

Guiding document on
 Developing a Risk-Based Strategic Plan
 for
 Control of Foot-and-Mouth Disease

Version <1.1>

<24/05/2013>

Table of Contents

Introduction.....	4
Chapter 1 Situation analysis.....	7
1.1 Outcome 1:.....	7
1.2 Outcome 2:.....	8
1.3 Outcome 3.....	9
1.4 Outcome 4.....	9
1.5 Outcome 5.....	10
1.6 Outcome 6.....	10
1.7 Outcome 7.....	10
1.8 Outcome 8:.....	11
Chapter 2: Benefits of FMD Control.....	12
2.1 Expected benefits related to livelihoods and food security.....	12
2.2 Expected benefits related to improved financial conditions of private stakeholders.....	12
2.3 Expected benefits related to the public sector.....	12
2.4 Expected benefits related to trade.....	13
2.5 Expected benefits to the regional and international communities.....	13
2.6 Other expected benefits.....	13
Chapter 3 Framework for a risk-based strategy.....	14
3.1 – Goal.....	16
3.2 – Strategic Objective.....	16
3.3 – Component objectives, tactics and activities.....	17
3.3.1 Component objectives.....	17
3.3.2 Tactics/Approaches.....	17
3.3.3 – Activities and planning in time.....	18
3.4 Research and development.....	19
Chapter 4 Monitoring and evaluation.....	20
4.1 Definition of indicators, targets and means of verification.....	20
4.1.1 Indicators and targets.....	20
4.1.2 Means of verification.....	22
Chapter 5 Operational plan.....	23
5.1 Organisation of FMD control.....	23
5.2 Implementation table.....	24
5.3 Summary of the Budget.....	26

5.4 Reference to Standard operating procedures (SOP) and technical documents	26
Chapter 6 Technical Assistance Plan	28
6.1 Technical Assistance Approach	28
6.2 Summary table	28
6.3 Terms of reference and proposals	29
Glossary	30
Results based management terms:.....	30
Progressive Control Pathway (PCP-FMD) terms:.....	31

Introduction

The first of the three components in the Global Foot-and-Mouth Disease Control Strategy (GS) is "Improving global FMD control", and the FMD Progressive Control Pathway (PCP-FMD) has been adopted as the major tool for this component. The other two components that make up the GS are "Strengthening the Veterinary Services" (Component 2) and "Prevention and control of other major diseases of livestock" (Component 3).

The Global FMD Control Strategy is not seen as a 'stand-alone activity', aimed solely at FMD control, but as a carrier mechanism to simultaneously progress in other fields, with the strengthening of veterinary systems as the linchpin. To progress with FMD control, strengthening the Veterinary Services (VS) in a sustainable manner will be imperative, and this in turn will create better possibilities to control other priority diseases and pursue sensible and cost-effective combinations of activities

(excerpt from the Global FMD Strategy)

For Component 1, a document is available that outlines the PCP-FMD principles, stage descriptions and standards¹. Within this document, each PCP-FMD Stage is described as a series of outcomes that must be achieved to complete that Stage and progress to the subsequent level of FMD control. The final outcomes of Stages 1 and 2 are the development of a national Risk-Based Strategic Plan for FMD control. Fulfilling this outcome is required for to complete these Stages and progress along the PCP-FMD.

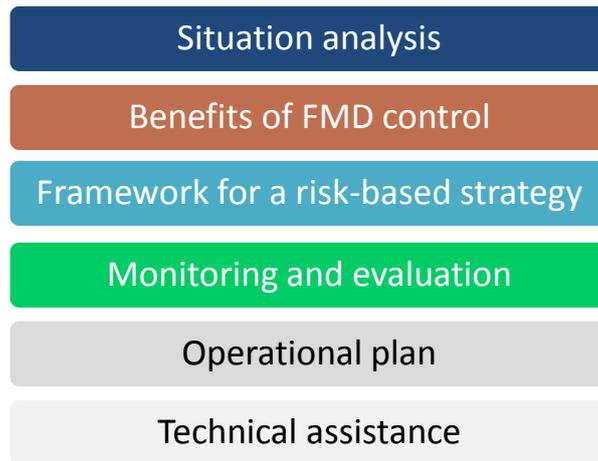
At the end of Stage 1, the national Risk-Based Strategic Plan (RBSP) for the control of FMD has the aim of reducing the impact (ie consequences) of FMD in at least 1 zone or husbandry sector. Stage 1 of the PCP-FMD guides countries to identify and characterize the main FMD risk hotspots within the country, and the control strategy outlines how the FMD risk can be effectively mitigated using the resources available. Risk is defined as a measure of the combination of of probability and impact of FMD entry and/or spread.

At the end of Stage 2, the national Risk-Based Strategic Plan for FMD is revised to be more aggressive, with the aim of eliminating FMD from at least a zone of the country.

Documentation is available to support VS staff to develop a national Risk-Based Strategic Plan (RBSP) for FMD that is appropriate for countries completing PCP Stage 1 and moving to PCP Stage 2. The available documents include:

1. **Template:** a blue-print of headings and sub-headings of subjects that need to be covered within the Risk-Based Strategic Plan. It consists of 6 chapters, as portrayed in the figure below:

¹ <http://www.fao.org/ag/againfo/commissions/docs/PCP/PCP-26012011.pdf>

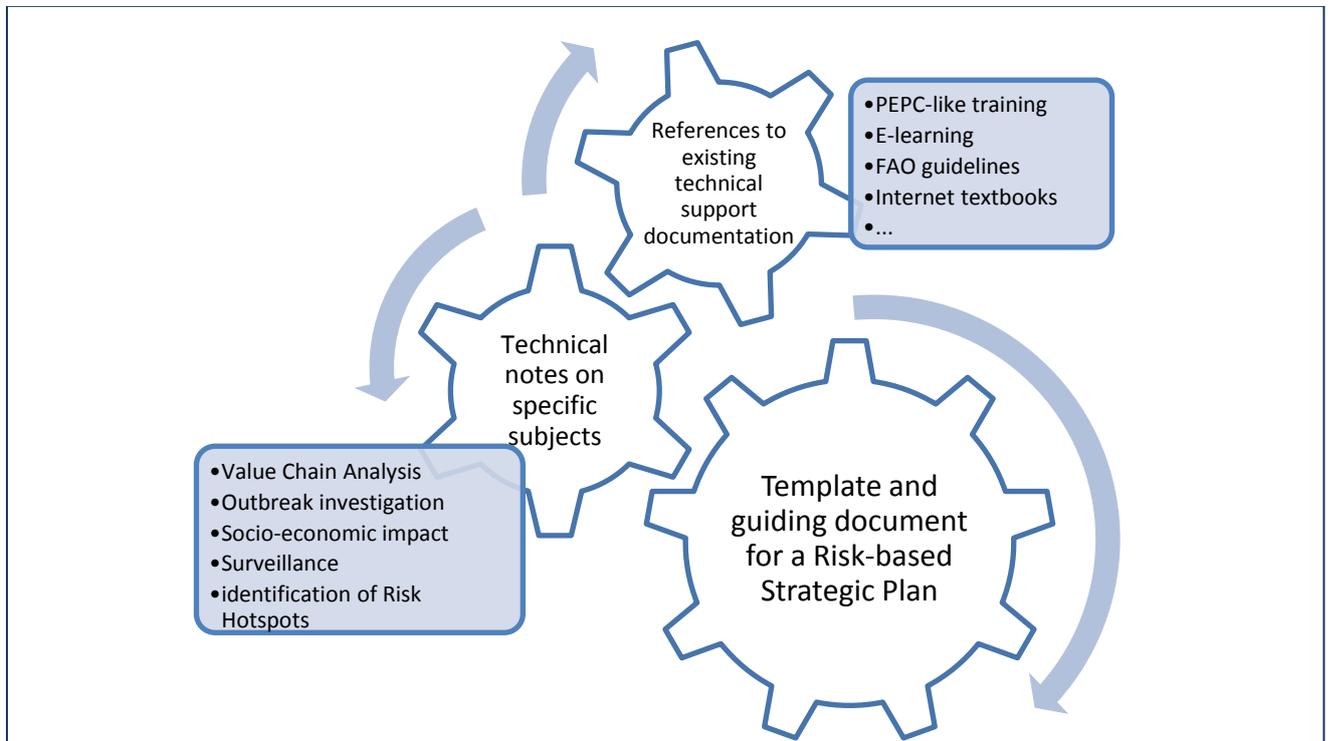


2. **Guiding document:** a document that provides details and illustrations on what is expected for each chapter of the RBSP.
3. **Evaluation form:** This form will guide PCP Assessors who are reviewing the Risk-Based Strategic Plan to determine if they fulfil the requirements of Stage 1 of the PCP-FMD

The above will be supported by:

4. **Technical notes** on specific subjects in relation to outcomes 1-7 of PCP-FMD Stage 1 such as
 - a. Disease outbreak investigation
 - b. Value chain analysis
 - c. Socio-economic impact analysis
 - d. Surveys and surveillance
 - e. Risk analysis with regard to defining risk hotspots
 - f. ...
5. **References to existing technical support documentation** on these subjects. For example, there are 2 FAO guidelines available describing value chain analysis that provide extensive information on 'why', 'what', 'how', 'when' and 'who'. Rather than to write another document, we will make references to existing documentation. This technical support documentation may also relate to e-learning tools or information on internet.

Resources to support countries engaged in the PCP-FMD (especially for Stages 1 & 2)



We are still in the process of drafting and collating technical notes and support documentation, thus it is currently incomplete.

Chapter 1 Situation analysis

Countries in PCP Stage 1 are conducting activities that provide insights into all aspects of FMD in the country, including transmission and impact of FMD infection. Thus, they can define areas and practices of **high risk** for FMD. Each outcome for Stage 1 is described in more detail below. In the Situation analysis, the main points from each of these outcomes with respect to their relevance to FMD control should be summarized.

Words in **red** are included in the Glossary.

1.1 Outcome 1: All **husbandry systems**, the livestock marketing network and associated **socio-economic drivers** are well described for FMD susceptible species

FMD virus is primarily spread by everyday activities that are part of raising and handling livestock, such as milk collection, buying and selling of livestock, feed, taking animals to and from grazing land etc. Therefore these activities (related to husbandry systems and animal movements) should be well understood by those responsible for FMD control, as well as the underlying socio-economic drivers, in other words the reasons why livestock are raised and marketed in the ways that they are (FAO, 2011).

Movement patterns: There should be a general understanding of movement patterns for the main FMD susceptible livestock in the country such as large ruminants (cattle and buffalo), small ruminants (sheep and goats) and pigs. For those species/husbandry types considered at higher **risk** of FMD, the information should be more detailed and include numbers, origin and destination, the purpose of the movements and any seasonal patterns.

Stakeholders: In order to reduce the transmission of FMD, some actions must be taken by the stakeholders who conduct these day-to-day activities. FMD control will be much more successful if most stakeholders comply with the control measures. At this point, all stakeholder categories (i.e. not individuals but groups) should be identified by the Veterinary Authority, and a representative or contact for each category identified (name and address).

Both FMD and related control measures impact on the business and livelihoods of the stakeholders. From the stakeholders' point of view, this impact of control measures may be positive (healthier stock, enhanced productivity, more markets to sell products) or negative (lose money due to movement restrictions, loss of markets due to confirmed status). If FMD is perceived to cause substantial losses, then stakeholders will be more motivated to control it. However, if the *FMD control measures* cause large or ongoing losses, then stakeholders will be less likely to comply with the measures. It is therefore recommended that the Veterinary Authority work closely with the stakeholders in order to understand their perceptions, beliefs, interest, possible reasons for resistance and concerns with respect to FMD control.

The **incentives and constraints** that pertain to the behaviours and livelihoods of the stakeholders should be understood and taken into account in developing FMD control measures. These incentives and constraints will largely determine both motivation to control FMD and compliance with any control measures implemented.

In PCP-Stage 1, the most important sources of income for each stakeholder category should be identified, as well as their main expenses and reasons for financial losses. This will allow the

Veterinary Authority to understand the level of importance of FMD to the particular stakeholder. Important constraints should also be identified and described, and will include the regulations that govern each industry/stakeholder, for example the number of days per week markets are permitted to be open, which vaccines are licensed within the country, rules pertaining to carcass disposal, treatment of raw milk etc.

Information related to this outcome should be summarised in section 1.2 of the RBSP Situation Analysis template. In this section, the main animal movement patterns important for FMD spread should be summarized, including a description of the motives and reasons for these movements. Stakeholders that are most impacted by FMD should be identified, as well as any estimates of the impact or direct costs of FMD.

1.2 Outcome 2: The distribution of FMD in the country is well described and understood and a ‘working hypothesis’ of how FMD circulates in the country has been developed

In order to reduce the spread of FMD, the mechanisms of how FMD is passed from farm-to-farm, and region-to-region within the country must be described and understood. Information about how livestock are raised in the country (Outcome 1) is combined with information about FMD occurrence to identify the common and important routes and drivers of FMD transmission. This is called a ‘working hypothesis’, and is a tentative identification of the main reasons for FMD spread (risk factors, patterns) that should be reviewed for accuracy, refined and improved as more information becomes available. This working hypothesis is a critical input in the development of a risk-based FMD control strategy.

To fulfil this outcome, the **incidence** of FMD in different regions of the country and in different husbandry systems should be estimated. ‘Regions’ might correspond to districts, provinces or husbandry areas (for example, if a group of districts constitute the main dairy-producing area then this might be defined as a ‘region’ over which incidence is estimated).

An estimation of FMD incidence is required to assess and compare FMD **risk** in different regions and production types, and also provides a baseline to determine if FMD control measures are reducing the risk over time.

A necessary first step is to define and count the number of **epidemiological units**, the denominator for the incidence calculation. FMD incidence (I) can then be calculated using the number of clinically confirmed cases (i.e. the number of epidemiological units which have animals with clinical signs of FMD) and/or the results from a **non-structural protein (NSP) serosurvey**.

$$I = \frac{\text{the number of FMD infected epidemiological units in a given period of time (eg. 1 year)}}{\text{the total number of susceptible epidemiological units}}$$

The data used to calculate incidence should be **epidemiologically robust**, meaning as reliable and free from **bias** as possible. If incidence is estimated using reports of clinical signs compatible with FMD, the accuracy of the estimate can be affected by under-reporting and misdiagnosis. If non-structural protein (NSP) serosurvey data are used, then the survey should be carefully designed and conducted to minimise bias (for examples, see Bayissa et al, 2011; Gelaye et al, 2009).

Outbreak investigations should be conducted regularly to describe the clinical presentation of FMD and identify the source and common mechanisms of spread, as well as the causative serotype. Ideally, there should be Standard Operating Procedures and standard data recording forms should be developed and used for these investigations.

Information about husbandry (Outcome 1), the distribution of and results of outbreak investigations can be used to generate a working hypothesis of how FMD virus circulates in the country¹.

Information related to this outcome should be summarised in sections 1.1 and 1.3 of the RBSP Situation Analysis template. In section 1.1, information about the incidence of FMD by species, production sector, area and season should be summarised. In section 1.3.1, the main routes by which FMD virus enters and circulates within the livestock population should be described (“working hypothesis of FMD circulation”).

1.3 Outcome 3: Socio-economic impacts of FMD on different stakeholders have been estimated.

The impact of FMD must be understood for two main reasons. First, the magnitude of the losses must be described in order to convince governments, stakeholders including industry and international organizations to invest in controlling it. Second, the FMD impact should be measured in order to ensure that the control measures are reducing it (ie cost-benefit analysis).

In PCP-Stage 1, countries should identify and measure the impact of **direct losses** due to FMD in the key husbandry systems and industries, such as the extent of decreased production (milk and meat), lost draught power and increased mortality caused by FMD.

Information related to this outcome should be included in section 1.2 of the RBSP Situation Analysis template. Stakeholders that are most impacted by FMD should be identified, as well as any estimates of the impact or direct costs of FMD.

1.4 Outcome 4: The most common circulating strains of FMDV have been identified.

Knowledge about the circulating serotypes and strains is needed to further understand how FMD virus is transmitted within the country, and also to design an effective, risk-based control program using vaccination. There is little or no cross protection provided by immunity to different FMD serotypes, and so identification of circulating serotypes is required to design an effective vaccination program.

Full characterization of circulating strains (including sequencing and vaccine matching) is needed to ensure that the vaccines used offer protection. Strain characterization can also assist to pinpoint the origin of new viruses entering into the country, for example from cross border animal movements, wildlife, or trade. Threats posed by new viruses or antigenic drift should be identified as quickly as possible, to allow steps to reduce the associated risks, for example by enhanced border security in high-risk areas or changing the strains included in vaccines.

In order to obtain an accurate picture of circulating strains, samples should be collected from different geographic areas and husbandry types, and at regular intervals. It is recommended that countries submit at least 30 isolates per year to the Regional and/or the World Reference Laboratory for full characterization including sequencing and vaccine matching.

Information related to this outcome should be summarised in section 1.1 of the RBSP Situation Analysis template.

1.5 **Outcome 5: There has been progress towards developing an enabling environment for control activities.**

This outcome remains relevant at all PCP Stages and describes the setting in which FMD control must be applied, and whether or not the underlying conditions will aid or impede control. There are several factors included:

FMD surveillance system: In PCP Stage 1, FMD should be a notifiable disease and the reporting of suspect cases should not be discouraged. This is necessary to demonstrate commitment to FMD control.

Strengthening Veterinary Services: This is a very broad area, that is covered in more detail in the Global strategy of FMD control² and the OIE – PVS tool³. Specific critical competencies of the Veterinary Services relevant for FMD control for each PCP-FMD Stage are identified in the Global strategy of FMD control.

In PCP-Stage 1, it is recommended that a unit in the official Veterinary Services is devoted specifically to FMD control to ensure that roles and responsibility for FMD control are clear. It is also recommended that training for field veterinarians is provided in infectious disease control, outbreak investigation and surveillance.

Review legal framework: The Veterinary Services need legal authority to pursue disease control. In this 1st PCP Stage, the veterinary legislation should be assessed with a view to future control measures, such as the right to enter premises for surveillance and control purposes, to impose movement restrictions etc.

Develop information systems: Decisions about FMD control should be based on information about the field situation, which in turn derives from data collected from suspect case reporting, outbreak investigations, laboratory results, surveys etc. Centralized, computerized information systems should be developed to store and manage these data and to facilitate their analysis so that it can be used in decision making about FMD control.

Information related to the roles and responsibilities for FMD control, as well as results from any OIE-PVS missions, should be summarised in section 1.4 of the RBSP Situation Analysis template

1.6 **Outcome 6: The country demonstrates transparency and commitment to participating in regional FMD control.**

FMD is one of the most contagious diseases, if not the most, and as such FMDV often crosses borders to infect animals in neighbouring countries. Therefore, all countries are put at risk by the FMD situation in other countries, particularly neighbouring countries and trading partners. Further, a regional approach to FMD control is preferred and most likely to be effective.

1.7 **Outcome 7: Risk hotspots for FMD transmission are identified**

Risk hotspots are specific point(s) in the production or marketing network at high **risk** for FMD (ie. that have a high probability of FMD infection, or where the consequences of FMD infection are great). For example, live animal markets are commonly identified as risk hotspots, because they

² <http://www.fao.org/docrep/015/an390e/an390e.pdf>

³ <http://www.oie.int/support-to-oie-members/pvs-pathway/>

represent a place where FMD-infected animals can mix extensively with and infect other animals, which in turn are sold and transported back to farms where they may infect yet more livestock. Another example of a risk hotspot might be milk collection, in which a vehicle travels from farm to farm without adequate biosecurity measures, sometimes carrying FMD virus with it.

To fulfil this outcome, risk hotspots are identified and described as precisely as possible; risk pathways are commonly used for this purpose (for example, see FAO, 2011). Further, important aspects of these risk hotspots that are not fully understood should be identified and research activities planned to fill these knowledge gaps.

Information related to this outcome is summarised in sections 1.3.2 and 1.6 of the RBSP Situation analysis template.

1.8 Outcome 8: A strategic FMD control plan with the aim of reducing the impact of FMD in at least one zone or husbandry sector is developed.

Results from Outcomes 1-7 should be used to develop this strategic plan, which should be endorsed by the Veterinary Authority and clearly based on the risks identified through other Stage 1 activities.

Monitoring and evaluation of the strategy should be built into the plan. Monitoring and evaluation should occur regularly and routinely, to determine if the strategy is effective at reducing the impact of FMD.

Development of the strategic plan for FMD control is outlined in detail in chapter 3 of this document, and in the associated template. Monitoring and evaluation is described in chapter 4 of this document and the corresponding template.

Chapter 2: Benefits of FMD Control

It is important to carefully consider and evaluate the expected benefits of embarking on a strategic plan to control FMD. An understanding of the benefits that would be realised is important to ensure support for the Plan. There is a need for advocacy in many places and at many levels:

- The national government, who will be at least partially responsible for funding the implementation of the Plan,
- External organisations who may provide technical assistance or financial support
- Private stakeholders (smallholders and industry), who will usually partially fund the Plan, and whom must comply with the control measures
- Field staff, who must implement the activities

Similarly, the benefits arising from FMD control will also have a positive impact at many levels. The distribution of these benefits will vary from country-to-country, according to many diverse factors including but not limited to:

- The current distribution and severity of FMD in the livestock population
- The importance of FMD susceptible livestock for livelihoods, food security and in the national economy
- The potential for new opportunities for trade in livestock and animal products
- The potential for spread of FMD from the country to other countries
- The impact of FMD on wildlife populations

2.1 Expected benefits related to livelihoods and food security

Livestock production contributes significantly to socio-economic development and sustainable food security for small-holders. Livestock also contribute to less tangible outcomes such as capital reserves and social status.

2.2 Expected benefits related to improved financial conditions of private stakeholders

Livestock are a source of financial revenue in many different ways including the provision of meat, milk, manure for crops, and draught power for transport and ploughing. Through production losses, FMD translates into important financial losses that would decrease with improved control.

2.3 Expected benefits related to the public sector

In addition to the direct benefits described above, improved FMD control will also benefit the public sector in many ways. By strengthening the veterinary services (component 2 of the Global Strategy), the efficiency and performance of the VS will improve which will result in their improved capacity to control other diseases as well as FMD. Also, as countries move along the PCP-FMD towards eradication, it is expected that fewer resources will need to be devoted to FMD control, freeing them up for other uses.

2.4 Expected benefits related to trade

FMD is a major constraint to trade, internationally, regionally and sometimes even within countries. The constraints typically affect the trade of live animals and animal products, but may also impact crops as well in some instances. Improved FMD control is expected to open up new markets for the country's producers and industries.

2.5 Expected benefits to the regional and international communities

FMD is commonly considered the most important transboundary animal disease. Incursions into free countries occur, and are extremely costly to control. Even in countries where FMD is endemic, the incursion of a new strain or serotype has serious implications. Therefore, there are substantial benefits to be realised outside the country as well. These benefits begin to be realised even at the early PCP Stages. As countries better understand the nature of FMD epidemiology within a country (PCP Stage 1 activities), they can protect themselves from incursions from that country.

2.6 Other expected benefits

The FMD situation within each country is unique, and so are the benefits to be realised from its control. For example, there may be important benefits related to wildlife or the environment.



Chapter 3 Framework for a risk-based strategy

In this section, a framework for a risk-based strategy for FMD control is given. It is based on general concepts of project management and focusses on the need to provide clear goals, well-defined objectives and strategies before embarking on implementation.

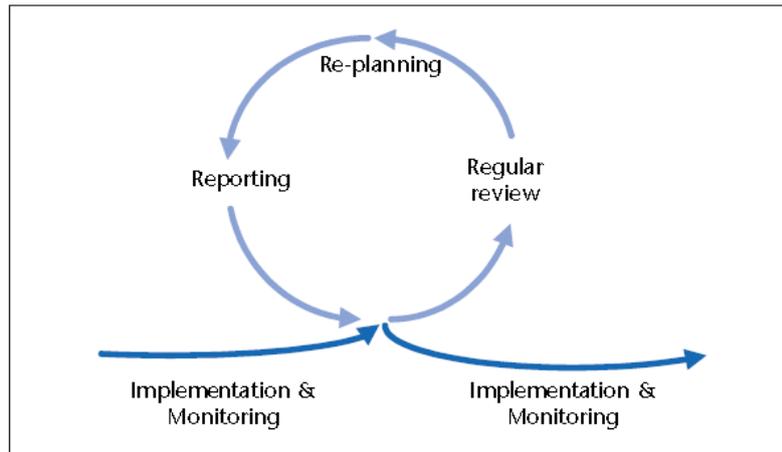
In different textbooks, guidelines and donor requirements there are variations of language and terminology used related to project management. The common key approach is to think through projects using a logic model, and the reader should not focus on the terminology which may vary. In this document, we use terms like “goal”, “strategic objectives”, “component objectives”, “strategies” and “activities”. All terms are explained in the Glossary.

The figure below captures key aspects and the boxes numbered 1 to 6 are discussed in more detail below.



An important feature of FMD management is that it is an *iterative process*. This means, that whatever strategy is developed at the start, will have to be regularly monitored and evaluated for its impact (results). The strategy will likely need to be modified (fine-tuned) according to the monitoring results, as the impact of control strategies may not have the intended effect and also because circumstances may change over time.

For this reason, there is a strong focus on the definition, monitoring and evaluation of indicators that measure - quantitatively or qualitatively - the level of implementation and the level of impact of the control strategy. This is covered in detail in chapter 4. Based on the feed-back provided by the indicators, the control strategy will need adaptation in terms of its objectives, its strategies, its activities and its budget and planning.



The sections below relate to Chapter 3 of the template.

3.1 – Goal

- Is sketching the overall aim of FMD control in general terms such as *“improving livelihoods by improving animal health and production”*. Normally related to a national or sector level achievement.
- Statement wording: *To contribute to ..., to reduce ..., to improve ...*
- However, it may be related to the concept of PCP-FMD and projecting the regional roadmap plan on FMD control such as
 - *E.g. “Achieving OIE-status of FMD free with vaccination by 2022”*
- Is a long-term achievement 5 – 20 years
- Could be part of the national policy on animal health – the country’s vision on FMD in relation to other disease control and food safety policies

3.2 – Strategic Objective

- The overall purpose of the Strategic Plan in the medium term (3-5 years). In one sentence, states the expected impact or effect on the target group, by when and where.
- Statement wording: *To increase ..., to improve ...*
- May relate to a specific PCP-FMD Stage
 - *“Achieving PCP-FMD stage 3 in 2015”*
- Defined by Ministry of Agriculture, as part of application of the national policy on disease control and food safety
- Prepared by the Veterinary Authority
- Should be achievable in the medium term (3-5years)

The Goal and Strategic Objective outline the long-term ambitions and vision of the national government (goals) and the application of that vision by the Veterinary Authority (Strategic Objective) for the next 3-5 years regarding FMD control.

To match the Goal with the Strategic Objective it requires common ground between national policy, competencies of veterinary staff and budget availability within the Veterinary Services. Therefore,

defining the Goal and Strategic Objective will require intense discussions and serious commitment from the policy makers and Veterinary Authority.

For these reasons, it may be helpful to define not-too-long but shorter term, less ambitious goals in combination with easier-to-achieve objectives, as a way to get FMD control on the national agenda. This will also make it easier to celebrate (small) successes after a relatively short period of time.

The Goal and Strategic Objective are best defined using SMART criteria: specific, measurable, achievable, results focused, and time-bound. For more details on these terms, see chapter 4.

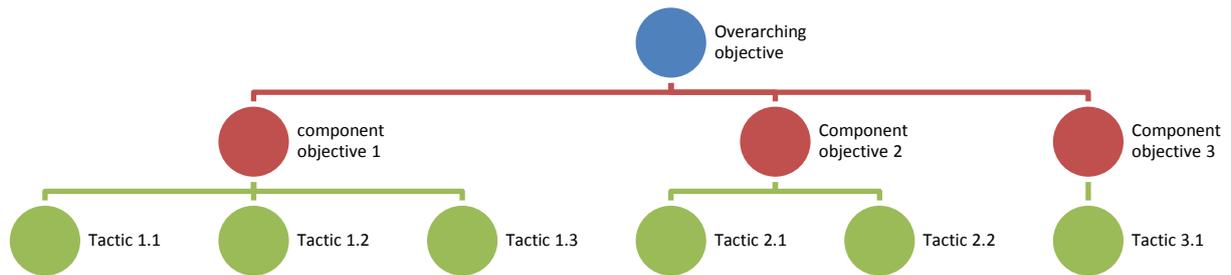
3.3 – Component objectives, tactics and activities

3.3.1 Component objectives

- Specific objectives set to mitigate specific risks identified in the country and improve national FMD risk management practices
- The achievement of these component objectives (there will usually be several) will ultimately result in the achievement of the Strategic Objective
- Each component objective should be clearly associated with a risk hotspot, address an important gap identified in the situation analysis, and/or improve national FMD risk management as needed to achieve the Strategic Objective
- Best defined using SMART criteria: **s**pecific, **m**easurable, **a**chievable, **r**esults focused, and **t**ime-bound. For more details on these terms, see chapter 4.
- Should be achievable in the short to medium term (1-3 years)
- Prepared by the FMD task force and agreed by the Veterinary Authority

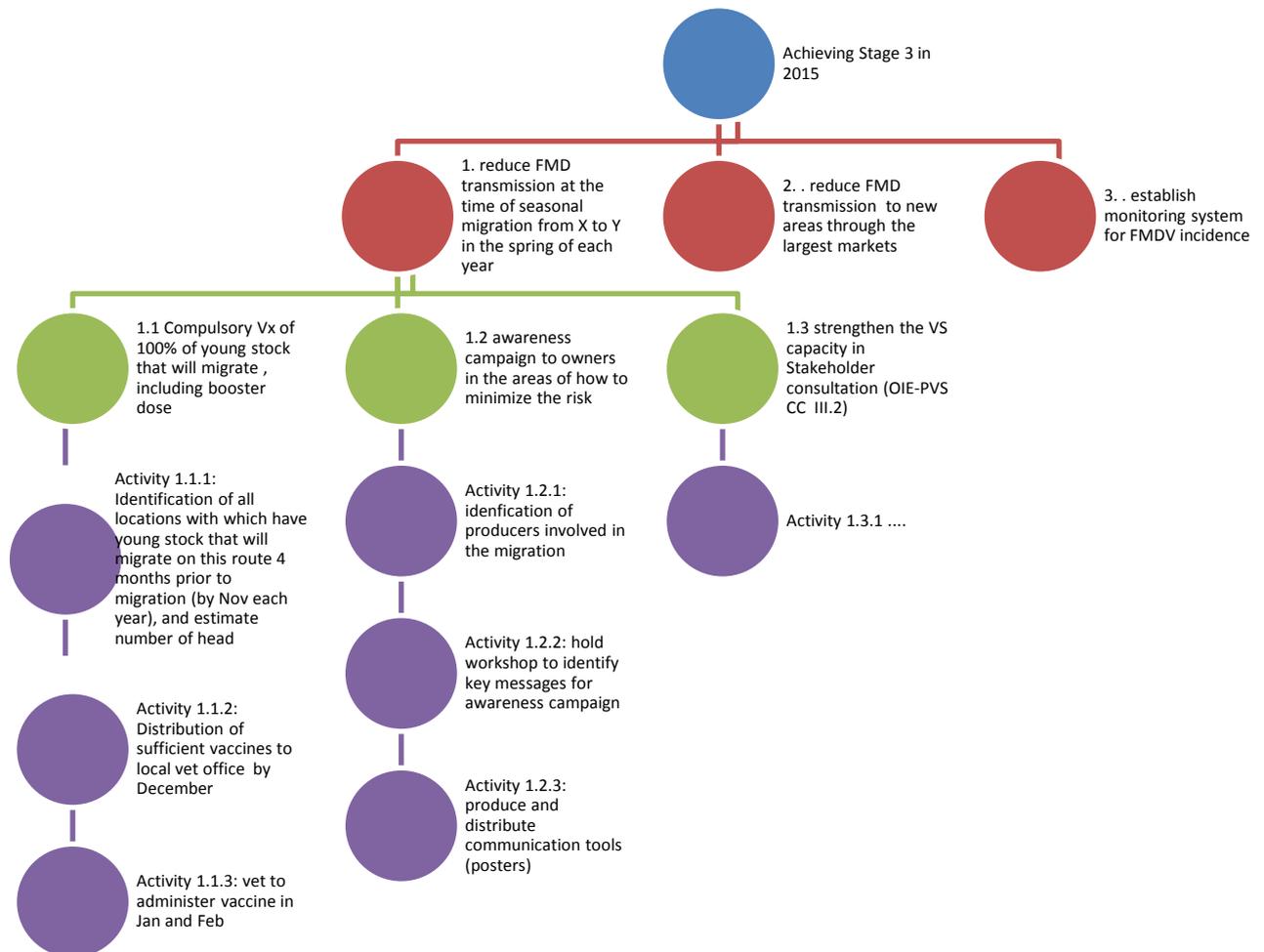
3.3.2 Tactics/Approaches

- Tactics are the specific approaches that will be taken to achieve the component objective.
- More than one tactic may be required to achieve each component objective
- It defines **how** a certain risk related to FMD control is going to be tackled.
 - If the component objective is to reduce the risk of migrating livestock, an example of tactics may be 1) the compulsory vaccination of 100% of young stock that will migrate, including booster dose, and 2) an awareness campaign to owners in the areas of how to minimize the risk.
- Best defined using SMART criteria: specific, measurable, achievable, results focused, and time-bound. For more details on these terms, see chapter 4.
- The tactics will sometimes be related to strengthening the veterinary services. The OIE-PVS tool defines an number of critical competencies that veterinary services should attain.
 - Some of these are particularly relevant to FMD control and these are described in the Global Strategy
- Defined by national FMD task force in collaboration with field units as both planned and ad hoc activities are required to deal with the demands of the moment
- Endorsed by Veterinary Authority and Ministry of Agriculture



3.3.3 – Activities and planning in time

- The tasks that need to be carried out to implement the tactics and achieve the objectives
- Statement wording: *Prepare ..., design ..., construct ..., research ...*
- Activities are also best defined using SMART criteria: specific, measurable, achievable, results focused, and time-bound. For more details on these terms, see chapter 4.
- Activities required to implement each tactic are listed in this section. A detailed plan for carrying out the activities is described in Chapter 5.
- Activities are defined by central and local FMD task force, and usually implemented by field staff



3.4 Research and development

While developing a strategic plan for FMD control, there will be (numerous) areas that lack detailed information. This should however not be cause for delaying the implementation of FMD control. Rather, parallel to implementation, an analysis of the areas that require more investigation and research needs to be performed which will be the basis for development of a long-term research programme. The considerations include:

- Prioritisation of gaps in knowledge required to fully implement the Strategic Plan for control
- Supplement information to support decision making by Veterinary Authority
 - E.g. Simulation modelling, Cost benefit analysis
- The research involve a collaborative program with internal and external research organisations (Universities, World Reference Laboratory for FMD, etc)
- Need to be defined by central FMD task force and agreed by both local and central veterinary services

Chapter 4 Monitoring and evaluation

Monitoring and evaluation (M & E) is an integral and essential component of the Strategic Plan for FMD control. The Plan should be monitored and evaluated on two distinct aspects: *impact* and *implementation*.

The M & E of *impact* is done to ascertain that the implementation of the Plan is having the desired effect in reducing the consequences of FMD in the target population(s). In other words, it verifies that the strategic and component objectives are being met. M & E of impact answers the question “Do the activities indeed help to achieve the objective, for example to reduce the economic losses due to clinical FMD?”

In parallel, M & E of *implementation* is needed to assess the level of at which the activities defined in the Plan are carried out. In other words, it compares planned activities with the actual activities carried out in the field. This involves the collection of information on how each of the tasks was implemented to learn if the activities and budget are in line with the proposed working schedule.

M & E of both implementation and impact requires carefully designed, well-defined indicators and targets. An indicator is a measurement that provides evidence that a certain condition exists or certain results have or have not been achieved. A target defines the desired value of the indicator that should be achieved (ie what measurement are you aiming for?). A general principle is that the minimum set of indicators should be measured to the information required for a thorough evaluation.

Information from M & E provides feedback that is needed to modify and improve the Strategic Plan over time as more evidence is available and as the disease situation and/or the environment changes. The Strategic Plan may also need to be modified if evaluation shows that implementation of activities is not feasible or does not result in the desired impact. For example, results from M & E may point out that more training is needed on certain competencies or that some activities require re-budgeting.

M & E results are also foreseen to provide evidence on achievements and progress made, and as such will be useful to discuss with government and with Ministries involved the importance of continued and future budget allocation.

Ideally M&E should be designed and executed by people that are not directly involved in FMD control. This will allow for the M&E to objectively collect, analyse and report on implementation and impact of FMD control over time. However, M&E staff need to be positioned close to the central and local FMD task forces as to benefit from the daily interactions.

4.1 Definition of indicators, targets and means of verification

4.1.1 Indicators and targets

Indicators are measures used to assess progress towards implementing activities and achieving objectives. An indicator should provide, where possible, a clearly defined unit of measurement detailing the quantity, quality and timing of the expected result. A good indicator includes ‘what’, ‘when’, ‘which’, ‘where’, ‘a target’, and reference to ‘a baseline’. Indicators should be defined for each objective and tactic.

For example, vaccination coverage is a commonly used indicator. It should be clearly defined what 'vaccination coverage' means in each instance: for example, vaccination coverage of cattle in 2013 may be defined as "the percentage of cattle between 6-12 months of age that received 2 doses of vaccine in 2013".

A target is the value, directly related to the indicator, used to define the desired level of the indicator. Continuing with the example above, the target for vaccination coverage may be 90% in 2013.

As another example, if the component objective is "to reduce FMD transmission at the time of seasonal migration from X to Y in the spring", then an indicator and target could be expressed:

"At the end of spring (*when*), 90% (*target*) of the susceptible migratory population (*what*) of small ruminants (*which*) in the area between X and Y (*where*) has been vaccinated against FMD. This will reduce the risk of FMD transmission considerably compared with the situation last year when only 40% of the susceptible population (*baseline*) was vaccinated"

Tips on writing indicators:

- Keep it simple
- Normally, indicators are completed at the level of component objectives and strategies only
- Write 1-3 indicators for each objective and/or tactic
- Indicators should demonstrate progress towards, and achievement of, the objective
- Do not reinvent the wheel, use existing indicators or available data
- Participatory M&E: use indicators that can be collected by stakeholders and field staff
- Try and relate indicators to baseline data if possible
- Indicators should be SMART
 - Specific: indicators need to be specific and relate to the conditions FMD control seeks to change
 - Measurable: quantifiable indicators are preferred because these are more precise, can be aggregated and allow statistical analysis. However, some development process indicators may be difficult to quantify, and qualitative indicators should be used.
 - Attainable: information should be attainable at reasonable costs using appropriate collection methods.
 - Relevant: relevant to the management information needs of the people who will use the data. Indicators must also be selected to meet the management and informational needs of all partners to implementation. Field staff may need different information that are no relevance to senior managers and vice versa.
 - Timely: information on an indicator need to be collected and reported on the right time to influence many management decisions.

Tips on defining targets:

- Relate targets to existing baseline information, thus to demonstrate what progress is foreseen
- Define targets that are achievable. Once achieved, a new target should be defined. Better to achieve targets regularly than not achieving at all.

4.1.2 Means of verification

Means of verification describe the source of information that needs to be collected to qualify and/or quantify the defined indicators. It needs consideration how information will be collected, who will be responsible and how often the information should be provided.

Examples include

- Minutes of meetings
- Field surveys
- Project and investigation reports
- Records from district and/or provincial offices
- Annual surveys

When considering means of verification, consider these questions:

- Do appropriate external sources of data already exist?
- Are these sources specific enough?
- Are sources reliable and accessible?
- Are costs for obtaining information reasonable?
- Should other sources be created?

Chapter 5 Operational Plan

The operational plan provides the information necessary to understand how the National FMD Strategic Plan will be implemented. It consists of four sections, beginning with an overview of the organization of FMD control within the country. The second section is a detailed table describing all activities that need to be implemented in order to accomplish the identified objectives. The 3rd section provides an overview of the budget for the strategy, and the 4th refers to Standard Operating Procedures and other technical annexes.

It is very important that the activities described are consistent with those listed in Chapter 3. This is best done by applying a consistent numbering of activities, as provided in the example in Chapter 3 of this document and the template.

The operational plan is best developed for a minimum of one year and a maximum of two years, with quarterly time frames.

5.1 Organisation of FMD control

This section describes the roles and responsibilities of the different organizations and stakeholders (?) involved in the development, implementation and monitoring of the Strategic Plan.

To achieve FMD control within a country, there is need for:

- Decision making, including the articulation of goals and priorities
- Evaluating options and developing strategies
- Implementing activities
- Monitoring & evaluation

The separation of these levels is important, as it builds in critical checks and balances by designating different roles and responsibilities to different players. These may be best accomplished by involving different organisations/persons that represent different hierarchical levels. However, at the same time it requires strong coordination and collaboration to be successful in FMD control. The table below is a summary of what organisation is to agree, to develop or to implement, relative to goal, strategic objective, tactics, activities and standard operating procedures (SOPs).

Key points are:

- The overall responsibility for oversight of the program usually remains with the Veterinary Authority. Within the Veterinary Authority, an FMD task force may be responsible for development of component objectives and strategies and coordination of activities.
- For the FMD task force to design the Strategic Plan, it needs to consider this as a process of integration and exchange of information and knowledge about FMD in the country. This may be best done by a small group of veterinary specialists, from different backgrounds and different departments.
- Roles and responsibilities of the different organisations need to be defined, and staff as well as other resources must be allocated accordingly.

The participation of private stakeholders in the design and decision making process ensures a control strategy that reflects their needs and interests. It is also critical to maximise compliance with the regulations and activities associated with the Strategic Plan.

Overview of terms used for defining the risk-based control strategy, and suggested related responsibilities:

	Is what	Developed by	Agreed by	Implemented by	Monitored by
Goal	Long term vision on FMD	Government	- Government - Private stakeholders	<i>Not applicable</i>	
Strategic objective	Medium term	Veterinary authority	- Ministry/ies - Private stakeholders	<i>Not applicable</i>	Ministry
Component objectives	Short-medium term (1-3 years), specifically aimed to mitigate risks	FMD task force --- Private stakeholders	- Veterinary authority -- Private stakeholders	<i>Not applicable</i>	Veterinary authority
Tactics	Plan of action 1-3 years term	FMD task force -- Private stakeholders	- Veterinary authority - Private stakeholders	<i>Not applicable</i>	FMD task force
Activities	Listing and planning of actions per month up to year	Local task forces and vet services	- FMD task force -local vet services	- Field staff - Private vets	FMD task force
SOPs	Guidelines on activities	Local task forces	FMD task force and local task forces	Field staff and private vets	<i>Not applicable</i>

5.2 Implementation table

Here, the details of the activities listed in chapter 3 are presented, including what the activity involves, when and where it will be implemented and who will implement it. It also indicates how the implementation will be monitored and evaluated (refers to the indicators defined in chapter 4). Finally, the table summarizes how much each activity will cost and the source of funding for the activity.

This table should be detailed on a quarterly basis. An example is provided below, continuing from that presented in Chapter 3.

Component Objective 1. Reduce FMD transmission at the time of seasonal migration from x to y during the spring of each year

Quarter 4: October-December 2014

Tactic 1.1. Compulsory vaccination of young stock that will migrate, including booster dose

	Unit	Quantity	Date	Location(s)	Implementer	Cost	Source of funding	Indicator	Other
1.1.1. Identify all locations that have youngstock that will migrate on this route	premises	all	To be completed by 1 Dec	1) Cowland province 2) Anguston province	Cowland provincial VS Anguston provincial VS	\$1,700 USD	Provincial veterinary services (Cowland and Anguston)	Proportion of locations identified (out of all locations with youngstock that will attend migration)	Provinces require technical support from national FMD taskforce
1.1.2. Distribution of sufficient vaccine to local veterinary office by December	Vaccine doses	250,000	To be completed by 15 Dec	Vet offices in: Cowtown Anguston Sheepville	National vaccine producer	\$150,000	National veterinary services	Number of doses delivered	Requires some external fundingsupport (see technical assistance chapter)
1.1.3. ...									

Tactic 1.2 Awareness campaign to owners in the areas about how to minimise risk associated with migration

1.2.1 Identify producers to target message	Family names	All in target areas	Dec. 1	1) Cowland province 2) Anguston province	Cowland provincial VS Anguston provincial VS	(included in activity 1.1.1)	(included in activity 1.1.1)	Proportion of producers identified (out of all producers with youngstock that will attend migration)	
1.2.2 workshop to identify key messages	workshop	1	Nov 1	Capital city	communications office	\$1000	National veterinary services	Workshop report	
1.2.3...							

Some things to consider:

- The level of detail should be sufficient to be useful, but not so much that the tables become unmanageable. For example, each activity may involve sub-activities that are not listed in this document
- Location – be as specific as possible (eg an address is better than naming a city, the name of a city is better than a province...)
- Implementer – the person or group responsible for carrying out the activity. Things to consider when assigning responsibility:

- *Identify the position title, not individual name*
- *Fewer is better, one is best*
- *Identify a “primary” if more than one person is responsible*
- *The person responsible must have the authority and expertise needed to achieve the strategy*

5.3 Summary of the Budget

A Risk-Based Strategic Plan for FMD control will not lead to FMD control unless human and financial resources are available to implement the activities. In this section, the budget required to implement the strategy should be summarized, with an indication of to what level the activities will be implemented. Areas where external assistance is required for the implementation will be described in the ‘technical assistance’ chapter.

It is not within the scope of these guidelines to detail how to create a budget for a Strategic Plan for FMD control. In general, the budget for activities should be developed in the field, by local FMD task forces. Activities may then be aggregated to cost strategies by the central office for disease control or department of Planning, in close contact with Ministry of Agriculture and Ministry of Finance.

The budget should be:

- Consistent with the objectives, strategies and activities presented in chapter 3
- Available for different levels – i.e. the budget related to the overall goal, objective (medium term)... down to day-by-day activities by field staff and private vets
- Sustainable over the period for which objectives have been set.

5.4 Reference to Standard operating procedures (SOP) and technical documents

Standard operating procedures are:

- A document that fully describes any kind of activity: who, when, where, how, as to harmonize implementation of activities across different fields, areas, departments, individuals.
- Written by central and tested by local FMD task force
- Used by field staff

Although the SOPs are not included in the template for the Risk-Based Strategic Plan for FMD control, we do emphasize the need for standard operating procedures as an important tool to assure that activities in the field are done in a consistent, uniform, effective and efficient way across different staff and regions.

Standard operating procedures are like recipes, they provide in great detail the exact actions required to complete a task. These are by default used in diagnostic laboratories in order to minimize the variation of implementation between different days and by different laboratory staff. In a similar

fashion these are prerequisites for a consistent and accurate implementation of activities by different kinds of field staff.

For reference, the nationally agreed standard operating procedures (NASOPs) of the Animal Health Australia may be useful: <http://www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/nasops/>

Chapter 6 Technical Assistance Plan

Technical assistance from external bodies (donors, international organizations) may be required to fully implement the national risk-based Strategic Plan for FMD control.

This chapter describes the country's approach to acquire technical assistance, which may take the form of financial and/or technical support. It is very important that the technical assistance plan is consistent and coordinated with the overall national Strategic Plan for FMD control, and specifically with activities described in the operational plan (chapter 5).

It is noted that the OIE/FAO Global FMD Control Strategy was developed to assist FMD endemic countries to control FMD, and as such may provide support in the development and submission of technical assistance plans applications (?).

6.1 Technical Assistance Approach

This section describes the approach that the country will follow when seeking technical assistance to implement the Risk-Based Strategic Plan for FMD control. There should be a coordinator (representing the coordinating body) nominated to coordinate, implement and monitor the Plan. The different organizations responsible for strategy development and implementation should be represented in the coordinating body.

It is likely that there will be a need to prioritize the needs for technical assistance. This should be done in a timely manner (for example prior to the start of the fiscal year), and in consultation with stakeholders, perhaps in a stakeholder workshop.

Once priorities have been established, a detailed technical assistance plan may be developed (see 6.2 below). This should be circulated to stakeholders for comment prior to finalization. At this point, the veterinary services must engage with donors and develop specific proposals according to the individual donor requirements. The international organisations (FAO, OIE and others) may provide assistance with the preparation of project proposals.

The technical assistance plan should be continuously reviewed and monitored, in terms of priorities and the success of seeking support as well as in relation to deliverables that may be required to assure continuing support. As with the FMD control strategy, this will be an iterative process as priorities change over time, and as countries build on successful bids for assistance.

6.2 Summary table

This table is intended to facilitate planning and monitoring the technical assistance plan. The table lays out key information, including:

- Which activities require technical assistance? It is critical the activities indicated in the technical assistance plan are consistent with the objectives, strategies and activities outlined in chapters 3 and 4.

- What is the total cost of implementing the activity, and how much of this cost is already available?
- Funding gap: clearly states how much additional funding is required to fully implement the activity
- The authority responsible for the activity implementation should be indicated, as well as the planned start- and end-date of the activity
- If it is expected that it will not be possible to immediately fund all activities where technical assistance is required, then the activities should be prioritized. This should be done in consultation with stakeholders. Priorities may be indicated through ranking all activities (1-x) or by grouping activities according to the priority level (high, medium, low priority).

In addition to this table, Gantt charts may provide a useful overview of the timing of activities for which technical assistance is needed. Frequently used in project management, a Gantt Chart, or "bar chart" as it is often called, provides a graphical illustration of a schedule that helps to plan, coordinate, and track specific activities in a project.

6.3 Terms of reference and proposals

Each donor organization may require project proposals to be in a specific format, according to the criteria which they use for evaluation. It is beyond the scope of this document to describe each donor's requirements here, and readers are recommended to further research this important area on the donor's website or by contacting the organization directly. It is recommended that all proposals and terms of reference that have been developed are archived, and that the location and status (approved, pending, rejected) are noted within the Strategic Plan for FMD control document.

Glossary

Results based management terms:

Term	Definition
Goal	refers to the national objectives which FMD control is designed to contribute to, eg improving livelihoods. The goal helps set the macro-level context within which FMD control fits, and describes the long-term impact that the FMD control is expected to contribute towards (but not by itself achieve).
Strategic objective	refers to what FMD control itself is expected to achieve in terms of sustainable development results, if the relevant assumptions of FMD control design are correct. It is the positive developmental change which FMD control would produce if it were completely successful (and the assumptions were fully accurate). Examples might include increased animal health and production.
Component Objectives	where FMD control is relatively large-complex and has a number of components (output/work program areas) it can be useful to give each component an objective statement. These statements should help provide a logical link between the outputs of that component and the overarching objective. Examples may be the reduction of FMD transmission at the time of seasonal migration from X to Y in the spring of each year, or to reduce FMD transmission- to new areas through the largest markets.
Tactics	refers to the approach taken/decided to complete the component objective. It defines how a certain component of FMD control is going to be tackled. Examples may be the compulsory vaccination of -100% of young stock that will migrate, including booster dose, or an awareness campaign to owners in the areas of how to minimize the risk.
Activities	are the actual actions taken and tasks implemented in order to achieve the component objective, through the strategies defined. These actions are part of the planned work of the strategies. Examples might include: Identification of all locations with which have young stock that will migrate on this route 4 months prior to migration, and estimate number of heads
Indicators	Measures of progress or lack of progress used to assess steps forward towards meeting stated (component) objectives. An indicator should provide, where possible, a clearly defined unit of measurement and a target detailing the quantity, quality and timing of the expected result. For example, the indicator for vaccination may be the vaccination coverage of a specific subsector of livestock per vaccination campaign
Target	Is the value of an indicator defining the desired endpoint of an activity. For example, the target for vaccination coverage may be 90% of livestock per vaccination campaign
Means of verification	Source of information that needs to be collected to qualify and/or quantify the defined indicators and – ultimately – to assess them against the target. It needs consideration how information will be collected, who will be responsible and the frequency with which information should be provided.

Progressive Control Pathway (PCP-FMD) glossary:

Bias (in epidemiology): An error in the design or implementation of a study, which produces results that are systematically distorted in one direction. Bias should be considered at the level of data collection (i.e. sampling method), data recording and laboratory analysis. Some biases might be unavoidable, but these should be described and communicated transparently.

Biosecurity: Implementation of practices that create barriers in order to reduce the risk of the introduction and spread of disease agents within a farm, unit or region. Three principle elements of biosecurity are segregation, cleaning and disinfection (from FAO Biosecurity for Avian Influenza Handbook)

Constraints: A constraint is a limitation or restriction. In this case, it refers to the regulations, investment in human capital and infrastructure that limit what a stakeholder is able to do. For example, only certain FMD vaccines might be licensed for use within a country; or washing transport vehicles might be constrained by lack of running water.

Critical risk control point: A risk hotspot where feasible control measures exist to mitigate the risk. 'Feasible' control measures implies that they can be implemented from both the technical and socio-economic standpoint.

Direct losses: A loss that is the immediate result of the hazard of concern, in this case FMD infection. For FMD, direct losses include: lameness (especially impacts draught power), weight loss, increased mortality in young animals, abortion and decreased milk yield.

Enabling environment: The 'environment' refers to the underlying setting or context, in this case in which animal production occurs, FMD circulates and control measures are applied. The 'environment' includes the socio-economic status of the country, the laws and norms that govern all aspects of the country (including animal production and trade), the proficiency and resources of the Veterinary Services. An 'enabling environment' indicates that this underlying setting and conditions are favourable to the control of FMD.

Epidemiological unit (epi-unit): A group of animals with a defined epidemiological relationship that share approximately the same likelihood of exposure to a pathogen. This may be because they share a common environment (e.g. animals in a pen), or because of common management practices. Usually, this is a herd or a flock. However, an epidemiological unit may also refer to groups such as animals belonging to residents of a village, or animals sharing a communal animal handling facility. The epidemiological relationship may differ from disease to disease, or even strain to strain of the pathogen. (source: OIE Terrestrial Code)

Husbandry systems/livestock sector: the different methods used to breed, raise and care for livestock.

Extensive husbandry system: Characterized by low animal density, animals are grazing or scavenging and the producer may not see them regularly (e.g. cattle or sheep may graze on a pasture for several months without regular contact with the producer)

Intensive husbandry system: Characterized by high animal density, feed provided by the producer, producer has regular contact with livestock.

Impact: Measure of the consequences of an activity, event, hazard or action (here: FMD's) influence upon another. The impact of FMD refers to the magnitude of the consequences of FMD entry and/ or spread. In this case, the consequences may be epidemiological, environmental and/or economic, and may be direct or indirect.

Epidemiological consequences refer primarily to the probability and extent of onward spread, given FMD infection in an animal/sector/area.

Economic consequences include both direct losses (production losses, losses due to morbidity and mortality) and indirect losses (due to lost trade, costs of control measures etc).

Environmental consequences are foreseen to be primarily related to resultant control measures, such as large-scale disposal of carcasses (eg burial), construction of fences.

Incentives: An expected benefit, such as the expectation of reward, that induces action or motivates effort.

In this case, incentives are the factors that drive a stakeholder to conduct their business in the way that they do. The most important incentives are usually monetary gain and improved production. For example, a dealer (stakeholder) might choose to sell animals at a particular market because that is where they can get the highest price (monetary gain is the incentive). Or a producer chooses to vaccinate their animals because they believe that they will be more productive (higher production is the incentive).

Incidence : The number of new cases of FMD in a defined population within a specific period. It is calculated by:

$$I = \frac{\text{the number of newly FMD infected epidemiological units in a given period of time}}{\text{the total number of susceptible epidemiological units that exist in that period of time}}$$

Indicators: Indicators are measurements of actions, resources or outcomes associated with relevant activities in FMD control. Measurements can be repeated over time to track progress toward achievement of objectives.

Implementation indicators "indicate" the extent to which planned activities have been conducted, for example the percentage vaccination coverage that was attained in a sector or zone, the number of markets that had surveillance visits, the percentage of outbreaks for which the serotype was identified etc.

Impact indicators measure whether the Plan's objective is being achieved (e.g. percentage decrease in FMD incidence in a certain area or sector over 3 years, or the percent increase in profit or productivity in a given period of time).

Monitoring: Ongoing efforts directed at assessing the FMD status of a given population. This includes routine recording, analyses and distribution of information related to the disease/infection.

Non-structural protein (NSP) serosurvey: Sampling a population of susceptible animals to determine the prevalence of NSP antibodies. Antibodies to NSP will be usually present in animals naturally infected by FMD virus, but NOT those that are vaccinated by a purified vaccine. Therefore, a carefully designed NSP serosurvey can be used to estimate the incidence of FMD in a population.

Outbreak investigation: A rapid, thorough case-study that describes the clinical presentation of the disease, verifies the diagnosis through laboratory testing, identifies the source and common mechanisms of spread, the dynamics as well as the causative serotype. Ideally, there should Standard Operating Procedures and standard data recording forms should be developed and used for these investigations.

Risk: measure of the combination of probability and impact of an undesired event, in this case FMD entry and/or spread

Risk hotspot: Point in a production or marketing network where there is a high probability and/or consequence of FMD entry/spread. It may or may not be possible to mitigate the risk associated with the hotspot.

Risk-based control: Control measures that are selected based on their effectiveness at reducing the probability and impact of FMD entry and/or spread. Usually these will be identified through risk assessment.

Risk pathways: The risk pathway describes all the stages in the biological process that lead to the unwanted outcome. A risk pathway is a series of conditions that must be met, or events that have to occur, in order for the unwanted outcome to occur (FAO. 2011. A value chain approach to animal diseases risk management.)

Robust epidemiological data: refers to data that are appropriate to generate the desired information and are reliable and sufficiently free from bias.

Stakeholders: A stakeholder is any person, group, or institution that—positively or negatively— affects or is affected by a particular issue or outcome. As such, stakeholders in FMD control can include producers of all types of susceptible livestock, vaccine suppliers, livestock transporters, veterinarians, dealers, animal health workers, consumers...

Socio-economic drivers: Social and economic factors that provide impulse or motivation; in this case the reasons behind the ways of raising and marketing (selling) livestock

Surveillance: The term *disease surveillance* implies that some form of directed action will be taken if the data indicate a disease level above a certain threshold. Therefore, disease surveillance is made up by at least three components: (1) a defined case detection process, (2) a predefined disease intervention strategy (directed action), and (3) a defined threshold of disease frequency.

Targets: A desired goal or aim to be achieved.

Implementation targets refer to goals set for the activities within the Strategic Plan, such as the vaccination coverage that should be achieved, number of surveillance visits that should be done within a year, the percentage of outbreaks for which the serotype should be identified.

Impact targets refer to the desired reduction in FMD incidence or FMD losses that occur because of the implementation of the strategy.

Transmission pathways: The routes and mechanisms by which a pathogen is transmitted from animal-to-animal, farm-to-farm and/or region-to-region.

Vaccination coverage (VC): Percentage of a target population that are immunized in a specified time period. Vaccination coverage is often reported in relation to a mass vaccination campaign, and may be reported at the animal level and/or epi-unit level.

$$\textit{Animal level VC} = \frac{\textit{Number of animals that received at least 1 dose of FMD vaccine}}{\textit{total number of susceptible animals}}$$

When calculating animal level VC, the target population must be specified and may refer to animals within an epi-unit, district, region, province or country. For primo-vaccinates, it may be appropriate to only count animals who receive both the initial vaccination plus a booster.

$$\textit{Epi unit level VC} = \frac{\textit{Number of epi units that were vaccinated}}{\textit{total number of susceptible epi units}}$$

When calculating epi unit level VC, a ‘vaccinated epi-unit’ must be specifically defined and may include epi-units where the animal-level VC exceeds a specified minimum (e.g. epi-units may be considered “vaccinated” if at least 80% of susceptible animals in that unit have been vaccinated in the last 6 months).

Value chain: Description of all components of a system involving FMD susceptible species from input suppliers, through producers of animals, to marketing, processors and consumers. Importation of relevant animals and animal products as well as movements of animals associated with transhumance should also be included. It is important to describe the nature of the links between the components in the system, and to include consideration of why the network is structured as it is (economics, incentives, governance).

Working hypothesis: A tentative explanation for a set of observations, that is meant to be reviewed for accuracy, refined and improved as more information becomes available