
Guidelines on Commodity-Based Trade Approaches for Managing Foot and Mouth Disease Risk in Beef in Southern Africa

3rd Edition



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



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Citation:

Thomson, G., Penrith, M.-L., Atkinson, S. J. and Osofsky, S. A. 2018. Guidelines on Commodity-Based Trade Approaches for Managing Foot and Mouth Disease Risk in Beef in Southern Africa. 3rd Edition. Technical Report on behalf of Cornell University's AHEAD Program. 17 pp.

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Acknowledgements

This document is based on the 2015 and 2017 'Guidelines for the Implementation of a Value Chain Approach to Management of Foot and Mouth Disease Risk for Beef Exporting Enterprises in Southern Africa' developed with the support of 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	European Commission for the Control of Foot-and-Mouth Disease
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot and mouth disease
GAP	Good agricultural practices
GHP	Good hygiene practices
GMP	Good manufacturing practices
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)
SPS	Sanitary and Phytosanitary
TAHC	Terrestrial Animal Health Code (of the OIE)
TFCA	Transfrontier conservation area
WHO	World Health Organization of the United Nations
WTO	World Trade Organization

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.

For decades, this situation has simply been accepted because the types of FMD viruses prevalent in the region are maintained by wildlife and are therefore essentially 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 and options include, among others, management of risk of FMD along individual value chains to enable assurance that the final products are free of FMD virus and therefore can be traded with negligible risk of transmission of infection, irrespective of the FMD status of the locality of production (i.e. commodity-based trade [CBT]).

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 an updated edition because they expand options for enabling market access for beef producers in southern Africa not located in areas free from FMD. In this new (2018)

document, further changes have been made to incorporate topics identified during consultation at a meeting of the Southern African Development Community (SADC) Livestock Technical Committee in July 2018.

This document, like its previous editions, demonstrates that export of beef from SADC countries or 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, under the umbrella term commodity-based trade, 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.

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, and were influential in the development of trade standards that required cloven-hoofed animals and commodities derived from them to originate from geographic areas free 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, and this situation will continue unless safe, scientifically-based alternatives, which are now available in the form of commodity-based trade (CBT) approaches, are more widely adopted.

Producers in southern Africa are particularly affected because the SAT (South African Territories) serotypes of FMD viruses (SAT1, SAT2 and SAT3) 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 extant 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 feasible. This is reflected in the Progressive Control Pathway for FMD (PCP-FMD) that was developed in 2011 by the Food and Agriculture Organization of the United Nations (FAO), in collaboration with the World Organisation for Animal Health (OIE) and the European Commission for the Control of Foot-and-Mouth Disease (EU-FMD), as a tool for controlling FMD by progressively eliminating infection in livestock from countries or parts of countries in which FMD is endemic. However, implementation of the PCP-FMD, as it stands, is problematic in southern Africa because the role of African wildlife in the maintenance of the SAT serotypes, and other factors such as exceptional viral diversity peculiar to SAT serotypes, preclude achievement of the final target of the PCP-FMD, namely maintenance of FMD freedom without vaccination.

Growing recognition that a different approach is needed to facilitate trade, particularly regional and inter-regional trade, in beef derived from places where FMD cannot be eliminated due to the presence of wildlife and SAT serotypes of FMD virus has led to the development over time of three alternatives for achieving CBT. These are (1) processing of beef in order to destroy virus potentially present, (2) compartmentalization of beef production enterprises, and / or (3) management of FMD risk along value chains in order to assure that the final commodity has negligible risk of transmitting FMD virus.

In November 2012 the 'Phakalane Declaration' 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 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. However, despite espousal of support for non-geographic approaches to trade in animal commodities and products by SADC and COMESA, there has until recently been little progress in practical application of the approaches to trade in meat in these regions.

This guide is primarily intended to assist enterprises in southern Africa interested in exporting beef to countries or zones that are free of FMD in how to select and successfully apply one or more of the above-mentioned CBT alternatives. Definitions for technical terms used in this document are given in Section 7.

2. International FMD standards for beef trade

International phytosanitary standards were developed to minimise the risk of transmission of diseases to humans, animals or plants through trade in agricultural commodities and products, while at the same time, minimizing the use of standards as non-tariff barriers to trade. The OIE is mandated by the World Trade Organization (WTO) to provide international standards for trade in livestock commodities (live animals are considered by OIE to be commodities) where transboundary animal diseases pose a potential risk. 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. The World Health Organization (WHO) and FAO are responsible for food safety guidelines, codes of practice and standards, which constitute the other component of sanitary management (Codex Alimentarius – <http://www.fao.org/fao-who-codexalimentarius/codex-texts/list-standards/en/>).

The OIE also provides an independent accreditation mechanism for member countries to obtain recognition of country or zonal freedom from some diseases, including FMD. The requirements for recognition by the OIE of FMD-free countries and zones, either where vaccination is not or is practised, are provided in Articles 8.8.2 and 8.8.3 of the TAHC. Official recognition for such countries or zones is provided by the OIE on approval of an application submitted by member countries. Once an application by a member country is approved, the relevant country or zone is listed on the OIE website. Such listing needs to be reconfirmed annually. However, for some countries and zones in southern Africa FMD-freedom is not achievable; hence the need for alternative ways of producing 'safe' beef while assuring markets that the level of safety is internationally acceptable.

Consequently, the OIE also provides standards whereby the three alternative strategies for FMD risk management for beef mentioned above can be applied (as discussed in more detail in section 2.2). Since the OIE does not provide an accreditation mechanism for these approaches, it is necessary for the exporting country that uses these alternatives to convince the importer, including the official veterinary service of the importing country, that the measures actually achieve compliance with the relevant standard.

It should be emphasized that the OIE standards are recommendations and their adoption by member states is voluntary. In deciding which standards to adopt, member states should be cognisant of the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), which was designed to facilitate safe trade in agricultural commodities and products while discouraging the unjustified application of standards as non-tariff barriers to trade. The SPS Agreement (https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm) recommends that commodities should be traded freely between countries of similar SPS status with regard to trade-sensitive diseases unless the importing country can provide scientific justification for applying a higher standard (Article 5).

Trade is driven by markets and therefore it is important for business enterprises to determine the sanitary, quality and volume requirements of target markets in order to trade successfully. Some beef-producing countries in the SADC region have succeeded in accessing high value markets such as the EU by establishing zonal or, in the case of Swaziland, country freedom from FMD. Acceptance of non-geographic standards by markets in the developed world is, however, difficult, despite the fact that the WTO SPS Agreement states that countries should recognize the equivalence of different approaches for achieving commodity safety provided that they are scientifically justifiable. With broader acceptance of non-geographic standards, many countries that are unable to satisfy national demand for beef through local production could offer alternative markets for would-be exporters, including those in non-FMD-free countries or zones in the SADC region.

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 and the control measures applied to eliminate the specific FMD occurrence. An extended interruption of business obviously presents a major problem for any commercial enterprise.

2.2 Non-geographic trade standards related to international beef trade (see section 6 definitions)

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 (Article 8.8.31);
- Establishment of compartments free from FMD (Article 8.8.4);
- Management of FMD risk along beef value chains (Article 8.8.22).

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.

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 feasibility of implementing Article 8.8.4 in FMD-endemic areas with free-living wildlife is discussed in Section 4.3.

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.

2.2.3 FMD management along value chains (see Article 8.8.22 and 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. The concept is to allow for integration of food safety assurance with the management of trade risks for FMD, because HACCP (Hazard Analysis & Critical Control Points) and CBT principles are similar and

can readily be applied in parallel (Figure 1). Food safety risk management of infectious agents is universally independent of whether specific infections are present in the locality of production or not.

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’ and that the risk can be further reduced to ‘negligible’ status (the lowest possible risk category) by the application of additional mitigation measures applied along the value chain.

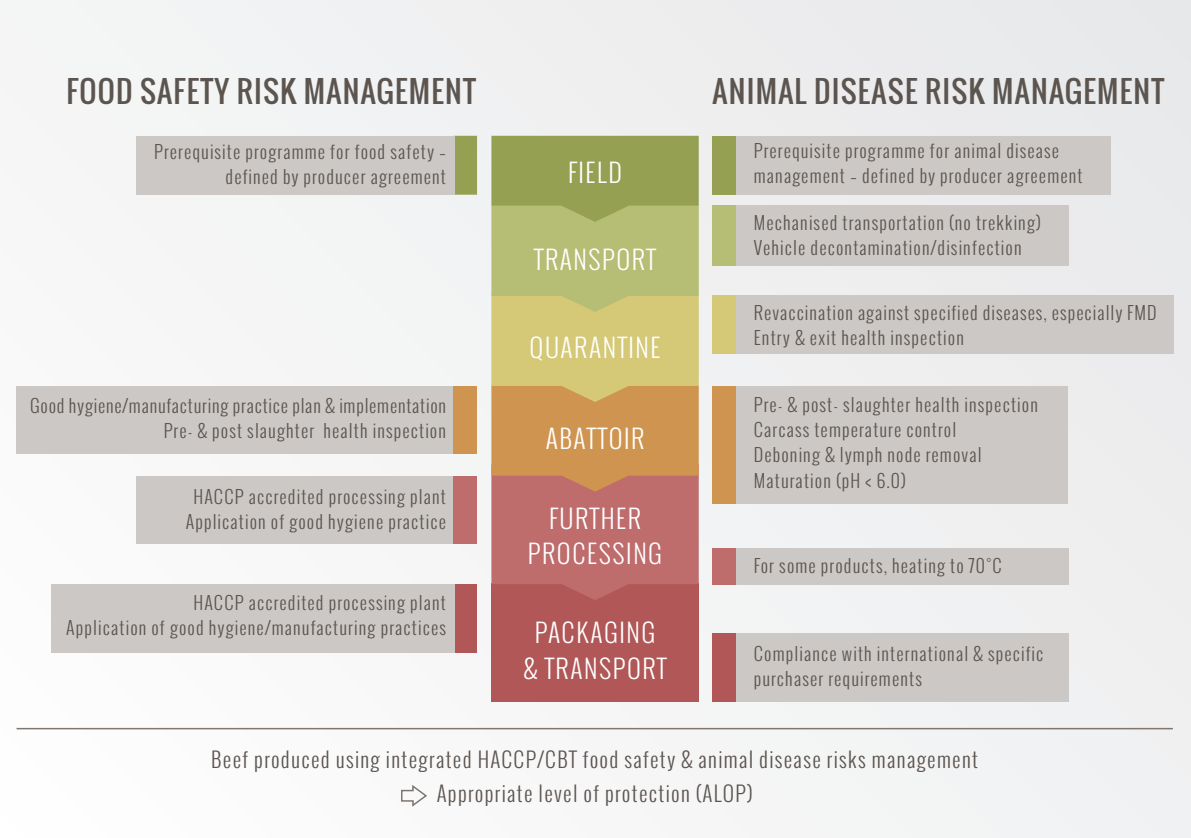


Figure 1. Parallel application of food safety and animal disease risk management measures along a value chain for beef production in a location that is not recognised as free from FMD.

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.

Article 8.8.22 provides a standard covering several crucial steps in a value chain approach, but additional options for risk management throughout the value chain, for which no standards have thus far been developed, are described in Section 4.

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. 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 in addition 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 (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 programmes to ensure functionality, e.g. good hygiene practices (GHP) and good manufacturing practices (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, as shown in Figure 1.

4. Deciding upon appropriate approaches to management of FMD risk 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 have a range of defined options to consider. They can focus on processing to inactivate FMD virus, compartmentalisation, or compliance with Article 8.8.22 (Box 2). If a different risk mitigation-based value chain approach for which no standard currently exists is deemed better suited to the enterprise in question, risk analysis may be needed.

4.1 Targeting markets in countries or zones that are not free of FMD

The WTO SPS Agreement sets out the basic rules underlying food safety and animal and plant health standards, including the principles of equivalence and non-discrimination between countries where the same or similar SPS conditions prevail (https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm). Accordingly, those entities exporting beef to destinations that are not free of FMD should not be subjected to SPS measures that are not applied to beef trade within the importing country itself – that is, no additional restrictions are to be imposed by the importer in terms of FMD. The implication is that beef produced in non-FMD-free countries or zones, including bone-in beef, should be easily marketable to other non-FMD-free countries or zones. That is the



¹ FMD-free compartments are not achievable where FMD vaccination is practiced as FMD-vaccinated animals / FMD vaccination are excluded from compartments under the current OIE standard. In addition, the presence of free-ranging wildlife makes demonstrating that "no case of FMD has occurred within a 10 km radius of the compartment during the past 3 months" essentially impossible.

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

practice in many parts of the world today. A specific FMD strain or strains in one country may not be the same as a strain or strains in a potential trading partner country, and this may be viewed as a risk not worth taking by some countries. However, if two countries both have FMD-infected status, the decision to take the consideration up to the level of the particular strain prior to considering trade would remain their prerogative but is not imposed by any international regulations.

Other approaches, i.e. those outlined below, are therefore relevant when exporting from countries or zones that are not free of FMD to destinations that are free of FMD, including, if they exist, FMD-free zones situated in the same country.

4.2 Processing of beef to inactivate any virus potentially present (Article 8.8.31)

If products have been processed in compliance with Article 8.8.31 they can be certified as free from FMD virus. There is no requirement for quarantine of cattle prior to slaughter, but the animals will have had to have been slaughtered under conditions that satisfy international norms for food safety (as well as animal welfare, which these *Guidelines* do not address).

4.3 Can the business enterprise be compartmentalized to comply with Article 8.8.4?

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. There is reason for some optimism, however, that vaccination against FMD within compartments will be allowable in the future. Interestingly, neither the general guidelines on implementation of compartments provided by the TAHC (Chapter 4.4) nor the guidelines for compartments for avian influenza and classical swine fever (Chapters 10.4 and 15.2) preclude vaccination.

Another obstacle is that for initial approval of a FMD-free compartment, the veterinary authority needs to establish that no case of FMD has occurred within a 10 km radius of any part of the compartment in the last three months (Article 8.8.4, Box 1). This proviso will exclude enterprises situated in areas where free-ranging cloven-hoofed animals, including wildlife, cannot be prevented from approaching anywhere within 10 km of the compartment's perimeter. 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, is a 'killer' requirement. Again, this type of proviso is not included in Chapters 4.4, 10.4 or 15.2 of the TAHC.

Nevertheless, enterprises operating on sufficiently large, well fenced farms may be able to construct a compartment within the premises that can comply with the conditions of Article 8.8.4 and accordingly be approved and certified for export.

4.4 Can the business enterprise comply with Article 8.8.22 without a quarantine station?

Enterprises as described under 4.3 in which cattle could be kept for the required pre-slaughter period of 30 days in a facility surrounded by a 10km radius that could not be penetrated by free-living cloven-hoofed animals not under the requisite management of the enterprise could potentially comply with Article 8.8.22 without an officially supervised quarantine station being available. However, the intensity of surveillance that would be required largely renders this option impractical in areas where FMD is endemic in southern Africa.

4.5 Can the business enterprise access an officially supervised quarantine station to enable compliance with Article 8.8.22?

Since May 2015, Article 8.8.22 (Box 2) 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 CBT approach is suitable for a number of existing beef value chains in southern Africa that have utilised quarantine or that now wish to do so.

4.6 A value chain approach to FMD risk management for safe beef trade

As described previously, in 2011 the FAO published guidelines for the application of risk mitigation measures along value chains to manage risks associated with animal diseases. The concept has since been expanded to integrate the management of food safety and animal disease risks along value chains using a HACCP approach (Figure 1).

The value chain approach consists of a series of risk mitigation measures, including some or all of the measures provided in Article 8.8.22, that are applied at various points along the production chain, including ‘beyond the farm gate’. This includes suppliers and other components of the value chain. 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. This is a robust system because if one measure fails there are others to back it up (i.e. redundancy is built into the system). Implicit in such approaches is the potential for designing risk mitigation that is specific for particular value chains.

Table 1 summarises the measures that can be applied to mitigate the risk of FMD contamination of beef produced in endemic locations. Some but not all of these are incorporated in Article 8.8.22 (Box 2).

Table 2 provides an example of the risk mitigation measures that were applied to provide integrated assurance for freedom from FMD virus and food safety of matured, deboned beef produced in an area that was not free of FMD owing to the presence of large numbers of free-ranging infected African buffalo, using a value chain approach. The value chain was situated in a transfrontier conservation area (TFCA) where separation of cattle and wildlife populations (and thereby application of geographic management of FMD risk) is impractical owing to topography (major rivers and wetlands). Moreover, fencing has been disastrous for migratory wildlife and is consequently problematic from the TFCA perspective, even if the topography would allow for fencing. The simple value chain that was already in place (Figure 3) was therefore adapted to ensure that the beef produced complied not only with the requirements of Article 8.8.22, but also achieved requirements for food safety and compatibility with the principles of wildlife conservation. A producer protocol was part of the prerequisite programme, designed to minimize wildlife / cattle interaction as well as foster the production of more and better quality beef.

The measures reflected in Table 1 are illustrative of the types of options that can be considered in other locales. Quarantine was part of the mix of risk mitigation measures adopted in this case because it was part of the existing value chain, but as indicated above, options without quarantine may be possible, depending on the value chain and the robustness of the risk reduction process.

Adopting this approach provides 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, particularly for the future of communities living in the region’s TFCAs.

Table 1. Range of risk mitigation measures applicable against FMD virus contamination of beef, including processed beef, produced in endemic locations.

Location of activity	Activity No.	Activity designed to reduce FMD risk	Potential CCP (Y/N)	Purpose
Field	1	Targeted FMD surveillance	N	Determination of the primary FMD risk in the cattle population
	2	Vaccination programme to achieve effective herd immunity	Y	Prevent circulation of FMD virus in the cattle population
	3	Prevention of infection <ul style="list-style-type: none"> • Quarantine • Compartmentalisation • Herding/kraaling 	Y	<ul style="list-style-type: none"> • Exclusion of cattle with FMD or those incubating the disease • Minimization of possibility of infection • Decreasing likelihood of exposure to infection
			Y	
			N	
	4	Protection from infection during transportation	Y	Prevention of exposure to infection during transportation
5	Good agricultural practices (GAP) including record-keeping	N	Reduction of possibility of undesirable farming practices while ensuring accountability	
6	Animal identification and traceability	Y	Ensuring traceability to support disease control and comply with requirements for some markets	
Abattoir	7	Ante- and post-mortem inspection	Y	Minimization of diseased animals being slaughtered or such carcasses being further processed
	8	Exsanguination	N	Reduction of the viral content of muscle should viraemia be present in the absence of disease
	9	Electrical stimulation of carcasses	Y	Promotion of carcass acidification/inactivation of FMD virus (pH <6)
	10	Beef maturation	Y	Inactivation of FMD virus in striated muscle
	11	Deboning	Y	Removal of FMD virus present in bone marrow
	12	Removal of lymph nodes	Y	Removal of FMD virus in lymph nodes
Manufacturing plant	14	Secondary processing <ul style="list-style-type: none"> • Heating to 70° C for 30 min. • Drying salting • Other* 	Y	<ul style="list-style-type: none"> • Inactivation of FMD virus • Inactivation of FMD virus • Inactivation of FMD virus (depending on the process)
			?	

* There are many complex processing methods that have the potential to inactivate FMD viruses but that have not yet been investigated in that respect.

Table 2. Actions aimed at providing quality deboned beef that is safe for human consumption and from animal diseases – FMD particularly – as well as potentially competitive in most markets **Critical control points are indicated in boldface.** Other value chains 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 effective traceability system, 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- and post-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.

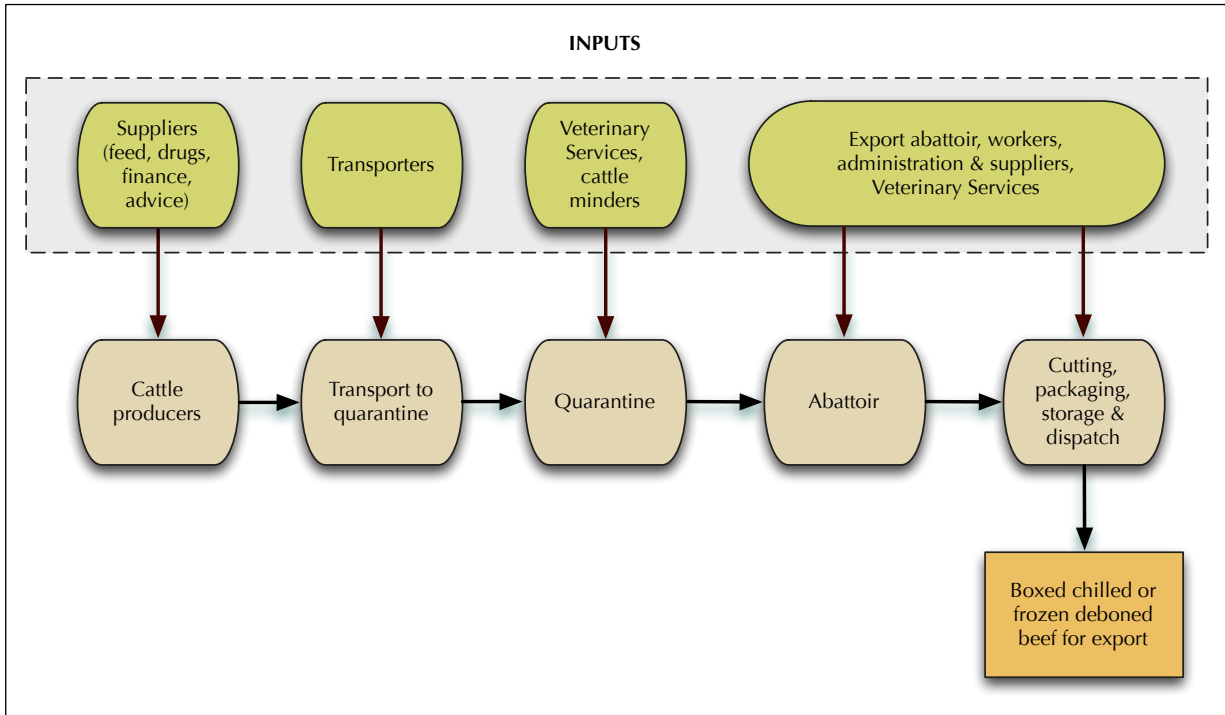


Figure 3. Example of a simple value chain for beef production in the SADC region in areas considered endemic for FMD due to the presence of susceptible free-ranging wildlife.

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

5.1 Auditing and certification

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.

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.

If the approach adopted in any way digresses from the international standards, it is crucial to demonstrate that the approach adopted achieves overall negligible residual risk, *i.e.* risk 'equivalence' to one or more of these standards. That can be done through a formal risk assessment.

Unfortunately, it must be admitted that OIE-recognition of freedom from FMD of countries or zones is sometimes not accepted by powerful trading nations and trade blocks. Various reasons are advanced for this, but non-acceptance of international trade standards essentially comes down to unfair trade practice; this would also apply if compliance with the non-geographic standards were not accepted. While such non-

acceptance could be contested via dispute resolution mechanisms provided by the WTO and OIE, this is an expensive and lengthy process.

Risk assessment is the tool of choice recommended by the WTO SPS Agreement and the OIE to determine equivalence of sanitary measures (Chapter 5.3 of the TAHC). 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.

5.2 Animal identification and traceability

Animal identification has many applications and has been used for a long time by farmers to assist their record-keeping, track production performance and enable them to positively identify animals recovered after stock theft. Its usefulness has been recognised at official levels in most countries. Increasing concerns about food safety have resulted in requirements for traceability systems for foodstuffs – in particular, bovine spongiform encephalopathy (BSE, ‘mad cow disease’) – first diagnosed in the UK in 1986. UK outbreaks were suspected to have resulted in disease in humans who ate material from infected cattle, and systems were developed to link animal identification with traceability of animal-derived food (individual identification of cattle is now often a required element of the traceability system). Most major beef-producing and -trading countries have since instituted national identification systems based on identification of individual cattle. For many beef markets, traceability has become a condition of access. In the SADC region, Botswana, Namibia and Swaziland have developed systems compliant with EU requirements (an electronic system for identification and traceability of individual cattle). It is probable that ultimately this requirement will become universal even at national levels for assurance of food safety, but the OIE does provide standards (Chapters 4.1 and 4.2 of the TAHC) for alternatives in terms of group identification that may be useful to countries wishing to initiate a system but lacking the necessary resources for countrywide application of the more sophisticated individual animal-focused systems. The general standards for animal disease traceability published by the United States Department of Agriculture in 2016 also make provision for alternatives to individual animal identification. Essentially, the OIE standards indicate that the system must be under the control of the veterinary authority and supported by legislation, and that animal traceability should be linked to traceability of products of animal origin. However, it recommends that the system should be determined by what it is expected to achieve and makes provision for group identification, including without physical identifiers, if that will serve the purpose of the system. It also provides that the information system that supports identification may be either paper-based or electronic. The standards also support the concept of equivalence by recommending that comparisons to determine the equivalence of different animal identification and traceability systems should be based on performance criteria rather than design criteria.

5.3 Transit of beef

During the journey of beef from a FMD-free area of production to a FMD-free importing destination, it may be necessary for it to transit zones or countries that are not free of FMD. Certain countries or trading blocs, notably the USA and the EU, but also countries in the SADC region that are free of FMD or have official FMD-free zones, require that beef going to those destinations should not transit FMD-infected zones or countries. Conversely, some countries in the region also require that beef originating in areas that are not free of FMD may not transit FMD-free zones in their journey to destinations that are also not free of FMD; sometimes the restriction on transit is extended even to areas that are not free of FMD, which is of course unacceptable.

However, CBT and Article 8.8.22 foresee export of fresh, chilled, deboned beef from areas that are not free of FMD to destinations that include countries that are free of FMD or have FMD-free zones. While it seems unlikely that the USA or EU would agree to anything but the current geographical standards, it is hoped that

such beef will be able to access regional markets including in countries that are free or have zones that are free of FMD.

In some countries that have free and infected zones, veterinary authorities might apply transit restrictions so that beef from an infected zone is not allowed to move through a free zone on the way to another infected zone in the same country or to another country.

Whether the restrictions placed on transit are either fair or scientifically justifiable merits debate, and in some cases it is possible that negotiation would resolve the problem. However, when possible and cost-effective, it may be simplest to try to plan routes that avoid road transit through FMD-free zones or countries unless a clear policy for transit conditions (including specifications related to sealed vehicles, etc.) can be developed at a regional level and acceptance can be gained from trading partners and / or neighbours who impose the conditions. Where the restrictions are placed by the exporting country itself on beef exiting the country, serious consideration should be given to developing a set of conditions that would assure safe transit rather than denying less fortunately situated producers the opportunity to access export markets.

6. Definitions

Case: an individual animal infected by a pathogenic agent, with or without clinical signs (OIE, 2018).

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, 2018).

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, 2018).

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, 2018).

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, 2018).

Risk assessment: The evaluation of the likelihood and the biological and economic consequences of entry, establishment and spread of a hazard (OIE, 2018).

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).

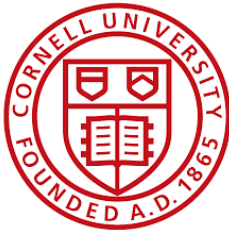
7. Further reading

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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.