CHAPTER 7

CONCLUSION

The aim of the study was to develop a statistical model for the infectious livestock disease anthrax and forecasting disease outbreak in Karnataka. The forecasting models were developed at three levels – district level, tauk level and village level. The findings of the study were contemplated in three levels – Descriptive level, Disease-presence only level and Disease presence-absence level.

Descriptive epidemiology of anthrax suggested that 31.6% of taluks reported outbreaks of anthrax. 80.84% of outbreaks have been reported in a total of 17 taluks. A taluk level comparison of outbreaks between two time periods suggested that outbreaks reduced in most of the taluks. The findings on relationship between soil type and the outbreak of anthrax suggested that more than 80% of the outbreaks occurred in red (red loamy and red sandy) soil.

*Disease-presence* only level study suggested that Zero Truncated Poisson model provided the best fit for the district wise as well as taluk wise outbreak of the disease. Risk map model showed Chikkaballapura district as having very high risk of anthrax outbreak at district level. Taluk level Risk map suggested Chikkaballapura taluk in Chikkaballapura district as having very high risk of anthrax outbreak at taluk level. Sharing the border with other states that leads to interstate movement of animals could also be the reason for maximum risk as the disease is endemic in the tri-junction of Andhra Pradesh, Karnataka and Tamil Nadu. Through the parameter estimates of Zero truncated Poisson model, it was observed that the presence of Red loamy soil is the major contributor for the occurrence of anthrax outbreak; the interaction of one month lag of NDVI with soil nutrient Boron is highly associated high risk of outbreak of anthrax; the interaction of lag period of NDVI with soil pH, sulphur and zinc is also associated with an increase in the likelihood of outbreak of anthrax.

At Disease *presence-absence* level, risks were estimated for all taluks and villages. Through Species Distribution Modelling, likely risk of anthrax was identified. Random Forest emerged as the best predicting model both at taluk level and village level.
Factors such as sociological, health conditions of livestock, lack of knowledge about the risk of anthrax among farming community, preventive and control measures taken by the concerned authorities may also play important roles in the endemicity of the disease. So, the models developed helps to identify the risk factors associated with the incidence of anthrax and guides authorities to effectively develop and implement preventive and control measures in risk areas. The model information can be utilized for educating livestock farmers regarding anthrax which can avert economic loss to them.

Risk map developed will be beneficial for policy makers and veterinarians for better management of the disease with optimum use of resources such as manpower, money, material and effective vaccination programme. The risk map can also be utilized by the animal husbandry department of Karnataka to take up appropriate control measures at taluk/village level. Thus, forecasting model developed can assist in preventing the occurrence of anthrax or at least in being prepared for it so that it can be controlled effectively.

Limitations of the study

Study results are affected to certain extent by poor surveillance methods adopted in the state. Inspite of advanced techniques and digitisations there is under/delayed reporting of disease outbreaks. Further, there is under ascertainment because the animals are not provided the health care as is the case in humans amounting to poor reporting of the disease outbreaks.

In the domain of risk factors in the modelling, many potential parameters could not be included because of their non-availability or difficulty in their measurement. The study area is limited to only Karnataka state in the present study and hence results cannot be projected to all India level. Further research may be taken up on application of advanced modelling on disease outbreak.