Preventive Veterinary Medicine 113 (2014) 469–483

Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

Risk assessment and cost-effectiveness of animal health certification methods for livestock export in Somalia

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ARTICLE INFO

Article history:
Received 2 February 2013
Received in revised form 2 January 2014
Accepted 3 January 2014

Keywords:
Risk assessment
Cost-effectiveness
Somalia
RVF
FMD
Brucellosis
PPR
CCPP
CBPP

ABSTRACT

Livestock export is vital to the Somali economy. To protect Somali livestock exports from costly import bans used to control the international spread of disease, better certification of livestock health status is required. We performed quantitative risk assessment and cost-effectiveness analysis on different health certification protocols for Somali livestock exports for six transboundary diseases.

Examining stock at regional markets alone without port inspection and quarantine was inexpensive but was ineffective for all but contagious bovine pleuropneumonia, contagious caprine pleuropneumonia and peste des petits ruminants. While extended pre-export quarantine improves detection of infections that cause clinical disease, if biosecurity is sub-optimal quarantine provides an opportunity for transmission and increased risk. Clinical examination, laboratory screening and vaccination of animals for key diseases before entry to the quarantine station reduced the risk of an exported animal being infected. If vaccination could be reliably performed weeks before arrival at quarantine its effect would be greatly enhanced.

The optimal certification method depends on the disease. Laboratory diagnostic testing was particularly important for detecting infections with limited clinical signs in male animals (only males are exported); for Rift Valley fever (RVF) the probability of detection was 99% or 0% with and without testing.

Based on our findings animal inspection and certification at regional markets combined with quarantine inspection and certification would reduce the risk of exporting infected animals and enhance disease control at the regional level. This is especially so for key priority diseases, that is RVF, foot-and-mouth disease and Brucellosis. Increased data collection and testing should be applied at point of production and export.

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1. Introduction

The Somalia economy is highly dependent on livestock export to the Middle East, with over four million livestock (mostly sheep and goats) exported in 2010 (FSNAU, 2011). Importing nations have at times blocked this trade to prevent incursion of exotic pathogens (Davies, 2006; FEWS-NET, 2010; Abdo-Salem et al., 2011). Approximately

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http://dx.doi.org/10.1016/j.prevetmed.2014.01.003

55% of Somalis are directly dependent upon livestock, with livestock exports accounting for 40% of the GDP (Knips, 2004; Qeiliye, 2008; Hamud, 2010). Loss of this export revenue due to prior trade bans has been disastrous for the Somali economy and the resulting reduction in supply has caused problems for importing countries (Davies, 2006; Abdo-Salem et al., 2011).

Currently, exported Somali livestock pass through privately owned quarantine stations, although an unknown number are exported informally without quarantine (Abdo-Salem et al., 2011) (Addis workshop, 2010 – see Section 2). Before animals gain entry to the quarantine they receive a pre-quarantine clinical inspection. Upon entry animals are treated for ectoparasites; diagnostic testing and vaccination are also carried out. Animals are examined throughout the quarantine period and rejected if diseased. The use of diagnostic tests, vaccination and length of quarantine vary according to the requirements of different importing nations. Animals found to be healthy are issued with a health certificate, allowing them to go for export to the specified country. Whether or not whole batches are rejected rather than individuals would depend upon the circumstances.

In some regions of Somalia animals may be clinically inspected at regional markets before reaching the quarantine. Healthy animals can then obtain a movement licence, allowing the animal or the batch to travel to the port.

There are important issues to keep in mind when considering sanitary controls for livestock export in Somalia. This livestock trade is of huge economic importance and with limited alternative economic opportunities it needs to be safeguarded. Blocking the trade not only increases poverty amongst the Somali people, but can actually increase the risk of disease spread through increases in smuggling and illegal livestock exports. Finally imposing export protocols that fully comply with OIE standards is challenging in Somalia.

In this paper we evaluate current export health certification methods based on port quarantine inspection and alternatives using upstream health certification at regional markets; minor variations in length of quarantine and laboratory testing protocols have also been assessed.

Recommendations made on adapted methods of livestock export disease control in a developing country like Somalia are specific to this compromised situation and, although they may relevant to other developing countries, should not be interpreted as more widely applicable.

2. Materials and methods

In the study a quantitative risk assessment combined with cost-effectiveness analysis has been used to evaluate the following different certification models:

- Certification based on procedures performed at the quarantine stations only.
- Certification based on procedures performed at the quarantine combined with regional market inspection.
- Certification based on regional market inspection only.

Export without certification has also been assessed for comparison; this could also be seen as the risk with no control measures as is the case with illegally exported animals. Length of quarantine period was 21 days unless stated otherwise.

The species and diseases considered were selected according to stakeholder's recommendations. Diseases included in the study are: foot-and-mouth disease [FMD] (cattle and sheep/goats), Brucellosis (cattle, sheep/goats and camels), contagious bovine pleuropneumonia [CBPP] (cattle), Rift Valley fever [RVF] (sheep/goats), contagious caprine pleuropneumonia [CCPP] (goats) and peste des petits ruminants [PPR] (sheep/goats).

For all the diseases and species considered the risk question was:

> "What is the risk that an animal of species X, exported from Somalia, is infected with the causative agent of disease Y?"

Biological pathways were drawn up to describe the series of events required for an animal to be infected at the point of export. The estimated proportion of exported animals that were infected using a given certification method was compared to the proportion infected with no control measures in place. This risk difference was multiplied by the total number of exports from Bossaso and Berbera ports in Somalia in 2010, i.e. 3 919 218 shoats (sheep and goats), 227 611 cattle and 120 962 camels (FSNAU, 2011). This provided an estimate of the number of infected animals prevented from being exported per year by the various certification methods (compared to exporting with no control measures).

Quantitative data were used to provide values for the model input parameters; these were obtained from scientific publications, official reports, recorded data and expert opinion collected at two workshops (Addis workshop, 2010; see description below). When a design prevalence was required a low value was used reflecting the need to detect even low levels of disease and the expected low prevalence amongst largely clinically healthy export quality livestock.

Cost-effectiveness analysis was preferred to cost–benefit analysis as the future economic benefits were too complex and speculative to estimate. The measure of effectiveness in the cost-effectiveness analysis of the certification methods was taken as the reduction in the number of exported animals that were infected, any subsequent benefits are a function of this. Dividing the cost of each health certification method by the reduction in the number of infected animals being exported provided a measure of cost-effectiveness, i.e. the cost ($) per infected animal prevented from being exported (Knight-Jones et al., 2010); the smaller the Figure the more cost-effective (note: $ refers to US$ throughout the manuscript).

Cost was estimated as the price charged. For inspection performed at a regional market this was $15 per 100 cattle or camels and $5 per 100 shoats inspected; sheep and goats were treated as a single group (shoats). For quarantine there was some variation and distributions were used. The total quarantine fee for shoats, including inspection,

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