1. Temperature Humidity Index (THI)-Kriging and its effect on Bluetongue disease

Climate change is one of the major threats for survival of various species, ecosystems and the sustainability of livestock production systems across the world. These factors causes stress on the animals. One such parameter for assessing the heat stress on animals is THI. The temperature humidity index (THI) is a simple combination of temperature and humidity. The study was conducted to elucidate the result of the variation of THI and effect of THI on disease incidence. Kriging was used for the representation of the data over the area as it is one of the several methods used for the spatial interpolation over continuous field. Kriging can be understood as a two-step process: first, the spatial covariance structure of the sampled points is determined by fitting a variogram; and second, weights derived from this covariance structure are used to interpolate values for unsampled points or blocks across the spatial field. THI values was calculated using the formula,

$$\mathbf{THI= (1.8*AT+32) - [(0.55-0.0055*RH) \times (1.8* AT -26)]}$$

Where AT = air temperature, RH = relative humidity (%)

THI values calculated were classified into different level of stress. THI thresholds for heat stress in animals are as following comfort (THI < 68), mild discomfort (68 < THI < 72), discomfort (72 < THI < 75), alert (75 < THI < 79), danger (79 < THI < 84), and emergency (THI > 84). For calculation of the THI the air temperature and relative humidity data was extracted from MODIS website and shape file was defined for southern states and THI was calculated using the formula. The calculated THI values were plotted using ordinary kriging. Before plotting these values for southern India the variogram model was selected based on the least RMSE value. When the data was modelled for testing the best variogram model, Gaussian model showed the least RMSE value and hence it was selected. Using kriging tools, we seek the instances where transmission can occur based on suitable THI values for BTV and hence THI values were integrated with the disease. The findings indicate that warmer regions are at high risk for the disease whereas cooler regions are at lower risk. Research from the past also indicated that temperature and relative humidity have a positive effect on bluetongue infections. These results helps us to design the control tool for the disease as timely intervention can prevent the spread of the disease.

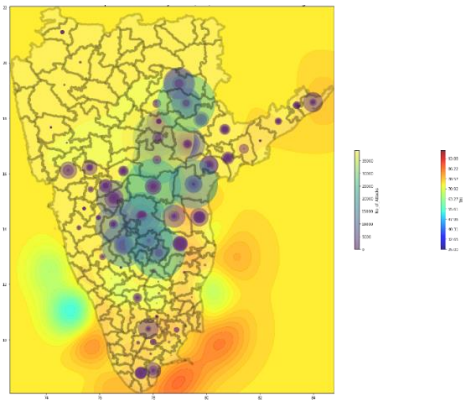

Fig1. Bluetongue Disease on Temperature Humidity Index for Southern State

2. Effect of climatic factors on other infectious disease

a. LSD-Lumpy Skin Disease

Air temperature, NDVI, PET and wind speed are the climatic parameters which are significantly contributing for the occurrence of LSD.

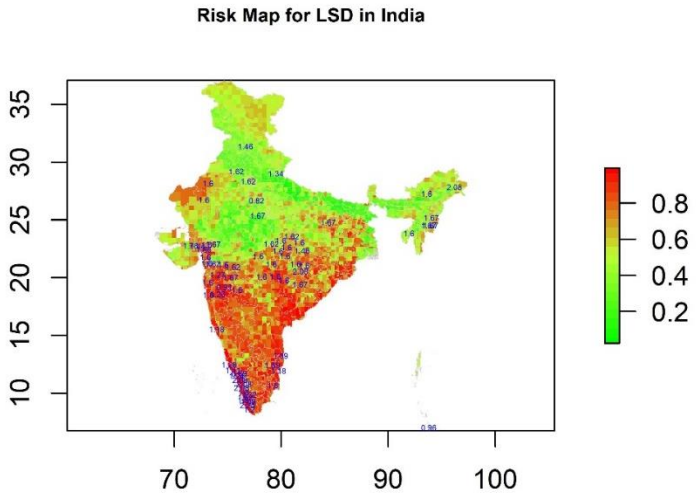

Fig2. Risk Map for LSD in India

b. **Avian Influenza**

Avian influenza has a significant correlation with various parameters such as EVI, LST, NDVI, Potential evaporation rate, Specific humidity and wind speed

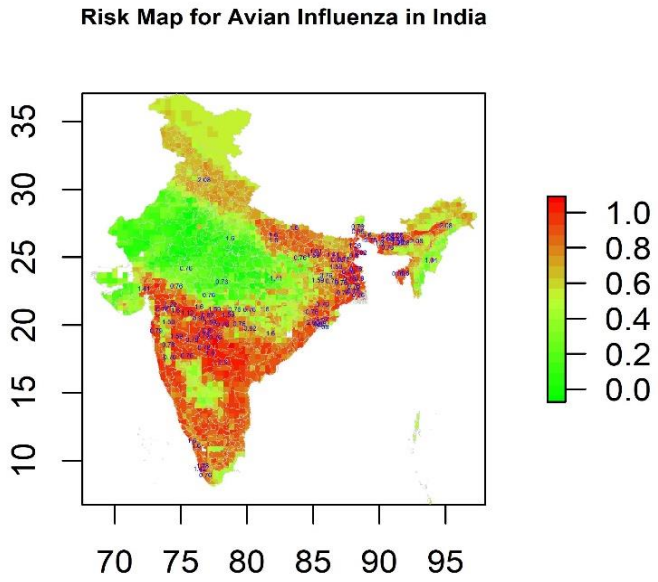

Fig3. Risk Map for Avian Influenza in India

c. ASF-African Swine Fever

Air temperature, EVI, PET, Potential evaporation rate, Rain precipitation rate, Specific humidity and wind speed are few of factors which are significantly responsible for causing the disease

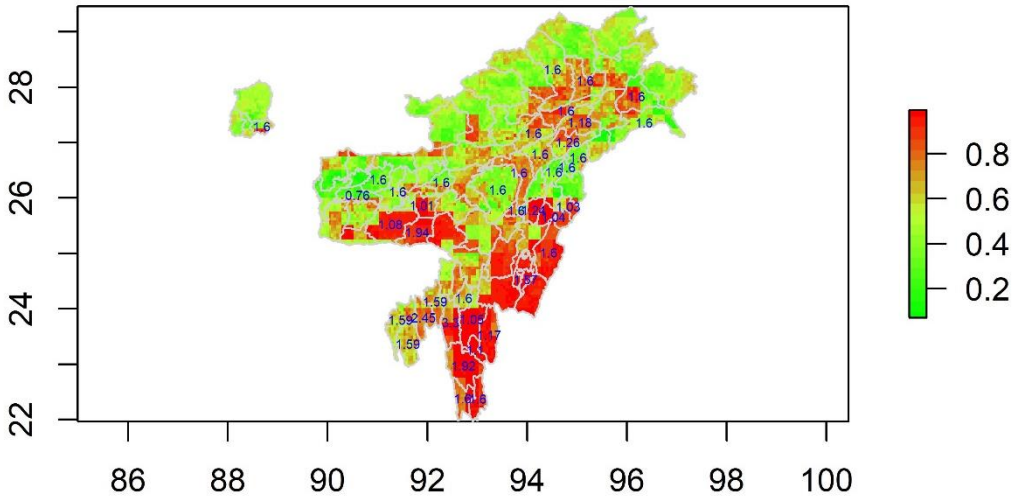

Fig4. Risk Map for African swine fever in North Eastern Region

d. **CSF- Classical Swine Fever**

Principal causes of CSF disease are EVI, LST, Potential evaporation rate and wind speed

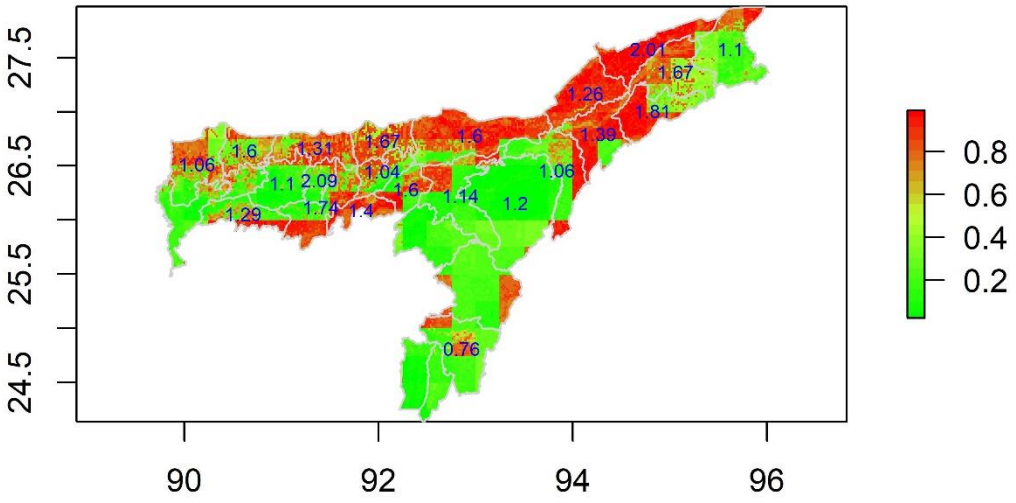

Fig5. Risk Map for Classical Swine Fever in Assam

e. **Theileriosis**

Air temperature, EVI, LST, NDVI, PET, Potential evaporation rate, Rain precipitation rate are the factors that are root cause for the disease

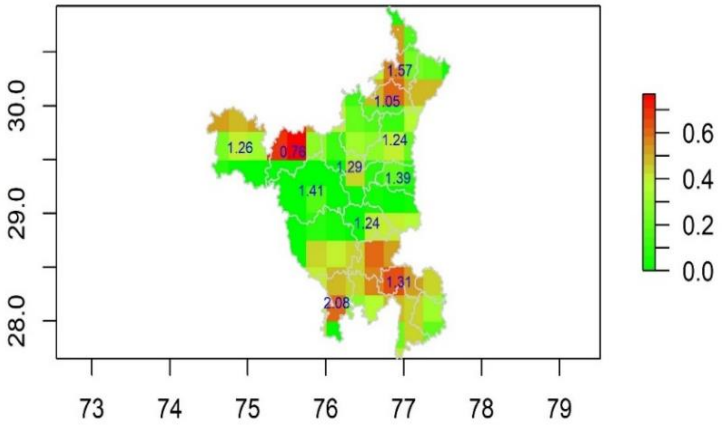

Fig6. Risk map for Theileriosis in Haryana

f. **GIP-Gastro-intestinal Parasitism**

EPG>1000

Air temperature, EVI, LAI, PET, Soil moisture, Specific humidity and Wind speed showed that these factors do significantly contribute for the disease incidence

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EVI, LAI, PET, Potential evaporation rate, Specific humidity are the climatic parameters affecting the animals causing GIP

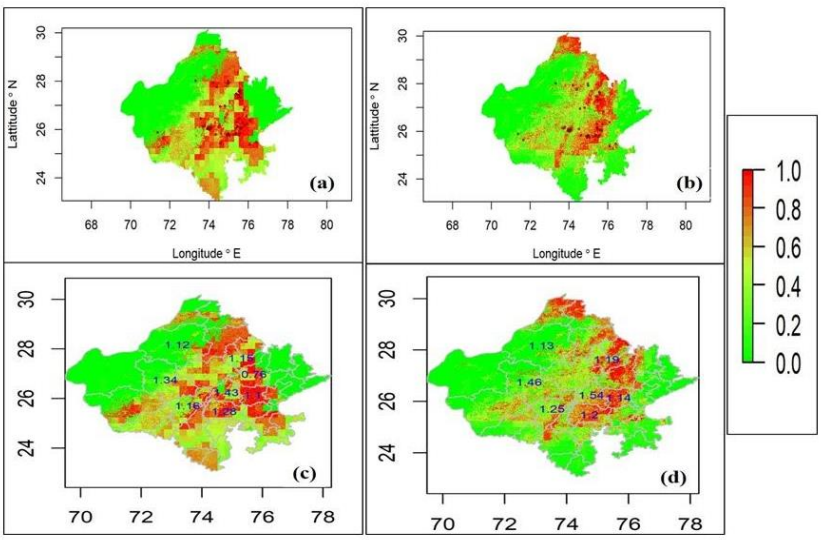

Fig7. Risk map for GIP in Rajasthan

g. **Anthrax**

EL NINO

Various factors affecting the Anthrax EL-Nino disease are Air temperature, Potential evaporation rate and wind speed

LA NINA

Air temperature, EVI, NDVI, Specific humidity, Wind speed are the parameters responsible for the cause of Anthrax

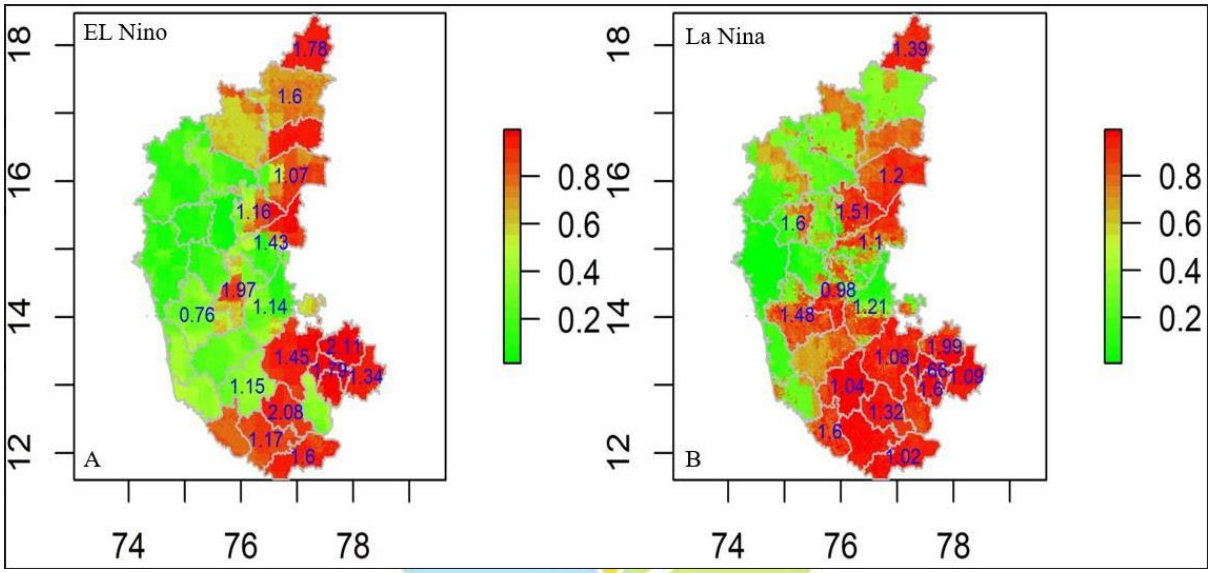

Fig7. Risk map for Anthrax in Karnataka