factors for introduction of FMD into the farm in various animal husbandry systems
• Identifying key factors in a biosecurity plan and their impacts
• Exploring socio-economic drivers to improve stakeholders’ engagement in implementing biosecurity

POTENTIAL RESEARCH TOPICS

• Exploring accessible remedies that can be utilised to treat FMDV infected livestock and how these can be at its most effective (dosage, frequency, application, etc.)
RESEARCH SUPPORTING SAFER LIVESTOCK MOVEMENT AND TRADE

In FMD endemic countries, it is usually difficult to enforce livestock movement restrictions, particularly during FMD outbreaks, given the small holder systems predominantly depending on trading of livestock to provide family income. It is long recognised that in the SEACFMD region, movements of infected livestock play a key role in FMD dissemination, and thus it is crucial to implement movement restriction of infected animals and zoosanitary measures during livestock movements to minimise the risk of FMD spread. These management practices include testing and screening for diseases, isolation or quarantine of infected animals, immunisation, and selective purchasing.

RESEARCH SUPPORTING EFFICIENT USE OF DISINFECTANTS

Disinfectants are widely used in the SEACFMD region during FMD outbreaks, while further research is desired to develop standardised disinfectant efficacy test methods, to assess activity of antimicrobial pesticides against FMDV, and to define optimal conditions of use for new and established disinfectants.
2.6 STUDIES ON THE MANAGEMENT OF ANIMAL MOVEMENT AND CONTROL ZONE

Studies conducted during the 3rd and 4th Phases of SEACFMD have improved our understanding of the dynamics, extent and drivers of livestock movement in the region. Findings confirm that, to reduce disease incidence and spread, efforts are best focused at source and critical control points in production and supply chains. Enhanced movement monitoring will be required to identify critical control points more precisely and the findings will be used as the basis for risk assessment and for the design of control programmes, both nationally and regionally.

RESEARCH IDENTIFYING KEY ANIMAL MOVEMENT PATHWAYS AND THE SOCIO-ECONOMIC DRIVERS

Livestock movements are known to play a key role in the spread of FMD. Recent studies have shown a substantial trade-driven cross-border livestock movements and their close relations with the distribution and transboundary spread of FMDVs. However, the studies also highlight the dynamic nature of livestock trade in the region and the need to conduct further studies to review livestock movement pathways periodically. With the increasing market relatedness within the SEACFMD region, closely monitoring animal movement patterns, including the key movement pathways and origins and volumes of the animals moved, should be continued. Besides, in-depth studies of the drivers of the movements, such as market supply/demand, price differentials across countries/regions, transportation infrastructure changes/development, religion/social environment, etc, are also required. These studies would provide evidence for more focussed and efficient policies on the safe trade of livestock and their products.

POTENTIAL RESEARCH TOPICS

- Studies to continuously monitor the regional and national movement pathways of FMD susceptible livestock and their products
- Identification of socio-economic drivers for animal and animal product trade
RESEARCH ON THE ESTABLISHMENT OF CHINA-SEA FMD BORDER CONTROL ZONES

At present, many of the livestock movements in SEA are destined for China, which are unofficial as Chinese law bans importation of live animals from countries where FMD is endemic. However, the financial incentives for moving livestock into China and the necessity to meet the high demand for livestock products continues to drive high volumes of unofficial trade. To promote safer cross-border livestock trade, Chinese Government is considering relaxing regulations to allow importation of livestock from FMD control zones/trade zones, and proposals have been made for establishing such zones along China-Myanmar and China-Laos borders. To progress towards this, investigations to identify suitable areas for the establishment of trade/control zones, feasibility studies for setting up pre-quarantine farms/holding yards, risk assessment studies to evaluate the risks of FMDV incursions into the border zones, as well as cost-benefit studies to compare the legal and illegal trade modes and examine who benefits and who pays, are needed to assist decision makers.

POTENTIAL RESEARCH TOPICS

• Risk assessment study to support the establishment of FMD control zones along China-Laos and China-Myanmar borders
• Value-chain study to support the establishment of FMD border control zones
3. Coordination and Advocacy

PUBLIC AWARENESS OF FMD CONTROL

Effective communication is an integral component of a successful animal health programme. It is a tool through which the public and key stakeholders gain knowledge and understanding and develop proper awareness that shall direct them to either support and adopt the practices being shared. A number of public awareness campaigns and information materials were produced and disseminated during the early phases of SEACFMD. However, given that FMD control programme involves some technicalities that are not easily understood by those in the grassroots level including farmers who are directly involved with the livestock, it is important to develop strategies that can translate scientific information for easy and better understanding of the public including technical staff in the Veterinary Services to achieve the desired behavioural change among the target audience.

Studies on factors that affect the delivery of communication and inhibit adoption of measures for effective FMD prevention and control by the target audience will help programme implementers better understand the target audience. It will provide valuable inputs to design appropriate approaches and interventions to achieve best results. Assessment of communication and gender/social competencies of Veterinary Services staff involved in public awareness campaigns will provide information on the skills/trainings need to reduce the gap in communication. Continuous engagement with stakeholders is necessary to be updated with the situation and easily identify challenges and gaps to come up with necessary actions to address identified gaps.

Baseline information is particularly useful not only in designing an effective control strategy for FMD but also in measuring impact of the programme including determining change in behaviour. Baseline information may vary from each country considering the different cultural, economic and social environment, thus, Member Countries are encouraged to conduct own baseline survey to gather data on knowledge, attitudes, and practices of relevant stakeholders including perception of farmers and accessibility and participation by women to animal health services and programmes. These are useful in designing interventions to influence and facilitate faster adoption of recommended practices towards FMD prevention and control.
Socio-behavioural factors profoundly affect the effectiveness of disease monitoring and control policies, which may include the paucity of FMD knowledge of farmers, insufficient compensation, trade barriers, etc. Research is needed to enhance our understanding of local cultural and social factors that influence the agricultural community’s tendency to report FMD outbreaks and control activities. Future promotion programmes that aim at increasing farmers’ motivation to participate in FMD reporting and control should give attention to the perceived barriers influencing the intentions to apply these measures.

**POTENTIAL RESEARCH TOPICS**

- Developing a model for effective FMD communication and reporting system
- Design, delivery and implementation of animal health information system: Case study and lessons from ISIKHNAS and IRIS
- Research on the barriers of FMD reporting and control
- Impact of FMD control programmes among households in selected pilot vaccination areas
- Estimation of the burden of disease in local small holders
- Assessment of the role of women in animal production and their participation in FMD control program
- Enhance accessibility of farmers including women in remote areas to Veterinary Services and FMD control programmes
- Adoption of recommended practices among farmers in selected pilot vaccination areas
4. Governance and Policy

**Socio-economic studies to support FMD control policies**

Sustaining the accomplishments over the four phases of SEACFMD programme is important to achieve the desired target of the SEACFMD Campaign. Thus, it is important that governments are convinced of the benefits of FMD prevention and control programme so that needed resources are provided coupled with enabling mechanisms such as legislation and gender-responsive policies. However, studies on costs and benefits of FMD control options that could support decision-making is limited in the region. The full social and economic impacts of FMD and FMD control remains unclear in large parts in this region, which hampers effective design of control policies. Studies are needed to provide science-based information to assist governments to prioritise FMD control measures. Socio-economic impact of FMD on poverty alleviation and food security as well as on improved access to market and trade can strengthen support of governments to the campaign. Also, investigations on the benefits of FMD eradication and freedom would add to the attractiveness of implementing the SEACFMD Roadmap.

**Research investigating socio-economic impact of FMD in endemic countries**

Despite some studies on FMD-related financial losses in some Member Countries, the socio-economic impact of FMD outbreaks should be better understood in some other endemic countries to assist policies on FMD control. A failure to appreciate the FMD burden may agitate insufficient political and funding support and private stakeholders’ engagement. Research to assess FMD impact can be layered on the herd level, i.e. modelling the dynamics of the herd to see how herd structure, productivity and efficiency are impacted by FMD; on the household level, i.e. interviewing farmers about who is affected and how; and on the sector and whole economy level, i.e. how FMD reduces flows of animals and products to the market, how benefits and costs affect different groups (public sector and revenues, holdings of different types and location including those outside FMD-free zones, consumers, environment and wildlife).
RESEARCH ASSESSING THE IMPACT OF FMD CONTROL MEASURES

For FMD endemic countries, apart from studies to assess the impact of FMD, it is equally important to assess the impacts of FMD Control Programmes to provide justification for sustained investments in FMD control programmes. With the increasing application of vaccination in FMD control in endemic countries, studies are needed to compare the actual cost of vaccination, including the cost of the vaccines and the campaign, with the benefits of reduced FMD occurrence. This will be especially useful in the design and application of wider scale of vaccination campaigns as well as promoting public awareness and government commitment of FMD control.
RESEARCH ON SOCIO-ECONOMIC BENEFITS OF MAINTAINING FMD FREEDOM

Indonesia, Singapore, the Philippines, Brunei and Eastern Malaysia have successfully maintained their FMD free status without vaccination for decades. It is known that those countries have benefited from greater animal production opportunities for trade and increased access to higher priced markets. However, quantitative analysis of the socio-economic impact of FMD elimination is lacking. Future studies would include assessing socio-economic benefits of FMD freedom, analysing potential costs for FMD outbreaks and eradication, and evaluating costs of FMD preparedness approaches. The study findings would be useful for advocacy efforts to encourage the decision makers of governments and other stakeholders to sustain the efforts on FMD prevention and contingency planning, as well as to motivate endemic countries to progress FMD control and eradication.

POTENTIAL RESEARCH TOPICS

- Critical review of legislations and policies supporting FMD control programme: lessons and recommendations from FMD-free countries
- Value chain analysis in FMD-free countries
- Costs and effect of FMD vaccination on poverty alleviation and trade access in FMD-endemic countries
- Adoption of government recommended practices and its effect on the prevention and control of FMD
- Creation of cross-national cooperation as a result of harmonised FMD prevention and control strategy
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