Finnish Food Safety Authority Evira

The simulated effect of sheep farming in the spread of foot and mouth disease in Finland

Rintakoski S*., Virtanen T., Sahlström L. & Lyytikäinen T.
*Corresponding author: Simo Rintakoski, simo.rintakoski@evira.fi, Evira, Risk Assessment Research Unit, Mustialankatu 3, 00790 Helsinki, FINLAND, www.evira.fi

Foot and mouth disease (FMD) is a highly contagious epizootic disease. The host species are all cloven-hoofed animals. FMD has last been reported in Finland in 1959 and is controlled by both domestic and EU legislation.

Sheep farming in Finland

Sheep production in Finland is relatively small scaled compared to other European countries. There are around 100 000 sheep and 3000 sheep farms in Finland. Most of the farmers are hobby farmers and only 6% of the sheep farmers get their livelihood from farming alone.

The aim of this study was to explore the effect of sheep farming in foot and mouth disease (FMD) outbreaks in Finland by comparing disease spread from pig and cattle farms using two simulation models with different assumptions.

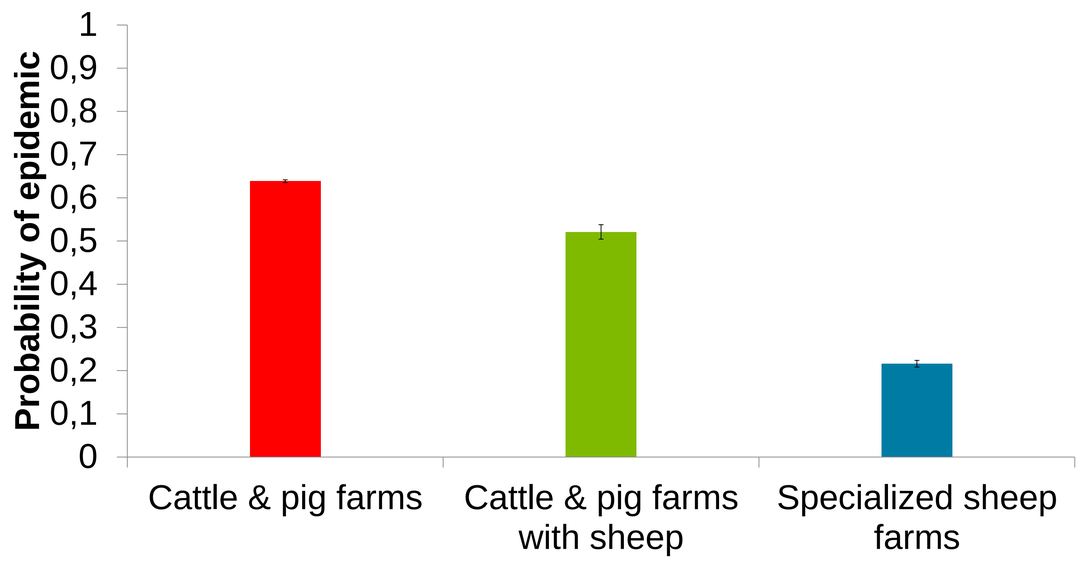

Figure 1. The probability of an FMD epidemic on different farm types. Sheep contacts are included in the simulation and sheep can spread FMD (Model 1). Farm type refers to the farm type of the primary infected farm.

Outbreak simulations

To estimate the effect of sheep farming on FMD spread in Finland, the probabilities of FMD epidemics on pig and cattle farms using two separate simulation models were compared. 100 000 outbreak iterations were performed per model. Epidemic outbreak was defined as an outbreak with more than one infected farms. Data from 2009 was used in both models.

Model 1. All production types were included in the model. FMD can infect pigs, cattle and sheep. Sheep farming activities can spread FMD further.

Model 2. Only pig and cattle farms were included in the model. None of the sheep farming contacts were taken into account.

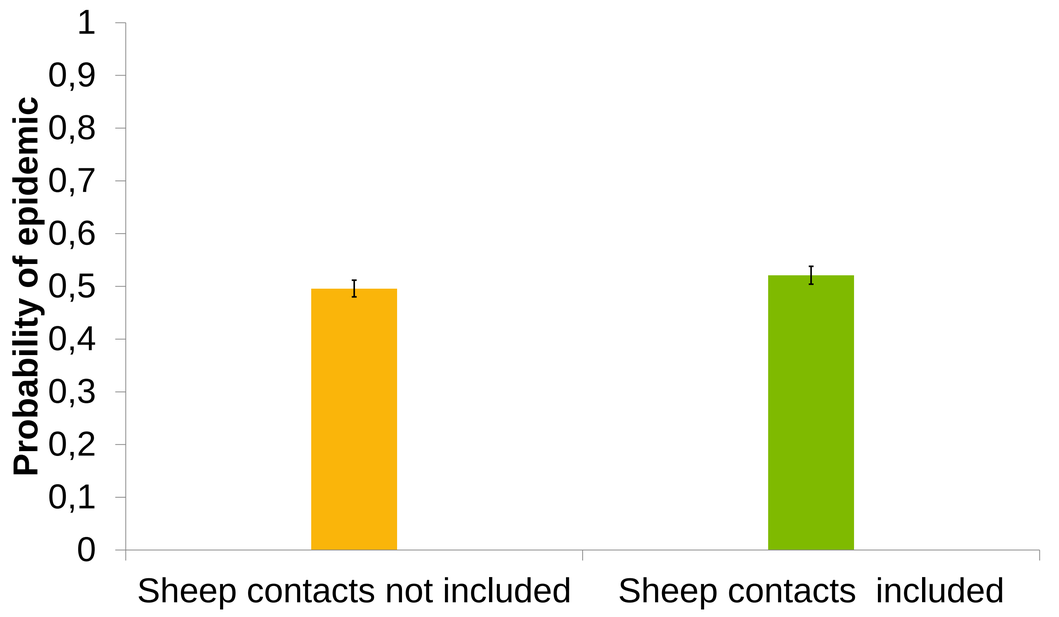

Figure 2. The effect of sheep farming on the probability of an FMD epidemic when the infected farm has sheep production in addition to cattle or pig production. Yellow indicates simulation results without modelled sheep contacts (Model 2) and green include FMD spread by sheep farming (Model 1).

Results

Outbreak simulations that included sheep farms (model 1) showed that the probability of an FMD epidemic when a sheep farm was the primary infected farm was 0.22. This is less than half of the probability compared with other farm types (Fig. 1).

Probabilities of epidemic outbreaks did not differ between the two simulation models when the infected farm had sheep production in addition to cattle or pigs (Fig. 2).

Discussion and conclusions

Sheep farming has very little or no additional effect on the spread of FMD in Finland. This is supported by the low probability for epidemic outbreaks originating from sheep farms and the fact that the probability of an epidemic on mixed farms did not notably increase when sheep farming was included in the simulation model. The low number of sheep farms and the limited contacts between them explain the low effect of sheep farming on the spread of FMD in Finland.

The likely explanation why specialized farms without sheep have a higher probability of spreading the disease, is that they are on average larger and therefore have more contacts (animal transportation etc.).

IN CONCLUSION: Sheep farming has a negligible effect on the risk of FMD spread in Finland. Small farm size and sparse contact networks make the spread of FMD from sheep farms unlikely.