

# Farm evacuation coefficient: a novel indicator in veterinary crisis management

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Whenever an area is struck by a massive disaster such as extreme flooding, an earthquake, forest fire or chemical spill, not only people suffer the consequences but also the animal population will be hit severely. A quick search in available literature gives an indication on how veterinary professionals and other emergency responders train and organise themselves to cope with these events in an effort to save as many lives (human beings and animals) as possible.

Linnabary and New<sup>1</sup> describe in this paper how from the 1950s the principles of disaster medicine were taught in the US veterinary colleges and to military veterinarians, providing various examples and detailed descriptions for emergency responders. In order to be better prepared, Linnabary and New<sup>2</sup> also describe the results of a survey of emergency evacuation of dairy cattle. This survey was designed to determine the farmers' attitudes regarding evacuation, the availability of equipment and personnel, the estimated numbers of cattle, evacuation time, destination and care of evacuated cattle, and any possible alternative in case cattle could not be moved. The results indicated a lack of preparedness and high economic vulnerability of farmers. In their conclusion the authors pleaded for a timely and detailed analysis of the local situation, combined with preplanning and drill exercises to be well prepared in case of an emergency. In the authors' opinion, local emergency-planning committees should be strengthened with this particular expertise.

In the aftermath of Hurricane Katrina, Hunt and others<sup>3</sup> investigated the psychological effects of the loss of

a pet on survivors of the disaster. Pet loss was strongly associated with psychopathology, and the impact of the loss on post-traumatic stress disorder (PTSD) was mediated by acute stress and dissociative symptoms during the evacuation. This suggests that forced abandonment of a companion animal during an evacuation adds considerably to the acute trauma, thereby increasing the risk of long-term PTSD.

In 2009 Wilson and others<sup>4</sup> published 'Livestock evacuation or not: An emergency response assessment of natural disasters'. In this paper three logistical challenges were determined in relation to a volcanic eruption in New Zealand: evacuation time, evacuation transport recourses and the availability of sufficient capacity to accommodate the evacuated livestock. In their conclusions and recommendations, the authors indicated that a detailed analysis of livestock evacuations should be made in order to better understand the constraints of moving significant numbers of animals before, during or following a significant natural disaster. Based on their study the authors recommended further analyses around the world for more knowledge about the huge amount of movement with livestock.

White and Palen<sup>5</sup> described in their paper for the 2015 International Conference on Information Systems for Crisis Response and Management how in the USA the Emergency Operations Center is often inundated with calls from animal owners who are aware they are under pre-evacuation or mandatory evacuation, but are unsure of what to do about evacuating their animals, noting that animal evacuation is often a highly improvised activity for owners and responders. Their paper reports on how preparing and streamlining procedures between emergency responders and the public can be considered an effective strategy to support the decision-making process for animal evacuation.

In 2015 the Federation of Veterinarians of Europe (FVE)<sup>6</sup> organised its symposium *Natural disasters and 'One-Health', Are we prepared?* An important conclusion drawn during this symposium is that 'It is

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*acknowledged that the overwhelming majority of the animal keepers want to save their animals and take a risk in order to do so. Pet owners would put themselves or others in danger in order to save their pets, while farmers try to save their animals even though they know that when the crisis is finished it will be very difficult to recover. Therefore, animals must be saved together with their owners, in order to avoid increasing the risks during the crisis period and also help the local community to recover quickly afterwards'.*

These studies and the FVE standpoint therefore strongly support the necessity to develop an animal evacuation plan for both animals and their owners.

Taking the aforementioned papers as examples, the key elements of crucial importance for an effective and timely evacuation of animals are information, planning and training. All these elements play an important role in an evacuation strategy developed for any group of animals and the decision point to execute this strategy.

Taking a river flooding as a likely scenario for the Netherlands, any evacuation strategy focusing on animals will be secondary to the evacuation of people in the affected area. The timing and efficacy of a possible strategy are highly influenced by the 'Decision Paradox'.<sup>7</sup> This all has to do with the timing of the decision, as when you get closer to the point in time when the levee will actually be breached (100 per cent certainty of failure), little time remains available to effectively evacuate people from the affected area. As a result, a final decision on whether people are to be evacuated is to be made well in advance (2–4 days) with a relatively high chance (40–60 per cent) that the actual levee breach will not take place at all.<sup>7</sup> The number of people requiring assistance (eg, elderly or hospitalised persons) and actual time needed to complete the precautionary evacuation will of course strongly depend on the local infrastructural and demographic situation.

Taking the clear limitations on available infrastructure and logistics in case of a massive evacuation into consideration and the given fact that a final decision to evacuate will be made as late as possible, an animal evacuation cannot coincide in time and place when people are being brought to safety.

As a consequence, animal transport will have to take place before any decision to evacuate people (well before 4 days prior to the event), or after the flooding has started. Great efforts will be made to save whatever is possible, taking into account that many animals will drown. From a practical viewpoint, this last approach is the most realistic and is the current strategy adopted in the Netherlands.<sup>1</sup>

With several clear requirements available and in line with the opinion of various ministries, organisations and institutes, the Institute of Risk Assessment Sciences Division, Division of Epidemiology and Veterinary Public Health, Faculty of Veterinary Medicine is now developing the farm evacuation coefficient (FEC), as part of its Master's thesis research programme. In the pilot phase, the focus will be on dairy farms and making an inventory of all the different factors that can be regarded relevant for the development of the FEC. The end result will be to determine if, how or when the animals on that particular farm could be evacuated or whether a suitable alternative needs to be developed. Factors will include the geographical location of the farm (potential flood area), access to road network and type (local roads, provincial roads, elevated roads, motorways), and vicinity to villages and cities to get an indication of available capacity in case of evacuation. At farm level an inventory will be made on the number of animals present and any available details (eg, age, breed, production status, health status). Also, the surrounding areas will be surveyed to determine if a vertical evacuation option is available and an inventory will be made for alternative locations where the animals can be transported to. Each relevant factor will be clearly described and a specific impact weight added to it based on expert opinion and available assessment tools. In this way an overall semiquantitative impact assessment can be made per individual farm, indicating whether it can be evacuated, at what cost (effort, financial), how long it is likely to take and what the consequences will be at the receiving end for all the relocated animals. Should an evacuation be considered as a non-viable option, alternative scenarios can be developed, such as vertical evacuation, emergency slaughter or onsite euthanasia and disposal of the carcasses.

In each case, an informed decision will become possible for the crisis response team when facing such a dire situation, and this decision will be based on the actual situation at farm level, making good use of available time and resources. In addition, the farmers will be given a clear perspective on what to do and what to expect. This improved coping capacity will not only reduce the chance of panic or passiveness due to the overwhelming situation but will also strengthen the resilience of the affected people and help them to return to normal in the aftermath of the event.

In November 2016, the National Security Profile (NSP) was published, presenting an All Hazard overview of potential disasters and threats that could disrupt society in the Netherlands. This report was drafted by the Analysts Network National Security,<sup>8</sup> commissioned by the Steering Group National Security, an interdepartmental organisation that advises the Dutch Government on national security issues. In order to compare different threats, an assessment tool was developed, taking into account the combined impacts on

<sup>1</sup>Evacuation plan livestock, Dutch agricultural organisation LTO, internal document.

territorial, physical, economic and ecological safety and social-political stability, with a scale ranging from limited to catastrophic. In their assessment, a severe flood originating from the sea is considered to have the highest overall impact, with a catastrophic result linked to a highly unlikely chance of happening. Ranking number 5, a river-based flooding is considered to have a severe impact combined with a somewhat likely chance of happening.

Similar to existing evacuation plans, this assessment focused on human beings with animals not even considered in the NSP. During the presentation of the report in March 2017, the question was asked as to why animals were left out of the assessment. The response provided did not clarify the omission but did confirm the importance to have animals included in any future revision of the NSP (J.J. Wijnker, personal communication).

Therefore, during the pilot phase of the FEC development, several farms located in the Lopiker- en Krimpenerwaard near the city of Utrecht will be chosen to participate. This area is specifically identified for having a flood risk (weak levees<sup>9</sup>), but it is also the area of the University Large Animal Practice,<sup>10</sup> where the Master students from the Faculty of Veterinary Medicine train during their internships. Easy access to local dairy farmers, who are accustomed to working with veterinary students and faculty staff, should provide a sound basis to generate all relevant information for the FEC. Other sources of information such as national databases, governmental and private organisations have also been identified and are willing to participate.

At the national level, the Ministry of Economic Affairs started with a revision of their guidance document on the evacuation of both large and companion animals in February 2017. When finalised, this document should provide a solid basis for a subsequent organisation of relevant partners and operational readiness, allowing them to be well-prepared and trained in case of emergency. Inclusion of the FEC as a novel indicator in this guidance document could assist in the identification of relevant information and required partners in

the preparatory phase for any natural disaster. Therefore it could contribute to the overall awareness and readiness in veterinary crisis management.

In our opinion, the newly developed FEC can play an important role on what to do with livestock when facing a flood and can be regarded a valuable tool for a timely and effective decision, considering animal health and welfare.

Given the importance of being well-informed, prepared and trained for the event of a natural disaster and the overall support given to our initiative, we feel confident that we are able to develop a usable tool and will see it implemented as part of the standard decision-making process during crisis management.

**Competing interests** None declared.

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