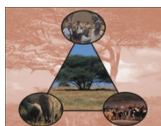

Guidelines on Management of Foot and Mouth Disease Risk through Value Chain Approaches for Beef Exporting Enterprises in Southern Africa

2nd Edition



Animal & Human Health for the Environment And Development (AHEAD)



Cornell University
College of Veterinary Medicine



Citation:

Thomson, G., Penrith, M.-L., Atkinson, S. J. and Osofsky, S. A. 2017. Guidelines on Management of Foot and Mouth Disease Risk through Value Chain Approaches for Beef Exporting Enterprises in Southern Africa. 2nd Edition. Technical Report on behalf of Cornell University's AHEAD Program. 15 pp.

Address:

Cornell University
College of Veterinary Medicine
Dept. of Population Medicine & Diagnostic Sciences
240, Farrier Road
Ithaca, NY 14853

www.cornell-ahead.org

Cover photo:

Mark Atkinson

The contents of this report are the responsibility of the authors, and do not necessarily reflect the views of Cornell University.

Acknowledgements

This document is based on the 2015 ‘Guidelines for the Implementation of a Value Chain Approach to Management of Foot and Mouth Disease Risk for Beef Exporting Enterprises in Southern Africa’ supported by the AHEAD Program. The contents were originally informed by a project entitled ‘Development of Export Opportunities for Beef Products from the Zambezi Region’ funded by the Livestock Marketing Efficiency Fund of the Millennium Challenge Account, Namibia and led by the Meat Board of Namibia. We thank all those involved for that valuable learning opportunity.

Abbreviations

CBT	Commodity-based trade
CCP	Critical control point
COMESA	Common Market for Eastern and Southern Africa
EU-FMD	Foot and Mouth Disease Commission of the European Union
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot and mouth disease
GHP	Good hygiene practice
GMP	Good manufacturing practice
HACCP	Hazard analysis & critical control points
OIE	World Organisation for Animal Health
SADC	Southern African Development Community
SAT	South African Territories (serotypes of FMD viruses)
TAHC	Terrestrial Animal Health Code (of the OIE)
WHO	World Health Organization of the United Nations
WTO	World Trade Organization
ZR	Zambezi Region of Namibia

Summary

In most of southern Africa the vast majority of cattle are located in areas not free of foot and mouth disease (FMD), leaving owners of these cattle with limited access to regional and international beef markets. This situation constrains investment in cattle production, thereby limiting rural development and helping to entrench rural poverty in one of the least developed regions of the world.

For decades, this situation has been accepted as irredeemable because the type of FMD prevalent in the region is maintained by wildlife and is therefore technically difficult or impossible to eliminate. Moreover, until recently, international trade rules and conventions were founded on the need for the locality of beef production to be free of FMD. Fortunately, this situation is changing so that today a number of alternative approaches are available.

The first edition of these Guidelines was published early in 2015 to inform beef producing enterprises of the nature of developments at that time and specifically how, step by step, a value chain approach could be exploited to broaden market access. Since May 2015, further changes in international animal health standards for trade in beef produced in FMD-endemic areas have been adopted by the OIE (World Organisation for Animal Health). These changes necessitated this updated edition because they expand options for enabling market access for beef producers in southern Africa not located in areas free from FMD.

1. Introduction

Foot and mouth disease (FMD) has major effects on international trade in cloven-hoofed animals and products derived from them. Although people are not susceptible to FMD, its effects on high producing animals such as dairy cows and intensively farmed pigs can be catastrophic, and this has led to massive investment in eradication of the disease from industrialised countries. These countries are understandably anxious to prevent introduction or re-introduction of FMD. The result is that producers of beef and other meat derived from cloven-hoofed animals in areas that are not recognised as free of FMD are confronted by non-tariff barriers to trade. Producers in southern Africa are particularly affected because the SAT (South African Territories) serotypes of FMD viruses evolved in and are endemic to most African buffalo (*Syncerus caffer*) populations. Nearly all free-living buffalo become infected with SAT viruses without developing obvious disease within the first year of life. Breeding herds periodically transmit SAT viruses to other species, including domestic livestock. Available evidence indicates that breeding herds containing acutely infected calves are mostly responsible for such transmission. Elsewhere in the world, other FMD serotypes (O, A and Asia 1) are almost exclusively associated with domestic livestock, mainly cattle and pigs. Wildlife are therefore insignificant in maintaining FMD outside Africa. Management of FMD in most parts of the world consequently targets domestic livestock, and eradication of FMD in such situations is a feasible goal. However, that is not the case for the SAT serotypes (SAT1, SAT2 and SAT3) in southern Africa (Thomson et al, 2017).

The Food and Agriculture Organization of the United Nations (FAO) developed a pathway for the progressive control of FMD based on eliminating FMD infection in livestock from countries or parts of countries in which FMD is endemic (FAO/OIE/EU-FMD, 2011). This initiative was adopted by the World Organisation for Animal Health (OIE) as a tool to assist in the management of FMD. However, implementation of this pathway, as it stands, is problematic in southern Africa because the role of African wildlife in the maintenance of SAT serotype FMD is not considered. For that reason, the pathway is not altogether appropriate in southern Africa.

There is therefore growing recognition that a different approach is needed to facilitate trade, particularly regional trade, in beef derived from places where FMD cannot be eliminated due to the presence of SAT serotypes of FMD virus and wildlife. In areas where this situation prevails, three alternative options are recognised for overcoming the FMD risk associated with beef trade: (1) processing of beef so that any virus possibly present is inactivated (i.e. destroyed), (2) application of 'compartmentalisation,' and (3) management of FMD risk along value chains where the concepts of commodity-based trade (CBT) and hazard analysis & critical control points (HACCP) are applied. These options can also be used in combination.

This guide is intended to assist enterprises in southern Africa interested in the application of one or more of these three alternatives. Definitions for technical terms used in this document are given in Section 8.

2. International FMD standards for beef trade

The OIE is mandated by the World Trade Organization (WTO) to provide international standards related to animal diseases for trade in livestock commodities (live animals are considered by OIE to be commodities). For terrestrial animals, the standards are published in the Terrestrial Animal Health Code (TAHC), available on the OIE website (www.oie.int). A chapter on each listed disease is provided in the TAHC. One of the chapters, i.e. Chapter 8.8, deals with FMD.

As noted above, there are a number of alternative OIE standards related to FMD and trade in beef. Traditionally, safe beef trade in relation to FMD was founded on the geographic distribution of FMD, i.e. the creation of FMD-free countries or zones (one or more regions within a country) where vaccination against the

disease is not practised. The requirements for recognition by the OIE of FMD-free countries and zones where vaccination is not practised are stipulated in Article 8.8.2 of the TAHC. Official recognition for such countries or zones is provided by the OIE on approval of an application submitted by the OIE member country. Once an application is approved, the relevant country or zone is listed on the OIE website and this listing must be reconfirmed annually. More recently, the OIE has also made it possible for countries or zones free from FMD to be recognized even where routine vaccination is practised (Article 8.8.3). Such countries or zones, once approved, are also listed on the OIE website. Thus, in effect, the OIE provides an independent accreditation mechanism for countries or zones that are free from FMD whether or not routine vaccination against FMD is practised.

The OIE currently also provides three international standards for FMD that are independent of the geographic distribution of FMD viruses. These are relevant to FMD risk management of beef, viz. for: (1) processing of beef to inactivate FMD viruses (Article 8.8.31); (2) deriving beef from cattle located in 'FMD-free compartments' (Article 8.8.4 – 'compartmentalisation' is a system based on biosecurity management of establishments such as animal holdings that make up the compartment [see definitions]); and (3) safe importation of fresh meat of cattle and water buffalo (*Bubalus bubalis*) from countries or zones not recognised as free from FMD but where an official FMD control programme exists (Article 8.8.22). The latter essentially constitutes a commodity-based trade/value chain approach.

For these three possible non-geographic risk management measures the OIE does not provide an accreditation mechanism. It is consequently necessary when applying them for the exporting country to convince the importer, including the official veterinary service of the importing country, that the relevant international standard has actually been complied with.

There is, moreover, a standard for importation of domestic ruminants from FMD infected countries or zones where an official FMD control programme exists (Article 8.8.12). This standard is not related to beef specifically but rather to live cattle that, theoretically, could be used to provide a source of beef. However, that standard will not be considered further in this guide because its provisions require not only that each imported animal needs to be isolated for a 30 day period prior to importation, but also that all such animals must be subject to virological and serological testing for FMD with negative results. The implication for routine beef production is that such importation would be logistically impractical as well as prohibitively expensive.

2.1 Compliance with geographic trade standards for FMD

As indicated above, the following geographically-based options exist for exporting beef in respect of FMD risk:

- Country or zone free of FMD where vaccination is not practised (TAHC Article 8.8.2);
- Country or zone free of FMD where vaccination is practised (TAHC Article 8.8.3);

Requirements for beef intended for export where either of these two situations apply are uncomplicated, viz. the need for a certificate provided by the exporting country's competent authority (i.e. the official veterinary service) to show that the location from which the beef was derived has the designated status and that the animals were slaughtered in an approved abattoir (Article 8.8.20). For FMD-free countries or zones where vaccination is practised, tissues from the head, including the pharynx, tongue and associated lymph nodes need to be excluded (Article 8.8.21).

A major problem for businesses based at locations within zones recognised by the OIE as free from FMD is that if FMD infection is detected in either diseased or healthy animals within that zone, the status of that zone

will be suspended for at least 3 months, possibly extending to 2 years (Article 8.8.7), unless the country concerned establishes a 'containment zone' in accordance with Article 8.8.6, in which case trade from the previously FMD-free zone (which then maintains its free status) may continue. The variation in the period of suspension is determined by the type of FMD freedom (as shown by the two bullet points above) and the control measures applied to eliminate the specific FMD occurrence. An interruption of business extending over a year or more obviously presents a major problem for any commercial enterprise.

2.2 Non-geographic trade standards related to international beef trade (see definitions in section 8 below)

As indicated above, there are three possible approaches for management of FMD risk in respect of beef trade where the country or zone from which the beef is derived is not recognised as free from FMD:

- Processing to inactivate any FMD virus that could potentially be present;
- Establishment of compartments free from FMD;
- Management of FMD risk along beef value chains.

2.2.1 Processing to inactivate FMD virus present in meat (Article 8.8.31)

Processes such as canning, cooking during which a core temperature of 70°C or higher is maintained for a minimum of 30 minutes, or curing by drying and salting, are accepted by the OIE as effective in destroying FMD virus in meat. Therefore, there is no reason why meat and meat products subjected to these treatments cannot be exported regardless of the FMD status of the area of origin.

However, adoption of this alternative implies that the nature of the traded commodity will be different in a variety of respects, including the infrastructure/equipment/expertise required to produce marketable processed products, differences in import tariff rates (these vary between importing countries), and selection of target markets. These factors will materially influence the costs of production and marketing and therefore the return on investment.

The commodities and products referred to in this guide generally fall into three HS (Harmonised Commodity Description and Coding System developed by the World Customs Organisation) categories used in international tariff determination:

- 020130 – boneless beef, processed and other, chilled;
- 020230 – boneless beef, processed and other, frozen;
- 160250 – meat preparations of bovine animals, meat or meat offal, prepared or preserved (excluding liver and homogenised preparations).

Tariffs applied by countries differ, especially between 020 and 160.

2.2.2 Compartments free from FMD (Article 8.8.4)

A compartment consists of one or more establishments within which animal health risks are managed using a common, i.e. integrated, biosecurity system. Compartments may consist of a single farm, a group of farms, or one or more farms as well as relevant service providers such as feed and/or animal suppliers. The concept has been most successfully applied to intensive farming systems as found in the pig and poultry industries, where a high level of control over the animals and their environment is possible.

The major obstacle to using compartmentalisation for managing FMD in endemic locations is that vaccination is expressly prohibited (Article 8.8.4, Box 1 – clause 2 c). This extends to the introduction of vaccinated animals into FMD-free compartments, i.e. no cattle vaccinated within the last 12 months may be introduced into such a compartment. To preclude the use of vaccination in compartments for FMD in southern Africa potentially increases rather than decreases the risk.

Box 1: Provisions of Article 8.8.4 of the OIE's Terrestrial Animal Health Code dealing with establishment of a FMD-free compartment

A Member Country wishing to establish a FMD free compartment should:

1. have a record of regular and prompt animal disease reporting and if not FMD free, have an official control programme and a surveillance system for FMD in place in accordance with Articles 8.8.40 to 8.8.42 that allows knowledge of the prevalence, distribution and characteristics of FMD in the country or zone;
2. declare for the FMD free compartment that:
 - a. there has been no outbreak of FMD during the past 12 months;
 - b. no evidence of FMDV infection has been found during the past 12 months;
 - c. vaccination against FMD is prohibited;
 - d. no animal vaccinated against FMD in the past 12 months is in the compartment;
 - e. animals, semen and embryos should only enter the compartment in accordance with relevant articles in this chapter;
 - f. documented evidence shows that surveillance in accordance with Articles 8.8.40 to 8.8.42 is in operation;
 - g. an animal identification and traceability system in accordance with Chapters 4.1 and 4.2 is in place;
3. describe in detail:
 - a. the animal subpopulation in the compartment;
 - b. the biosecurity plan to mitigate the risks identified by the surveillance carried out in accordance with point 1.

The compartment should be approved by the Veterinary Authority. The first approval should only be granted when no case of FMD has occurred within a ten-kilometre radius of the compartment during the past three months.

Furthermore, for initial approval of a FMD-free compartment, the veterinary authority needs to establish that no cases of FMD have occurred within a 10 km radius of any part of the compartment in the last three months (Article 8.8.4, Box 1). As per the definition provided in the TAHC glossary (also see definitions below) and the principles upon which the TAHC FMD chapter is based (Article 8.8.1), 'a case' clearly means infection – whether accompanied by disease or not – in any susceptible species of animal. This, in the context of southern Africa where free-living wildlife are present, is a 'killer' requirement, and together with the exclusion of vaccination, makes the application of compartmentalisation in localities where African wildlife are present impractical. There is reason for some optimism, however, that vaccination against FMD within compartments will be permitted in future, but that will not occur before May 2018.

2.2.3 FMD management along value chains (see definitions)

The implementation of this approach is founded on a guide provided by the FAO (2011) and Article 8.8.22 of the OIE's TAHC. Article 8.8.22 is not labelled as a value chain-based approach by the OIE – but in effect that is what it is. The concept has been expanded in a recent publication (Thomson et al, 2013), which showed that trade risks associated with FMD can be managed along value chains, together with food safety. This is possible because HACCP and CBT principles are similar and can readily be applied in parallel (Figure 1). It needs to be borne in mind that food safety risk management of infectious agents is universally independent of whether specific infections are present in the locality of production or not.

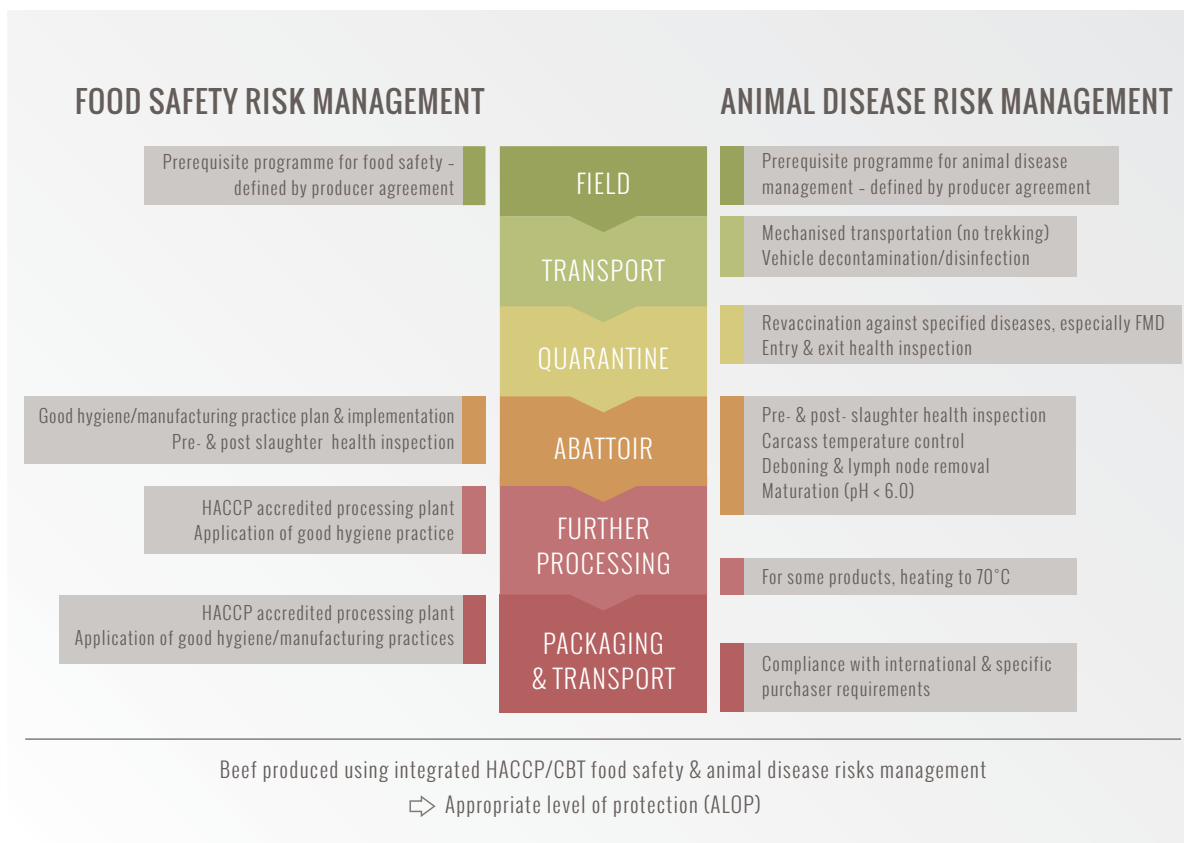


Figure 1. Parallel application of food safety and animal disease risk management measures along a value chain for beef production in a location that is not recognised as free from FMD: Pilot project conducted in the Zambezi Region of Namibia over the period 2010-2014 (see Section 6 below).

It has been known for many decades that matured, deboned beef from which visible lymph nodes have been removed does not contain transmissible quantities of FMD virus because the low pH (<6) of striated muscle attained during the maturation process inactivates FMD virus. In a qualitative risk assessment carried out on behalf of the OIE in 2010 it was determined that the FMD risk posed by such beef is 'very low' (Paton et al, 2010). The risk can, according to these authors, be further reduced to 'negligible' status (the lowest possible risk category) by the application of additional mitigation measures applied along the value chain. This provides the technical basis for clause 2 of Article 8.8.22 (Box 2).

Crucially, the option of quarantine was added to clause 1 c of Article 8.8.22 by the OIE in 2015 (Box 2) because, in areas where free-ranging wildlife (particularly African buffalo) occur, it would be impossible to certify with any credibility that FMD, whether clinical or subclinical and in any FMD-susceptible animal, had not occurred within 10 km of the establishment of production in the previous 30 days. This change allowing quarantine as an alternative has materially increased the potential application of Article 8.8.22 in the southern African context.

For producers that do not have access to a quarantine station it is still possible to achieve negligible risk for chilled or frozen beef because there are alternative risk reduction measures – so far not recognised by the OIE – that enable equivalence with one or more existing standards to be achieved (see section 4.3 below).

Box 2: Provisions of Article 8.8.22 in the OIE's Terrestrial Animal Health Code dealing with recommendations for the importation of fresh meat derived from cattle located in FMD infected countries or zones with an official control programme for FMD, involving compulsory vaccination of cattle [References to water buffalo (*Bubalus bubalis*) have been omitted but the article is also applicable to them.]

Veterinary Authorities should require the presentation of an international veterinary certificate attesting that the entire consignment of meat:

1. comes from animals which:
 - a. have remained, for at least three months prior to slaughter, in a zone of the exporting country where cattle are regularly vaccinated against FMD and where an official control programme is in operation;
 - b. have been vaccinated at least twice with the last vaccination not more than six months, unless protective immunity has been demonstrated for more than six months, and not less than one month prior to slaughter;
 - c. were kept for the past 30 days in an establishment, and that FMD has not occurred within a 10 kilometre radius of the establishment during that period, or the establishment is a quarantine station;
 - d. have been transported, in a vehicle which was cleansed and disinfected before the cattle were loaded, directly from the establishment of origin or quarantine station to the approved slaughterhouse/abattoir without coming into contact with other animals which do not fulfil the required conditions for export;
 - e. have been slaughtered in an approved slaughterhouse/abattoir:
 - i. which is officially designated for export;
 - ii. in which no FMD has been detected during the period between the last disinfection carried out before slaughter and the shipment for export has been dispatched;
 - f. have been subjected to ante- and post-mortem inspections within 24 hours before and after slaughter with no evidence of FMD;
2. comes from deboned carcasses:
 - a. from which the major lymphatic nodes have been removed;
 - b. which prior to deboning, have been submitted to maturation at a temperature above +2°C for a minimum period of 24 hours following slaughter and in which the pH value was less than 6.0 when tested in the middle of both the *longissimus dorsi* muscle.

3. Regional trade initiatives

Difficulties experienced by beef producers in Southern African Development Community (SADC) countries in gaining access to regional and international markets for livestock commodities and products due to FMD endemicity are well recognised. A different approach to sanitary risk management is consequently needed in Africa to facilitate such trade. In November 2012, *The Phakalane Declaration on Adoption of Non-Geographic Approaches for Management of Foot and Mouth Disease* was adopted by the SADC Livestock Technical Committee. This called for the adoption of CBT and other non-geographic approaches for FMD management as additional (i.e. alternative) regional standards for trade in animal products (http://www.wcs-ahead.org/phakalane_declaration.html). This followed adoption of the CBT concept by ministers of agriculture of COMESA (Common Market for Eastern and Southern Africa) member states in 2008.

Despite espousal of non-geographic approaches to trade in animal commodities and products by SADC and COMESA, practical application to trade in beef in these regions has made little headway. This guide is intended to help address this deficiency.

4. Integrated management of sanitary (i.e. food safety and animal disease) risk along beef value chains

Even where FMD risks associated with beef can be effectively mitigated, beef destined for the international market must obviously also be certified as safe for human consumption. This means that risk mitigation measures additional to those directed at managing FMD and other animal disease risks need to be implemented.

Food safety is universally founded on the process known as HACCP (Hazard Analysis & Critical Control Points – Box 3), which is particularly applicable to value chain management. Not only is it routinely applied to value chains as a whole but also within individual components of value chains such as abattoirs, food processing plants and retail outlets. In the latter case, independent HACCP certification is usually available via regionally accredited institutions or companies.

Box 3: Steps and principles of the hazard analysis & critical control points (HACCP) system

- Step 1 Assemble the HACCP team
- Step 2 Describe the product
- Step 3 Identify the intended use of the product
- Step 4 Construct the flow diagram
- Step 5 On-site confirmation of the flow diagram
- Principle 1 List all potential hazards associated with each step of the flow diagram, conduct hazard analysis and consider control measures to manage the identified hazards
- Principle 2 Establish critical control points (CCPs)
- Principle 3 Establish critical limits for each CCP
- Principle 4 Establish a monitoring system for each CCP
- Principle 5 Establish corrective actions for each CCP
- Principle 6 Establish verification procedures for each CCP
- Principle 7 Establish overall documentation and recording system

Fundamental to the HACCP system are critical control points (CCPs) that focus risk management and monitoring of food safety risks at defined points along the value chain. The location of CCPs along the value chain will vary with the product as well as the production process. Implementation of risk management at CCPs, furthermore, needs to be supported by 'prerequisite practices' to ensure functionality, e.g. good hygiene practice (GHP) and good manufacturing practice (GMP). It has moreover been shown that CCPs can also be used to manage animal disease risks. That facilitates integration of food safety and animal disease risk management.

4.1 Auditing and certifying

Geographically-based control of FMD is traditionally organised, financed and conducted by the national competent authority which is usually the official veterinary service. The only requirement for producers is compliance with the country's regulations in this respect, which are conventionally based on standards set by the OIE. Unfortunately, it must be admitted that freedom from FMD of countries and zones recognised by the OIE is sometimes not accepted by powerful trading nations and trade blocks. Various reasons are advanced for this; however, non-acceptance of international trade standards essentially comes down to unfair trade practice. That, of course, could be contested via dispute resolution mechanisms provided by the WTO and OIE. The problem is that few developing countries are in a position to follow that option because of the expense, expertise and time such a course necessitates.

For non-geographic approaches to FMD risk management, the official veterinary authority needs to certify that at least one of the three alternatives has been complied with, *viz.* Articles 8.8.31, 8.8.4 or 8.8.22 of the TAHC. Furthermore, compliance with those standards, including most of the cost thereof, is the responsibility of the enterprise concerned. Nevertheless, because FMD is a controlled disease throughout the SADC region, the official veterinary authority remains responsible for permitting non-geographic approaches as well as for auditing and certification.

4.2 Deciding upon a more appropriate approach to management of FMD that will facilitate trade

Figure 2 provides a Decision Tree to guide beef business enterprises in fulfilling international sanitary requirements for the different options available (other than country or zonal freedom from FMD where vaccination is not practised). To date, no countries or zones free of FMD 'with vaccination' have been recognised in the SADC region or indeed in Africa, but the option nevertheless exists. For the present, beef producing enterprises located in non-FMD-free countries or zones need to consider whether processing to inactivate FMD virus, compartmentalisation, or compliance with Article 8.8.22 (Box 2) suits the enterprise in question best.

4.3 An alternative non-geographic approach to FMD risk management not covered by current international standards

As pointed out in section 2.2.3 above, Article 8.8.22 (Box 2) of the OIE's TAHC provides an international standard for trade in matured, boneless beef from which the visible lymph nodes have been removed that is produced in countries or zones that are not free of FMD as long as the enterprise concerned is in a location where an official FMD control program is in operation. This standard now (i.e. since May 2015) accepts that a 30 day quarantine period prior to slaughter of the cattle concerned is an effective alternative risk mitigation measure (that is, acceptable in lieu of the requirement to certify "that FMD has not occurred within a 10 kilometre radius of the establishment" within the past 30 days). This suits a number of existing beef value chains in southern Africa that have utilised quarantine or that now wish to do so. On the other hand, there are

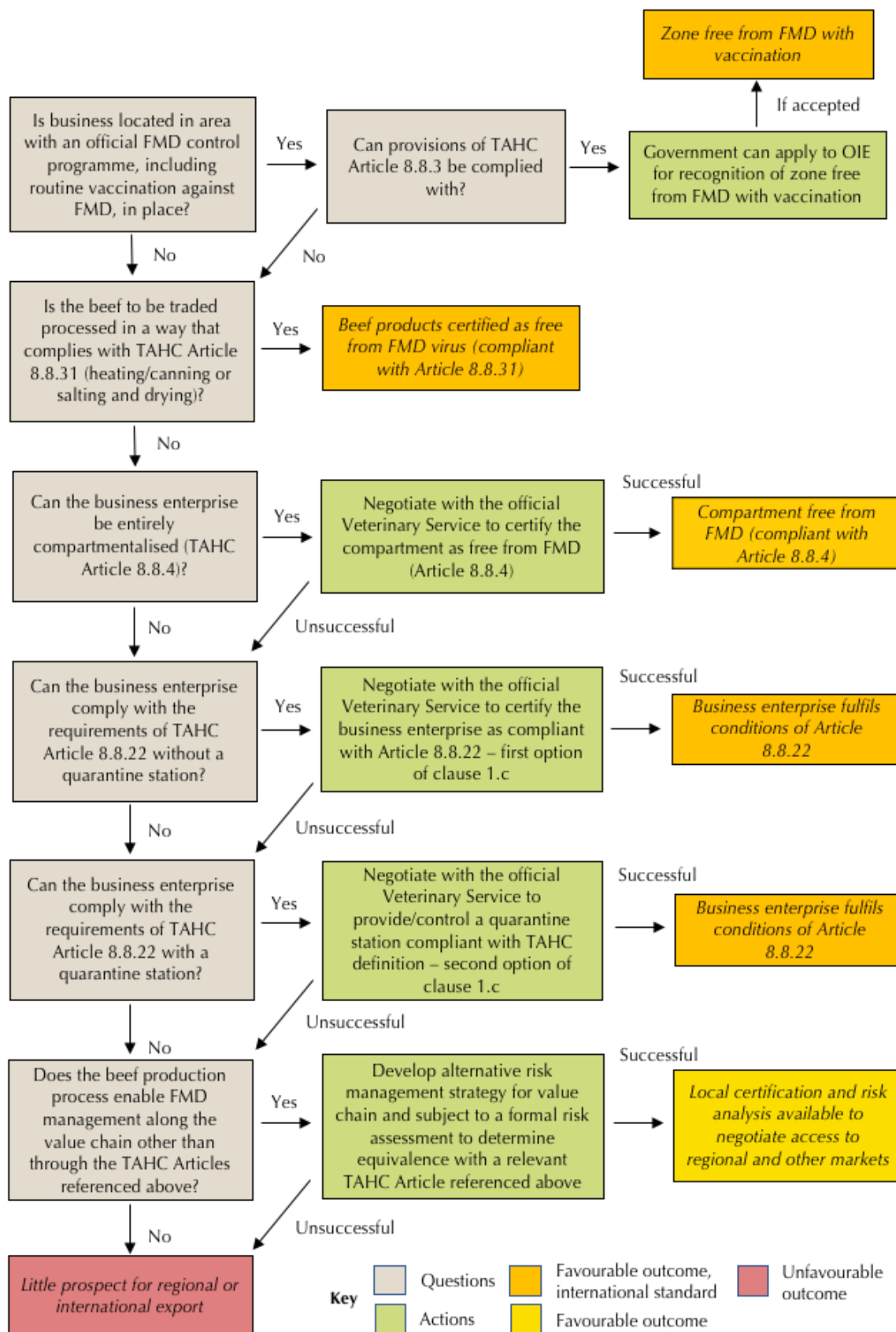


Figure 2. Decision tree for beef business enterprises located in areas not recognized internationally as free from FMD without vaccination.

value chains where adoption of quarantine in the mix of risk management measures could be problematic. Other risk management options may thus merit exploration.

An important aspect of value chain-based risk management is that it is not dependent on a single mitigation measure; it is instead dependent on a series of measures or barriers focused on CCPs along the value chain. This is a safer system because if one measure fails there are others to back it up (i.e. redundancy is built into the system). The array of risk mitigation measures that can potentially be used against most infectious agents, including FMD, provides an opportunity to develop innovative risk management strategies that rely on a mix of risk reduction measures, only some of which are currently recognised in international standards. Implicit for such approaches is the possibility of designing risk mitigation that suits particular value chains but not necessarily others. However, it is crucial to demonstrate that any innovative approach adopted achieves overall risk mitigation that is 'equivalent' to one or more international standards. That can be done through a formal risk assessment.

Both the WTO's Agreement on Application of Sanitary and Phytosanitary Measures (SPS Agreement-www.wto.org/english/tratop_e/sps_e/spsagr_e.htm) and the OIE (Chapter 5.3 of TAHC) accept the principle of equivalence. However, the findings of risk assessments are often disputed by importing countries and for that reason it can be difficult to obtain access to markets based on demonstration of equivalence unless the importing country is anxious to engage in the specific trade. Thus, the adoption of this approach and the practical difficulties it poses need to be carefully considered if a strategy involving demonstration of equivalence is deemed necessary.

In this regard, a current initiative involves investigation into the potential use of mobile abattoirs for harvesting beef in extensive rangeland systems. At least two pilot projects in this connection are in progress in southern Africa. From the SPS perspective, risk management applicable in respect of both animal disease and food safety presents potential complications that are so far inadequately understood. Nevertheless, mobile abattoir application also provides several potential advantages. Until more experience and information is obtained in these respects, it is premature to include the application of mobile abattoirs in these guidelines.

5. Animal identification and traceability

Sanitary assurance, especially related to food safety, is a fundamental requirement for trade in foodstuffs in the modern world. Therefore, adequate traceability is an essential requirement. When it comes to beef, identification of individual cattle is often required as an element of the traceability system. Many developed countries have national systems but in the SADC region few countries have reliable national systems (Botswana, Namibia and Swaziland are current exceptions). This problem can be overcome by development of value chain-specific systems. Assistance with that is available from specialists in this field.

6. Complementary issues related to market access success of beef value chains

Compliance with international sanitary standards for animal diseases and food safety is not enough to enable success in accessing regional and international beef markets; the product also needs to be competitive in terms of quality, price and consistency of supply. In the commercial sector these issues are vital. The application of sanitary measures should therefore ideally be integrated into the production system as seamlessly as possible and – if feasible – contribute to improved quality and lowered cost of production, i.e. overall competitiveness of the final product.

A pilot project conducted in the Zambezi Region of Namibia (ZR) from 2011-2014 on developing export opportunities for beef products also aimed to increase the competitiveness of the ZR's beef. In this respect it needs to be understood that the ZR lies at the centre of the Kavango Zambezi (KAZA) Transfrontier Conservation Area (TFCA) – one of the world's largest TFCAs. Substantial herds of free-ranging buffalo are found in and around the TFCA, as are other FMD-susceptible wildlife. The ZR is consequently a FMD-infected zone. Separation of cattle and wildlife populations (and thereby application of geographic management of FMD risk) in the ZR is impractical owing to topography (major rivers and wetlands). Moreover, fencing has been disastrous for migratory wildlife and is consequently problematic from the transfrontier conservation area perspective.

It was necessary to devise a system whereby not only the sanitary risks were well managed but also for which the competitiveness of the beef produced was improved. Given the location, a more wildlife-compatible (i.e. non-fence-based) solution was sought. The simple value chain that was already in place in the ZR (Figure 3) was therefore adapted to ensure that the beef produced complied not only with the requirements of Article 8.8.22, but was also acceptable from a food safety perspective, and was compatible with the principles of wildlife conservation. The farmer protocol that was part of the prerequisite programme contributed to the production of more and better quality beef. The measures adopted, many of which were already in place, are reflected in Table 1 and are illustrative of the types of options that need to be considered in other locales.

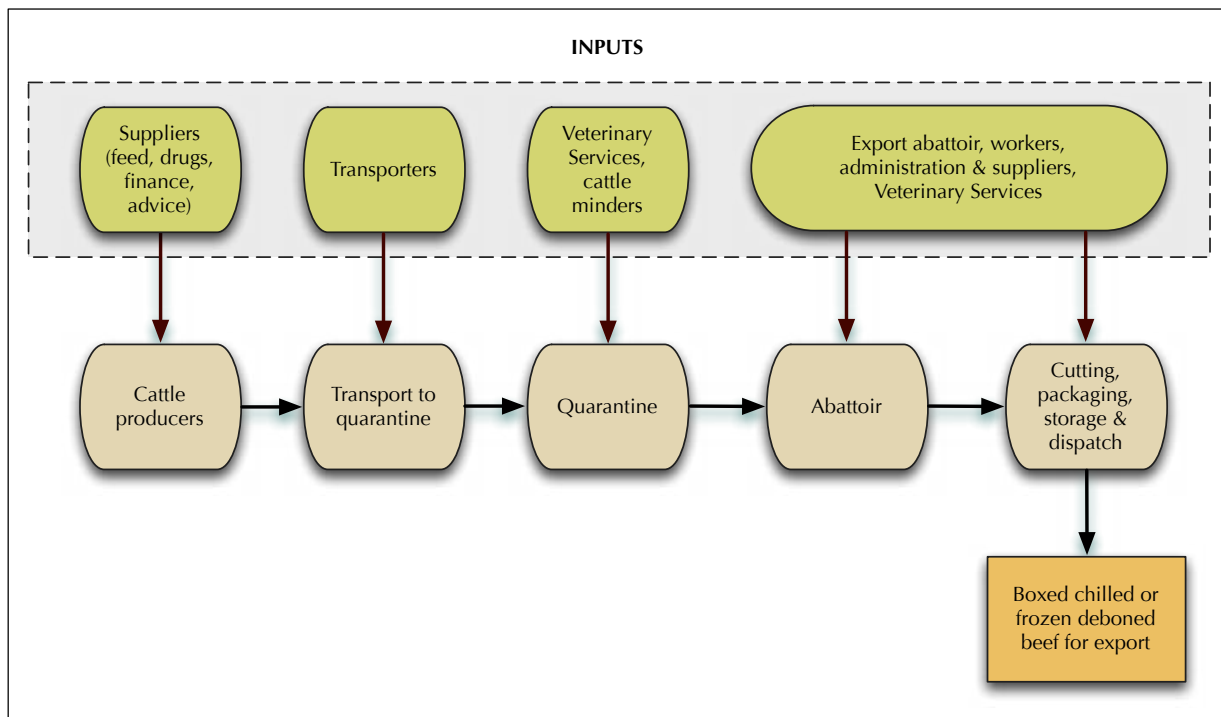


Figure 3. Example of a simple value chain for beef production in the Zambezi Region of Namibia

Table 1. Actions aimed at providing quality deboned beef that is safe for human consumption and from animal diseases – FMD particularly – as well as being potentially competitive in most markets, as derived from the Zambezi Region pilot project. Critical control points are indicated in boldface. Other locales may need to adopt different sets of measures to meet their own context-specific needs.

Location	Actions aimed at:		
	Improvement of product quality and quantity	Achievement of appropriate level of protection for food safety	Achievement of appropriate level of protection for animal disease control
Field	<ul style="list-style-type: none"> • Animal identification and record keeping • Compliance with producer protocol adapted to area (grazing strategy, supplementary feeding practices, herd management/breeding practices and general health management) • Provision of essential infrastructure such as loading ramps for cattle 	<ul style="list-style-type: none"> • Animal identification, record keeping and effective traceability system • Avoidance of undesirable feeding practices (e.g. use of meat/bone meal), observance of treatment recommendations for control of parasites and infectious diseases (including withdrawal periods for drugs used for treatment) 	<ul style="list-style-type: none"> • Animal identification, record keeping and movement records/control • Grazing and kraaling strategies that avoid contact with buffalo as far as possible • Compliance with vaccination programmes aimed at control of specified diseases especially FMD • Monitoring of compliance at farm level (animal health/extension services)
Transportation	<ul style="list-style-type: none"> • Observance of protocol requirements aimed at avoidance of cruelty and achievement of good quality product • Provision of feed and water before/after transportation 	<ul style="list-style-type: none"> • Observance of good practice guidelines for animal transport (well-designed vehicles and effective load-space disinfection) 	<ul style="list-style-type: none"> • Motorized transportation to abattoir (i.e. avoidance of trekking) • Decontamination of transport vehicles between batches
Quarantine	<ul style="list-style-type: none"> • Sustainable management of grazing resources • Provision of adequate water • Supplementary feeding when necessary 	<ul style="list-style-type: none"> • Avoidance of any prohibited substances • Adherence to withdrawal periods for drugs used for treatment • Official residue monitoring programme 	<ul style="list-style-type: none"> • 30 day quarantine of cattle • Revaccination against specified diseases, especially FMD, on entry to the quarantine station • Compliance with OIE definition of quarantine • Entry and exit health inspection
Abattoir	<ul style="list-style-type: none"> • Provision of adequate feed and water before slaughter • Improvement of animal management practices in the holding area • Ensuring carcass maturation 	<ul style="list-style-type: none"> • Documented traceability system • Washing down of animals on arrival at abattoir • Cleanliness of the holding areas • Ante-mortem health inspection • Carcass/meat inspection • HACCP and GHP implementation supported by independent certification • Temperature control, including refrigeration • Microbiological monitoring • Monitoring of residues 	<ul style="list-style-type: none"> • Documented traceability system • Ante- and post-mortem health inspection • Prescribed maturation of carcasses over a 24h period, including pH determination • Thorough deboning and removal of lymph nodes • 21 day 'quarantine of meat' post-slaughter*

*The authors note this is above and beyond OIE requirements.

The approach adopted consequently provided four benefits: (1) compliance with the international standard for beef produced in an infected zone where an official FMD control programme exists (i.e. Article 8.8.22), (2) compliance with international food safety norms, (3) improved productivity and quality of beef delivered, and (4) compatibility with wildlife conservation, which is economically and environmentally crucial for the future of the people living in the region's TFCAs.

7. Conclusion

This document demonstrates that export of beef from SADC countries and zones not recognised as free from FMD is possible, especially to regional markets (because the sanitary circumstances that prevail in the southern Africa region are common to many countries). Furthermore, several alternative approaches are potentially possible, and this guide outlines those that comply with international trade standards as well as their respective advantages, disadvantages and requirements. Integration of sanitary risk management (i.e. for both food safety and animal disease) together with measures that improve the quality and quantity of the end-product along value chains offers an approach that until recently has been largely unrecognised, despite providing clear advantages for southern Africa specifically.

8. Definitions

Case: an individual animal infected by a pathogenic agent, with or without clinical signs (OIE, 2017).

Commodity-based trade: An array of alternatives that can be used individually or in combination to ensure that the production and processing of a particular commodity or product are managed so that potential food safety and animal health hazards are reduced to appropriate risk levels (Thomson et al, 2013).

Compartment: An animal subpopulation contained in one or more establishments under a common biosecurity management system with a distinct animal health status with respect to a specific disease or specific diseases for which required surveillance, control and biosecurity measures have been applied for the purpose of international trade (OIE, 2017).

Competent authority: The veterinary authority or other government authority of a member country having the responsibility and competence for ensuring or supervising the implementation of animal health and welfare measures, international veterinary certification and other standards and recommendations of the Terrestrial Animal Health Code and of the Aquatic Animal Health Code in the whole country (OIE, 2017).

Equivalence: The state wherein sanitary or phytosanitary measures applied in an exporting country, though different from the measures applied in an importing country, achieve, as demonstrated by the exporting country and recognized by the importing country, the importing country's appropriate level of sanitary or phytosanitary protection. A determination of the recognition of equivalence may be with respect to a specific measure or measures related to a certain product or categories of products, or on a systems-wide basis (WTO Sanitary and Phytosanitary (SPS) Handbook Training Module: Chapter 4 – https://www.wto.org/english/tratop_e/sps_e/sps_handbook_cbt_e/c4s1p1_e.htm).

Establishment: The premises in which animals are kept (OIE, 2017).

Hazard analysis & critical control points (HACCP): A system which identifies, evaluates and controls hazards which are significant for food safety (FAO, 1997 – <http://www.fao.org/docrep/005/y1579e/y1579e03.htm>).

Maturation of beef: Natural acidification of striated muscle of exsanguinated carcasses kept at a temperature above 2 °C for 24 hours after slaughter so that the pH of the *M. longissimus dorsi* (a convenient muscle to sample) falls to a pH below 6.

Non-geographic approach to managing sanitary trade risk: The application of measures for sanitary risk management that are not based on the geographic occurrence of the infection in question (i.e. as opposed to risk management based primarily on the occurrence/non-occurrence of the infection in question in a defined locality).

Quarantine station: An establishment under the control of the veterinary authority where animals are retained in isolation with no direct or indirect contact with other animals, to ensure that there is no transmission of specified pathogenic agents outside the establishment while the animals are undergoing observation for a specified length of time and, if appropriate, testing or treatment (OIE, 2017).

Risk assessment: The evaluation of the likelihood and the biological and economic consequences of entry, establishment and spread of a hazard (OIE, 2017).

Value chain: A value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production, delivery to the final customers, and final disposal after use (R. Kaplinsky and M. Morris, 2000 – www.prism.uct.ac.za/Papers/VchNov01.pdf).

9. References

FAO/OIE/EU-FMD, 2011. The progressive control pathway for FMD control (PCP-FMD).

http://www.fao.org/fileadmin/user_upload/eufmd/docs/PCP/PCP_en.pdf

FAO, 2011. A value chain approach to animal diseases risk management – technical foundations and practical framework for field application. *Animal Production and Health Guidelines*. No 4. Rome.

<http://www.fao.org/docrep/014/i2198e/i2198e00.pdf>

OIE, 2017. Terrestrial Animal Health Code (2017). www.oie.int/international-standard-setting/terrestrial-code/access-online/

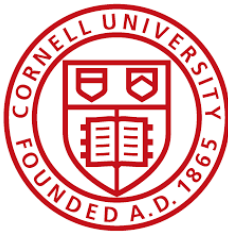
Paton, D.J., Sinclair, M. and Rodrigues, R., 2010. Qualitative assessment of the commodity risk for spread of foot-and-mouth disease associated with international trade in deboned beef. *Transboundary and Emerging Diseases*, 57: 115-134. <http://dx.doi.org/10.1111/j.1865-1682.2010.01137.x>

Thomson, G.R., Fosgate, G.T. and Penrith, M.-L., 2017. Eradication of transboundary animal diseases: Can the rinderpest success story be repeated? *Transboundary and Emerging Diseases*, 64: 459-475.

<http://onlinelibrary.wiley.com/doi/10.1111/tbed.12385/full>

Thomson, G.R., Leyland, T.J. and Donaldson, A.I., 2009. De-boned beef – an example of a commodity for which specific standards could be developed to ensure an appropriate level of protection for international trade. *Transboundary and Emerging Diseases*, 56: 9-17. <http://dx.doi.org/10.1111/j.1865-1682.2008.01054.x>

Thomson, G.R., Penrith, M.-L., Atkinson, M.W., Thalwitzer, S., Mancuso, A., Atkinson, S.J. and Osofsky, S.A., 2013. International standards for commodities and products derived from animals: the need for a system that integrates food safety and animal disease risk management. *Transboundary and Emerging Diseases*, 60: 507-515. <http://dx.doi.org/10.1111/tbed.12164>



Cornell University's Animal & Human Health for the Environment And Development (AHEAD) Program is a convening, facilitative mechanism, working to create enabling environments that allow different and often competing sectors to literally come to the same table and find collaborative ways forward to address challenges at the interface of wildlife health, livestock health, and human health and livelihoods.



We convene stakeholders; help delineate conceptual frameworks to underpin planning, management and research; and provide technical support and resources for projects stakeholders identify as priorities. AHEAD recognizes the need to look at health and disease not in isolation but within a given region's socioeconomic and environmental context.