Fighting for the U.S. Cattle Producer!
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Docket Clerk, U.S. Department of Agriculture
Food Safety and Inspection Service
Patriots Plaza 3
1400 Independence Avenue SW.
Mailstop 3782, Room 8–163A
Washington, DC 20250–3700.

Via E-Mail: www.regulations.gov

Re: R-CALF USA Comments in Docket No. FSIS–2012–0028 (RIN 0583–AD51): Proposed Rule: Eligibility of Namibia To Export Meat Products to the United States

Dear Sir or Madam:

The Ranchers-Cattlemen Action Legal Fund, United Stockgrowers of America (R-CALF USA) appreciates this opportunity to submit comments to the U.S. Department of Agriculture (USDA) Food Safety and Inspection Service (FSIS) regarding the agency's proposed rule: *Eligibility of Namibia to Export Meat Products to the United States* (Proposed Rule), published at 80 Fed. Reg., 56,401-56,405 (Sept. 18, 2015).

The Proposed Rule would add Namibia to the list of countries whose meat inspection system is equivalent to that of the United States, thereby granting Namibian beef access to the U.S. consumer market. For the reasons stated below, R-CALF USA strongly opposes the Proposed Rule and respectfully urges FSIS to withdraw it from consideration.

A. The FSIS Is Attempting to Certify Namibia's Eligibility to Access the U.S. Market Based on a Narrow Review of Products and Without Fully Evaluating the Safety of Other Products that Can Later Be Exported to the U.S. Without any Additional Rulemaking.

R-CALF USA is deeply concerned that the FSIS is recommending approval of this Proposed Rule based largely on statements and assurances by the Namibian government that it: 1) "intends" to limit exports to the U.S. to only boneless (not ground) raw beef products, such as primal cuts, chuck, blade, and beef trimmings (80 Fed. Reg., 56,401); 2) "intends" to certify only

one Namibian slaughtering plant to export beef to the United States (*id*., 56,404); and, 3) does not "inten[d]" to export head and cheek meat to the United States.[1]

Those three significant intentions proffered by the Namibian government to obtain FSIS approval for its exports are not binding limitations on future exports. This fact was clearly acknowledged by FSIS when it stated that Namibia would not be precluded from exporting other meat products in the future under this Proposed Rule. (80 Fed. Reg., 56,404.)

The classic metaphor of the camel sticking its nose under the tent is applicable here. The FSIS has not fully evaluated the effectiveness, let alone the equivalency, of Namibia's food safety systems for products such as ground beef, head meat or cheek meat. Yet, it is attempting to satisfy its congressionally-mandated public rulemaking process by evaluating only a very limited list of products for which it believes Namibia's food safety system is adequate. This scheme enables the agency to then "escape" from under the public rulemaking mandate when Namibia subsequently requests to expand the scope of exported products. The effect of this scheme is that the FSIS effectively reserves for itself the unilateral authority to grant Namibia's future requests without any meaningful input from the public. Once the camel's nose enters the tent, the rest of its body will immediately follow.

1. **Non-Binding Assurances Made in the Proposed Rule Are Inconsistent with the Final Audit.**

The Proposed Rule seeks to grant Namibia eligibility to export beef to the United States based on a more expansive list of beef products than the Final Audit expressly included as a basis for concluding that Namibia's food safety system is adequate. The FSIS provides the express assurance that if the Proposed Rule becomes final, Namibia will be eligible to export "boneless (not ground) beef raw products such as primal cuts, chucks, blade, and beef trimmings." (80 Fed. Reg., 56,403.) The Final Audit, however, contains the express assurance that only the following meat products would be exported under the Proposed Rule: "chuck, blade, and trimmings." (Final Audit at 24.) Thus, and contrary to the statements contained in the Proposed Rule, the Final Audit did not consider whether "boneless (not ground) beef raw products such as primal cuts" are currently being subjected to an adequate food safety system. Indeed, the Final Audit's findings and recommendations were based on the exclusion of those additional products. And, FSIS states that other unspecified procedures would need to be taken before any additional products are allowed into the U.S. market. (*See, e.g*., 80 Fed. Reg., 56,404.)

2. **The Final Audit Identified Systemic Problems with Two Beef Products that Are Not Precluded from Export to the U.S. Under the Propose Rule.**

The Final Audit identified contaminations of Shiga toxin-producing *E. coli* (STEC) on head meat and cheek meet on multiple occasions in 2014. (Final Audit at 24.) The only mitigation proffered

[1] Final Reports of Initial Equivalence Follow-up On-Site Audits Conducted in Namibia January 28 to February 1, 2013 and August 13 to 21 2014, Evaluating the Food Safety Systems Governing the Production of Meat (Slaughter and Processing) Products Intended for Export to the United States of America, USDA-FSIS (2014), hereafter "Final Audit," at 24.

by the Final Audit regarding the systemic contaminations identified on these products applicable to the Proposed Rule was a non-binding letter by the Namibian government confirming that "Head and cheek meat will not be offered for U.S. export." (*Id.*) This is an inadequate response to this serious deficiency for the following reasons. First, R-CALF USA understands that STEC is an enteric bacterium capable of contaminating meat products only if the meat products come into direct contact with fecal material. A serious, systemic food sanitation breach must have occurred for meat products from the head of a bovine to come into direct contact with fecal material. Second, the fact that head and cheek meat tested positive for STEC over the course of two and three months, respectively, strongly suggests that all the other food safety systems within the establishment failed completely to correct the contamination problem. The Final Audit is silent regarding why the establishment experienced contamination problems spanning several months before they were addressed and what specific corrective actions were taken to prevent further contaminations.

B. The Public Is Prevented from Ascertaining the Seriousness of the Numerous Instances of Reported Non-Compliance.

The Proposed Rule does not provide sufficient information to allow the public to provide thoughtful, serious and important comments regarding the FSIS' evaluation of Namibia's food safety system. Specifically, the FSIS does not disclose either the cause or nature of the deficiencies it found during its most recent audit of Namibia's food safety systems.

1. Deficiencies Identified with Namibia's Sanitation Performance Standards.

The FSIS does not disclose either the cause or nature of the two deficiencies regarding sanitation performance standards identified by the auditors in 2014. (Final Audit at 17.) As a result, the public is precluded from providing any meaningful comments regarding the potential, long-term safety risks associated with those deficiencies.

2. Deficiencies Identified with Namibia's Hazard Analysis Critical Control Point Plan.

The FSIS does not disclose either the cause or nature of the three deficiencies regarding Namibia's Hazard Analysis Critical Control Point (HACCP) plan identified by the auditors in 2014. (Final Audit at 19.) As a result, the public is precluded from providing any meaningful comments regarding the potential, long-term safety risks associated with those deficiencies.

3. Deficiencies Identified with Namibia's Chemical Residue Programs.

The FSIS does not disclose the frequency or progression of violations under Namibia's chemical residue program. As a result, the public is precluded from making a determination regarding whether Namibia's enforcement sanctions are effective at minimizing violations to its chemical residue programs. This is important because, as discussed in more detail below, the potential for and occurrence of criminal activity within Namibia's food system is significant.

C. The FSIS Fails to Disclose the Existence or Adequacy of Any Mitigations to Prevent Foreign Animal Diseases and Zoonotic Diseases from Entering the U.S. On or In Namibian Beef.

A 2012 risk assessment conducted on behalf of the Namibian Meat Board reveals that zoonotic diseases are prevalent in the Namibian cattle herd and transmissible in Namibian meat, Namibia allows imports of both cattle and beef from countries not free of foot-and-mouth disease (FMD), and Namibia knows its food system is vulnerable to illegal activity.[2]

1. Rift Valley Fever, a Zoonotic Disease, Is Endemic in Namibia.

The U.S. Centers for Disease Control and Prevention (CDC) describes Rift Valley fever (RVF) as a viral disease that affects domestic animals, including cattle, and humans.[3] There is no established treatment for RFV and it can cause fatalities in both cattle and humans. (*Id.*) Humans can contract RVF by slaughtering or handling infected animals or by touching contaminated meat. (*Id.*) According to Namibia's Risk Analysis, RVF is endemic in Namibia and the country may have had an outbreak as recently as 2010. (Namibia Risk Analysis at 1, 8.) The Proposed Rule and related Final Audit are silent regarding what mitigations, if any, the United States has required Namibia to implement to prevent the introduction into and spread within the United States of Rift Valley fever from Namibian beef. It would be irresponsible for FSIS to authorize exports of Namibian beef without first conducting a comprehensive risk analysis regarding the risk of introducing Rift Valley fever into the United States via the importation of Namibian beef.

2. High-Risk Cattle and Beef Are Allowed to Enter Namibia and Are Presumably Comingled With Namibian Cattle and Beef.

Namibia imports breeding cattle from the Republic of South Africa, a country not free of FMD, and did so at least as recently as 2010. (Namibia Risk Analysis at 19.) Further, southern Namibia is at risk of becoming re-infected with FMD because authorities have dismantled a section of fence to allow buffaloes and elephants to re-enter what had been considered an area free of FMD. (*Id.* at 14.) Namibia also imports beef from countries not eligible to export beef to the United States. For example, Namibian slaughter and processing plants have access to beef imported from Western Cape/Johannesburg, Durban, and Cape Town, which are not considered FMD free. (*Id.* at 21.) Southern Namibia also imports beef from north of the veterinary cordon fence (VCF), a region where FMD is known to be rampant. (*Id.* at 4 (explaining that 1,121 tonnes of beef were imported from north of the VCF as recently as 2010).) The Proposed Rule is silent on what steps, if any, the FSIS has taken to ensure that beef exported to the U.S. is not derived from cattle imported from the Republic of South Africa, from FMD-affected northern Namibia, or from any other country where FMD is known to exist. Further, the Proposed Rule is

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[2] Risk Analysis on Animal Disease Hazards Associated with Import of Animal Commodities (Including Live Animals) and Products Into Namibia and Consequences Thereof, a study conducted on behalf of the Meat Board, Namibia, May 14, 2012 (hereafter "Namibia Risk Analysis"), attached hereto as Attachment A.

[3] CDC Rift Valley Fever Fact Sheet, U.S. Centers for Disease Control and Prevention, hereafter "CDC Fact Sheet, "available at http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/Fact_Sheets/Rift_Valley_Fever_Fact_Sheet.pdf.

silent on what steps, if any, the FSIS has taken to ensure that beef originating in other countries (including north of Namibia's VCF) is not comingled at slaughtering/processing plants that are eligible to export beef to the United States.

3. Namibia's Food System Is Vulnerable to Illegal Activity.

The Namibian Risk Analysis reveals, for example, that areas of southern Africa do not adequately enforce feed ban restrictions to prevent bovine spongiform encephalopathy (BSE), including countries where Namibia has or continues to import live cattle (*Id.* at 10.). It also reveals that illegal imports into Namibia present a significant risk for FMD. (*Id.* at 19). Based on these potential, if not likely, risks (*see id.* at 39 (describing how illegal cattle smuggling increases when the price differential increases), it would be irresponsible for FSIS to authorize the exportation of beef from Namibia without first conducting a comprehensive risk analysis on the risk of importing potentially contaminated beef due to the foregoing risk factors identified only recently in the Namibian Risk Analysis.

D. The FSIS' Economic Impact Analysis in the Proposed Rule Is Woefully Inadequate.

The FSIS claims that allowing Namibia to export beef into the United States under the Proposed Rule "will not have an impact on the United States economy." (80 Fed. Reg. at 56,404). This claim is meritless. Alarmingly, the agency made no attempt to determine the economic impact caused by the importation of an additional 1.9 million pounds of beef during the first year of the Proposed Rule's finalization or by the additional 12.5 million pounds expected to be imported by the fourth-year following finalization. (*Id.*)

Before addressing this specific issue, it is important to restate that the purported limits regarding the number of Namibian slaughtering plants, the scope of beef products to be exported from these plants, and the volume of beef exported from Namibia are not binding limitations under the Proposed Rule. Further, if the Proposed Rule is finalized, FSIS can approve new plants and increase the scope of products at its discretion, without a rulemaking process. Therefore, FSIS should have, at the very least, modeled the range of possible impacts the Proposed Rule would likely have on U.S. cattle farmers and ranchers. But it did not.

In early 2000, John VanSickle, Ph.D., Food & Resource Economics Department, University of Florida, critiqued a USDA economic analysis regarding the impact to U.S. cattle producers resulting from the import of, *inter alia*, 84,000 tons of boneless beef.[4] Dr. VanSickle found that USDA errored in its economic analysis by assuming that losses to the fed cattle sector and the feeder cattle sector were independent impacts rather than additive. (*Id.*) He also found that the USDA analysis did not include producer losses associated with price declines realized when producers continued marketing their domestic cattle after the additional imports entered the U.S. market. (*Id.*) Further, he found the USDA's analysis ignores impacts on associated industries and

[4] Economic Analysis of Proposed Rule for Bovine Spongiform Encephalopathy: Minimal Risk Regions and Importation of Commodities (APHIS Docket No. 03-080-1), John J.VanSickle, Florida State University, attached hereto as Attachment B.

on employment. (*Id.*) Dr. VanSickle then modeled the impact of the USDA's proposal using Implan multipliers that suggested that "a decline in $1 of sales for the cattle ranching and farming sector will have a $3.87 impact on total output in the economy."[5] The analysis also found that "every million dollars in sales of cattle or beef is associated with 43.5 jobs generated in the economy."[6]

Dr. VanSickle's more robust economic analysis concluded that allowing the importation of 84,000 tons (168 million pounds) of additional beef imports into the U.S. market would result in a negative impact to the U.S. economy of $1.29 billion and a loss of 11,189 jobs.

A rough distillation of Dr. VanSickle's modeling indicates that for every 1 million pounds in additional beef imports, the U.S. economy will be negatively impacted by $7.679 million and about 67 U.S. jobs will be lost.

Thus, R-CALF USA estimates that FSIS' expectation that Namibia will import 1.9 million pounds of beef in 2015 and 12.5 million pounds in 2019 will likely result in a negative impact on the U.S. economy of $14.9 million and $96 million, respectively, and the U.S. will suffer 127 job losses in 2015 and 837.5 job losses in 2019.

R-CALF USA's estimated range of a negative impact to the U.S. economy of $14.9 million the first year and $96 million by the fourth year after the Proposed Rule is finalized reveals that the Proposed Rule should be classified as having a major economic impact.

A quick review of trade data shows that the U.S. imported approximately the same amount of beef from Japan in 2014 that FSIS believes the U.S. will import from Namibia in 2015 (imports from Japan were 1.98 million pounds).[7] Data obtained from a USDA-Foreign Agricultural Services (FAS') Global Agricultural Trade System (GATS) query shows that the value of beef imported from Japan in 2014 was $12.46 million. This quick comparison demonstrates the reasonableness of R-CALF USA's estimate. It shows that if Japan's 1.98 million pounds of imports were to displace U.S. production by the same amount, causing even more U.S. producers to exit the industry (as over half a million already have while USDA has continually encouraged more imports over the past 30 years without any regard for their impacts on U.S. cattle farmers and ranchers), then the Proposed Rule would have a negative economic impact somewhat close to R-CALF USA's estimate. But, even if it did not displace some or all of the beef produced by U.S. producers, the aforementioned Implan multiplier of $3.87 would still negatively impact the U.S. economy because it would represent the cost of the U.S. cattle industry's lost economic opportunity to market an additional 1.98 million pounds of beef – that opportunity being displaced by beef imported from Namibia.

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[5] Economic Analysis of Proposed Rule for Bovine Spongiform Encephalopathy: Minimal Risk Regions and Importation of Commodities (APHIS Docket No. 03-080-1), John J.VanSickle, Florida State University, available at http://r-calfusa.com/wp-content/uploads/2013/04/151103-Expert-Economic-Evaluation-John-VanSickle.pdf.
[6] *Id.*
[7] Beef and veal: Annual and cumulative year-to-date U.S. trade (carcass weight, 1,000 pounds) USDA-Economic Research Service, Oct. 7, 2015, available at http://www.ers.usda.gov/data-products/livestock-meat-international-trade-data.aspx.

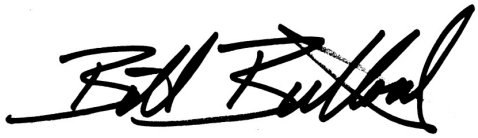
It may not be lost on reviewers that the beef imported from Japan may be substantially different than the beef expected to be imported from Namibia. This is likely to be true. At the same time, however, it reveals the inappropriateness of FSIS's sophomoric calculation of Namibia's share of total U.S. production and total U.S. imports. If Namibian beef is, *e.g.*, grass-fed, antibiotic and hormone free, and/or organic, then it too would fall in a very special class that would not be a substitute for the vast majority of beef produced in the U.S. – *i.e.*, conventional corn-fed beef. If this is the case, though R-CALF USA does not know if it is, then the universe of product substitutes (comparable products) would be significantly smaller than total U.S. production and total U.S. imports, which would render meaningless the calculation FSIS has made to support its absurd conclusion that there would be no economic impact resulting from the addition of millions of pounds of imported beef into the U.S. market.

It should be no surprise to FSIS that increasing the supply of beef imports, however small, will have a profound impact on U.S. cattle farmers and ranchers given the farm level elasticity of demand for fed cattle. Researchers have found that a 1 percent increase in fed cattle supplies is expected to reduce fed cattle prices by as much as 2.5 percent.[8] Thus, increased imports of live cattle (and by extension beef) will significantly depress domestic cattle prices and harm U.S. cattle farmers and ranchers.

E. Conclusion.

For the reasons set forth above R-CALF USA strongly opposes the Proposed Rule and respectfully urges FSIS to withdraw it from consideration.

Sincerely,



Bill Bullard

[8] *See* Under Siege: The U.S. Live Cattle Industry, Bill Bullard, South Dakota Law Review, Vol. 58, Issue 3, 2013, at 587 (citing research by University of Nebraska-Lincoln), available at http://r-calfusa.com/wp-content/uploads/2013/04/130101UnderSiegeSDlAWrEVIEWBillBullard.pdf.

RISK ANALYSIS ON ANIMAL DISEASE HAZARDS ASSOCIATED WITH IMPORT OF ANIMAL COMMODITIES (INCLUDING LIVE ANIMALS) AND PRODUCTS INTO NAMIBIA AND CONSEQUENCES THEREOF

A study conducted on behalf of the Meat Board, Namibia

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14 May 2012

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Abbreviations and acronyms

ASF	African swine fever
BSE	bovine spongiform encephalopathy
CBPP	contagious bovine pleuropneumonia
CCP	critical control point
CCPP	contagious caprine pleuropneumonia
CSF	classical swine fever
DRC	Democratic Republic of Congo
DVS	Directorate of Veterinary Services
EC	European Commission
EEA	European Economic Area
EFSA	European Food Safety Authority
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FMD	foot and mouth disease
GBR	Global BSE Risk (European Commission)
GoN	Government of Namibia
HACCP	hazard analysis critical control points
HPAI-O	highly pathogenic avian influenza in ostriches
KAZA	Kavango-Zambesi
KZN	KwaZulu-Natal
LSD	lumpy skin disease
NCA	northern communal area
OIE	World Organisation for Animal Health
PPR	peste des petits ruminants
PVS	evaluation of performance of veterinary services
RSA	Republic of South Africa
RVF	Rift Valley fever
SADC	Southern African Development Community
SAT	South African territories
SPS	sanitary and phytosanitary
SVCF	south of the veterinary cordon fence
TADs	transboundary animal diseases
TAHC	Terrestrial Animal Health Code (of the OIE)
TFCA	transfrontier conservation area
USA	United States of America
VCF	veterinary cordon fence
vCJD	variant Creutzfeldt-Jakob disease
WAHID	World Animal Health Information Database (of OIE)
WTO	World Trade Organisation

1. Executive summary

Namibia's livestock export zone (i.e. the area south of the Veterinary Cordon Fence – VCF) has not suffered a trade-influencing animal disease outbreak, other than Rift Valley fever (RVF) in 2010, for more than 40 years. That fact demonstrates the efficiency of preventative measures currently in place. However, widening occurrence and increasing prevalence of some transboundary animal diseases (TADs) in the Caprivi and neighbouring countries, foot and mouth disease (FMD) and RVF especially, made re-assessment of current animal disease threats and counter measures that support the country's N$ 2.4 billion a year livestock industry necessary.

The occurrence of RVF in south-eastern and central Namibia in 2010 has been perceived by some within Namibia as resulting from infected animals entering the country across the South Africa border where widespread epidemics of RVF occurred in 2008-2010. It is much more likely that infected mosquitoes introduced the infection across the border because that is the usual way in which RVF epidemics spread. Furthermore, the lineage of RVF virus (designated H) that caused the South African epidemic in 2010 was first detected in the Caprivi in 2004. The bottom line is that RVF is endemic to almost all countries in sub-Saharan Africa, and Namibia would be wise to accept that the infection is endemic to the country. This should not affect trade between Namibia and South Africa but could be a complication for exports further afield than southern Africa.

Similarly, FMD is a regional problem; the sudden and unexpected up-surge in occurrence of cattle outbreaks in the last 10-12 years presenting a major regional problem. After a 20 year period of low prevalence between 1981-2000, a large number of outbreaks occurred in Botswana and South Africa (as well as other countries for which accurate data are unavailable) from 2001 onward. The majority of the recent FMD outbreaks in southern Africa have occurred in and around the Caprivi which lies at the core of the Kavango-Zambesi Transfrontier Conservation Area. The net result of this development is that the threat posed by FMD to Namibia's livestock and meat exports has increased substantially.

Hazards posed by all TADs as well as possible mechanisms for their introduction into the export zone were assessed on a semi-quantitative basis[1]. It was concluded that FMD, contagious bovine pleuropneumonia (CBPP – longsiekte), RVF, contagious caprine pleuropneumonia (CCPP – bok-longsiekte) and PPR all present significant risks of entering the export zone and causing outbreaks with potentially unfortunate economic consequences. These risks arise predominantly from the possibility of infected animals, both wild and domestic, entering the export zone by crossing the fencing system that protects the north-east of the country. The fencing system therefore constitutes a critical control point (CCP) and like all CCPs needs to be regularly and, preferably, independently audited. However, detailed audit reports on the various fences that make up the system were not available which meant that the efficiency of the system as a whole could not be objectively assessed; certainly not quantified. Furthermore, there are differing opinions on the efficacy of the fencing system but these are mostly anecdotal. An option to ensure that the fence is effective is to outsource the maintenance of the fence, while the Directorate of Veterinary Services remains the competent authority responsible for conducting audits on the maintenance work. An effective Veterinary

[1] Deficiencies in available data did not permit a full quantitative assessment.

Cordon Fence (VCF) remains the single most important factor that will prevent the outbreak of crippling diseases south of the VCF.

A particular issue relates to the 30 km section of lowered Botswana fence that runs along the southern boundary of the Caprivi (Bwabwata National Park) between Botswana's Northern Buffalo Fence and the Kwando River. This has established a wildlife escape-route for elephants and buffalo from northern Botswana into south-eastern Angola via the Caprivi. While this has enormous benefit for wildlife conservation in the Region, buffalo are likely to migrate steadily westwards in southern Angola and could present a FMD threat to the Kavango area of Namibia because there is no barrier protecting Kavango from animal incursion from Angola.

Two animal disease threats were identified that require special consideration in future because they potentially pose a risk to Namibia's export zone, *viz.* CCPP and PPR. The present system for movement of small stock across the VCF employing a quarantine system would be inadequate to prevent the entry of these two diseases – which could be present in neighbouring countries – into the export zone.

Potential importation of TADs via meat and meat products was assessed as presenting much lower risk for their entry into the export zone. This is because meat and meat products are much less efficient transmitters of the infections under consideration than live animals and also because a number of them [e.g. FMD, African swine fever (ASF) and classical swine fever (CSF)] need to be multiplied through infection of pigs, usually resulting from swill-feeding. This practice is rare if it occurs in the area south of the VCF which renders the risk concomitantly low. However, a significant problem has been created for Namibia by the loss of South Africa's FMD-free zone status resulting from the SAT 1 outbreak in northern KwaZulu-Natal in February to March 2011. This is because 94% of all Namibia's meat and meat product imports are pork or processed pork, most of it derived from South Africa. A small proportion (about 7%) of meat or meat product imports into Namibia between April to December 2011 (i.e. after South Africa was delisted as having a FMD-free zone) was identified as being potentially risky in respect of FMD and other diseases. This assessment may be a consequence of the data supplied to the consultants being insufficiently detailed data, i.e. the precise origin of some imports was unclear.

The potential economic impact of disease outbreaks would depend on (1) the specific disease because different diseases vary in their trade effects, (2) the speed and efficiency with which an outbreak is eliminated and (3) the management strategy employed against the outbreak because the resumption of exports is dependent on the control strategy adopted. These factors cannot be predicted accurately but the consultants nevertheless calculated probable economic impacts for each of the most likely scenarios based on the most probable course of events.

The economic impact estimates were based on the composition of the integrated livestock value chain. The sizes of the components of the value chain were estimated for this purpose:

- Livestock producer income – N$ 2.4 billion per annum;
- Expenditure by livestock producers – N$ 152 million per month;
- Income of livestock auction and transport industries – N$ 205 million per annum;
- Value addition by abattoirs – N$ 325 million per annum;
- A labour force of approximately 17 000.

A summary of the scenarios and probable impact is provided in the following table. The biggest impact would result from an outbreak of FMD south of the VCF (SVCF), for which a 'vaccination-to-live' strategy is adopted, amounting to N$ 2.2 billion.

Table 1 Possible future transboundary animal disease outbreak scenarios in Namibia showing estimated probability and possible economic impact

Disease	Scenario	Probability	Economic impact
FMD	Outbreak limited to one farm and surrounding area – stamping out of all infected and in-contact animals	Moderate	N$ 779 million
	Outbreak limited to single area SVCF – vaccination used to control outbreak but all infected and vaccinated animals stamped out (vaccination-to-die)	Moderate	N$ 1.15 billion
	Outbreak limited to single area SVCF – vaccination used to control outbreak but vaccinated animals not stamped out (vaccination-to-live)	Low	N$ 2.2 billion
	Outbreak NVCF (Omusati, Ohangwena, Oshana, Oshikoto) – vaccination used to control outbreak without stamping out	Moderate	N$ 332 million
RVF	Outbreak in the Windhoek District	Moderate	N$ 623 million
CBPP	Outbreak in the Outjo District – stamping out of all infected and in-contact animals	Low	N$ 642 million
CCPP	Outbreak in Outjo District – stamping out of all infected and in-contact animals	Moderate	N$ 315 million
PPR	Outbreak in Tsumeb District – stamping out of all infected and in-contact animals	Low	N$ 742 million

The main recommendations developed as a result of this study are the following:

- Regular and independent auditing of the fencing system protecting the export zone is essential in order to verify that it is functioning optimally; it is further suggested the auditing system could be founded on a HACCP (hazard analysis, critical control points) approach.
- Investigate the effectiveness of outsourcing of maintenance of the Veterinary Cordon Fence , while the Directorate of Veterinary Services remains the competent authority which will regularly audit the condition of the fence.
- The quarantine system for movement of small stock from north to south of the VCF needs be re-evaluated to ensure efficacy against PPR and CCPP.

- Applications for import permits for meat and meat products should be more carefully evaluated and, ideally, officials of the DVS who have the responsibility of checking import consignments be provided with the technology to test samples of imports for compliance with processing requirements.
- The livestock industries and DVS should jointly consider whether planning for creation of a containment zone in the event of a limited FMD outbreak in the FMD-free zone would be advisable or not, i.e. as provided for in Article 8.5.8 of the World Organisation for Animal Health's (OIE) Terrestrial Animal Health Code. This could ameliorate the economic impact of such a FMD outbreak.

2. Introduction

Namibia has spent many years and considerable resources in ensuring that it has access to high-value markets for its beef and related commodities/products. The meat industry of Namibia is currently worth approximately N$ 1.6 billion annually which makes up 80% of agricultural GDP and 4% of national GDP (P. Strydom, 2011). It is therefore vital that the requirements for access to international markets are maintained. That is dependent, among other factors, upon preservation of Namibia's excellent reputation as a source of safe, high quality meat and meat products.

Following the widespread occurrence of Rift Valley fever (RVF) in South Africa (RSA) in 2010 and apparent spill-over into Namibia[2] and the recent upsurge in occurrence of foot and mouth disease (FMD) outbreaks in the SADC (Southern African Development Community) Region, a risk analysis for imports of livestock and meat and meat products into Namibia was seen as important to assist in protecting the Namibian livestock and meat industry, i.e. identification and quantification of animal disease risks that potentially threaten the future viability of the meat industry of the country.

Live animal imports into Namibia are limited in comparison to exports. In 2010, a total of about 2 000 cattle, 1 700 sheep, 300 goats and 150 pigs were imported into the country, the vast majority originating from RSA.

As far as animal products are concerned the importation of pork and processed pork currently represents 94% of all imports. Namibia does not produce these products in sufficient quantities to satisfy local demand; the production of pork being financially difficult due to high feed costs, while processed meat is being imported as it is not produced locally in sufficient quantity due, reportedly, to the specialized expertise required for its manufacture. Mutton and beef imports represent only 2% and 4% respectively of total meat imports. Pork and processed pork products imports totalled 3 489 and 3 465 tonnes respectively in 2010 while beef and mutton imports stood at 330 and 172 tonnes respectively.

Livestock production in Namibia has historically been divided by the VCF established to prevent the spread of FMD and CBPP from the Northern Communal Area (NCA) southwards into the export zone of Namibia (Figure 1). Nevertheless, in recent years, deboned beef from the Katima Mulilo and Oshakati abattoirs has been sold south of the VCF, viz., 670 and 451 tonnes respectively in 2010.

[2] This is a contentious point because the most recent scientific information suggests an alternative view, discussed below.

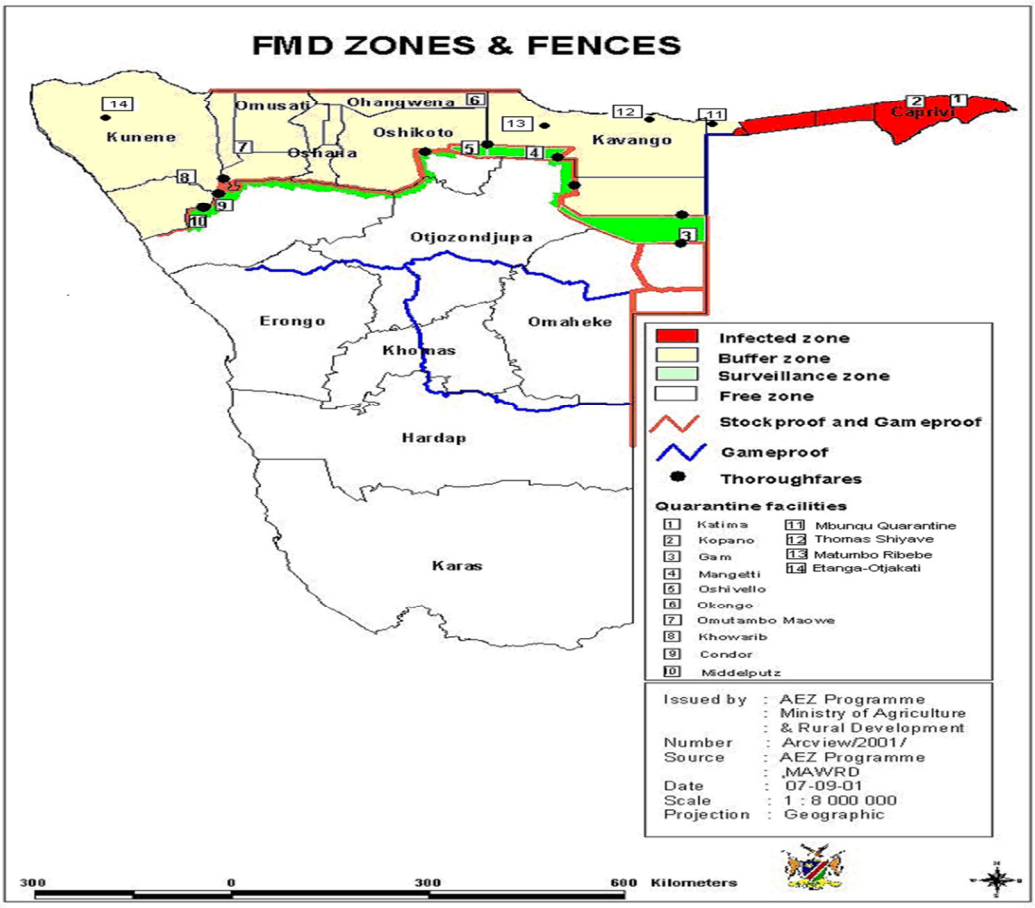

Figure 1 Namibia's FMD zones and associated fences

3. The regional situation in respect of transboundary animal diseases (TADs)

A recent investigation which examined the animal disease situation in countries that contribute to the Kavango-Zambesi (KAZA) Transfrontier Conservation Area (TFCA) as well as countries that border on those KAZA TFCA countries (Thomson and Penrith, 2012), concluded that:

- Published information on animal disease, including major TADs, is incomplete for most countries.
- Reporting on FMD by Botswana and Namibia appears to be timely and accurate and to provide a true reflection of the situation; an imperative dictated by the export trade in beef.
- Reporting on FMD by Angola, Tanzania and Zimbabwe is less likely to reflect the true situation in those countries and this may be a problem for their neighbours.
- Apart from FMD, diseases of particular concern for KAZA countries include CBPP, bovine brucellosis, bovine tuberculosis, rabies and canine distemper for wildlife where they share their habitat with domestic animals[3].
- PPR has been identified as an immediate threat by SADC to the entire region. Although the only countries that have officially reported that the disease is present are Democratic Republic of Congo

[3] Note: Diseases included under this bullet other than CBPP, while being important to animal and human health in some situations, are generally not considered important TADs and are therefore not decisive when it comes to trade, particularly trade in meat and meat products.

(DRC) and Tanzania, seropositive goats were found in Zambia near the border with Tanzania, thus bringing the infection closer to the KAZA area.

- It was not possible to evaluate the efficacy of control measures applied by the various countries but it is fair to say that the reports of diseases indicate that much more is needed for effective control.
- Disease outbreaks, in particular FMD and RVF, appear to be increasing in the region. Although some of this may be due to improved reporting, FMD is widely recognised to be on the increase in SADC countries and this is attributed at least in part to loss of effectiveness of vaccination.

This unsatisfactory situation within the SADC region is supported by reports from SADC Country Veterinary Services to the World Organisation for Animal Health (SADC FMD Bulletin – www.wcs-ahaead.org).

In the period 2005-2010 the following TADs (excluding those that affect poultry and companion animals exclusively) were reported to the OIE as being active: FMD, RVF, lumpy skin disease (LSD), African swine fever (ASF), anthrax, rabies, highly pathogenic avian influenza of ostriches (HPAI-O), contagious bovine pleuropneumonia (CBPP) and peste des petits ruminants (PPR). These diseases therefore pose a threat to Namibia as well. However, some are endemic to Namibia and therefore do not pose an exclusively external threat, e.g. FMD, ASF, RVF, LSD, anthrax and rabies.

A disease that is little mentioned in the context of TADs is contagious caprine pleuropneumonis (CCPP), a disease that causes significant losses in eastern Africa, including in Tanzania (WAHID – www.oie.int). It is likely that were CCPP to be introduced into Namibia, especially SVCF, it could have significant effect on the export of live goats by Namibia to RSA.

The situation with respect to individual transboundary animal diseases (TADs) in the SADC Region are discussed individually below.

3.1 Foot and mouth disease (FMD)

The FMD situation in the SADC Region has deteriorated significantly in the last 10 years, the last five particularly (Figure 2). Especially concerning have been apparently bizarre cross-border movements of SAT viruses. These have been detected on the basis of genome sequencing of some recent isolates (unfortunately for others the information regarding genome sequences is not in the public domain) which has enabled comparison with historic distributions of SAT viruses in southern Africa. An account of these events was provided recently by in the 3rd edition of the Southern African FMD Bulletin (December 2011 – www.ahead-wcs.org). The reasons for this heightened FMD activity and the unexplained transboundary spreads are open to debate but three factors are likely to be significant, *viz.* (1) an apparent decline in the efficacy of vaccines used against SAT serotypes of FMD virus in the SADC Region.

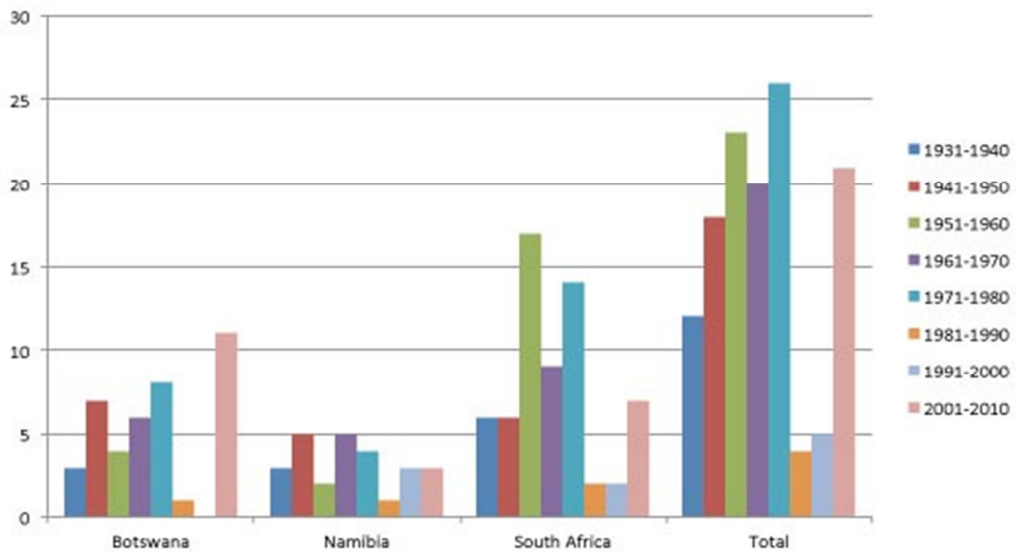

Figure 2 Occurrence of FMD outbreaks in three southern African countries in the last eight decades

(SADC Secretariat, 2009), (2) declining standards of control on the part of country Veterinary Services, especially vaccination programmes that do not administer vaccines to the numbers of animals and at the frequency required to generate adequate levels of herd immunity and (3) increasing numbers of wildlife and cattle in endemic areas (such as the Caprivi and Ngamiland, Botswana), resulting in increased wildlife/livestock interaction.

In South Africa – Namibia's most important regional trading partner for livestock and livestock products – a recent problem has been the SAT 1 outbreak (reported as being largely clinically unapparent) in northern KwaZulu-Natal (KZN) in February/March 2011. That resulted in RSA being delisted by the OIE as having a zone free from FMD where vaccination is not practised. This, in effect, equates to the whole of RSA now being classified as a potentially infected area despite the fact that the National Directorate of Veterinary Services reported the outbreak as having been resolved by 18/07/2011 (www.oie.int). Apart from anything else, this has stopped exports of cloven-hoofed livestock and wildlife (mainly high value breeding animals) from RSA to other SADC countries, Namibia in particular. It will probably take the RSA in the region of two years to regain its FMD-free status for areas other than the Kruger National Park and surrounds. A plan for re-establishing RSA's FMD-free zone has apparently been formulated by the National Directorate of Veterinary Services (DVS) but that plan is not in the public domain.

Figure 3 shows the distribution of FMD outbreaks reported to the OIE in the last three years and their geographic relationship with the Caprivi and Namibia generally. This map should be viewed with caution, however, because some countries – Zimbabwe particularly – do not report outbreaks routinely and for that reason such maps can be misleading.

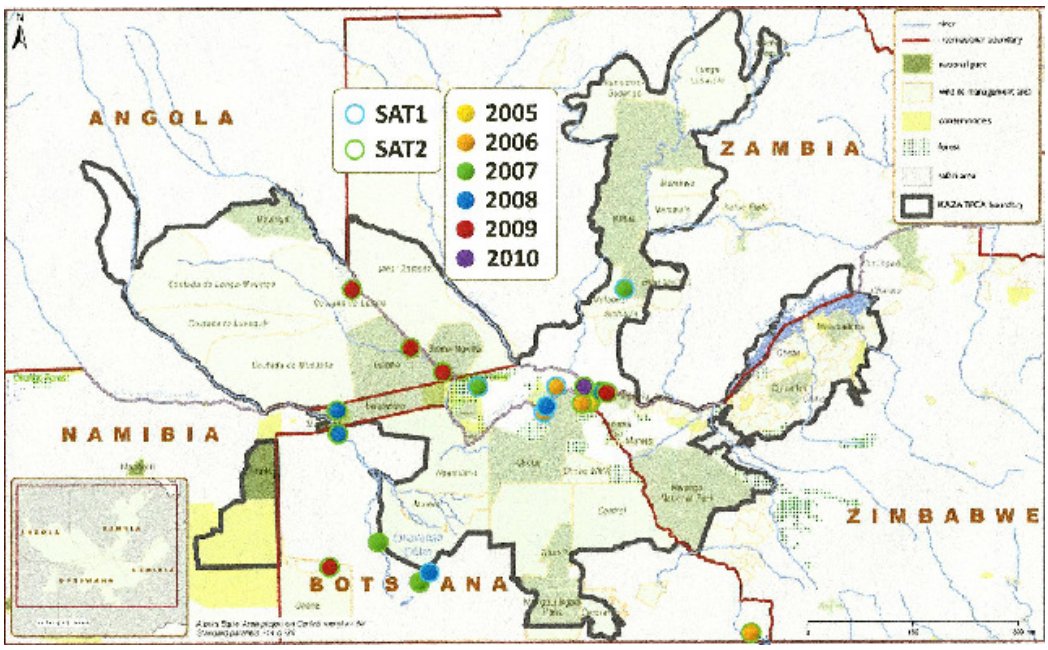

Figure 3 Occurrence of FMD outbreaks in and around the Caprivi/Kavango-Zambesi Transfrontier Conservation Area (2005-2010)

3.2 Rift Valley fever (RVF)

The OIE's TAHC (Article 8.11.1 – www.oie.int) points out that the historic distribution of RVF is sub-Saharan Africa, Madagascar and the Arabian Peninsula. Therefore any country in those locations is considered potentially infected. Furthermore, the same article emphasises that in inter-epidemic periods (which may last several decades) viral activity (referred to as 'prevalence' in the Article), may be difficult to measure in either mammalian hosts or mosquito vectors. Nevertheless, the RVF chapter recognises that ongoing surveillance aimed at both mammalian and arthropod vectors is important for identification of infected countries or zones 'without disease'.

For a country or zone within the historic distribution of RVF, freedom from infection may be claimed if a surveillance programme directed at humans, animals and mosquitoes has shown no activity over the preceding four years (Article 8.11.3.2 of the TAHC). Such an exercise would be both expensive and logistically challenging in Namibia. Furthermore, it is increasingly evident that RVF distribution and activity rates are a complex matter and that the recommendations of the TAHC in relation to RVF are unrealistic (Grobbelaar *et al.*, 2011). It is highly probable, based on the findings in this paper, that southern Africa needs to be considered as a permanently endemic area. Of course, that does not preclude the occurrence of long inter-epidemic periods, i.e. when no disease is evident in livestock or people and viral circulation in vectors difficult to detect.

Lineage H of RVF virus (15 lineages have so far been identified) was first recognised in the Caprivi in 2004. In 2009 this viral lineage caused focal outbreaks of RVF in the Northern Cape Province of RSA and in 2010 lineage H was associated with widespread occurrence of RVF in animals and humans in the RSA – including 26 human deaths among 244 confirmed cases (Figure 4; Grobbelaar *et al.*, 2011).

RVF occurred in the south and centre of Namibia in 2010 (presumably also lineage H although this remains to be confirmed) and in the NCA in 2011 (WAHID, 2010/2011 – www.oie.int).

It is clear from the above that RVF cannot be (1) considered a new introduction to Namibia, (2) that the infection did not enter the country for the first time in 2010 or (3) that RSA represents a threat to Namibia as far as RVF is concerned – RVF is simply a regional problem with RVF viruses being capable of unpredictable long-distance spread, almost certainly resulting from mosquito dispersal determined to a large extent by climatic factors.

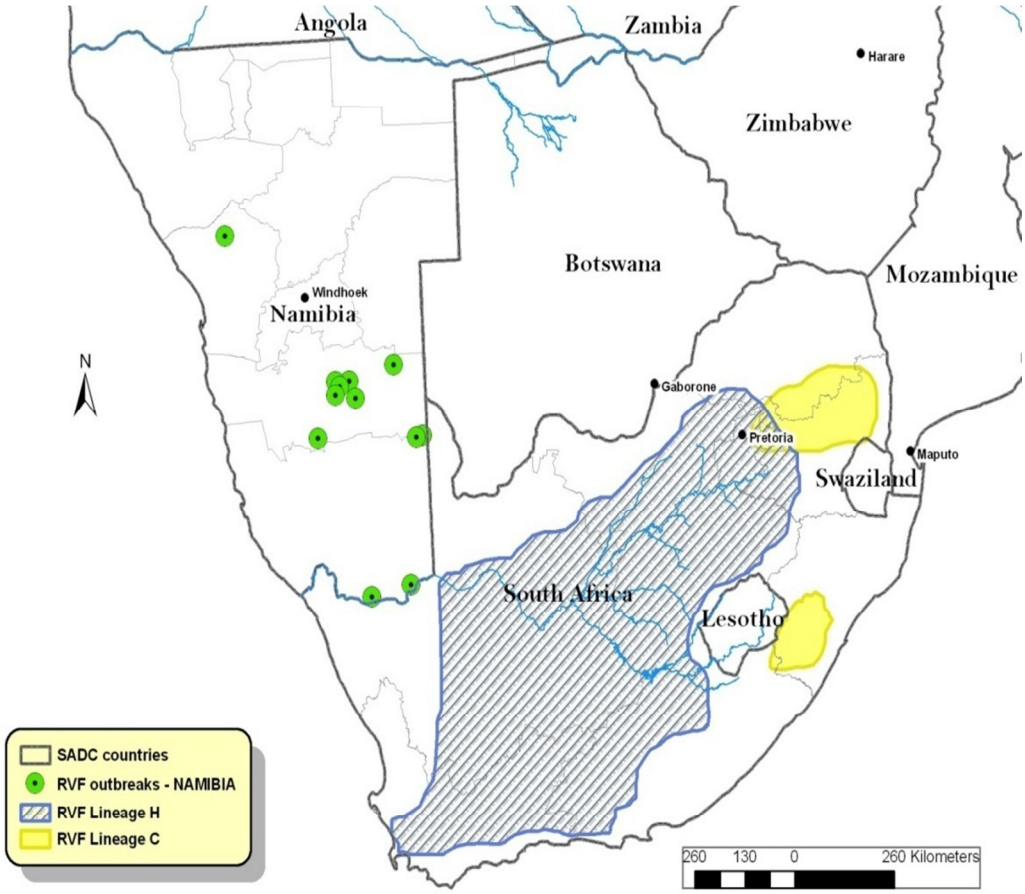

Figure 4 The distribution of Rift Valley fever (RVF) outbreaks in South Africa and Namibia in 2008-2010 (Note widespread occurrence of lineage C and H viruses in South Africa in 2009/2010. Lineage that occurred in Namibia is so far undetermined – modified from Grobbelaar *et al.,* 2011)

So while, according to current OIE recommendations, it would be possible for Namibia to claim freedom from RVF by 2015, i.e. by showing that no viral activity is detected in the intervening period, this is unlikely to be achievable in the light of current knowledge (Grobbelaar *et al.*, 2011). Such an attempt would therefore have a high probability of turning out to be futile.

3.3 Bovine spongiform encephalopathy (BSE)

This disease, which ironically has never occurred naturally in the Southern Hemisphere as far as is known, is nevertheless a problem for meat exporting countries in southern Africa because of trade rules associated with it. These trade rules and conventions demand – unreasonably many contend – massive expenditure on surveillance to meet international standards for access to international markets for beef and beef products.

The situation in the SADC Region with respect to BSE has recently been reviewed (Thomson, 2010). The executive summary of that report is quoted below because it summarises the present regional situation:

> *'The shapes of the bovine spongiform encephalopathy (BSE) and variant Creutzveldt-Jakob disease (vCJD) epidemic curves – almost exclusively confined to the northern hemisphere – strongly suggest that these two related diseases will soon occur at a very low rate world-wide. This control has been achieved primarily by the simple expedient of preventing waste tissues from slaughtered cattle being incorporated into cattle feeds. These measures need to be maintained to ensure that BSE and vCJD will not recur because the origin of the BSE epidemic is uncertain.*
>
> *Earlier investigations into BSE in some SADC countries indicated that a possibility exists for either infected cattle or meat and bone meal (MBM) from infected countries in Europe having been introduced into southern Africa in the 1980-1990s. There is some dispute over this issue but the possibility has not been disproven; certainly in respect of live cattle imports. The likelihood of more recent introduction (i.e. since 2003) is much lower.*
>
> *The important question, however, is: Had infected MBM or cattle been introduced to the Region in the past, could the BSE agent have been recycled by animal feeding practices in Botswana, Namibia, South Africa, Swaziland or Zimbabwe? This possibility is specifically legislated against in each of the five countries through making feeding of ruminant proteins (in some cases all animal proteins) to cattle illegal. The important issue though is to what extent this legislation is enforced.*
>
> *For Botswana, Namibia and Swaziland, 'stable' situations (i.e. overall management of measures designed to prevent the recycling of the BSE agent) have been instituted and are enforced. For these countries the BSE risk is therefore likely to be negligible at present. In the cases of South Africa and Zimbabwe, BSE-management measures have so far been less satisfactorily implemented (i.e. the BSE situation is more 'unstable'). For South Africa particularly, well-understood measures required to achieve stability have not been introduced or are inadequately enforced as shown by information readily accessible via the internet. This is possibly a reflection of the more complex livestock production/animal feed industries in South Africa as compared to neighbouring countries and also the decentralised (provincialised) official veterinary service.'*

3.4 Contagious bovine pleuropneumonia (CBPP)

Angola and Tanzania have been endemically infected with CBPP for a long period of time, particularly in the case of Angola, resulting in a continuous threat to the NCA. That is a prime reason for maintenance of the Veterinary Cordon Fence (VCF – Figure 1).

CBPP entered Ngamiland (northern Botswana) in 1994-1995 and resulted in the destruction and disposal of all 250 000 cattle in that area (subsequent restocking followed the mass-destruction). In the last 15-20 years the disease has also become established in western and north-western Zambia. However, reports on CBPP to the OIE from Angola and Zambia are inadequate to obtain a currently reliable appreciation of the situation in those countries (www.oie.int – WAHID).

3.5 Classical swine fever (CSF)

Classical swine fever, within the last century, only became important in southern Africa in 2005/2006 when a large outbreak occurred in the Eastern Cape Province (RSA) as a result of introduction from an unknown source. However, apart from localised spread to the Western Cape the disease did not disseminate widely and was resolved by 'stamping out' by the end of 2006 (WAHID - www.oie.int).

As far as is known, there are currently no sources of CSF virus close to the borders of Namibia. However, introduction from more distant locations could occur through the importation of pork and processed pork.

3.6 African swine fever (ASF)

This disease is endemic to many parts of southern Africa and is maintained in a sylvatic cycle between warthogs and argasid ticks of the genus *Ornithodoros.* The infection has little untoward effect on either warthogs (or other wild suids) or the ticks. However, when the infection is introduced into domestic pig populations it causes a highly fatal haemorrhagic disease which spreads rapidly by direct contact as well as indirectly in a number of ways but principally through swill feeding. In some parts of southern Africa such as west-central Malawi, eastern Zambia, the Angonia District of Mozambique and, historically at least, parts of Angola (the present situation in Angola is unknown) the infection became endemic within domestic pig populations, i.e. wild suids are not involved in maintaining the infection.

ASF is consequently endemic to large parts of Namibia (potentially wherever warthogs occur), including south of the VCF. Long experience with this disease has enabled it to be effectively managed. It has only rarely caused a problem in Namibia because domestic pigs, especially in the south of the country, are few in number.

3.7 Peste des petits ruminants (PPR)

There is widespread fear that PPR (a rinderpest-like disease of goats and sheep) is spreading inexorably southward in eastern Africa. It is currently endemic to most of West and East Africa, including Tanzania which it reached in 2008. It is also present in the DRC.

This disease is a clear and significant threat to Namibia because Zambia has uncontrolled/poorly controlled borders with Tanzania, DRC and Namibia.

3.8 Contagious caprine pleuropneumonia (CCPP)

This disease is reported as being present in Angola and also Tanzania; for Zambia no information on possible occurrence has been provided to the OIE (WAHID - www.oie.int). For these reasons CCPP is a clear threat to Namibia, more so than is the case for PPR. However, CCPP is not considered as dangerous as PPR probably because it does not spread as quickly or deliver the same short-term impact. However, CCPP can cause devastating mortality in goat flocks. It is therefore a clear threat to Namibia and could potentially already be present in the NCA.

Treatment with tetracycline is possible and vaccines can be produced against the F38 strain. However, obtaining such vaccine may be difficult because it is not widely available.

3.9 Anthrax

Most parts of the world, including sub-Saharan Africa, Europe and North America are not free from this disease; it is a disease that occurs sporadically over a wide area of the globe. Dissemination by international trade in meat is also most unusual. For those reasons, while its control in Namibia is important for human health and efficient livestock production, it is not a disease likely to interrupt trade unless it were to occur widely at high incidence levels.

3.10 Favourable/unfavourable circumstances for Namibia in respect of transboundary animal diseases (TADs)

Namibia is fortunate from the animal disease perspective in that, for its size, it has relatively short boundaries with neighbouring countries, i.e. the whole western boundary is formed by the Atlantic Ocean. Furthermore, most the country is arid or semi-arid and the eastern borders with Botswana and South Africa are mostly in areas where there are low densities of livestock and wildlife. The general aridity of the country has obvious disadvantages but, on the other hand, such climatic conditions do not favour parasites and pests. One of the reasons that Namibian weaners are so popular with RSA feedlots is their general good health on arrival (D. Verwoerd, personal communication, 2011).

The north-east of the country is much less arid – particularly the Caprivi – where the Zambesi-Okavango-associated wetlands provide an ideal habitat for buffalo that naturally maintain SAT serotypes of FMD virus within breeding herds. These habitats are also ideal for the maintenance of a number of arthropod-transmitted infectious agents. It is highly likely that RVF, for example, is endemic to this area and the outbreaks recorded in 2011 were therefore not surprising (Grobbelaar *et al.*, 2011). Furthermore, the north-east of the country and the eastern border with Botswana/RSA are effectively separated from the rest of the country by the VCF and the boundary fences – the eastern boundary is protected by three fences, a double fence on the Botswana side and a game-proof fence on the Namibian side (Figure 1). However, the consultants have not been able to obtain verifiable information on the integrity and efficacy of these fences. They have undoubtedly helped keep the southern parts of Namibia free from FMD outbreaks since the mid-1960s, i.e. a period of more than 45 years but, on the other hand, there are anecdotal reports indicating that the state of repair is inadequate.

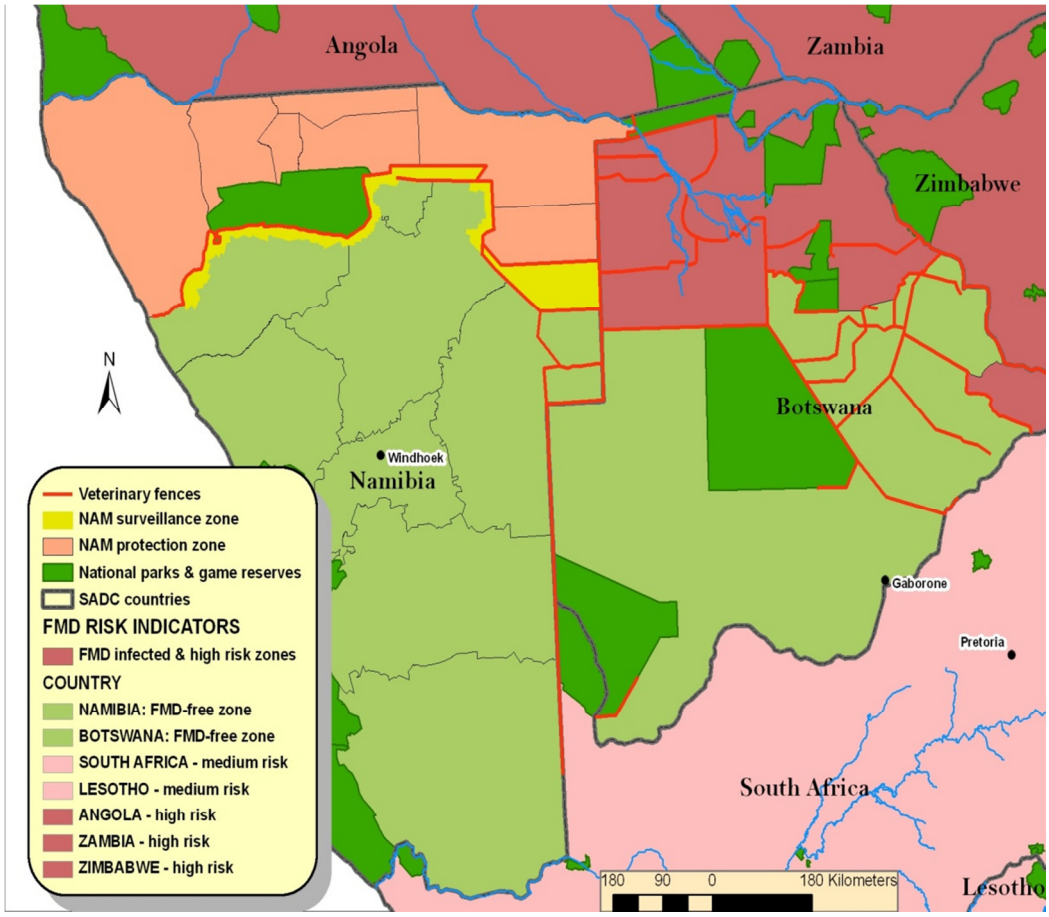

Figure 5 FMD situation in and around northern Namibia showing the developing FMD threat to the Kavango region

CBPP and FMD have for many years been a threat to northern Namibia because of more-or-less free movement of cattle between southern Angola and northern Namibia, i.e. one of the reasons why the VCF was constructed in 1961-1965 with addition of the northern Etosha National Park fence in 1972-1973 (R Taylor, personal communication, 2011). Over the period 1953-1999 Angola reported yearly outbreaks of FMD but reports then ceased, presumably as a result of the collapse of the colonial power and the prevailing war (Thomson, 1994). Ironically, animal disease pressure on northern Namibia decreased as a result of the fighting for independence and the Angolan Civil War (approximately 1974-1995) because livestock and wildlife numbers were greatly depleted by armed forces in the field; so there were just not enough animals to sustain infectious agents at a high level. However, the potential for the return of this risk is present as a result of the current livestock restocking programme in progress in Angola.

A longer term problem that deserves attention is that a section (about 30 km long – stretching between the Kwando River westwards to Botswana's Northern Buffalo Fence) of the fence along the southern border of the Bwabwata National Park has been lowered by the Botswana authorities. This has allowed elephants and buffalo to move through the Caprivi and into southern Angola. If these buffalo move further westward in Angola they could transmit FMD viruses to cattle and the infection could then spread back into the Kavango region (Figure 5).

4. International and regional sanitary standards associated with trade in animal commodities and products

International standards related to trade in animal diseases are the responsibility of the World Organisation for Animal Health (OIE), mandated by the World Trade Organisation's (WTO) Agreement on the Application of Sanitary and Phyto-sanitary Measures (SPS Agreement). These standards (for terrestrial animals) are contained in the Terrestrial Animal Health Code (TAHC) which is up-dated annually and the provisions published on the OIE's website (www.oie.int).

Access to markets is also governed by specific standards and regulations of the countries in which specific markets are located, the most important of which, for Namibia, are the EU, Norway, South Africa and the USA (in the latter case because Namibia has progressed well in obtaining access to the US beef market although exports to that destination have not yet commenced).

For the EU there are guidelines on how access for meat and meat products should be approached on the basis of the major European Commission (EC) regulations concerned, *viz.* 852/2004, 853/2004 and 854/2004 and amendments. These are all accessible via the European Commission website.

Being a member of the European Economic Area (EEA), although not the European Union (EU), Norway's import regulations for meat and meat products are largely harmonised with those of the EU, although there are special requirements in relation to *Salmonella*.

For South Africa the process for meat importation is set out in a document accessible via the internet – Importation of Meat: Requirements and Procedure (www.nda.agric.za/vetweb/). However, the provisions which will determine whether an import permit will be granted for specific commodities/products or not are not provided although the inference is that a risk assessment will be used to determine specific provisions. Exports of meat commodities/products to the USA are somewhat similar to those for South Africa (i.e. specific requirements are not provided). The process is outlined on the relevant website (www.fsis.usda.gov/regulations/Import_Information/index.asp) dealing with regulations and policies. It is clear that the decision as far as animal health aspects are concerned depends on the Food Safety and Inspection Service (FSIS) decision regarding 'equivalence determination'.

The only animal diseases for which the relevant international standard-setting body (OIE) provides accreditation are rinderpest (now eradicated from the globe so no longer practically relevant), FMD, CBPP and BSE. For Namibia the OIE lists on its website the following disease situations for these diseases:

- Rinderpest – free of the disease (infection)
- FMD – freedom for the zone designated by the DVS to OIE in February 1997 (i.e. SVCF)
- CBPP – limited to one or more zones (i.e. area north of VCF)
- BSE – undetermined BSE risk.

Prior to 2007 it was possible for countries outside the EU to apply to the EU Food Safety Authority (EFSA) for GBR (Global BSE Risk) classification. Namibia, following application, was recognised as a GBR III country (BSE likely to be present but not confirmed). Progress to GBR II status was mooted for Namibia but this was not in the end possible due to the volume of trade with RSA which was at that time also categorised by the EFSA as GBR III.

Since 2007 the EFSA has ceased categorizing countries and left this to the OIE because of the latter's global mandate. At present Namibia has no recognition with respect to BSE from the OIE and is therefore considered to be a country where the risk is undetermined.

Fortunately, the OIE recognises that deboned beef is a safe product in respect of BSE (Articles 11.5.1.1g and 11.5.14 – www.oie.int). This means that exported deboned beef does not require to be derived from a country recognised by the OIE as having 'negligible' or 'controlled' BSE risk.

5. TADs policy and management strategies in Namibia

National legislation pertaining to livestock production – Acts as amended with their Regulations and Government Notices – are the following:

- Animal Diseases and Parasites Act No. 13 of 1956
    - Animal Health Act No. 1 of 2011 (this Act, although promulgated, is apparently not being implemented as yet pending availability of the associated regulations)
- Animal Identification Regulations: Animal Diseases and Parasites Act, 2009 *(new animal identification including on-farm double ear tagging of cattle)*
- Stock Brands Act No. 24 of 1995
- Regulations in terms of the Stock Brand Act No. 24 of 1995 from 2004
- Prevention of Undesirable Residue in Meat Act No. 21 of 1991
- Regulations in Terms of The Prevention of Undesirable Residue in Meat Act No. 21, 1991 from 1994 *(prohibition of hormonal growth promoters and other substances)*
- Medicines and Related Substances Control Act No. 13 of 2003
- Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act No. 36 of 1947
- Prohibition in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act 36 of 1947 *(prohibition of the feeding of ruminant derived proteins to ruminants)*
- Stock Theft Act 12 of 1990
- Animal Welfare Act of 1962
- Meat Industry Act No. 12 of 1981 as amended

The Animal Diseases and Parasites Act (No. 13 of 1956) is effectively the current legislation dealing with management of animal diseases and import and export of animals and animal products because although a new Animal Health Act has been promulgated, the accompanying regulations are apparently not yet available.

Namibia has a Contingency Plan for FMD which suggests it is either newly developed or has recently been revised (Directorate of Veterinary Services, 2011). If there are similar plans for other diseases these have not been made available to the consultants.

The FMD Contingency Plan is a well prepared document which seems to comply with international norms. However, the Plan does not mention a new provision made available by the OIE for creating a 'containment zone' in the event of a limited FMD outbreak in FMD-free countries or zones, i.e. SVCF in the case of Namibia (Article 8.5.8 of the TAHC). The idea is to lessen the economic impact of a small outbreak in a large country or zone by isolating the FMD outbreak, thereby enabling commodities and products produced elsewhere in the country or zone to continue to be exported. Most major countries that are free from FMD have made provision for creation of a containment zone should circumstances arise that make such a course of action advisable. Namibia, judging by the contingency plan, will not consider such a course of action. Whether this is a wise decision is questionable.

6. Sanitary consequence of the occurrence of diseases identified by this investigation

An outbreak of one of the diseases identified in this study in the area south of the VCF (SVCF) in Namibia is likely to have the following effects:

6.1 Foot and mouth disease (FMD)

The TAHC defines the following periods for recovery of the status of a 'zone free from FMD where vaccination is not practised', i.e. Article 8.5.9:

- **Three months** after the last case where a stamping out policy and serological surveillance are applied;
- **Three months** after slaughter of all vaccinated animals where a stamping out policy, emergency vaccination and serological surveillance are applied;
- **Six months** after the last case or vaccination (whichever is the latest) where a stamping out policy and emergency vaccination **not** followed by slaughter of all vaccinated animals and serological surveillance are applied;
- **Twelve months** after the last case where a stamping out policy is not applied provided that there:
    - has been no evidence of infection in the last 12 months,
    - has been no vaccination within the last 12 months.

By these standards it would mean that a FMD outbreak SVCF is likely to halt all exports for at least three months and possibly – depending on the control options adopted – for up to a year. However, the OIE has in recent years introduced the possibility of limiting the trade effects of a FMD outbreak within a FMD-free country or zone through the establishment of a so-called containment zone (Article 8.5.8), as mentioned in the section above. In effect this enables countries to establish a temporary containment zone in the event of a single limited outbreak from which the rest of the FMD-free country or zone is effectively isolated. Such containment zones are not accredited by the OIE so trade between the affected country and importing countries needs to be agreed bilaterally. It is surprising that the contingency plan for FMD drawn up by Namibia's DVS does not mention this fact. The Meat Board and Meatco should consider bringing this apparent deficiency to the attention of the DVS.

The attitude of the EU, Norway and RSA to imports of meat following an outbreak of FMD SVCF are likely to be at least as severe as those recommended by the OIE and possibly more punitive because there is no evidence on the parts of the CAs of these trading entities that they will accept some of the more progressive standards adopted by the OIE in recent years (e.g. Articles 8.5.8 and 8.5.25).

6.2 Rift Valley fever (RVF)

In the existing circumstances in Namibia (see 3.2 above), the best option for Namibia would be to claim the status of 'RVF infected country (or zone – SVCF) without disease' (Article 8.11.4 of the TAHC). This

requires that RVF has not occurred in humans or animals for the past 6 months and that climatic conditions predisposing to outbreaks have also not occurred in that six-month period.

If that approach were adopted Namibia would comply with Article 8.11.9 that covers importation of 'meat and meat products of domestic and wild ruminants'. The provisions of this article are covered by normal practices at Namibian export abattoirs, i.e. (1) animals present in the country or zone for at least 30 days prior to slaughter, (2) the animals from which the meat was derived were slaughtered at an approved abattoir and subject to ante- and post-mortem examination with favourable results and (3) the meat was matured at a temperature >2^{0}C for at least 24 hours.

In the case that RVF occurs in humans and animals in future, i.e. a RVF outbreak, importing countries could justifiably block meat imports from SVCF for 6 months and require proof that the provisions of Article 8.11.4 have been met before resumption of trade. However, in 2010 when RVF outbreaks occurred in Namibia SVCF, exports to the EU, Norway and RSA were apparently little affected.

6.3 Bovine spongiform encephalopathy (BSE)

In theory, the identification of one or more cases of BSE in Namibia should have no significant sanitary effect because Namibia is not classified by the OIE among countries with 'negligible' or 'controlled' BSE risk. Furthermore, deboned beef is recognised by the OIE as a safe product even if derived from a country or zone where the risk is 'undetermined' (Article 11.5.1 of the TAHC). However, such an event (diagnosis of a case of BSE) would be widely publicised by the international press and the consequences on trade could be severe because many countries – including some in southern Africa – pay little heed to international norms under such circumstances.

6.4 Contagious bovine pleuropneumonia (CBPP)

In the event of an outbreak of CBPP SVCF Namibia would lose its recognised CBPP-free zone for a period of 12-24 months depending on whether stamping out was used to manage the outbreak or not (Articles 11.8.3 and11.8.4 of the TAHC). However, as far as beef is concerned – whether deboned or not – meat and meat products are accepted as safe products irrespective of the status of the country/zone of origin (Article 11.8.2). CBPP also has no effect on trade in meat derived from species other than cattle.

6.5 Classical swine fever (CSF)

An outbreak of CSF would have little if any effect on exports of meat and meat products (other than those containing pork) from Namibia because only *Suidae* are susceptible to the infection. Namibia currently exports no pig products.

6.6 African swine fever (ASF)

The same as for CSF applies.

6.7 Peste des petits ruminants (PPR)

If PPR were to occur in Namibia it would likely take 6 months for recognition of the country or a zone (which would need to be defined) as being free from PPR (Article 14.8.3 of the TAHC). This would mean cessation of all exports of live sheep and goats as well as fresh or chilled meat from goats or sheep (this provision of the TAHC is difficult to understand because trade in meat of sheep or goats is most unlikely to transmit PPR). Processed products could be exported if it is shown that the process would destroy any PPR virus present.

6.8 Contagious caprine pleuropneumonia (CCPP)

Occurrence of CCPP SVCF could affect Namibia's exports of goats to RSA. Based on Article 14.4.2 of the TAHC it would take Namibia one year at least after slaughter of the last case (a stamping out policy seems to be obligatory) for the region SVCF to again be able to claim freedom from the disease. This would fortunately not affect trade in goat meat because meat does not present a significant risk of transmitting CCPP (Article 14.4.12).

7. Pattern of livestock and meat and meat product imports into Namibia

7.1 Imports of animals

As indicated in the introduction, Namibia imported around 2 000 cattle, 1 700 sheep, 300 goats and 150 pigs in 2010, almost all from RSA. As far as is known to the consultants all these animals were imported on the basis of import permits and associated conditions set by Namibia's DVS which includes their derivation only from countries and zones free from FMD. As discussed below the DVS of Namibia appears to adopt ultra-safe approaches to imports and for that reason legal imports are unlikely to pose any significant animal disease risk. Conversely, possible illegal imports present a significant risk in the case of diseases such as FMD, CBPP, PPR and CCPP.

The loss of RSA's FMD-free zone status in early 2011 has complicated the import of animals because RSA is Namibia's major source of breeding animals – both livestock and wildlife. Consequently all imports were halted in early 2011 which continues to present a problem for farmers in Namibia. Obviously, the longer this import embargo continues the more the problem will be compounded. It is unlikely RSA will regain recognition of its FMD-free zone before March 2013.

The question arises as to whether continuation of non-acceptance of animal imports from RSA is justified. The reason is that the OIE makes provision for safe import of cloven-hoofed livestock from countries and

zones not recognised as free from FMD (Article 8.5.14 of the TAHC), i.e. the international standard recognises that such imports can be conducted safely if the provisions of Article 8.5.14 are complied with. The argument could therefore be made that Namibia's DVS sets a standard unnecessarily higher than the international norm. Reasons for instituting this higher standard has not been made public as far as the consultants are aware.

7.2 Meat and processed meat products imported into Namibia

Imports of pork and processed pork (3 489 and 3 465 tonnes respectively) represented 94% of animal product imports while mutton and beef (330 and 172 tonnes) represented 2% and 4% respectively in 2010. Requirements pertaining to the provisions set by the DVS for processed meats – including special reference to pork products – were supplied to the consultants by the DVS in the form of sample documents (Appendix A).

A detailed list of meat and meat products imported into Namibia over the last few years was provided to the consultants by the Meat Board Blue Books (2006-2011). The vast majority of these imports obviously presented negligible risk of introducing any of the target disease-agents under consideration, with one exception (import of sausage 'casings' from China). However, the problem already mentioned of RSA's loss of its OIE FMD-free zone changed this situation from the end of March 2011 onwards and potentially presents a high risk situation because, for the time being at least, imports from RSA are no longer derived from a FMD-free zone.

In order to manage this situation Namibia's DVS reinforced its requirements for imports:

- Pork carcasses, cuts and other unprocessed pork may not be imported from South Africa unless they are derived from four specific abattoirs and associated processing facilities – two in Gauteng and two in the Western Cape. The basis of this approval is clear separation of pig carcasses derived from compartmentalised pig farms (which are approved and registered by RSA's DVS) and carcasses derived from other production systems in RSA. The basis for this provision is that although RSA no longer has a FMD-free zone, registered compartmentalised pig farms and associated abattoirs are considered to be a safe source of pig carcasses and pork.
- For processed meats from all FMD-susceptible species the DVS's requirements are that they need to have been heated to a core temperature of 70^0C for 30 minutes[4].

Assessment of meat and meat product imports into Namibia according to these criteria is not straight-forward because the records held by the Meat Board lack sufficient detail to indicate the detailed nature of many imports. For example, there are many records where the imported products are listed simply as 'processed pork products'. The point is that there are many types of meat processing, not all of which involve heating to 70^0C – bacon, smoked products and some hams are examples.

[4] This is basically in accordance with Article 8.5.34 of the TAHC although the time of exposure recommended by the TAHC is 30 seconds rather than 30 minutes, i.e. DVD has adopted a higher standard than the international norm.

Table 2 Imports of meat and meat products into Namibia in the period April-December 2011 that may present a significant FMD (and other disease) risk

Product	Mass (kg)	Source	Comment
Sheep casings	9 575	Cape Town	Import from a non-FMD free zone
Sheep casings	18 920	China	China is not recognised as free from FMD and a number of other TADs occur there including CSF and PRRS
Hog casings	3 500	China	
Beef burgers/patties	23 024	Western Cape/ Johannesburg	Import from a non-FMD free zone
Fresh/frozen pork cuts and trimmings	171 552	Durban	No pig 'compartments' recognised in the vicinity of Durban
Beef body fat	4 200	Durban	Import from a non-FMD free zone
Processed beef	2 635	Cape Town	No detail of the process(es) involved and import from a non-FMD free zone
Frozen beef	29	Cape Town	Import from a non-FMD free zone
Meat rolls	5 631	Cape Town	No detail on manufacturing process
Total	**239 066**		

To examine this issue in more detail the records for meat and meat product imports into Namibia for April to December 2011 were examined. This period was selected because the outbreak of FMD in northern KZN occurred in March 2011, i.e. from April 2011 onwards imports of meat and meat products from RSA needed to be evaluated differently. Table 2 indicates the description and quantities of processed meat and meat products (total about 339 tonnes) that were imported over that nine month period from RSA which could have posed a significant risk of FMD virus importation (i.e. risk of 'release' but not necessarily of 'exposure' – see below). The reason there is uncertainty is that the descriptions of origin and identification of the products were imprecise. However, it needs to be borne in mind that these suspect imports constituted only 7% of meat and meat product imports in the nine month period.

8. Risks analysis for importation of animals and animal products into the area south of Namibia's Veterinary Cordon Fence (SVCF)

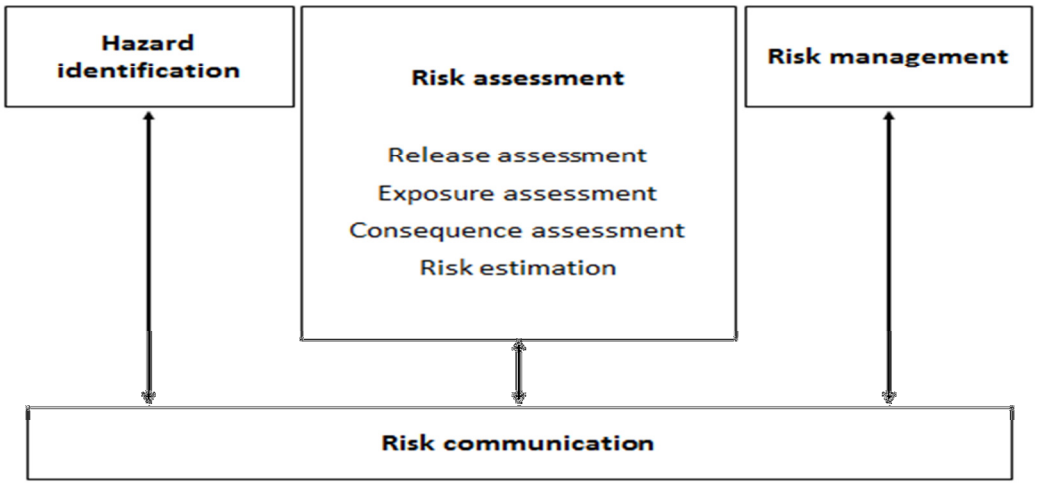

Figure 6 Basic components of risk analyses designed to evaluate the safety of imported animal commodities and products (adapted from Chapter 2.1 of the TAHC – www.oie.int)

Animal health risks associated with importation of animals and animal products are conventionally identified and measured by risk analysis which is a generic approach employed in many types of enterprise where significant risk of physical or other misadventure for either the public at large or specific enterprises exist. Risk analysis is therefore used in many fields, from finance to engineering.

Guidelines for import risk analysis associated with trade in animal commodities and products are provided in the OIE's Terrestrial Animal Health Code (TAHC – Chapter 2.1) which defines four components, *viz.* hazard identification, risk assessment, risk management and risk communication. Risk assessment in turn has at least four sub-components as shown in Figure 6.

The OIE's TAHC provides recommendations on safe trade practices relating to all the diseases covered by this investigation. Where imports of commodities and products are/have been based in accord with these recommendations the risk can be accepted as 'negligible', because they conform with the international safety standard. It is accepted by the WTO that transactions involving biological products cannot be entirely risk-free (sometimes referred to as zero risk), i.e. all transactions imply some risk. What is important is to ensure that the level of risk is 'acceptable' or 'appropriate' as it is termed in the SPS Agreement.

8.1 Hazard identification

Hazard identification is the first crucial step in risk analysis. This section therefore examines the potential hazards posed to Namibia and its livestock industries for each of the identified diseases.

8.1.1 Foot and mouth disease (FMD)

Potentially hazardous scenarios through which the introduction of FMD into the FMD-free zone of Namibia could be affected are the following:

- Livestock susceptible to FMD are imported into Namibia's FMD-free zone, legally or illegally, while in the incubation- or infectious phase of the infection (note that not all infected animals will necessarily develop disease).
- Young buffalo, probably in small groups accompanied by their mothers, escape across the VCF or the Botswana border while in the incubation or infectious phase.
- Older, persistently infected buffalo, i.e. carriers, enter the FMD-free zone by crossing the VCF or the border with Botswana.
- Cloven-hoofed wildlife, other than buffalo, in the incubation- or infectious phase cross the VCF or the Botswana border and transmit the infection to animals in the free zone.
- Trucks that have been used to transport infected animals in another country or the NCA that are then brought into the FMD-free zone and used to transport cloven-hoofed animals without prior cleansing and disinfection.
- Contaminated meat and meat products, most likely pork or partially processed products, are imported into the FMD-free zone and spread FMD virus directly or indirectly (most likely by consumption of contaminated swill fed to domestic pigs).
- Animal feedstuffs contaminated by FMD virus imported into Namibia's FMD-free zone.
- People who have recently been working with infected livestock in other countries or the NCA entering the FMD-free zone and transmitting the infection by working with local domestic or wild animals without washing or changing clothes.

8.1.2 Rift Valley fever (RVF)[5]

- Infected mosquitoes crossing the borders of the country and completing their life-cycle within Namibia (bearing in mind that transovarial transmission of RFV virus has been shown to be probable)[6].
- Livestock or wildlife in the incubation or infectious stage of infection are imported into the country and are fed on by local mosquitoes competent to transmit RVF.
- Contaminated milk/meat and products being imported into Namibia and cause RVF in people who handle or consume those products.

8.1.3 Bovine spongiform encephalopathy (BSE)

- Cattle in the long incubation phase of the disease being imported from a neighbouring country.
- Contaminated carcass meal (MBM) or formulated feed containing contaminated carcass meal is imported from RSA or another neighbouring country.

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[5] RVF may also occur spontaneously within Namibia because the infection is endemic to southern Africa.
[6] However, RVF outbreaks could also be precipitated by virus spread from potential endemic foci.

8.1.4 Contagious bovine pleuropneumonia (CBPP – lungsickness)

- Cattle in the incubation period or infectious phase of CBPP cross the VCF and enter the export zone where transmission of the disease occurs.

8.1.5 Classical swine fever (CSF)

- Pork or pork products contaminated with CSF virus are imported into Namibia and are fed to domestic pigs in swill.

8.1.6 African swine fever (ASF)

- Pork or pork products contaminated with ASF virus are imported into Namibia and are fed to domestic pigs in swill[7].

8.1.7 Peste des petits ruminats (PPR)

- Goats, or less likely sheep, enter the NCA from Zambia or Angola and from there the infection crosses the VCF via either legal or illegal imports into the export zone.

8.1.8 Contagious caprine pleuropneumonia (CCPP)

- Goats enter the NCA from Zambia or Angola and animals that become infected in the NCA cross the VCF either legally or illegally.

8.2 Risk assessment

The ToRs for this investigation (Appendix B) required that a quantitative risk analysis be conducted – which obviously necessitates a quantitative risk assessment – but this was not possible due to the lack of sufficiently detailed data for quantification. For that reason a semi-quantitative approach was adopted.

To illustrate the problem, for estimating the probability of incursion of live animals (wild or domestic) across the VCF or border fences (Namibia/Botswana and RSA borders) requires an objective assessment of the integrity and efficacy of the fences over a representative period of time (e.g. the average number of animals that crossed a given fence over a defined period, divided by the length of the fence). This can only be derived from a dedicated audit. Such audits have so far not been conducted or, if they have, the results are not in the public domain.

[7] This scenario could also arise from ASF viruses indigenous to Namibia.

In the case of meat and meat products the precise origin and nature of imports, including the processing methods for different products, need to be known. In the data provided to the consultants, many consignments of meat and meat products had no accurate identification as to origin (e.g. origin merely identified as 'Gauteng') or described simply as 'processed pork'). Where there is lack of information on the processing that a product will undergo or has undergone, one cannot calculate product safety quantitatively. The crucial point is that the international standard for inactivation of animal viruses (including FMD virus) is that the product must have been heated to a core temperature of 70^0C. Some processes (e.g. smoked products) only reach a temperature of about 35^0C. Therefore, a product description such as 'processed pork' is inadequate for quantitative risk assessment. The best that can be done in such circumstances is estimate the risk semi-quantitatively.

8.2.1 Release assessment

This deals with the probability of hazards (i.e. one or more of those listed above – 8.1.1 to 8.1.8) being introduced into the area SVCF through the importation of animal commodities[8] or products.

The risk of importing an infectious agent is a function of three factors (Chapter 2.1 of the TAHC):

- Biological factors – how an infectious agent generally interacts with susceptible animals, e.g. species and age of the animals concerned, and the measures that are or have been implemented to manage specific infections such as vaccination, testing and quarantine.
- Commodity factors – the probability of specific commodities/products being contaminated by the infectious agent under consideration because the probability of different commodities or products containing an infectious agent differs. For example, among the agents under consideration in this analysis, live animals are far more likely to transmit FMD than meat derived from those animals (Thomson and Bastos, 2004; Thomson *et al.*, 2004; Thomson *et al.*, 2009). Other considerations are the quantity of imported products and the effects on infectious agents of processing, storage and transport.
- Country factors – whether the infection and/or its potential vectors are present in the country of origin and disease prevalence. This generally also includes an assessment of the veterinary services of the exporting country, i.e. the body responsible for instituting standards and monitoring their application. However, that was not considered in this investigation because the consultants had neither the resources (time and money) nor the authority to undertake such investigations in countries exporting to Namibia. The OIE has a programme for evaluating member country veterinary services but the results of these assessments are rarely in the public domain; PVSs of Namibia's trading partners have either not been conducted or are not in the public domain. Namibia itself is exceptional in that the favourable result of the OIE's PVS is viewable on the OIE website (www.oie.int).

The results of the release assessment are summarised in Table 3.

[8] In this document, consistent with the OIE definition, 'commodities' includes live animals but, contrary to the OIE definition, does not include processed products; the latter are considered separately. So beef here is considered to be a commodity but bacon, as an example, is considered to be a product.

Table 3 Summary of the release assessment for disease hazards that pose a threat to Namibia's meat export zone

Disease	Hazard	Means of entry	Release assessment	Comment
FMD	Livestock enter Namibia's FMD-free zone (SVCF) while in the incubation- or acute phase of infection	• Cattle are driven or otherwise moved across the VCF or the Botswana boundary illegally	• Moderate	• If an economic incentive exists people will not be easily deterred from smuggling animals
		• Cattle stray across the VCF or Botswana boundary	• Low	• There are multiple fences livestock have to negotiate to enter SVCF
		• Cattle or other livestock from a neighbouring country are legally imported SVCF	• Negligible	• Issuance of permits is strictly controlled to ensure the safety of imported animals
		• Small stock cross the VCF or Botswana border fences	• Negligible	• Small stock are not efficient transmitters of FMD and long distances need to be covered which small stock will not easily achieve
	Acutely infected buffalo calves, probably in small groups accompanied by their mothers, enter SVCF	Breeding herds or parts thereof escape across fence gaps especially in the wet season	Moderate	While buffalo calves present the greatest danger they will only enter SVCF with breeding herds or parts thereof, i.e. not individually. This occurs infrequently
	Older, persistently infected buffalo, i.e. carriers, enter SVCF	Persistently infected adult buffalo, individually or in small groups, cross through fence gaps into SVCF	Low	Persistently infected buffalo transmit FMD inefficiently to cattle
	Cloven-hoofed wildlife, other than buffalo, in the incubation- or acute phase of FMD enter SVCF	Jump through or over the fences	Low	The risk is very low because wildlife other than buffalo do not regularly become infected with SAT viruses but the risk is not negligible
	Animal transporters (vehicles) contaminated with FMDV in neighbouring countries enter SVCF and are used to transport livestock locally	Empty trucks that have not been cleansed and disinfected before entry to Namibia may introduce infection into SVCF	Low	This is a small risk but not negligible since all neighbouring countries have locations where FMD is endemic
	Contaminated meat or meat products, most likely pork or partially processed pork products, enter the export zone legally or illegally	Bone-in meat or processed products that have not been heated to 70°C for 30 minutes contain infectivity, i.e. enter without an import permit or the import permit requirements have not been met	• Illegal importation – low • Legal importation – low	• This aspect is difficult to judge accurately. There is little incentive and it is difficult to smuggle large quantities of meat into Namibia. • The available data on processed products do not indicate whether they all reach 70°C. RSA is no longer recognised as free from FMD. Most/all processed pork is derived from compartmentalised production chains free from FMD in RSA. However, about 339 tonnes of meat products imported from RSA over the period April-December 2011 may have posed a low risk (see Table 2).

	Animal feeds contaminated by FMD virus are imported into Namibia's FMD-free zone	Contaminated feed such as maize, oil cakes, hominy chop and wheat bran brought in bulk into Namibia from Zambia or South Africa for sale to livestock farmers	Negligible	This method of introduction is theoretically possible but under southern African conditions the risk can be considered insignificant.
	People who have recently been working with infected livestock in other countries or the NCA then enter SVCF and transmit the infection by working with local animals	People infecting livestock through contaminated hands and clothing	Negligible	Possible but most unlikely
RVF	Infected mosquitoes cross the borders of the country and complete their life-cycle (bearing in mind that transovarial transmission of RFV virus has been shown to be probable)	Infection entering Namibia through infected mosquitoes moving across borders	Moderate	The long distance movement of RVF virus is usually associated with movement of mosquito vectors and not mammals
	Livestock or wildlife in the acute stage of infection are imported into the country and are fed on by mosquitoes competent to transmit RVF	Entry of the virus via animals that are or become viraemic after entry to Namibia	Low	Possible but unlikely
	Contaminated milk/meat and products imported into Namibia	Contamination of imported foodstuffs	Negligible	Infection is rarely transmitted by human foodstuffs even in the midst of outbreaks
BSE	Cattle in the long incubation phase of the disease being imported from a neighbouring country	Importation via live cattle	Low	The risk differs between countries – RSA presents the highest risk among neighbouring countries (see 3.3)
	Contaminated carcass meal (MBM) or formulated feed containing contaminated carcass meal is imported from RSA or another neighbouring country	Importation via animal feeds and feed constituents	Low	The highest risk is presented by RSA (see 3.3)
CBPP	Livestock enter Namibia's CBPP-free zone (SVCF) while in the incubation- or acute phase of infection.	• Cattle are driven across the VCF illegally • Cattle stray across the VCF	• Moderate • Low	See explanations under FMD
CSF	Pork or pork products contaminated with CSF virus are imported into Namibia	Importation through contaminated pork or processed pork	Negligible	There is no source of CSF in southern Africa at present
ASF	Pork or pork products contaminated with ASF virus are imported into Namibia	Importation through contaminated pork or processed pork	Low	Namibia is not free from ASF – the virus occurs widely in its sylvatic cycle but not in domestic pigs
PPR	Goats or sheep in the acute or incubation phase of the infection enter Namibia	Goats or sheep smuggled into Namibia or straying across borders; may cross to SVCF	Low	Infection probably not yet close to Namibia's borders
CCPP	Infected goats or those in the incubation phase of the infection enter Namibia	Goats smuggled into Namibia or stray across borders; may transmit to SVCF following quarantine	Moderate	The infection is present in Angola and no information supplied by Zambia. The quarantine system for goats crossing to SVCF is inadequate to prevent entry of CCPP

8.2.2 Exposure assessment

Exposure assessment deals with the probability of an infectious agent, once introduced into Namibia's export zone, will infect animals and be propagated (i.e. result in a disease outbreak).

As for the release assessment, biological-, commodity- and country-specific factors need to be considered (as for the release assessment).

Results of the exposure assessment are presented in Table 4.

Table 4 Summary of the exposure assessment for disease hazards that pose a threat to Namibia's meat export zone

Disease	Means of entry (Table 2)	Method of exposure	Exposure assessment	Comment
FMD	Cattle are driven across the VCF or the Botswana border illegally	Close contact with local livestock resulting in transmission of FMD to animals SVCF	Moderate	FMD outbreaks in cattle in Caprivi and Ngamiland have been frequent in recent years so illegal imports pose a significant risk
	Cattle from a neighbouring country stray across VCF or border fences	Close contact with resident livestock	Low	Difficult for cattle especially to stray across multiple fences and move long distances
	Cattle or small stock from neighbouring country are legally imported SVCF	Contact with cattle or small stock SVCF	Negligible	DVS exercises zealous control over import permits
	Small stock stray cross the VCF or Botswana border	Direct contact between small stock and local resident livestock	Negligible	Small stock are not efficient transmitters of FMD in southern African conditions and do not move long distances
	Breeding herds of buffalo or parts thereof escape across fence gaps especially in the wet season	Close contact between buffalo and cattle	Moderate	Breeding herds maintain SAT serotype viruses and may excrete large amounts of virus when calves are acutely infected
	Persistently infected adult buffalo, individually or in small groups, cross the VCF or Botswana border into SVCF	Close contact between buffalo and cattle	Low	Persistently infected buffalo (carriers) are poor transmitters of SAT viruses to cattle – require protracted close contact
	Cloven-hoofed wildlife other than buffalo – in the incubation or acute phase of infection – jump through or over the fences	Close contact with cattle or wildlife SVCF	Low	Although antelope such as kudu and impala develop FMD they are not efficient transmitters other than when high density populations occur
	Animal transporters (vehicles) contaminated with FMDV in neighbouring countries enter SVCF and are used to transport local livestock	Empty trucks that have not been cleansed and disinfected before entry to Namibia may introduce infection into SVCF	Low	Contaminated vehicles present a real threat
	Contaminated meat or meat products, most likely pork or partially processed pork products, enters the export zone legally or illegally	• Some of this material is fed to domestic pigs in the form of swill resulting in transmission	• Negligible	• Namibia has few if any swill-fed pigs SVCF
		• People handling the meat come in direct contact with livestock	• Negligible	• Meat importers' facilities (i.e. hygiene practices) are under the supervision of local health authorities which ensure good hygiene
	Animal feeds contaminated by FMD virus are imported into Namibia's FMD-free zone	Contaminated feed fed to ruminants or pigs SVCF	Negligible	Importation only permitted from reputable suppliers. Oral transmission of FMD to ruminants is very inefficient. Formulated feeds for pigs derived from commercial feed producers unlikely to be a source of infection.
	People who have recently been working with infected livestock in other countries or the NCA and then entering SVCF and transmitting the infection by working with local animals	People infecting livestock through contaminated hands and clothing	Negligible	Possible but very unlikely

RVF	Infected mosquitoes cross the borders of the country and complete their life-cycle (bearing in mind that transovarial transmission of RFV virus has been shown to be probable)	Incursion of infected mosquitoes	Moderate	It is likely that Namibia is endemically infected with RVF. Therefore while incursion into Namibia could occur from surrounding countries the opposite is also possible (RVF should not be considered 'foreign') – endemic to southern Africa generally.
	Livestock or wildlife in the acute stage of infection are imported into the country and are fed on by mosquitoes competent to transmit RVF	Local competent vectors feed on infected animal imports	Low	While this is possible it should be remembered that RVF is almost certainly already endemic to Namibia and its activity is usually dependent on unusually high rainfall
	Contaminated milk/meat and products imported into Namibia	Consumption of contaminated food by people or pigs to which the material may be fed in the form of swill	Negligible	Oral transmission of RVF virus to people or animals is very rare
BSE	Cattle in the long incubation phase of the disease being imported from a neighbouring country	BSE agent is cycled by locally manufactured animal feed	Negligible	Namibia has been evaluated as having a 'stable' BSE status
	Contaminated carcass meal (MBM) or formulated feed containing contaminated carcass meal is imported from RSA or another neighbouring country	Imported feeds consumed by local cattle	Negligible	Even if contaminated feed were imported it will not be recycled because the management of BSE risk factors is well managed
CBPP	Livestock enter Namibia's CBPP-free zone (SVCF) while in the incubation- or acute phase of infection	Cattle from NCA or neighbouring countries that reach SVCF transmit the infection to cattle with which they come in contact	High	CBPP could be imported into SVCF but its management is relatively easy to manage where commercial farming predominates
CSF	Pork or pork products contaminated with CSF virus are imported into Namibia	Transmission by swill fed to pigs	Negligible	Swill feeding is rare in Namibia, although not illegal. There are few pigs in the south of Namibia and those are not free ranging
ASF	Pork or pork products contaminated with ASF virus are imported into Namibia	Transmission by swill fed to pigs	Negligible	As for CSF
PPR	Goats or sheep stray or are illegally imported into Namibia	Transmission through direct contact with local small stock	Low	No close-by source of infection as far as is known
CCPP	Goats stray or are illegally imported into Namibia	Transmission through direct contact with local goats – even after quarantine in NCA	Moderate	Infection is present in Angola and possibly in Zambia (absence of reports to OIE)

8.2.3 Overall risk estimation

The overall risk estimation is derived following assessment of the interaction between factors important for 'release' and 'exposure'. For semi-quantitative assessments such as this a 2x2 table as shown in Table 5 is generally applied (Zepeda, 1998).

Table 5 Guide for the amalgamation of 'exposure' and 'release' assessment in determination of overall risk

Release assessment	Exposure assessment			
	Negligible	**Low**	**Moderate**	**High**
Negligible	Negligible	Low	Low	Moderate
Low	Low	Low	Moderate	Moderate
Moderate	Low	Moderate	Moderate	High
High	Moderate	Moderate	High	High

Definitions of risk used in this analysis:
Negligible – the probability of the event occurring is sufficiently low to be disregarded
Low – the event could occur but is improbable
Moderate – there is a likelihood of the event occurring but at low frequency
High – there is a likelihood of the event occurring regularly

The results of overall assessment are shown on Table 6.

Scenario pathways, incorporating probable release and exposure elements, are shown in Figures 7-14 for factors that are significant, i.e. excluding scenarios rated as presenting negligible risk (these need to be considered in conjunction with Table 7.

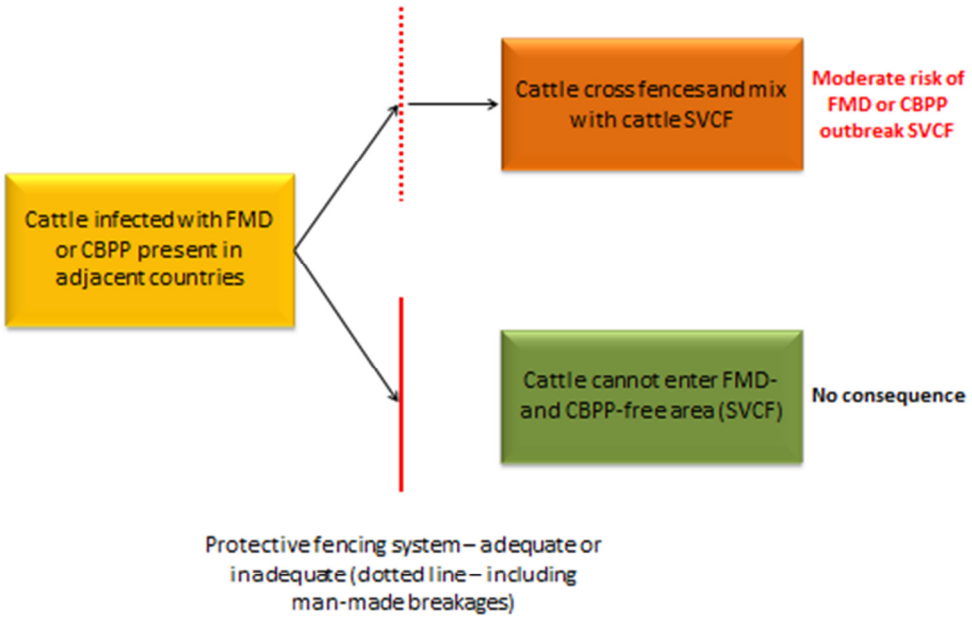

Figure 7 Scenario 1 (see Table 7)

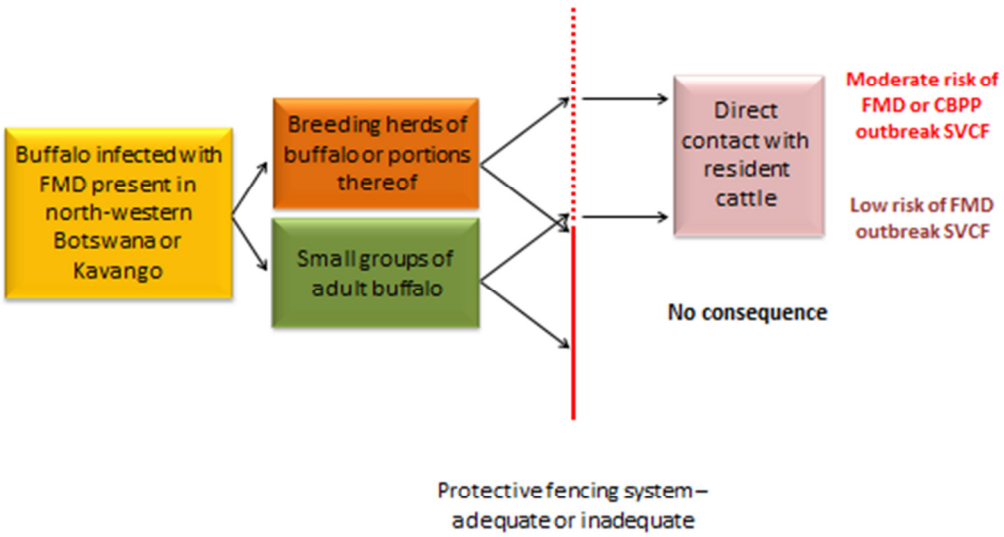

Figure 8 Scenario 2 (see Table 7)

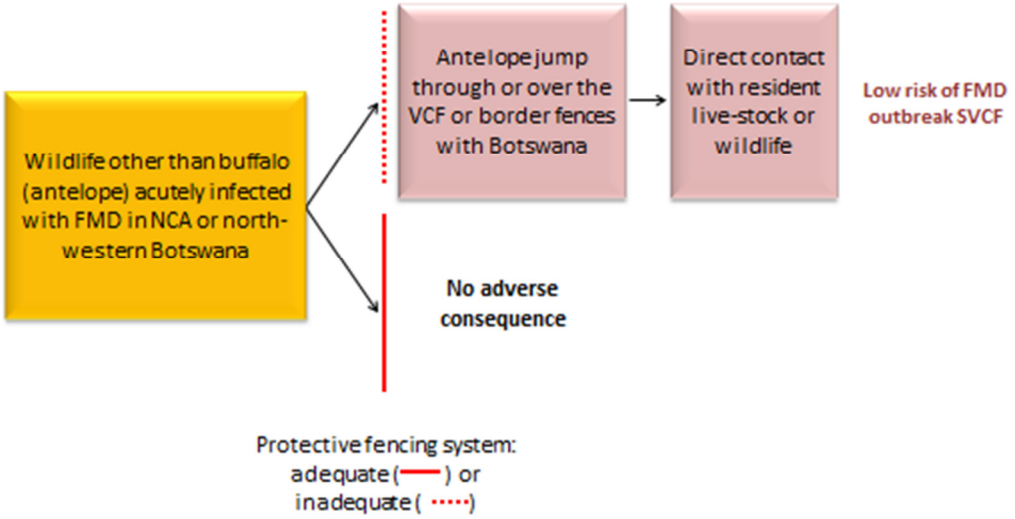

Figure 9 Scenario 3 (see Table 7)

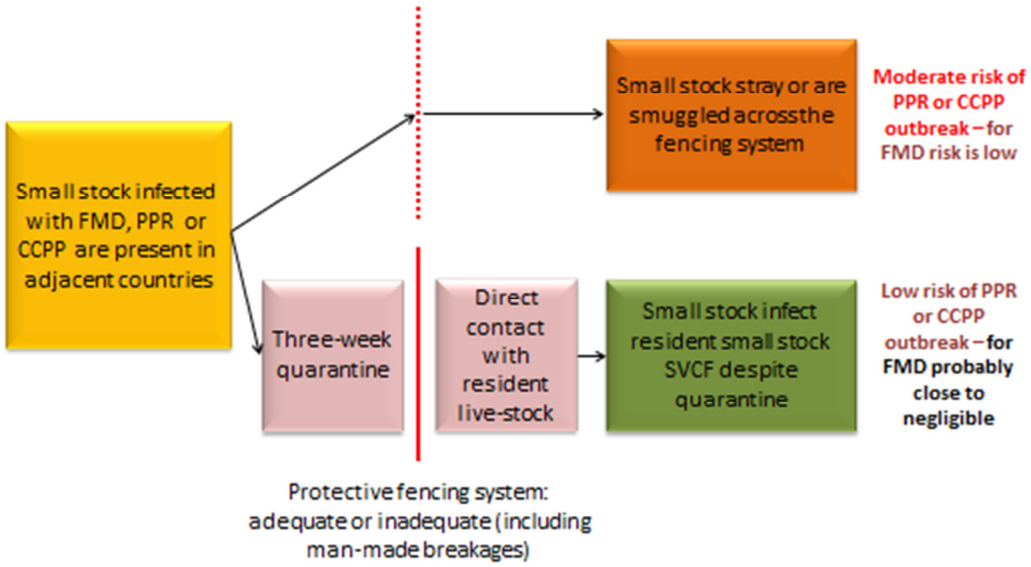

Figure 10 Scenario 4 (see Table 7)

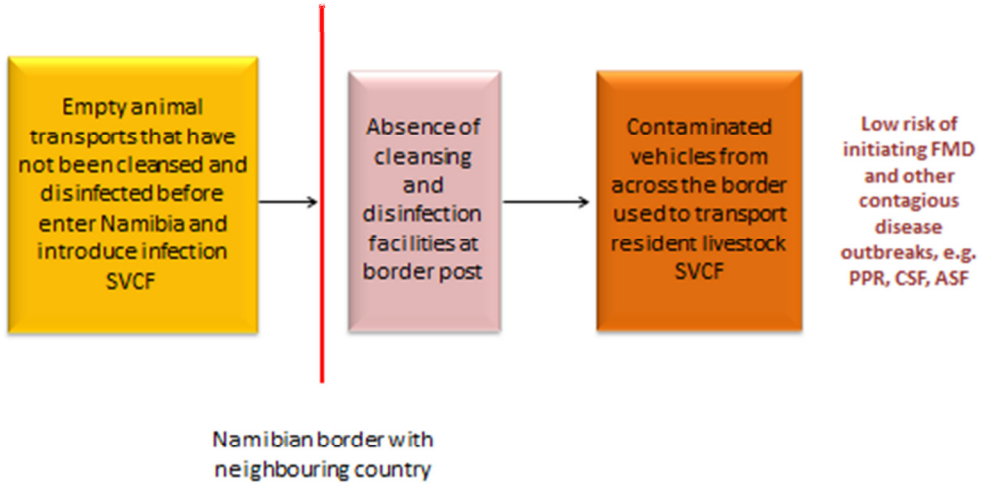

Figure 11 Scenario 5 (see Table 7)

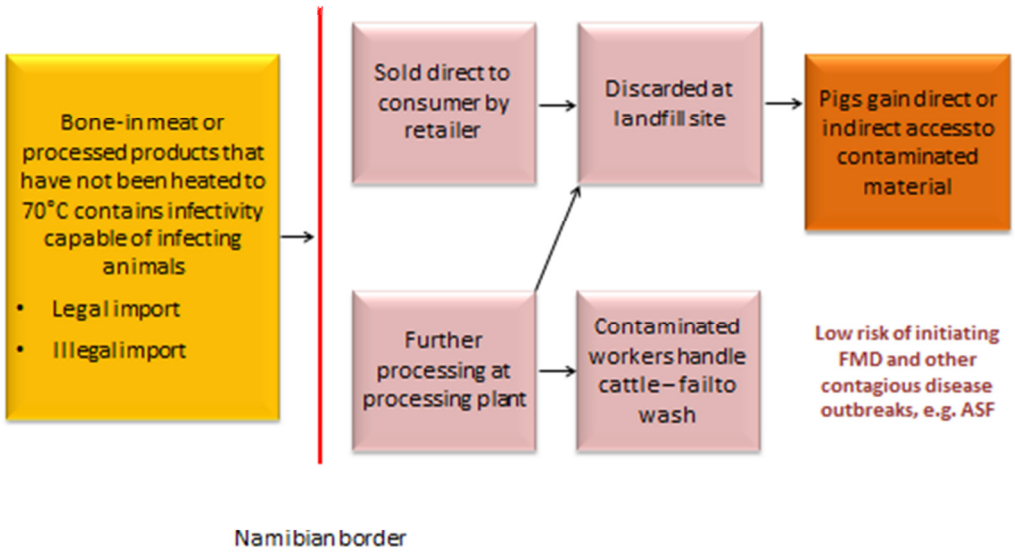

Figure 12 Scenario 6 (see Table 7)

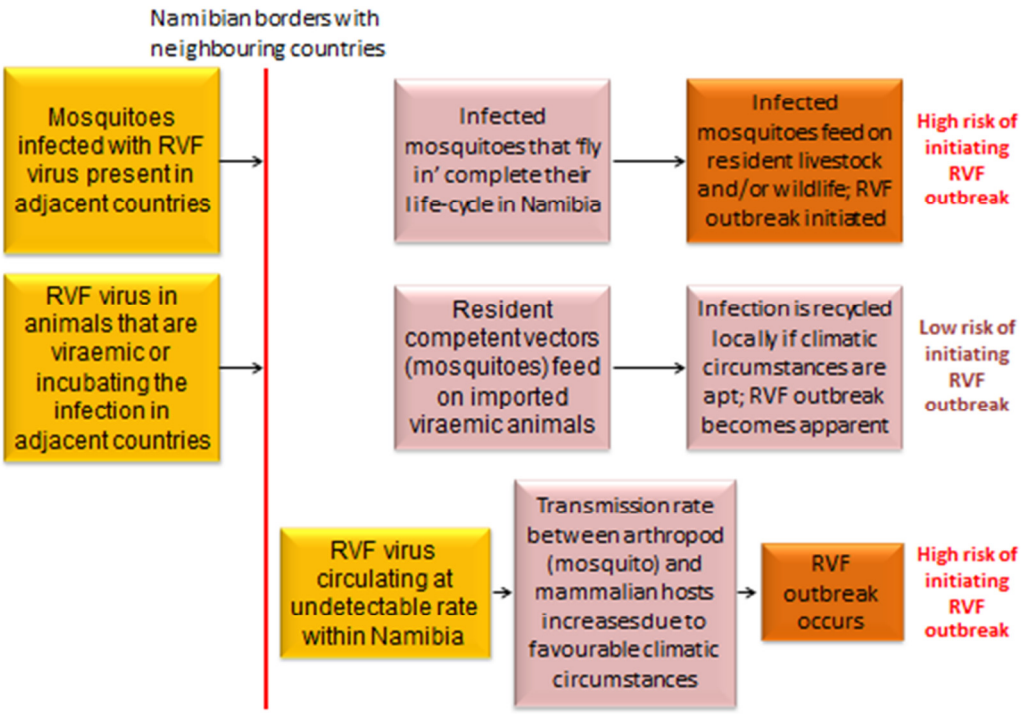

Figure 13 Scenario 7 (see Table 7)

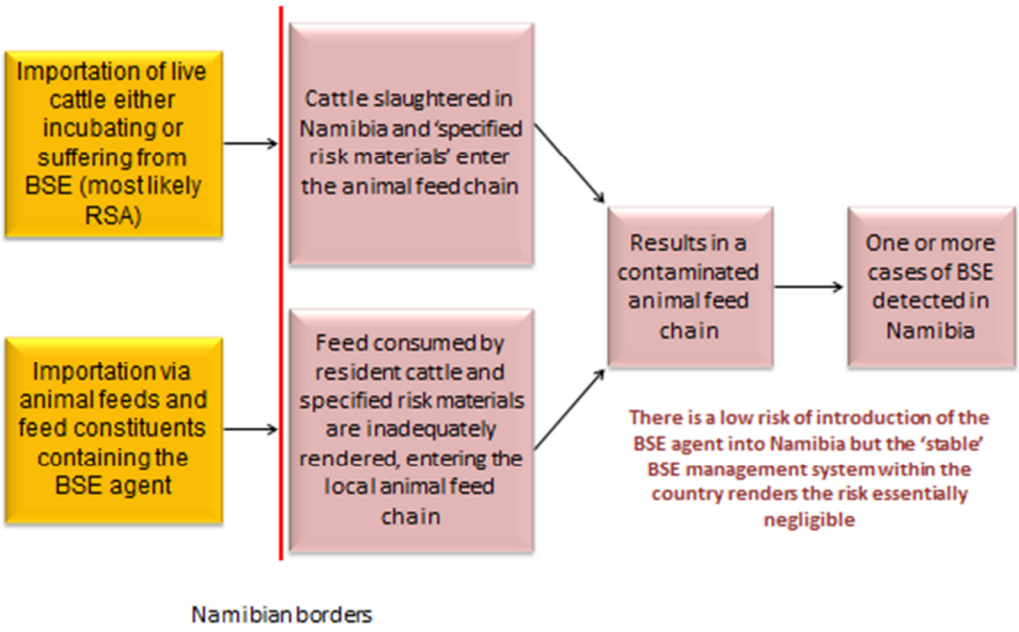

Figure 14 Scenario 8 (see Table 7)

8.3 Risk management

For all hazard/risk scenarios other than 'negligible' it is necessary to develop risk management (mitigation) measures. Suggested measures are summarised in Table 7.

Table 6 Summary of overall risk estimation (combination of release and exposure assessments) for disease hazards that pose a threat to Namibia's meat export zone

Disease	Means of entry	Release/exposure assessment	Overall risk estimation
FMD	Entry of livestock from NCA or Botswana SVCF		
	• Cattle are driven across the VCF or the Botswana boundary illegally	• Moderate/high	• Moderate
	• Cattle stray across the VCF or Botswana boundary	• Low/Low	• Low
	• Livestock from a neighbouring country are legally imported SVCF	• Negligible/Negligible	• Negligible
	• Small stock cross the VCF or Botswana border	• Negligible/Moderate	• Low
	Buffalo breeding herds or parts thereof escape across fence gaps especially in the wet season	Moderate/Moderate	Moderate
	Persistently infected adult buffalo, individually or in small groups, cross through fence gaps into SVCF	Low/Negligible	Low
	Wildlife other than buffalo enter SVCF		
	• Jump through or over the fences	• Low/Low	• Low
	• Legally imported SVCF	• Negligible/Negligible	• Negligible
	Empty trucks that have not been cleansed and disinfected before entry to Namibia may introduce infection into SVCF	Low/Low	Low
	Bone-in meat or processed products that have not been heated to 70°C contains infectivity capable of infecting animals	Low/Negligible (see Table 1)	Low
	Contaminated feed brought in bulk into Namibia from Zambia or South Africa for sale to livestock farmers	Negligible/Negligible	Negligible
	People from NCA or other countries infecting livestock through contaminated hands and clothing	Negligible/Negligible	Negligible
RVF	Infection entering Namibia through infected mosquitoes moving across borders	Moderate/moderate	Moderate
	Entry of the virus via animals that are or become viraemic after entry to Namibia	Low/Low	Low
	Contamination of imported foodstuffs	Negligible/Negligible	Negligible
BSE	Importation via live cattle	Low/Negligible	Low
	Importation via animal feeds and feed constituents	Low/negligible	Low
CBPP	• Cattle are driven across the VCF illegally	• Moderate/Moderate	• Moderate
	• Cattle stray across the VCF	• Low/Low	• Low
CSF	Importation through contaminated pork or processed pork	Negligible/Negligible	Negligible
ASF	Importation through contaminated pork or processed pork	Low/Negligible	Low
PPR	Goats or sheep enter Namibia through illegal movement or straying across fences	Low/Low	Low
CCPP	Goats enter Namibia across borders, especially into NCA, and are moved to SVCF (inadequate quarantine)	Moderate/Moderate	Moderate

Table 7 Mitigation measures recommended for the significant risks identified by this study (see also Tables 2-5)

Disease	Risk or hazard	Level of risk	Risk mitigation measures recommended	Further explanation
FMD	Cattle or other livestock are driven across the VCF or the Botswana boundary fences illegally and transmit the infection to animals SVCF	Moderate	• Management – as far as possible – of the relative price of cattle in NCA relative to Zambia, Botswana and SVCF • Regular fence maintenance and auditing • Observance of permit system and routine surveillance	9.4.1 Scenario 1 (Figure 7)
	Buffalo breeding herds or parts thereof escape across fence gaps (VCF and Botswana/Ngamiland border - especially in the wet season) and transmit the infection to cattle SVCF		• Regular fence maintenance and auditing, including monitoring of wildlife movement across fences in high risk areas • Contingency planning for such events	9.4.2 Scenario 2 (Figure 8)
	Cattle stray across the VCF or Botswana boundary and transmit the infection to cattle SVCF	Low	• Regular fence maintenance and auditing, including monitoring of wildlife movement across fences in high risk areas • Contingency planning for such events	9.4.1 Scenario 1 (Figure 7)
	Persistently infected adult buffalo (i.e. so-called carriers) – individually or in small groups – cross through fences gaps into SVCF and infect cattle there		• Regular fence maintenance and auditing, including monitoring of wildlife movement across fences in high risk areas • Contingency planning for such events • Important that reaction to such events is measured and appropriate	9.4.2 Scenario 2 (Figure 8)
	Wildlife other than buffalo (antelope) jump through or over the fences and transmit the infection to livestock (most likely cattle)		• Regular fence maintenance and auditing, including monitoring of wildlife movement across fences in high risk areas • Contingency planning for such events • Important that reaction to such events is measured and appropriate	9.4.3 Scenario 3 (Figure 9)
	Small stock stray cross the VCF or Botswana border and enter SVCF and then transmit the infection to other small stock or cattle		• Risk is very low, therefore in most cases such events will not require reaction • Occurrence needs to be monitored	9.4.4 Scenario 4 (Figure 10)
	Animal transporters – even empty ones – that have not been cleansed and disinfected before entry to Namibia may introduce infection SVCF resulting in infection of livestock there		• Management of this problem logistically complicated – needs to be considered by DVS and appropriate plan of action implemented if necessary	9.4.5 Scenario 5 (Figure 11)
	Bone-in meat or processed products that have not been heated to 70°C contains infectivity capable of affecting animals. Scraps of this meat are then fed to pigs via swill which starts a FMD outbreak SVCF		• DVS has adequate policy and practices – based on import permits – in place • Some past practices identified that possibly involve more than negligible risk which need to be re-evaluated (see Table 2)	9.4.6 Scenario 6 (Figure 12)
RVF	Infection entering Namibia through infected mosquitoes moving across borders and results in a RVF epidemic in Namibia	Moderate	• Beyond human control – RVF endemic to the Region • Emergency preparedness plan needs to address this potential hazard	9.4.7 Scenario 7 (Figure 13)
	Entry of the virus via animals that are or become viraemic after entry to Namibia and thereby infect local mosquitoes which spread the infection to people, livestock and wildlife	Low	• Very difficult to manage because most animal infections are subclinical • Emergency preparedness plan needs to be in place	

BSE	Importation of live cattle which are slaughtered and whose 'specified risk materials' enter the animal feed chain so that BSE becomes established in Namibia	Low	No additional measures considered necessary	9.4.8 Scenario 8 (Figure 14)
	Importation via animal feeds and feed constituents which result in cases of BSE which then result in the infection being perpetuated		No additional measures required	
CBPP	Cattle are driven across the VCF illegally and infect cattle SCVF	Moderate	As for FMD	9.4.1 Scenario 1 (Figure 7)
	Cattle stray across the VCF and infect cattle SVCF	Low	As for FMD	
CSF	Importation through contaminated pork or processed pork and scraps of that meat are fed to local pigs in swill resulting in an ASF outbreak	Low	Measures in relation to the control of this disease in place except legislation banning the feeding of swill to pigs. This should be reconsidered but may be impractical.	9.4.6 Scenario 6 (Figure 12)
ASF	Importation through contaminated pork or processed pork and scraps of that meat are fed to local pigs in swill resulting in an ASF outbreak	Low	ASF is already endemic to Namibia. The only measure which seems to be missing in relation to the control of this disease is legislation banning the feeding of swill to pigs. This could be reconsidered but may be impractical.	9.4.9 Scenario 6 (Figure 12)
PPR	Infected goats and sheep cross into Namibia from neighbouring countries	Low	Maintenance of border controls with close attention to movement – legal and illegal – of small stock. Possible modification of quarantine system for movement SVCF.	9.4.10 Scenario 4 (Figure 10)
CCPP	Infected goats cross into Namibia from neighbouring countries and cross SVCF	Moderate	Maintenance of border controls with close attention to movement – legal and illegal – of goats. Modification of quarantine system for movement SVCF.	9.4.11 Scenario 4 (Figure 10)

8.3.1 Cattle or other livestock are driven across the VCF or the Botswana/RSA boundary fences illegally and transmit the infections to animals SVCF

The VCF and fences along the north-eastern border with Botswana and RSA are vital for prevention of incursion of FMD and CBPP. Their effectiveness and maintenance are therefore critical.

The consultants have no personal knowledge on this issue and the only information available is in the form of personal opinion because as far as is known to us no formal audits of these fences have been undertaken in the recent past. Some of those consulted contend that the fences are adequate and well maintained while others provide less favourable opinion. It is obvious that opinion and fact may differ and for that reason it is recommended that the fences should be formally and independently (i.e. not by those responsible for maintenance) audited on a regular basis. Anything else for such a vital disease management system should be inherently unacceptable. The possible use of a HACCP-based approach to fence management is expanded upon below (see Section 9).

A further important factor is that the relative price of livestock, cattle particularly, needs to broadly similar on both sides of a barrier (i.e. fences) because if that is not so there will be a temptation to smuggle animals across the barrier. Therefore, price differentials for livestock across the VCF and eastern border fences needs to be monitored regularly to identify and manage situations developing whereby smuggling becomes unmanageably tempting; in such situations permit systems and fences become powerless and the greater the differential the more likely illegal activity becomes.

The chances of cattle or other livestock straying across fence lines is much lower that animals being smuggles across if the fence lines are effective and well maintained. Conversely, if fences are in poor condition it is likely animals will stray across on a regular basis, more particularly if fence breaks are not quickly repaired.

8.3.2 Buffalo breeding herds or parts thereof escape across fence gaps (VCF and Botswana/Ngamiland border - especially in the wet season) and transmit the infection to cattle SVCF

The possible movement of breeding herds of buffalo or parts thereof (i.e. groups of buffalo containing animals in the first year of life) present a particularly dangerous hazard because when young buffalo are first infected as calves they are likely to excrete much larger amounts of infectivity than adult buffalo (Thomson *et al.*, 2003; Thomson and Bastos, 2004). Environmental contamination is much more likely when SAT viruses are circulating in buffalo calves and the closeness of contact required to enable transmission to cattle is concomitantly reduced. For that reason such groups of animals are potentially much more dangerous than individual adult buffalo or even groups of adult buffalo.

The ability of fences to keep buffalo out, including where fences cross the courses of rivers and streams, is therefore vital. Furthermore, fence monitoring with accompanying contingency plans needs to be available and quickly deployable to detect such escapes when they occur and to apply effective counter measures.

In cases where individual or small groups of adult buffalo cross fences, even if they are persistently infected (i.e. so-called carriers – about 50% probability) the risk is much lower although this is poorly understood (Thomson *et al.*, 2003; Thomson and Bastos, 2004). Therefore, in such cases it is important that the reaction is not over-zealous. This seems to have been the case as reflected in an article in Die Republikein on 15 March 2012 ('Geen buffels in nuwe parke').

8.3.3 Wildlife other than buffalo (antelope) get through or over the fences and transmit the infection to livestock (most likely cattle)

Antelope that sometimes contract FMD such as impala and kudu are good jumpers and may easily clear fences of up to 2 m in height or even higher (Sutmoller *et al.*, 2000; Vosloo *et al.*, 2009). The VCF is said to be 3 m in height along most of its length and therefore the assumption is made that the risk of antelope jumping over it is negligible. Most of the eastern boundary with northern Botswana is also at least 2.4 m high but there are no independent reports on the integrity of these fences[9].

The recommendation relating to regular auditing of fences is equally applicable in this context.

8.3.4 Small stock stray cross the VCF or Botswana border and enter SVCF and then transmit the infection to other small stock or cattle

The risk posed by sheep and goats in this connection is much lower than for cattle and buffalo because they are less efficient transmitters of SAT serotype viruses and they tend not to be able to travel far in a day. Therefore, these species are not a serious risk but, on the other hand, the risk of small stock crossing fences is not negligible. Fence design and maintenance to ensure containment of small stock is therefore advisable.

8.3.5 Animal transporters that have not been cleansed and disinfected before entry to Namibia may introduce infection SVCF resulting in infection of livestock there

This problem is difficult to manage because the recent history of vehicles dedicated to animal transport that arrive at a border cross has not been determined. Border crossings in southern Africa do not generally have facilities for cleaning and disinfecting transporters.

The frequency with which empty animal transporters cross from one country to another in southern Africa is unknown to the consultants. For that reason it is impossible to evaluate the risk or propose practical management measures. However, this is a factor which requires more detailed evaluation.

[9] In 2000 one of us (GRT) visited this fence and much of it was in a poor state of repair – long sections were lying on the ground.

8.3.6 Bone-in meat or processed meat products that have not been heated to 70°C contains infectivity capable of transmission to susceptible animals; scraps of this meat are then fed to pigs via swill which starts outbreaks of FMD, ASF, CSF or SVCF

While it is clear that the vast majority of meat and processed meat product imports brought into Namibia in the last three years have been acceptably safe from an animal health perspective, there are some where the level of safety is possibly more than 'negligible' (Table 2). The regular importation of sheep and hog casings from China is an example – see below.

Between April and December 2011, (i.e. after RSA lost recognition of its FMD-free zone) about 339 tonnes of meat products were imported that may have involved significant risk. The Meat Board data sheets show that some uncooked meat products containing beef were imported as well as uncooked pork derived from locations other than the four recognised compartmentalised production systems in the RSA (Table 2). However, these potentially risky imports represented only 7% of imports of meat and meat products over the nine month period.

It is would appear that future applications for import permits for such products should be more carefully evaluated and perhaps not be granted. This applies particularly to the import of pig casings from countries where FMD and other exotic pig infections are prevalent (e.g. China)[10]. This question has been extensively studied and a risk assessment was conducted in Australia (Australian Quarantine and Inspection Service, 1999; Wieringa-Jelsma *et al.*, 2011; Wijnker *et al.*, 2012). The consensus is that the animal disease risk posed by imported casings is low but nevertheless four approaches are generally adopted: (1) refusal of import permits from countries where diseases of concern are prevalent, (2) subjecting imported casings to post-import treatment, (3) permitting only collagen casings where the method of production precludes survival of infectious agents or (4) acceptance of the low risk. In Namibia's case, because swill feeding is probably rare this risk may be considered insignificant. On the other hand, swill feeding of pigs in Namibia is apparently not illegal as is the case in many countries.

8.3.7 RVF entering Namibia through infected mosquitoes moving across borders and results in an epidemic in Namibia

It is well known that RVF in RSA has in the past occurred periodically and then spread widely in a short period of time, i.e. much faster than could have been achieved by movement of animals. Thus the occurrence of RVF in southern and central Namibia in 2010 and the north in 2011 is most likely to have occurred as a result of spread of infected mosquitoes from endemic hotspots in southern Africa and not by movement of animals. However, as explained above, lineage H of RVF virus was first identified in the Caprivi in 2004, long before the epidemics of 2009 and 2010 occurred in RSA (Grobbelaar *et al.*, 2011).

[10] It is understood that casings imported from China are actually derived from Australia – repackaging occurs in China – via RSA. What happens to the product in these various countries is impossible to ascertain.

Transport of the infection by infected animals can occur but seems to be a less frequent occurrence. Furthermore, because many animals are infected sub-clinically (abortion is the most common sign associated with infection while there are many other causes of abortion) or die acutely with little or no warning, detection of animals either in the incubation or in the initial stages of infection is problematic.

8.3.8 Importation of live cattle which are slaughtered and whose 'specified risk materials' enter the animal feed chain so that BSE becomes established in Namibia

It is very unlikely BSE is present in the southern African region but the risk is not negligible due to imports of live animals and MBM when the epidemic in Europe was at its height. However, the management of BSE in Namibia has been evaluated as good and therefore even if the BSE agent were imported it could not be recycled because of the measures in place (Thomson, 2010). For that reason BSE holds little threat for Namibia and additional risk management measures are not necessary.

8.3.9 Goats and sheep cross into Namibia from neighbouring countries and introduce PPR

There is little doubt that PPR will arrive in southern Africa sooner rather than later and will be problematic wherever goat production is significant. For that reason the threat to Namibia is clear and practical measures therefore need to be implemented to obviate this occurrence.

The quarantine system for small stock to move across the VCF (i.e. from NCA to SVCF) is arguably inadequate in the case of PPR because the infection is sometimes not clinically apparent. The OIE's TAHC recommends that quarantine should be accompanied by vaccination when importation from an infected country is undertaken (Article 14.8.7). This is a grey area as far as risk is concerned but requires careful consideration.

8.3.10 Goats cross into Namibia from neighbouring countries and introduce CCPP

This disease presents an appreciable risk to Namibia because it is present in Angola and possibly Zambia (which has open borders with infected countries such as Tanzania) because Zambia has supplied no information on this disease to the OIE (WAHID – www.oie.int). It could even therefore already be in the NCA.

Furthermore, the importation of goats SVCF would not be effectively prevented by the present three-week quarantine system because of the long incubation period of the disease (45 days according to the OIE) and the fact that carriers exist (Article 14.4.1 of the TAHC). The OIE recommends (Article 14.4.7) that two serological (complement fixation) tests be applied to animals before introduction. The management system for CCPP should be reconsidered because this disease could severely restrict export of live goats to RSA in future if it occurred SVCF.

9. Additional risk management measures that could be considered for protection against incursion of animal health hazards into Namibia's export zone

This investigation has identified three aspects of Namibia's defence against incursion of TADs-associated hazards resulting from import of commodities and products derived from livestock that require reconsideration, *viz.* (1) the fencing system in the north-east of the country, (2) the quarantine system for movement of small stock from the NCA to SVCF and (3) procedures related to import of processed animal products.

It is also suggested that adoption of hazard analysis, critical control points (HACCP) based approaches should be considered for refining risk reduction measures. Others have pointed out that the HACCP approach is apt as a management tool for animal diseases with the potential to spread rapidly as it is for food safety (USDA and others, 2009). That approach comprises seven basic steps (detailed explanation is available via the internet from a variety of sources):

- Conduct a hazard analysis (primarily to identify the hazards – this study could serve that purpose);
- Identify critical control points (CCPs);
- Establish limits for CCPs;
- Establish CCP monitoring requirements;
- Establish corrective actions when monitoring indicates deviation from CCP limits;
- Establish procedures for ensuring that the HACCP system is working as intended (i.e. verification procedures);
- Establish a system of record keeping.

This approach is suited to development of a management and auditing system for protection of Namibia's border against incursion of animal disease hazards. The only problem is that internationally recognised guidelines are not available but, on the other hand, Namibia has the resources to develop the system unaided.

9.1 Fencing system in the north-east of the country (VCF and associated border fences)

This system of fences is a clear CCP. Management of the fencing system can equally easily be identified as in need for improvement because the limits and monitoring requirements of the CCP (fence system) do not appear to be established, the monitoring system is not transparent and procedures for ensuring the system is working as intended also appear to be lacking. A recording system, if it exists, is not in the public domain and therefore not accessible to stakeholders for whom the performance of the fencing system is crucial. Lack of systematic and independent assessment of the fence system is without doubt the most significant threat to Namibia's export status for meat and meat products.

It is suggested that fence maintenance could be outsourced while the DVS remains as the competent authority conducting regular audits. This would arguably improve the functionality of the fence.

An effective VCF remains the most important single factor that will prevent the outbreak of TADs SVCF.

9.2 Adjustment of the quarantine system for small stock sales to SVCF

The current quarantine system (according to the DVS FMD Contingency Plan, 2011) is inadequate to prevent PPR and CCPP crossing into the export zone were they to enter the NCA. The current system should therefore be reconsidered using the relevant chapters of the OIE's TAHC as a guide because, as explained above, these two diseases are likely to threaten the NCA in the near future.

9.3 Verification of processing procedures for imports of processed meat products

Table 2 shows that in the period April to December 2011 339 tonnes of processed meats were imported into Namibia where there is reason to question whether the processing applied to those products was adequate to destroy infectious agents such as FMD. In such cases the inspector acting on behalf of the DVS would need to decide whether to approve a consignment or not without access to a system for sampling and testing. Such testing systems (e.g. based on measurement of surviving alkaline phosphatise) are readily available commercially and are practical and relatively cheap.

It is recommended that the DVS and the meat industries of Namibia consider adoption of testing systems for meat consignments where there is suspicion that processing may be inadequate.

10. Risk consequence

While risk consequence is an integral part of risk analysis (Figure 6), it is considered separately in this report because the approach and techniques employed differ from other components of risk analysis.

Entry of five specific diseases into Namibia, particularly SVCF, are evaluated because the overall risk assessment showed FMD, CBPP, RVF, PPR and CCPP to be the major hazards likely to result from legal or illegal imports of animal commodities and products (Table 6).

The economic consequences of an identified hazard occurring may be direct or indirect. Direct consequences are the cost of managing outbreaks and impact on production, while indirect consequences include:

- Impact on domestic trade and consumer demand;
- International trade effects, including loss of international markets;
- Impact on the environment;
- Impact on communities.

The direct costs of managing outbreaks were not evaluated because data on which to base such assessments in Namibia are not in the public domain. These costs would presumably be borne by the State, i.e. DVS. The direct impact of disease outbreaks on production was likewise not assessed because, for trade-influencing TADs such as those addressed in this report, the consequences of control measures instituted by the State to limit spread of the infection dwarfs the direct effects of the disease on production. So, for example, 'stamping out' of all infected and in-contact animals in a FMD outbreak has far more immediate and drastic effects on production than does the disease itself.

As regards the measuring the consequences for international exports occasioned by the occurrence of one of the five diseases which were considered to represent the most important risks to Namibian livestock SVF, two factors introduce uncertainty, *viz.* (1) the precise strategy that will be instituted by the DVS to manage the hazard (because a range of alternatives exist) and (2) the reaction of trade partners because some do not necessarily abide strictly by OIE standards.

10.1 Size of Namibian livestock-sector economy

In order to determine the economic impact of a disease outbreak on the livestock sector SVCF, the following information is necessary:

- The size of the livestock sector;
- Estimation of the monthly expenditure of livestock producers in Namibia SVCF;
- Identification of the composition of different value chains;
- Estimation of the level of employment created by the livestock industry SVCF;
- Evaluation of the size of each part of livestock value chains and their reliance on the Namibian livestock sector;
- Determination of the financial impact on the livestock industries of disease outbreaks under the most likely scenarios.

10.1.1 Size of the Namibian livestock producer sector SVCF

Based on information supplied mainly by the Meat Board of Namibia, the gross producer income from livestock was approximately N$ 2.4 billion for 2011. This total was derived from the value of cattle and small stock slaughtered or exported live, mainly to RSA but also to the NCA (*Tables 8 and 9*).

Table 8 Beef industry producer income SVCF for 2011

Beef slaughter (export abattoirs)	Weighted average price/kg	$ 24.23
	Number slaughtered	110 119
	Carcass mass	252
	Beef slaughter income export abattoirs	**$ 672 861 610**
Beef slaughter (local market)	Estimated weighted average price/kg C –grade	$ 22.00
	Estimated weighted average price/kg (A, AB, B) –grade	$ 24.00
	Estimated weighted average/kg (66% C and 34% rest)	$ 22.67
	Number slaughtered according to Meat Board	18 142
	Carcass mass	240
	Beef slaughter income local market	**$ 98 691 837**
	TOTAL BEEF SLAUGHTERED INCOME	**$ 771 553 449**
Cattle live exports to RSA	Total number of cattle exported	200 236
	Average weaner price/kg	$ 18.80
	Average weight of weaners	213
	Estimated value per weaner exported	4 004
	Average store price/kg	$ 15.93
	Average weight of stores	322
	Estimated value per store exported	$ 5 129.46
	Estimated value per head exported (80% weaners + 20% stores)	$ 4 229.41
	TOTAL ESTIMATED VALUE OF LIVE CATTLE EXPORTS TO RSA	**$ 846 880 541**
Cattle live exports to Nortern Communal Areas (NCA)	Estimated number of cattle exported from SVCF to NVCF	18 894
	Average auction price of oxen on auctions	$ 13.69
	Estimated average weight – oxen	420
	Average auction price of heifers on auctions	$ 17.23
	Estimated average weight – heifers	240
	Estimated value per head exported (50% slaughter animals and 50% breeding heifers)	$ 4 943
	TOTAL ESTIMATED VALUE OF LIVE CATTLE EXPORTS TO NCA	**$ 93 383 595**
	TOTAL BEEF INDUSTRY INCOME	**$ 1 711 817 585**

Table 9 Small stock producer income SVCF for 2011

Sheep slaughter (export and butchers)	Total number slaughtered (Export and Butchers)	797 239
	Weighted Average price all grades	$ 39.96
	Weighted average carcass weight	16.93
	TOTAL SHEEP SLAUGHTERED INCOME	**$ 539 350 361**
Live small stock exports	Number of sheep exported	67 280
	Average value of sheep/head	$ 676.52
	Number of goats exported	251 775
	Average value of goats/head	$ 678.61
	TOTAL ESTIMATED VALUE OF LIVE SMALL STOCK EXPORTS	**$ 216 373 487**
	TOTAL SMALL STOCK INDUSTRY INCOME	**$ 755 723 847**
	TOTAL LIVESTOCK PRODUCER INCOME	**$ 2 467 541 432**

10.1.2 Estimated monthly expenditure by livestock producers in Namibia

Table 10 shows the combined expenditure of different production systems; these include labour, feeds and licks, fuel, repair and maintenance, veterinary care, marketing, and other diverse cost. The total monthly expenditure of N$ 120 million does not include interest payments, capital redemption or remuneration of livestock owners.

Table 10 Monthly cash expenses of livestock producers SVCF

		Cash expenses/ annum/farm	Cash expenses/ month/farm	Total herd	Monthly expenses/head
Cattle	Cow/ox Grootfontein/Otavi	($466 498)	($38 875)	500	($78)
	Weaner/Ox Okahandja	($864 822)	($72 069)	938	($77)
	Weaner/Gobabis	($626 417)	($52 201)	629	($83)
Small stock	Lamb Karasburg	($561 335)	($46 778)	4 450	($11)
	Karakul/Lamb Helmeringhausen	($874 849)	($72 904)	6 070	($12)

	Average monthly expenses/head	National herd SVCF (2006)	Total monthly expenses	Total annual expenses
Cattle	($79)	1 164 127	($92 188 335)	($1 106 260 015)
Small stock	($11)	2 590 606	($29 173 395)	($350 080 746)
TOTAL			**($121 361 730)**	**($1 456 340 760)**

In 2011 the Namibian Agricultural Union (NAU) conducted a study to determine the total long-, medium- and short-term debt of the agricultural sector and arrived at an estimate of N$ 3.4 billion, including debts of the Agricultural Bank of Namibia and commercial banks. If it is assumed that the Namibian livestock sector owes 80% of the total debt. In that case the monthly repayments by Namibian livestock producers would amount to N$ 32 million.

The monthly expenditure for servicing the debts of livestock producers is consequently estimated at N$ 152 million.

10.1.3 Employment in primary production of livestock in Namibia

A case study was conducted by the NAU during 2012 which indicated that approximately 14 000 people are employed by the livestock sector in Namibia SVCF (Table 11). This conclusion is similar to that reached in 2008 by the Labour Force Survey of the Ministry of Labour and Social Welfare which estimated the agricultural labour force at about 13 500.

Table 11 Estimated employment opportunities in livestock farming SVCF

		Number of employees per herd	Total herd	Livestock/ employee	Average livestock/ employee	National herd SVCF (2006)	Estimated primary employment
Cattle	Cow/ox Grootfontein/Otavi	4.35	500	115			
	Weaner/Ox Okahandja	6	938	156	127	1 164 127	9 174
	Weaner/Gobabis	5.75	629	109			
Small stock	Lamb Karasburg	5.7	4 450	781			
	Karakul/Lamb Helmeringhausen	14	6 070	434	607	2 590 606	4 267
TOTAL ESTIMATED PRIMARY EMPLOYMENT OPPORTUNITIES IN LIVESTOCK SECTOR							**13 441**

10.1.4 Livestock auction and transport industry income

Based on the Annual Report of the Agra Cooperative for the period 1 August 2010 to 31 July 2011, it was estimated that an average commission of 5.4% is generated on livestock auctions in Namibia realising N$ 91.6 million annually (Table 12).

Table 12 Estimated size of auction industry SVCF

Number of cattle sold on auctions	Estimated value/head	Total value of cattle on auctions	Annual Commission %	Annual Commission income
300 000	N$ 4 099	N$ 1 234 million	5.40%	N$ 66.6 million
Number of small stock sold on auctions	**Estimated value/head**	**Total value of small stock on auctions**	**Annual Commission %**	**Annual Commission income**
715 939	N$ 648	N$ 463 million	5.40%	N$ 25 million
TOTAL ESTIMATED COMMISION INCOME/ANNUM				**N$ 91.6 million**

From information provided by the Namibia Livestock Agents and Transporters Association (S Prinsloo, personal communication 2012) and other industry experts, values associated with animal transportation were calculated, giving a total of N$ 205.6 million per annum (Table 13).

Table 13 Total estimated annual cost of Namibian livestock transport

Live cattle exports to RSA	Number of cattle exported – 2011	200 326
	Number of truck loads cattle	± 2000
	Cost of cattle exports/truck load	1 700 km @ N$ 28/km = N$ 47 600
	Cost of cattle exports	**N$ 95 million/annum**
	Subsidised backloads on cattle trucks	**±N$ 20 million/annum**
Small stock exports to RSA	Number of goats and sheep exported live	319 055
	Number of truck loads small stock	± 425
	Cost of small stock exports	**N$ 20 million**
	Subsidised backloads on small stock trucks	**± N$ 4 million**
Cattle slaughtered in abattoirs in Namibia	Cattle slaughtered in Namibia	170 000
	Cattle truck loads to local abattoirs	4 850/annum
	Cost of cattle transport to abattoirs/load	200 km @ N$ 32/km = N$ 6 400/load
	Total cost of cattle transport to abattoirs	**N$ 31 million/annum**
Cattle sold on auctions in Namibia	Cattle sold on auctions in Namibia	300 000
	Cattle truck loads to auction	6 000/annum
	Cost of cattle transport to auctions/load	100 km @ N$ 32/km = N$ 3 200
	Total cattle transport cost to auctions	**N$ 19.2 million**
Sheep slaughtered in abattoirs in Namibia	Sheep slaughtered in Namibia	792 239
	Sheep truck loads to local abattoirs	1 320
	Cost of sheep transport to abattoirs/load	250 km @ N$ 32/km = N$ 8 000/load
	Total cost of sheep transport to abattoirs	**N$ 10.6 million**
Small stock sold on auctions in Namibia	Small stock sold on auctions in Namibia	715 939
	Small stock truck loads to auction	1 200
	Cost of small stock transport to auctions/load	150 km @ N$ 32/km = N$ 4 800
	Total small stock transport cost to auctions	**N$ 5.8 million**
TOTAL ESTIMATED TRANSPORT COST OF LIVESTOCK SVCF		**N$ 205.6 million/annum**

10.1.5 Value addition by Namibian abattoirs

The export and local abattoirs in Namibia are essential to the functioning of the Namibian livestock sector; it employs about 2 000 people. The average value adding contribution of abattoirs is difficult to accurately determine, mainly due to the fact that all of the abattoirs are private businesses which are not willing to share their financial statements. Value addition by sheep abattoirs is lower than the export abattoirs for beef because whole sheep carcasses are exported to South Africa, while deboned cuts are exported to the EU in the case of beef. The total value of livestock slaughtered in Namibia amounted to N$ 1.3 billion in 2011. Industry experts estimate the direct value adding to the producer value at 25%. Therefore the direct value adding to the Namibian livestock industry amounts to about N$ 325 million per annum.

In reality the impact of export abattoirs on the Namibian economy is higher than the above-mentioned figure because if an export abattoir like Meatco were not part of the Namibian livestock industry, the producer price would decrease significantly due to lower competition in the market.

10.2 Comparative sizes of components of the overall livestock value chain

These are shown in Figure 15.

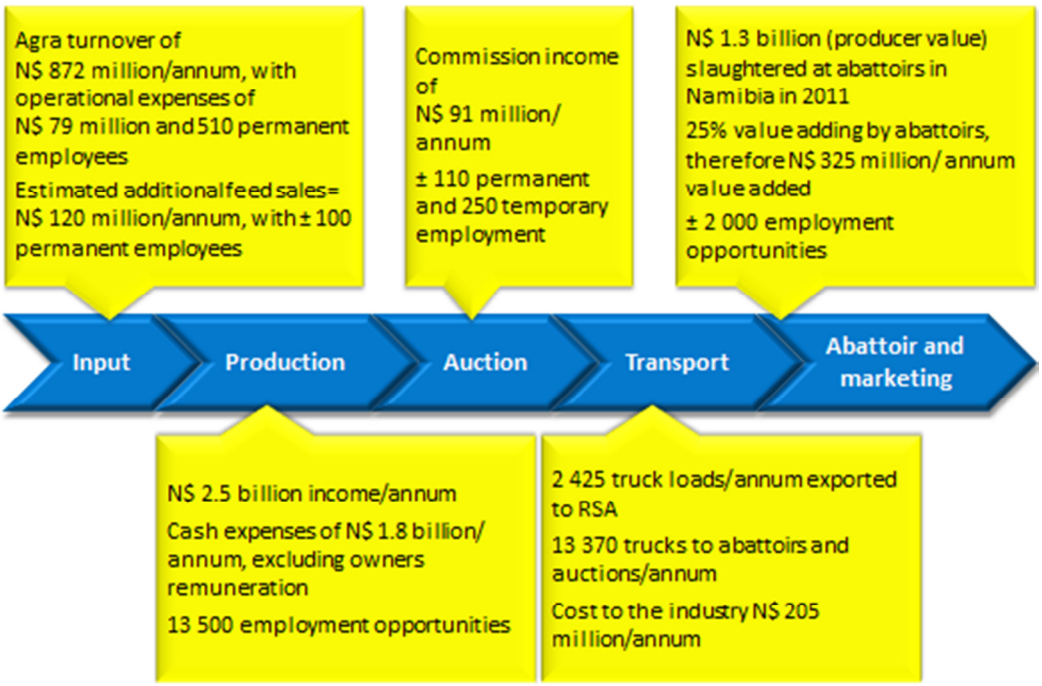

Figure 15 The value chain for meat production in Namibia

10.3 Economic consequences of significant animal disease hazards

10.3.1 Foot and mouth disease – large outbreak SVCF

The following assumptions were made:

- FMD suspected on 30 farms extending over the Otjozondjupa, Omaheke and Khomas Regions;
- Immediate nation-wide cessation of movement of cloven-hoofed animals while the outbreak is investigated and confirmed;
- All exports of animals and animal products halted immediately;
- Identification of infected and protection zones based on clinical surveillance;
- Stamping out of all infected animals and in-contact animals takes place (50 000 head of cattle);
- Surveillance, including serology applied to protection and free zones;
- Animal movement permitted in areas outside the protection zone when surveillance indicates cessation of viral circulation;
- End of the outbreak is declared 3 months after slaughter of the last infected or in-contact animal and completion of associated surveillance;
- Re-application to OIE for recognition of Namibia SVCF as a FMD-free zone where vaccination is not practiced;
- Approval from OIE;
- Resumption of livestock and meat exports.

It is important to remember that the above scenario reflects the best possible outcome from the disease control and economic perspectives. Such a large outbreak would likely result in technical, financial and logistical difficulties. If that were to occur, the duration of control actions and re-establishment of the FMD-free zone could last up to two years.

The likely events associated with such an outbreak are summarized in Figure 16.

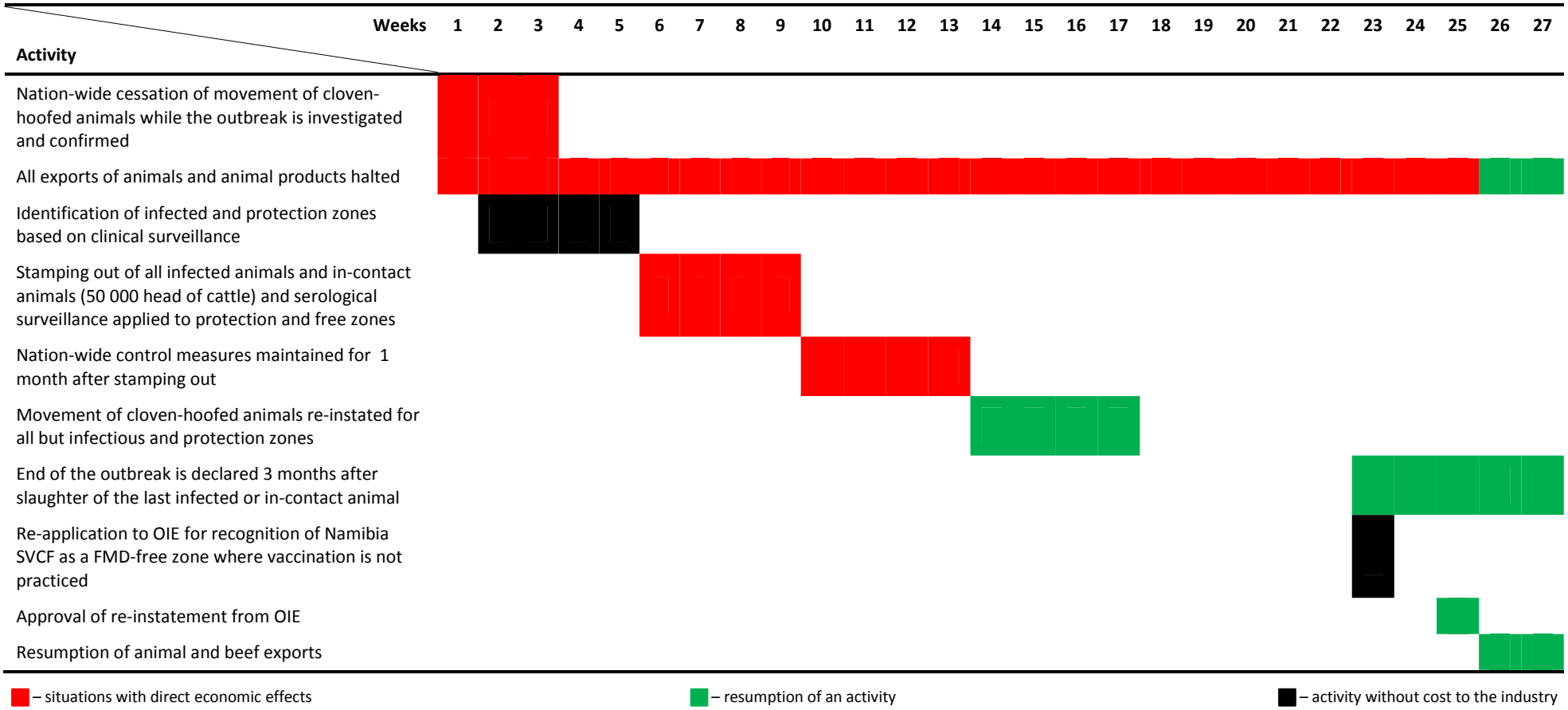

Figure 16 Schematic representation of the likely schedule of events associated with the control of a large FMD outbreak occurring in the Otjozondjupa, Omaheke and Khomas Regions of Namibia

10.3.2 Foot and mouth disease – limited to one farm and surrounding area (say ten farms radius): all infected and in-contact animals slaughtered

The probable cost of such an outbreak is shown in Table 14 – N$ 779 million.

Table 14 Foot and mouth disease on a single farm and spread to surrounding area – No vaccination and slaughter of all infected and in-contact animals (stamping out)

Slaughtering of all affected animals	10 farms @ 500 animals/farm = 5 000 animals
	5 000 animals @ N$ 5 000/animal = N$ 25 million
Cash expenses of all livestock producers for 4 months	N$ 150 million/month x 4 months = N$ 600 million
No auctions in Namibia for 4 months	N$ 7.58 million/month x 4 months = N$ 30 million
No transport of any livestock to RSA for 4 months	N$ 11.6 million/month x 4 months = N$ 46 million
No slaughtering of livestock for the export market for 4 months	N$ 393 million @ 20% value adding = N$ 78 million
TOTAL ESTIMATED LOSS TO THE ECONOMY	**N$ 779 million**

10.3.3 Foot and mouth disease – outbreak limited to a particular area where vaccination is applied but all vaccinated animals are slaughtered (so-called vaccination-to-die)

If, as part of the control strategy, cattle-at-risk are vaccinated but are then killed once the outbreak is over, the status of FMD-freedom will take at least six months to re-instate. The cost of this scenario, shown in Table 15, would likely be in the region of N$ 1.15 billion.

Table 15 Foot and mouth disease outbreak in a particular area – vaccination and slaughter of all infected, in-contact and vaccinated animals

Slaughtering of all inoculated animals at 40% below market value	10 000 animals @ N$ 5 000/animal @ 40% = N$ 20 million
Cash expenses of livestock producers for 6 months	N$ 150 million/month x 6 months = N$ 900 million
No auctions for 6 months	N$ 7.58 million/month x 6 months = N$ 45 million
No transport of any livestock to RSA for 6 months	N$ 11.6 million/month x 6 months = N$ 70 million
No slaughtering of livestock for the export market for 6 months	N$ 589 million @ 20% value adding = N$ 118 million
TOTAL ESTIMATED LOSS TO THE ECONOMY	**N$ 1.15 billion**

10.3.4 Foot and mouth disease – outbreak limited to a particular area where vaccination is applied, and the vaccinated cattle are not killed (so-called vaccination-to-live)

In the event that vaccination is used as part of the control strategy but the vaccinated cattle are not killed at the end of the outbreak, recovery of the FMD-free status would take at least 12 months.

The cost of such an approach, shown in Table 16, would be in the vicinity of N$ 2.19 billion.

Table 16 Foot and mouth disease in a particular area – vaccination but no slaughter of infected or in-contact animals

Cash expenses of livestock producers for 12 months	N$ 150 million/month x 12 months = N$ 1.8 billion
No auctions for 12 months	N$ 7.58 million/month x 12 months = N$ 91 million
No transport of any livestock to RSA for 12 months	N$ 11.6 million/month x 12 months = N$ 139 million
No slaughtering for local market for 3 months	N$ 24 million @ 20% value adding = N$ 5 million
No slaughtering of livestock for the export market for 12 months	N$ 786 million @ 20% value adding = N$ 156 million
TOTAL ESTIMATED LOSS TO THE ECONOMY	**N$ 2.19 billion**

10.3.5 Foot and mouth disease – Outbreak in the Northern Communal Areas (NCA), limited to the Omusati, Ohangwena, Oshikoto and Oshana regions where vaccination is applied, and the vaccinated cattle are not killed

In this situation the economic impact would be lower as shown in Table 17 but it is probable that the sociological impact would be much higher. Sociological impact is, however, difficult to quantify.

The cost estimate is N$ 332 million.

Table 17 Foot and mouth disease in NCA – vaccination but no slaughter of all infected and in-contact animals

Cash expenses of livestock producers for 12 months [DVS (2010) Cattle = 813 806; Sheep = 24 084; Goats = 685 556]	N$ 28 million/month x 12 months = N$ 336 million
No slaughtering of livestock at the Oshakati abattoir for 9 months	7 500 cattle @ N$ 4 500/head @ 20% value adding = N$ 6.75 million
TOTAL ESTIMATED LOSS TO THE ECONOMY	**N$ 332 million**

10.3.6 Rift Valley fever – outbreak SVCF

This assessment was complicated by the fact that the economic consequences of the widespread occurrence of RVF in south-eastern and central Namibia in 2010 were not what would have been expected based on the recommendations in the OIE's TAHC. So, exports of meat from Namibia to RSA and the EU were apparently not significantly affected. Likewise cattle and small stock exports from Namibia to RSA were not affected, presumably because RSA also had a widespread RVF epidemic at that time. There is therefore an incongruity between the expected consequences (based on recommendations of the OIE) and what actually transpired. What will happen the next time round is therefore to a large extent unpredictable.

This assessment for RVF was based on presumption of a RVF outbreak causing abortion in cows on several farms in the Windhoek district. The probable/possible consequences (if the suspicion were to be confirmed) would likely be:

- All movement of livestock is immediately prohibited in Windhoek, Okahandja, Karibib, Rehoboth and Gobabis Districts (according to the DVS census of 2006, the number of livestock in these districts is: cattle – 609 820, sheep – 438 896 and goats – 293 281).
- All exports of meat and livestock (apart from canned products) cease.
- The RVF outbreak is brought under control in 2 months.
- No export of beef for 6 months after the last RVF case; therefore no meat exports for eight months.
- Export of live animals to RSA will likely commence six months after the last RVF case; therefore no live exports for eight months.

Table 18 details the estimated cost of N$ 623 million.

Table 18 Outbreak of Rift Valley fever in the Windhoek district

Cash expenses of livestock producers in Windhoek, Karibib, Rehoboth, Okahandja and Gobabis for 6 months	N$ 66 million/month x 6 months = N$ 396 million
No auctions for 6 months (50% of cattle auctions and 25% of small stock auctions affected)	N$ 3.33 million/month x 6 months = N$ 20 million
No transport of any livestock to RSA for 6 months	N$ 11.6 million/month x 6 months = N$ 46 million
No slaughtering of livestock for the export market for 8 months	N$ 807 million @ 20% value adding = N$ 161 million
TOTAL ESTIMATED LOSS TO THE ECONOMY	**N$623 million**

10.3.7 Contagious bovine pleuropneumonia outbreak in the Outjo District (SVCF)

The assessment was based on the assumption that an outbreak occurs on ten farms in a single district with the following likely consequences:

- All movement of livestock is immediately prohibited in Outjo, Khorixas, Otjiwarongo, Okakarara, Omaruru, Karibib, Otjimbingwe, Otjihorongo and Okombahe districts. (According to the DVS census of 2010, the number of cattle in these areas is 276 029)
- Because CBPP is not transmitted by beef export of beef would likely be minimally affected.
- Slaughter of 5 000 cattle in the infected area, including possible contacts and surrounding area.
- Extensive surveillance, including serology, required to determine the extent of disease spread lasting at least four months – cattle auctions resume after five months.
- No live cattle exports for 12 months from Namibia.

The predicted economic consequence of such an event, amounting to N$ 642 million, is shown in Table 19.

Table 19 Outbreak of contagious bovine pleuropneumonia in the Outjo district

Slaughtering of 5 000 cattle from infected and surrounding area	5 000 head of cattle @ N$ 6 000/head = N$ 30 million
Cash expenses of all livestock producers SVCF for 3 months	N$ 150 million/month x 3 months = N$ 450 million
No cattle auctions countrywide for 12 months	N$ 5.55 million/month x 12 months = N$ 67 million
No transport of any cattle to RSA for 12 months	N$ 7.9 million/month x 12 months = N$ 95 million
TOTAL ESTIMATED LOSS TO THE ECONOMY	**N$ 642 million**

10.3.8 Contagious caprine pleuropneumonia outbreak in Outjo District

The immediate economic impact of such an event would depend on what strategy the DVS chose to adopt in response because while CCPP could have significant long-term economic consequences it is a treatable condition in the early stages of infection (tetracyclines) and vaccines can also be effective although they are not readily available. It is assumed that the DVS would likely attempt a stamping out policy if the outbreak were to be discovered prior to significant spread.

A further difficulty in estimating economic impact of CCPP is the recommendations of the relevant Chapter (14.4) of the TAHC. In that chapter a country may only claim freedom from CCPP a year after stamping out has been completed. On the other hand, an infected zone only remains so for 45 days after completion of stamping out. Which approach is likely to be adopted to manage an outbreak is difficult to predict but there could be significant effects on goat exports.

For this estimate a 12 month waiting period was assumed.

The scenario analysed in terms of a CCPP outbreak was as follows:

- All movement of goats is immediately prohibited in Outjo and Khorixas Districts. According to the DVS census of 2010, the number of goats in Outjo and Khorixas was 162 320.
- Obligatory ‘stamping out’ of 20 000 infected and in-contact goats in affected area.
- Banning of live exports of goats from Namibia to RSA for 12 months. According to DVS census of 2006, the total goat herd SVCF was 1.287 million.

On this basis, the economic impact on the livestock value-chain of a CCPP outbreak SVCF was N$ 315 million (Table 20).

Table 20 Outbreak of contagious caprine pleuropneumonia in Outjo and Khorixas (SVCF)

Cash expenses of goat producers (SVCF) for 15 months (1.287 million goats @ N$ 14/goat/month)	N$ 18 million/month x 15 months = N$ 270 million
Obligatory stamping out and replacement of all goats in infected areas (20 000 heads of goat)	20 000 goats @ N$ 678/goat = N$ 13.5 million
No goat auctions for 15 months (40% of small stock auctions)	N$ 0.83 million/month x 15 months = N$ 12.5 million
No transport of any goats to RSA for 15 months (250 000 live exports/annum; 400 trucks of goats to RSA in 18 months)	400 truck load @ N$ 47 600/load = N$ 19 million
TOTAL ESTIMATED LOSS TO THE ECONOMY	**N$ 315 million**

10.3.9 Peste des petits ruminats outbreak in the Tsumeb district (SVCF)

The analysis was based on the following:

- Stamping out of 20 000 head of small stock in the infected and surrounding areas.
- All movement of small stock is immediately prohibited in all districts SVCF. According to the 2006 DVS census, the total small stock herd SVCF was 3.4 million.
- Cessation of live exports of goats and sheep from Namibia to RSA for 12 months.
- Banning of export of sheep and goat meat from Namibia for 12 months.

Table 21 shows the estimated cost to be N$ 742 million.

Table 21 Outbreak of PPR in Tsumeb district (SVCF)

Cash expenses of all small stock producers (SVCF) in Namibia for 12 months (3.4 million heads @N$ 14/head/month)	N$ 48 million/month x 12 months = N$ 576 million
Stamping out of 20 000 head of small stock in infected and surrounding areas.	20 000 small stock @ N$ 677/head = N$ 13.5 million
No small stock auctions for 12 months	N$ 2.08 million/month x 12 months = N$ 25 million
No transport of any small stock to RSA for 12 months (319 000 live exports/annum; 425 trucks in 12 months)	425 truck loads @ N$ 47 600/load= N$ 20 million
No slaughtering of small stock for the export market for 12 months	N$ 539 million @ 20% value adding = N$ 108 million
TOTAL ESTIMATED LOSS TO THE ECONOMY	**N$ 742 million**

11. Discussion

The ToRs for this investigation required that a quantitative risk analysis be conducted, necessitating a quantitative risk assessment. The latter was not possible due to the lack of sufficiently detailed data on which to base quantification. For that reason a semi-quantitative approach was adopted. To illustrate the problem, for estimating the probability of incursion of live animals (wild or domestic) across the VCF and border fences (Namibia/Botswana/RSA borders) requires an assessment of the integrity and efficacy of the fences over a representative period of time (e.g. the average number of animals that crossed a given fence over a defined period, divided by the length of the fence). This can only be derived from a dedicated audit. Such audits have so far not been conducted or, if they have, the results are not in the public domain.

The major disease hazards that threaten Namibia – rated as moderate by this investigation – arise from the possibility of live animals crossing the barrier fencing system that guards the north and north-east of the country (Figures 1 and 5). Such events could arise from animals either being smuggled across the border or as a consequence of the fencing system functioning inadequately, i.e. wild or domestic animals being able to penetrate it unaided.

The potentially FMD-infected areas of South Africa and Botswana (Ngamiland is an FMD-infected zone) bordering Namibia, are fenced. These fences together with the VCF shield Namibia's export zones from FMD and in the case of the VCF also from CBPP.

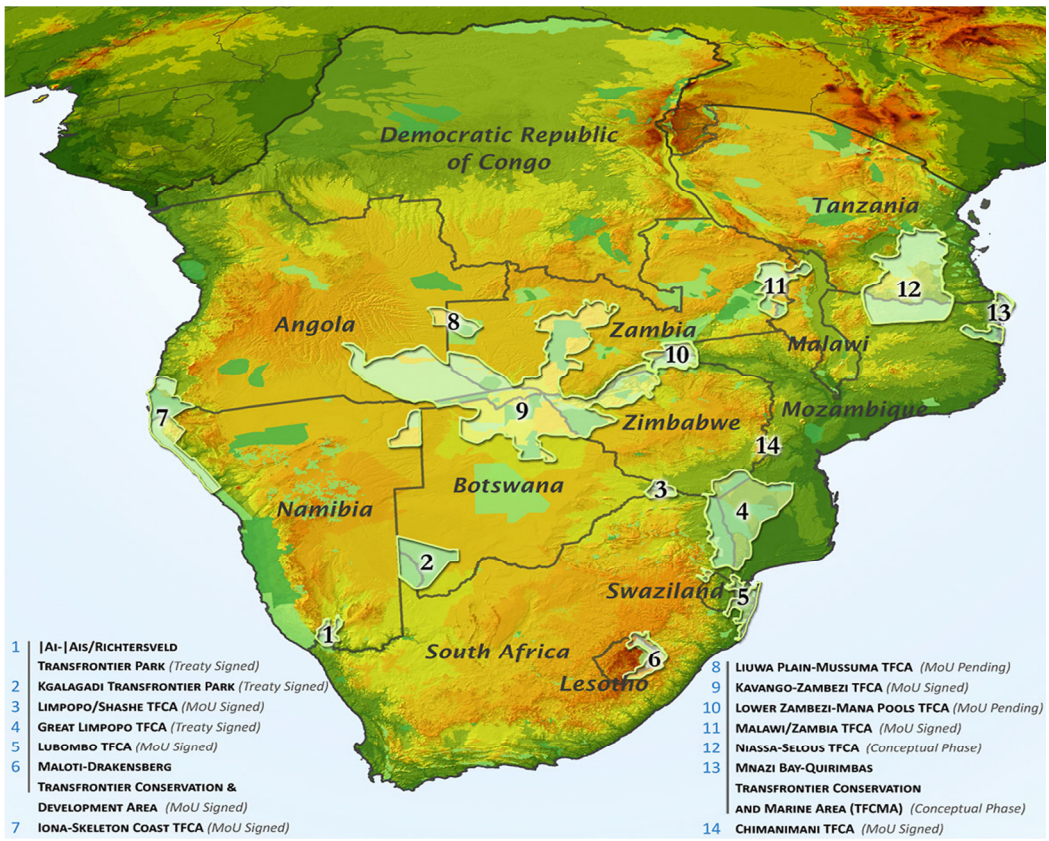

Figure 17 The position and extent of the 14 designated Transfrontier Conservation Areas in southern Africa (No. 9 is the Kavango/Zambesi TFCA)

The fencing issue is complicated by the Caprivi lying at the core of the KAZA TFCA, i.e. a huge area, about the size of Italy (the exact size is not yet finalised but likely to exceed 400 000 km^2), situated north-east of Namibia's main beef export zone (Figure 15). On 15 March 2012 the KAZA TFCA was officially launched by Ministers responsible for environmental affairs in the five KAZA countries (Angola, Botswana, Namibia, Zambia and Zimbabwe). This followed the signing of the KAZA TFCA Treaty by the Heads of State of the same 5 countries on 18 August 2011 (www.kavangozambesi.org). The KAZA TFCA is therefore now a reality and no longer a prospective development.

A conflict has arisen over many decades between conservationists and animal disease control authorities because of fundamentally different visions on how animal populations should be managed. Maintaining the 'connectivity' between animal populations (to ensure adequate gene flows etc.) is vital for conservation while animal disease regulators seek to minimize 'connectivity' between animal populations of different health status, particularly when it comes to directly transmitted (i.e. contagious) diseases such as FMD, CBPP, PPR and CCPP. This is the principle behind the fencing system designed to prevent both wild and domestic animals from entering the export zone (Figure 1; Hanks and Ferguson, 2010).

Table 6 identifies five moderate- and 12 low-risk hazards posed by infectious animal diseases. The moderate risks are: (1) FMD crossing the VCF or country borders either via smuggled cattle or (2) young buffalo (i.e. parts of breeding herds) that cross the same fences and introduce FMD, (3) CBPP entering the export zone across the VCF via smuggled cattle, (4) RVF occurring as a result of mosquitoes from neighbouring countries entering Namibia (although it is also possible for RVF outbreaks to arise from foci within Namibia[11]), (5) CCPP entering the NCA from neighbouring countries and from there gaining entry to the export zone through either illegal (smuggling) or legal means because the current quarantine system is inadequate to manage potential transmission of CCPP across the VCF. Low risks are presented by ASF, PPR and BSE although the BSE risk results from an anomaly inherent in the semi-quantitative approach adopted for this investigation (Table 5). In reality the highly stable BSE management system in operation in Namibia would preclude the BSE agent from being recycled even if it were to be imported (Thomson, 2010).

Of particular concern to Namibia is the SAT 1 FMD outbreak that occurred in northern KZN of RSA in February to March 2011. That outbreak resulted in RSA losing OIE recognition for its long-established FMD-free zone with the result that imports of live animals and commodities and products derived from animals that were sourced from RSA after March 2011 were/are not derived from a zone recognised internationally as free from FMD.

In early 2012 RSA suffered an outbreak of ASF in parts of the country (Gauteng and Mpumalanga Highveld) where, as far as is known, ASF has not occurred for many decades. Fortunately, this outbreak did not extend to compartmentalised pig farms.

The RVF situation in Namibia is complex because, contrary to popular belief, there is molecular evidence that lineage H of RVF virus (which caused widespread outbreaks in RSA in 2009-2010) arose in or arrived at

[11] It should be accepted that RVF is not a foreign disease as far as Namibia is concerned – the southern African region, including Namibia, is endemically infected.

the Caprivi in 2004 (Grobbelaar *et al.*, 2011). How the outbreaks in southern and central Namibia recorded in 2010 arose is uncertain because sequencing data for the viruses involved are not currently available in the public domain (many RVF viruses have been sequenced at the ARC-Onderstepoort Veterinary Institute in the last few years but this has not included viruses from Namibia – Dr F Majiwa, personal communication, 2012).

Entry of RVF into Namibia is not preventable because the available evidence is that spread is predominantly a result of infected mosquitoes moving or being transported over long distances. This means that only the impact (i.e. not the occurrence) can potentially be managed through the use of vaccine, although vaccine usage is problematic from a number of perspectives (Grobbelaar *et al.*, 2011). It is nevertheless evident that the risk of RVF outbreaks occurring has increased in recent years as a result of more-or-less continuous RVF epidemics in RSA since 2008 (Figure 4). It should be borne in mind that the phenology[12] of RVF and its vectors, particularly in relation to the Gariep River Basin and other southern African ecosystems, is poorly understood. The current take-home message therefore is that RVF should be accepted as endemic to Namibia.

Although the impact of RVF could, in theory at least, be mitigated by preventative vaccination of susceptible livestock as indicated above, such action could interfere with the area SVCF being recognised as free from RVF by trading partners. This problem could only be solved by bilateral negotiation because the OIE does not provide an accreditation system for RVF status (i.e. unlike FMD, CBPP and BSE).

As already indicated, a difficulty for this study was lack of independently-derived data on the efficacy of the fencing systems; some unofficial reports (with accompanying photographs) suggest the system is inadequate although the official stance is that it is adequately functional. This meant, for a start, that this investigation could not be quantitative as originally intended (see Appendix B and 8.2) but even the semi-quantitative approach adopted cannot be considered robust unless there are verified assessments on the integrity of the fencing system, preferably accompanied by regular audits of the frequency with which animals cross vital fence lines. This lack of auditing is a clear deficiency.

It is recommended that the DVS and other stakeholders in the fencing system consider using a HACCP-based approach to manage it in future. This is explained in Section 9.

Lack of data on the performance of hazard management systems extends to the import of meat and meat products, including processed pork products which comprise the bulk of Namibia's meat imports. The precise origin and processes to which imported products have been subjected over the years are seemingly unavailable in a consolidated form. It is true that authorized officials within the CAs of countries exporting to Namibia are obliged to certify that the conditions of the import permit issued by Namibia's DVS have been complied with.

The importance of this issue has been accentuated since March 2011 when RSA lost its listing as a country with a large FMD-free zone because RSA is the major source of meat and meat products imported into

[12] The study of periodic plant and animal life-cycle events and how those are initiated by season and inter-annual variation in climate.

Namibia. The system instituted by Namibia's DVS since March 2011 requires that imports of pig meat and products are sourced from four approved supply chains based on compartmentalisation of the commercial pork industry in RSA (two in Gauteng and two in the Western Cape). However, Table 2 shows that some imports of meat and meat products from RSA and other countries since April 2011 were not immediately identifiable as 'safe' for one reason or another. It is therefore recommended that in future not only should added care be taken over the issuance of import permits but also that DVS consider providing its inspectors with tools to test whether processing procedures to which the products were subjected were adequate to destroy dangerous infectious agents. Effective and user-friendly test systems are commercially available and reasonably priced.

It needs to be borne in mind that potential FMD, CSF and ASF hazards posed by imported raw and processed meat depend almost exclusively on the imported material being consumed by pigs which are then able to amplify the infectivity and precipitate disease outbreaks (Thomson and Bastos, 2004). The danger of this occurring in Namibia's export zone appears to be slight because there are few non-commercial pigs that may have access to swill SCVF. However, it is understood that feeding untreated swill to pigs in Namibia is legal (i.e. not prohibited as is the case in many countries – Dr A Bishi, personal communication, 2012). This should be reconsidered.

There is a low risk of importing BSE from RSA in the form of live cattle or formulated feedstuff for reasons explained in sections 3.3, 6.4 and 8.3.8. However, because of the 'stability' of the BSE management procedures applied in Namibia, even if that were to occur, there is negligible risk of the BSE agent being recycled.

The fact that Namibia's contingency plan for FMD (Directorate of Veterinary Services, 2011) does not mention the potential offered by the TAHC's Article 8.5.8, i.e. application of 'containment' zoning in the event of an outbreak of FMD in the export zone, is an issue that needs to be followed up because it provides the potential for ameliorating the economic effects of a FMD outbreak of limited size SVCF.

Economic consequences of possible disease outbreak scenarios posed by FMD, CBPP, RVF, CCPP and PPR on the livestock industries of Namibia were assessed as part of this investigation. However, direct costs of disease management and any compensation that may need to be paid to livestock owners as a result of 'stamping out' ordered by the GoN were not considered because data on which to base such assessment are not available in the public domain.

In order to conduct the costing undertaken, the following information was assembled:

- Economic size of the livestock sector;
- Monthly expenditure of livestock producers in Namibia SVCF;
- Composition and size of the various value chains;
- Employment created by the livestock industries SVCF;
- Financial impact on the livestock industries of possible disease outbreaks under the most likely scenarios.

12. Conclusions and recommendations

The fact that Namibia's export zone (i.e. the territory SVCF) has not suffered a trade-influencing animal disease outbreak other than RVF for many decades attests to the efficiency of its control measures. However, trends in the southern African region, especially with respect to FMD but also other diseases such as RVF and PPR, have necessitated a reappraisal of current threats to Namibia. Furthermore, there have been recent changes at the international level (the OIE and its recommendations in the form of the TAHC) in the approach to management of some animal diseases that potentially enables re-evaluation of traditional approaches to the management of TADs.

The major animal disease threats to Namibia's livestock industries are posed by illegal entry of live animals (both domestic animals and wildlife) that are either smuggled across the country's borders or stray across the fencing system that protects Namibia's export zone against incursions from the north and north-east. The diseases that pose the greatest threat to Namibia in this way are FMD, CBPP, PPR and CCPP. Imports of meat and meat products, on the other hand, pose little threat although it is suggested that controls in this respect could be improved.

The main recommendations are therefore:

- Regular and independent auditing of the fencing system protecting the export zone in order to verify that it is functioning optimally; it is further suggested this could be based on a HACCP approach and conducted by an independent body.
- The quarantine system for movement of small stock from NCA to SVCF needs be re-evaluated to ensure efficacy against PPR and CCPP.
- Applications for import permits for meat and meat products should be carefully evaluated and, ideally, officials of the DVS who have the responsibility of checking import consignments need to be provided with the technology to test samples of imports for compliance with processing requirements.
- The livestock industries and DVS should jointly consider whether planning for creation of a containment zone in the event of a limited FMD outbreak in the FMD-free zone would be advisable or not (i.e. as provided for in Article 8.5.8 of the TAHC).

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Appendix A
Veterinary Health Certificate

B: VETERINARY HEALTH CERTIFICATE

I,.....a **veterinarian** authorised thereto by the Veterinary Authority of the Republic of South Africa hereby certify that the cooked meat (pork) product(s) described in **Section A:**

B1. **Health Requirements**:

1. The meat derived from .....(animal species)
2. The cooked meat products were:

- Manufactured from premises at least 100 kilometers from any place where Vesicular Stomatitis or Foot-and- Mouth Disease has occurred within the preceding 12 months.
- Manufactured from meat derived from animals which were slaughtered at an abattoir approved for export to Namibia by the official South African veterinary authority.
- In the case of meat originating from pigs, the animals originated from areas free from restrictions regarding African Swine Fever, Classical Swine Fever and Porcine Reproductive and Respiratory Syndrome (PRRS) or alternatively from approved piggeries and herds approved for export by the provincial director.

3. The products:

Were processed at a veterinary approved processing facility, monitored by South Africa authorities and where hygiene conditions are satisfactory in all respects. The method of production renders the product safe and poses no risk of transmitting FMD. An inner core temperature of at least **70°C** for a minimum of **30 minutes was maintained**.

3.1 Were after processing wrapped and packed in an establishment approved for export and stored in a hygienic manner taking necessary precautions to avoid contact of the product with any potential sources of FMD virus.

3.2 Are considered to not to contain any harmful additives and are unconditionally fit for human consumption.

4. The markings on the packaging containing the finished product are fully descriptive and identify the plant of origin

6. The motor vehicle or container used for conveyance of the cooked meat product conforms to internationally accepted standards of cleanliness, construction, maintenance and operation, was loaded under supervision and sealed immediately after loading at the approved facility.

Container/vehicle number.....Seal Number/s .....

8. Done at (place) ..... on .....(date)

Signature .....

AUTHORISED VETERINARIAN **Official stamp**

Name in Print: .....

Address .....

.....

.....

A COPY OF THE COMPLETED PERMIT MUST BE FAXED TO THE STATE VETERINARIAN AT DESTINATION PRIOR TO DEPARTURE.

Incomplete health certificates may result in the consignment being refused entry into Namibia

Appendix B
Terms of reference

TERMS OF REFERENCE:

RISK ANALYSIS FOR LIVESTOCK AND MEAT IMPORTS INTO THE FOOT AND MOUTH DISEASE FREE ZONE OF NAMIBIA AND ASSESSMENT OF POTENTIAL ECONOMIC CONSEQUENCES OF THE ENTRY, ESTABLISHMENT AND SPREAD OF SELECTED PATHOGENIC AGENTS

1. Introduction

The Meat Board of Namibia wishes to appoint suitable consultant(s)/a consultancy to conduct a quantitative risk analysis of imports of livestock and meat/meat products into the FMD free zone of the country. In addition, the study should investigate potential economic consequences of the entry, establishment and spread of pathogenic agents of relevance to the red meat sector.

The study is a short term consultancy making use of available data and information to be obtained from the Meat Board of Namibia, Directorate of Veterinary Services of Namibia and other sources.

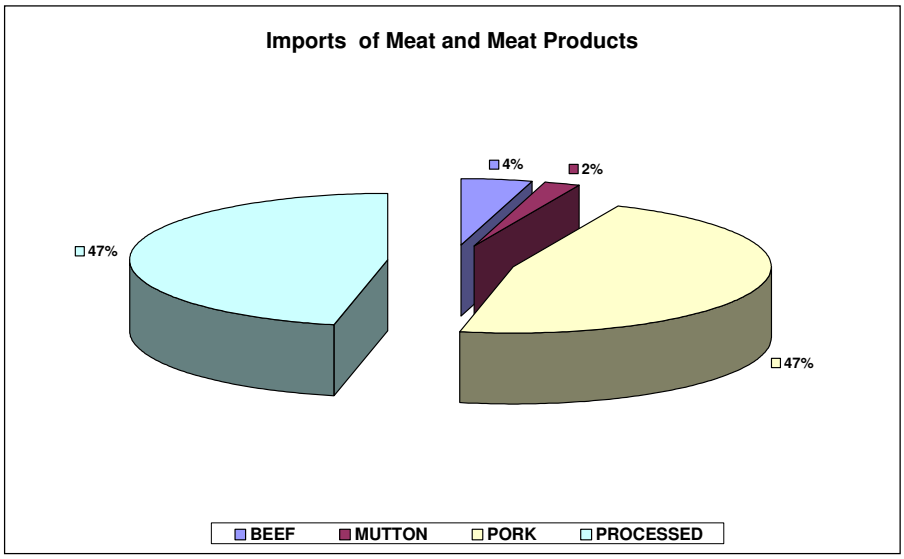
2. Background

Following the spill of RVF from RSA to Namibia in 2010 and seen the reoccurrence of FMD in the region, a risk analysis for imports of meat and livestock into the country is seen as a helpful means to identify and quantify risks to the Namibian livestock and meat industry, which is export orientated.

Live animal imports into Namibia are very limited if compared to export figures. In 2010, a total of about 2000 cattle, 1700 sheep, 300 goats and 150 pigs were imported into the country, the vast majority originating from RSA.

As far as animal products are concerned the importation of pork meat as well as processed products represents 94% of all imports (see fig 1). Namibia does not produce these products in sufficient quantities to satisfy local demand. The production of pork is financially difficult due to the high feed cost, while processed meat is being imported as it is not produced locally due to specialized expertise required. Mutton and beef imports represent 2% and 4% respectively and are negligibly small. Pork and processed imports in 2010 were 3 489 tons and 3 465 tons respectively while beef and mutton imports stood at 330 tons and 172 tons respectively. Further, approximately 670 tons are sold from Katima Mulilo abattoir, Caprivi, (FMD infected zone), and 451 tons of beef from Oshakati abattoir, servicing the Northern Communal Areas, a FMD buffer zone.

Figure 1: Importation of Meat and Meat Products



3. Beneficiary

The beneficiaries of this study will be the Namibian red meat industry in general, the competent authority (Directorate of Veterinary Services) and the Namibian livestock producers and processors.

4. Contracting Authority

The Meat Board will contract a consultant/team of consultants for this assignment.

5. Scope

For budgetary reasons, the study will be limited to animal diseases of importance to animal and public health with cattle, sheep, goats and pigs being hosts of the disease, (e.g. FMD, RVF, CSF, BSE, and CBPP) but exclude diseases of those animal species outside the current mandate of the Meat Board (e.g.AI).

The economic consequences of the entry, establishment and spread of pathogenic agents should be limited to those presented in the risk analysis. Consequences need to be assessed and described for all stakeholder groups, but also for the national economy in general.

6. Objectives

The overall objective of the study is to conduct and present a comprehensive import risk analysis according to international practice on the risks associated with the import of meat/meat products and livestock into the FMD-free zone of Namibia and to assess the economic impact of such hazard imports.

The specific objectives are as follows:

a) To identify sources of imports (livestock, meat and meat products) into the FMD free zone
b) To identify potential hazards to be imported from current trading partners/other zones into Namibia's FMD free zone limited to those of importance to the red meat industry
c) To conduct a quantitative risk analysis for the identified pathogenic agents taking into consideration their origin, animal disease status of the country/zone of origin, trade volumes etc.
d) To investigate potential economic consequences of the entry, establishment and spread of pathogenic agents of relevance to the red meat sector with regards to the
    - Red meat sector, including all roleplayers along the production and marketing chain
    - The National economy
e) Make recommendations for the mitigation of such import risks

7. Structure and timeline

Structure: The risk analysis should be composed of hazard identification, risk assessment, risk management and risk communication.

Sources: Sources for information/data to be used should include, but are not limited to:

- Import statistics (Meat Board of Namibia)
- Information on animal disease data in countries of origin (e.g. WAHID, SADC livestock reports etc.)
- Control mechanisms and procedures for import control put in place by DVS, Meat Board of Namibia and other institutions

Timeline: It is expected that the study will be concluded within 3 months from the appointment of the successful bidder. The three months period will include the submission of a draft report to stakeholders for comments and the final report plus a presentation of final results to interested stakeholders.

8. Consultant/Consultancy team profile

It is anticipated that this study will be compiled by one consultant or a team of consultants with proven experience in the field of import risk analysis in animals and animal products. Preferably at least one of the members of the consultancy team needs to have a qualification in veterinary medicine and in agricultural economics. Sound knowledge of the Namibian trade in meat/meat products and livestock is necessary.

9. Budget

The overall budget for the consultancy is limited to N$ 130,000.00 incl. 15% VAT.

10. Submission

Interested parties should submit their proposals (3 hardcopies, 1 electronic copy) not later than **8th August 2011: 17H00** to

Meat Board of Namibia
The General Manager
30, David Hosea Meroro Road
Windhoek
Phone: +264-61-275830

The technical proposal will describe the proposed overall study strategy (methodology) and detailed work plan of the specific phases and tasks to be undertaken, the study team members' responsibilities and curricula vitae, the time schedule for carrying out the work, and the expected outputs. It will include evidence that the consultant, through past experience and training, is qualified to carry out the work. The consultant shall include a detailed chart indicating all key elements of the study with their respective time durations as well as personnel.