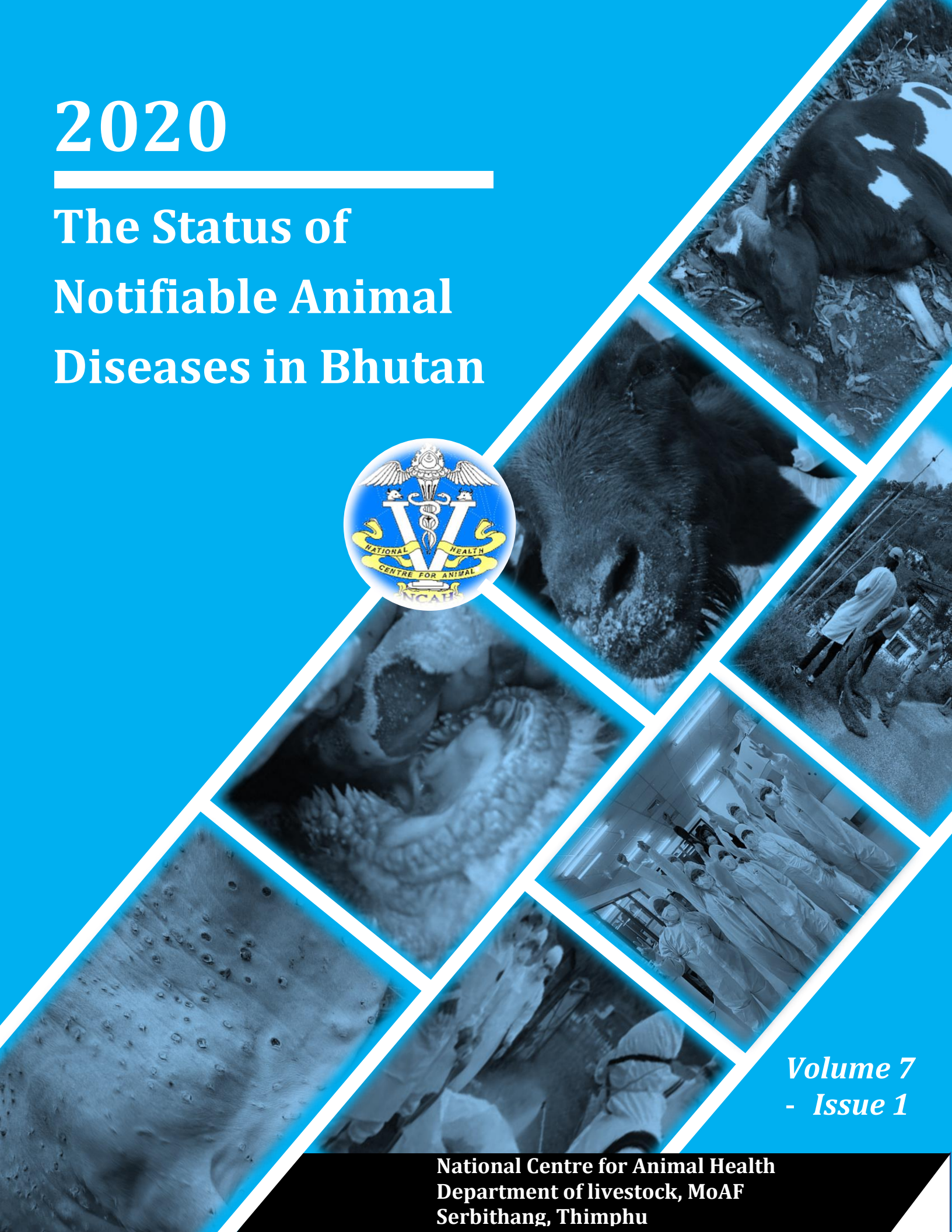
2020

The Status of Notifiable Animal Diseases in Bhutan



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ROYAL GOVERNMENT OF BHUTAN
Ministry of Agriculture and Forests
Department of Livestock
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FOREWORD

This report, The Status of Notifiable Animal Diseases in Bhutan for 2020, compiled by Disease Prevention and Control Unit (DPCU) of the National Centre for Animal Health (NCAH), provides an overview of all notifiable – zoonotic and non-zoonotic – animal diseases reported in the country since 1996. The report specifically presents a descriptive analysis of notifiable animal disease outbreaks reported in Bhutan during the calendar year 2020. The main purpose of this annual report is to provide an update and information sharing regarding the notifiable animal disease situations in the country to all stakeholders including veterinarians, veterinary paraprofessionals, livestock commodity centres, other relevant stakeholders, and the policymakers.

Firstly, I would like to thank the Director of the Department and the Chief Veterinary Officer, Animal Health Division, Department of Livestock for their support and guidance. I would also like to thank all the Regional Directors, Programme Directors, Farm Managers, Dzongkhag Livestock Officers, Veterinary Officers and Veterinary paraprofessionals of all the Dzongkhags for their kind support and cooperation in implementation of animal disease outbreak prevention and control programmes in the field. My sincere acknowledgement also goes to all the animal disease outbreak notification focal persons at the RLDCs, veterinary hospitals, livestock extension centres, regional and central farms, and research centres for actively reporting disease outbreak information to the concerned authorities on real-time basis.

Lastly, I would like to thank Disease Prevention and Control Unit (DPCU), NCAH for taking the lead in producing this annual report.

The information contained in this report could also be used for developing preparedness and response plans by the concerned government agencies responsible for animal disease prevention and control, and it can be used as baseline data for strategic plan development, policy interventions and other related programmes.

We wish you a happy reading!

Dr RB Gurung
Programme Director

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1. BACKGROUND

Notifiable animal disease is any animal disease that upon suspicion or detection must be immediately notified to the nearest animal health centre or relevant agencies. In context to Bhutan, notifiable animal diseases are those zoonotic or non-zoonotic diseases listed by the Department of Livestock, Ministry of Agriculture and Forests, as depicted in the Livestock Rules and Regulations of Bhutan 2017 (see table 1&2), and that, as soon as detected or suspected, must be reported to the nearest animal health centre by the fastest means of communication. The emerging diseases – causing a significant impact on animal or public health resulting from a change of a known pathogenic agent or its spread to a new geographic area or species; or a previously unrecognised pathogenic agent or disease diagnosed for the first time – of national importance as declared by the Department of Livestock should also be notified to the concerned veterinary authorities for immediate response and actions.

As per the OIE's Terrestrial Animal Health Code 2019, definition for case, outbreak and epidemiological unit are as follows:

Case: an individual animal infected by a pathogenic agent, with or without clinical signs.

Outbreak: occurrence of one or more cases in an epidemiological unit

Epidemiological Unit: a group of animals with a defined epidemiological relationship that share approximately the same likelihood of exposure to a pathogenic agent. This may be because they share a common environment (e.g., animals in a pen), or because of common management practices. Usually, this is a herd or a flock. However, an epidemiological unit may also refer to groups such as animals belonging to residents of a village, or animals sharing a communal animal handling facility. The epidemiological relationship may differ from disease to disease, or even strain to strain of the pathogenic agent.

For the purpose of this report, considering the small geographical area and the epidemiolocal relationships shared by the animals/herds in the sub-district, locally known as Gewog, an outbreak is defined as an occurrence of one or more confirmed disease-specific cases in a gewog within a month's period.

This report presents a brief descriptive analysis of the reported notifiable animal diseases during the calendar year 2020, January to December, and the trend of outbreaks since 1996. The data used for analyses in this report were retrieved from the Veterinary Information System, 1996 to 2010; the online Transboundary Animal Disease Information System (TAD*info*), 2011-2020; and the real-time disease outbreak information maintained at the Disease Prevention and Control Unit (DPCU), NCAH – recorded in reference to the flash and follow-up reports submitted by the disease outbreak investigation team from the field.

As per the Livestock Rules and Regulations (LRR) of Bhutan 2017, the notifiable animal diseases in Bhutan comprise of 18 non-zoonotic and 19 zoonotic animal diseases, as shown in table 1&2.

Table 1: Notifiable animal diseases in Bhutan (Source: LRR 2017).

Notifiable Diseases			
S.N.	**Disease name**	**S.N.**	**Disease name**
1	Anthrax	10	Glanders
2	Avian Influenza	11	Haemorrhagic Septicaemia
3	Avian Leucosis Complex	12	Infectious Bursal Disease
4	Black Quarter	13	Marek's Disease
5	Brucellosis	14	Newcastle Disease
6	Classical Swine Fever	15	Peste des petits ruminants
7	Contagious caprine pleuropneumonia	16	Porcine Reproductive and Respiratory Syndrome
8	Equine Influenza	17	Rabies
9	Foot and Mouth disease	18	Strangles

Table 2: Zoonotic notifiable animal diseases in Bhutan (Source: LRR 2017).

Zoonotic Diseases			
S.N.	**Disease name**	**S.N.**	**Disease name**
1	Anthrax	11	Leptospirosis
2	Brucellosis	12	Leishmaniasis
3	Campylobacteriosis	13	Listeriosis
4	Crimean Congo Haemorrhagic Fever	14	Rabies
5	Colibacillosis (*E.Coli*)	15	Salmonellosis
6	Cysticercosis	16	Trichenellosis
7	Dermatomycosis	17	Tuberculosis
8	Ehrlichiosis	18	Toxoplasmosis
9	Highly Pathogenic Avian Influenza	19	Toxocariasis
10	Hydatidosis		

To provide guidance and support for the field professionals, concerned offices and relevant stakeholders for timely implementation of the strategic plans for the prevention and control of notifiable and other priority animal diseases in Bhutan, following official plan documents have been developed:

- National Foot and Mouth Disease Prevention and Control Plan 2020
- National Influenza Pandemic Preparedness Plans and Standard Operating Procedures 2020
- National Peste des petits ruminants Prevention, Control and Eradication Plan 2020
- National Rabies Prevention and Control Plan 2017
- National Gid (Coenurosis) Disease Prevention and Control Plan 2016
- Guidelines for Preparedness, Surveillance and Control of Anthrax in Human and Animals in Bhutan 2013

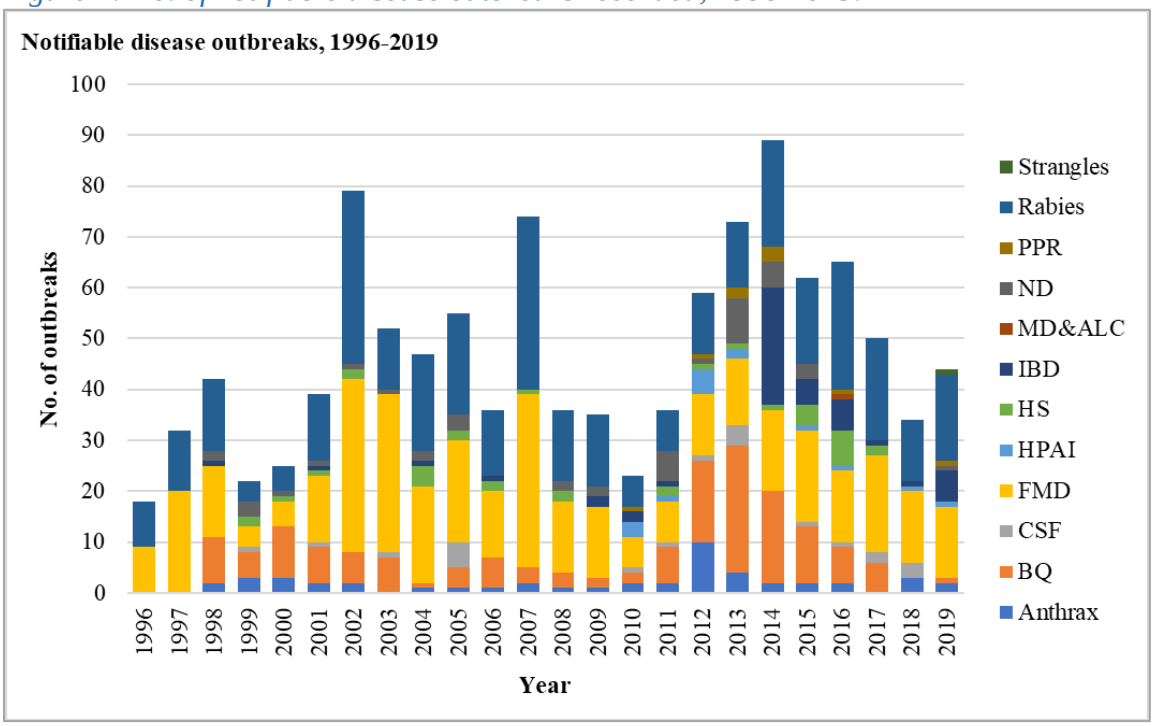
2. AN OVERVIEW OF NOTIFIABLE ANIMAL DISEASES IN BHUTAN

2.1. 1996 to 2019

Between 1996 and 2019, outbreaks of 13 different notifiable animal diseases were reported from across the country, through flash and follow-up reports. The diseases reported during this period are as listed below:

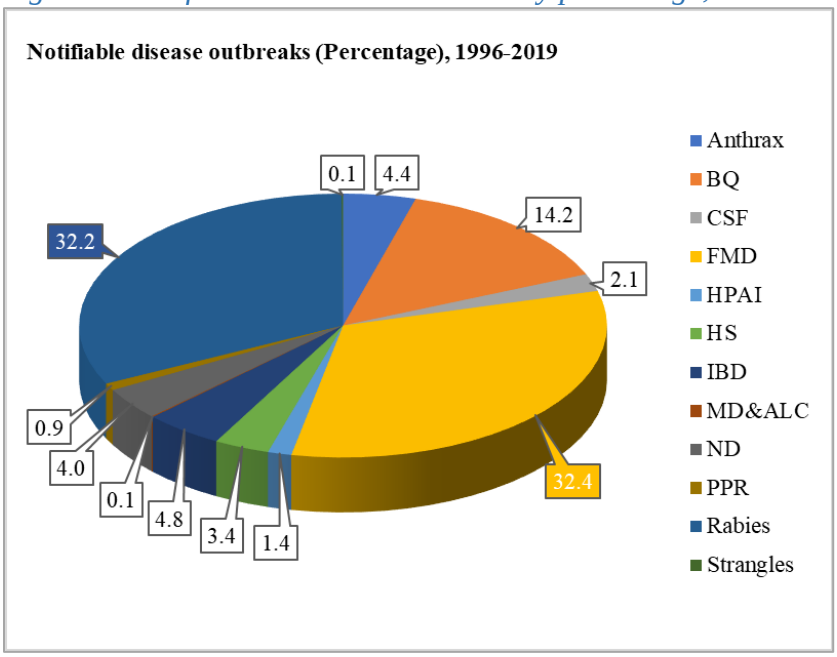
1. Anthrax
2. Avian leucosis complex (ALC)
3. Black quarter (BQ)
4. Classical swine fever (CSF)
5. Foot and mouth disease (FMD)
6. Highly pathogenic avian influenza (HPAI)
7. Hemorrhagic septicaemia (HS)
8. Infectious bursal disease (IBD)
9. Marek's disease (MD)
10. Newcastle disease (ND)
11. Pest des petits ruminants (PPR)
12. Rabies
13. Strangles

Figure 1: No. of notifiable disease outbreaks recorded, 1996-2019.



A total of 1035 outbreaks were recorded, of which, Foot and mouth disease (FMD) and Rabies outbreaks constituted 64 percent of the total (see figure 1). The calendar year 2014 recorded highest number of outbreaks (n=89), followed by 2002 (n=79), 2007 (n=74), 2013 (n=73), etc. (see figure 1).

Figure 2: Notifiable disease outbreaks - by percentage, 1996-2019.



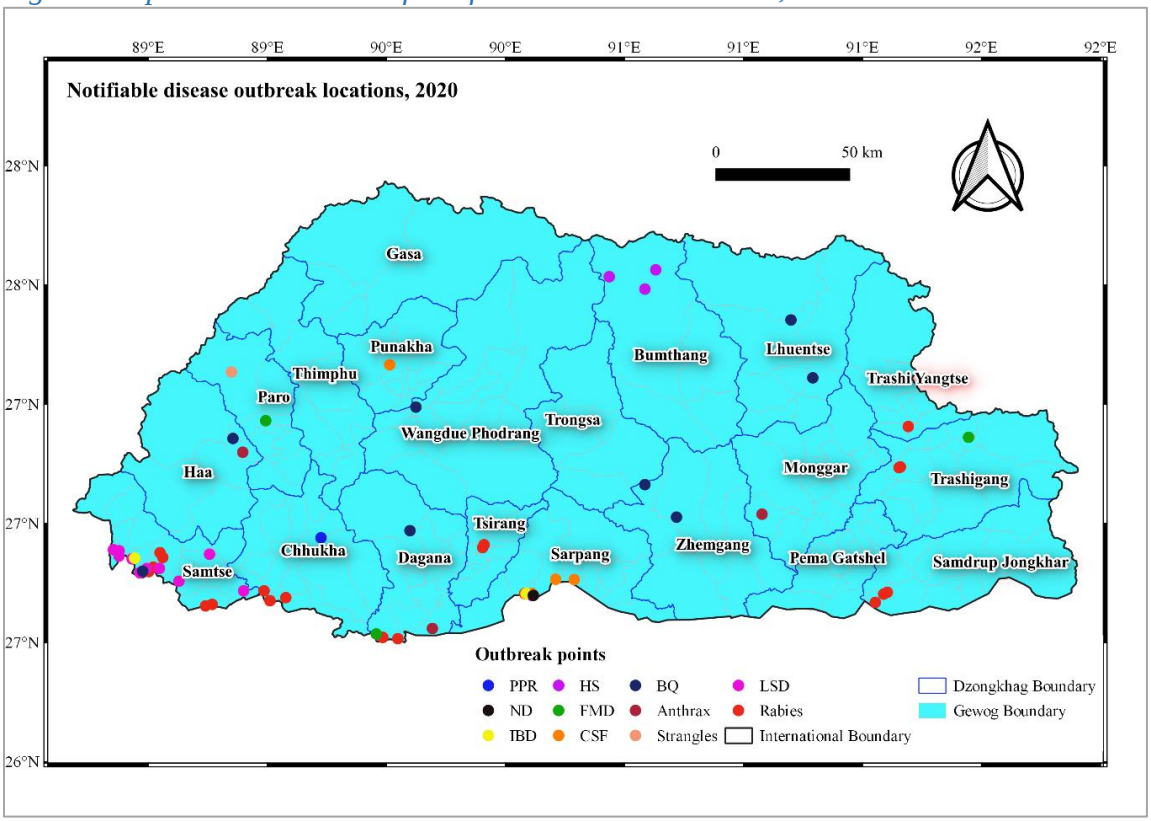
2.2. Calendar Year 2020

During the calendar year 2020, notifiable animal diseases outbreak reported are as listed in the following table.

Table 3: Notifiable animal diseases reported during the calendar year 2020.

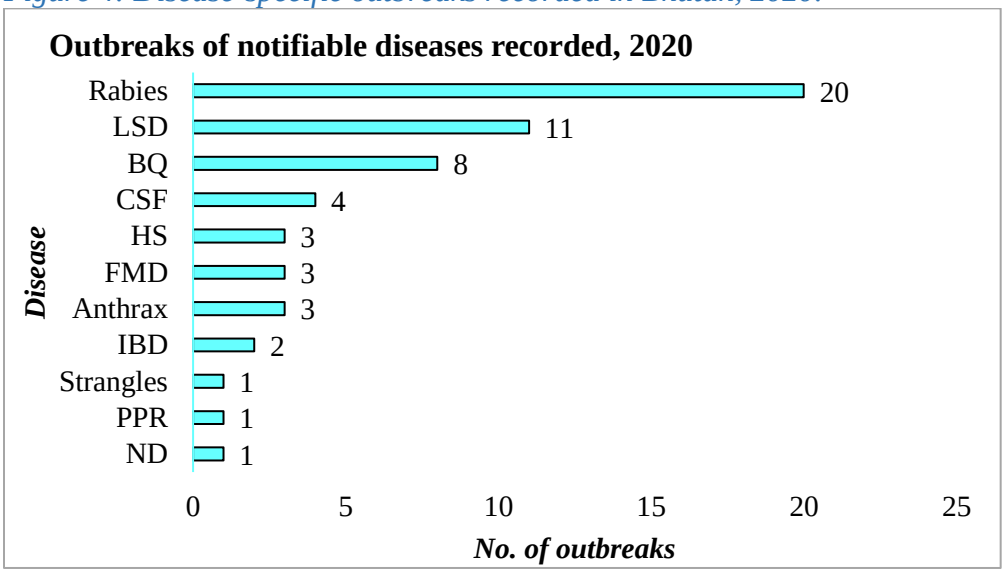
Sl. No.	***Disease***	***Species affected (as per OIE-listed diseases)***
1	Anthrax	Multiple species
2	Black quarter (BQ)	
3	Foot and mouth disease (FMD)	
4	Rabies	
5	Hemorrhagic septicaemia (HS)	Bovine
6	Lumpy skin disease (LSD)	
7	Peste des petits ruminants (PPR)	Caprine and Ovine
8	Classical swine fever (CSF)	Swine
9	Strangles	Equine
10	Infectious bursal disease (IBD)	Avian
11	Newcastle disease (ND)	

Figure 3: Spatial distribution of notifiable disease outbreaks, 2020.



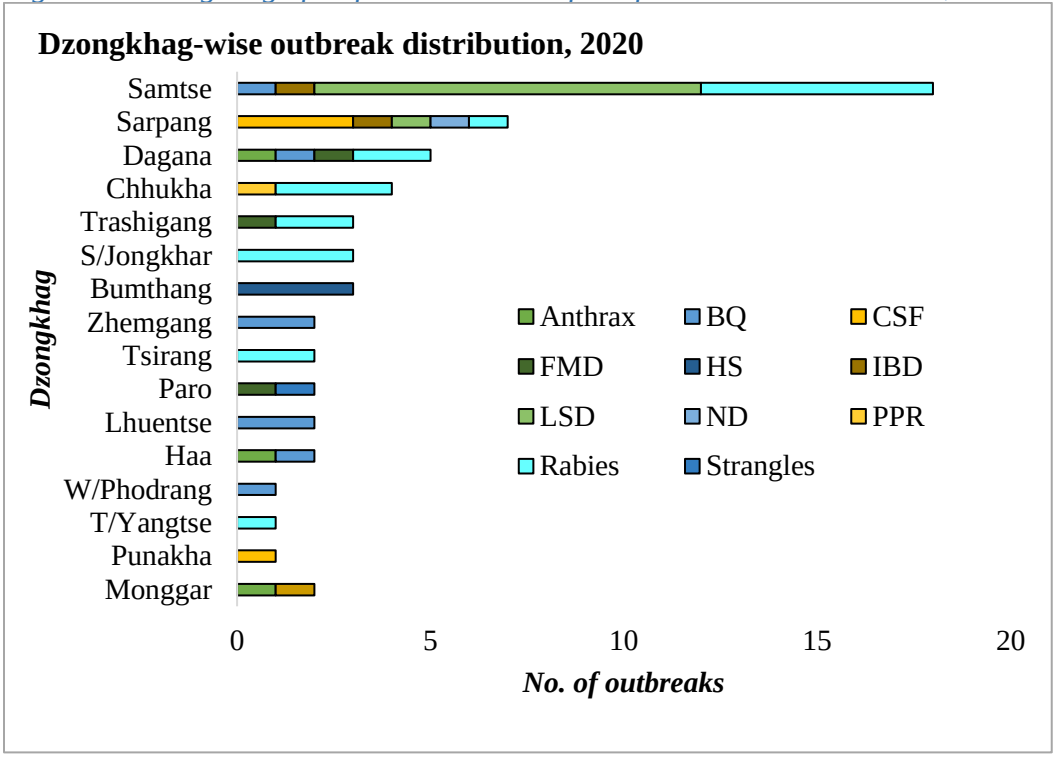
A total of 57 separate outbreaks were reported during the calendar year: 20 outbreaks are of rabies (40 percent), 11 of LSD (19 percent), 8 of BQ (14 percent), and others (see figure 4).

Figure 4: Disease-specific outbreaks recorded in Bhutan, 2020.



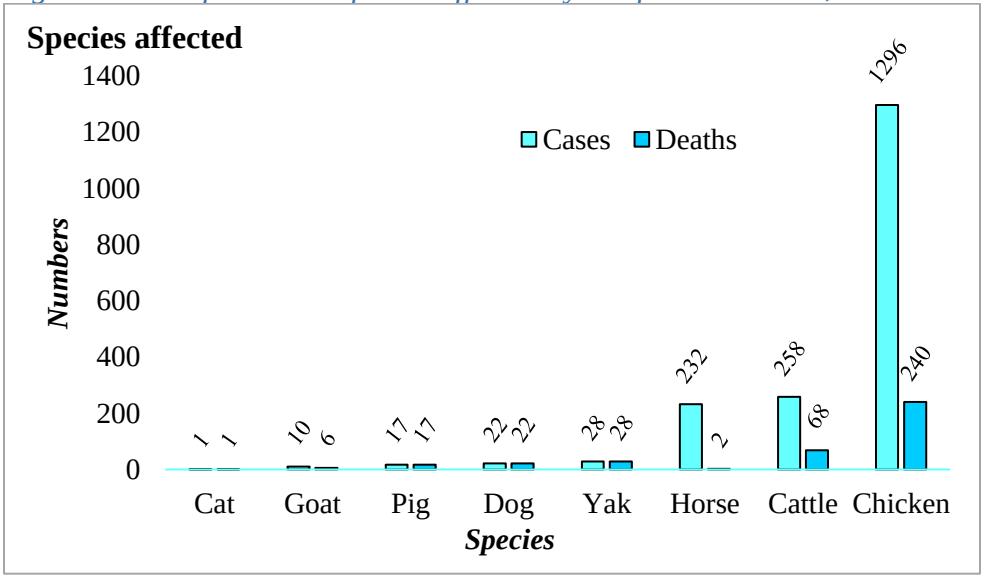
Samtse dzongkhag alone reported 18 outbreaks (32% of the total), followed by Sarpang (n=7), Dagana (n=5), Chhukha (n=4), and others (see figure 5).

Figure 5: Dzongkhag-specific distribution of notifiable disease outbreaks, 2020.



Of the 1864 livestock species affected, 384 died (see figure 6), and 16 dzongkhags, 36 gewogs (see figure 3), and 69 villages were affected. Details of the species affected by various diseases are as shown in the following figure.

Figure 6: No. of livestock species affected by notifiable diseases, 2020.



3. MULTIPLE SPECIES DISEASES

3.1. Anthrax

3.1.1. The Disease

Anthrax is caused by the spore-forming bacteria *Bacillus anthracis*. The name of the bacteria derives from the Greek word for coal, because of the ulcers with dark centres that develop on the skin of affected people. Anthrax spores are extremely resistant, and it can survive in the environment for decades, making the control or eradication of the disease very difficult.

Anthrax commonly causes high mortality, primarily in domestic and wild herbivores as well as most mammals and several bird species, and it is a serious zoonosis – transmitted from animals to humans.

Anthrax does not directly spread from animal to animal or from person to person. The bacteria produce spores on contact with oxygen; these spores are extremely resistant and survive for years in soil, or on wool or hair of infected animals, which if ingested or inhaled by an animal, or on entering through cuts in the skin, they can germinate and cause disease. Because the blood of infected animals sometimes fails to clot and may leak from body orifices, insects can spread the bacteria to other animals.

Carnivores and humans can become infected by eating meat from an infected animal. But typically, animals become infected by ingesting spores which are in the soil or in feed.

Per-acute, acute, sub-acute and, rarely, chronic forms of the disease are reported. Ante-mortem clinical signs may be virtually absent in per-acute and acute forms of the disease. Meanwhile, the only sign in chronic form may be enlarged lymph glands.

Ruminant animals are often found dead with no indication that they had been ill. In acute form, there may be high fever, muscle tremors and difficult breathing seen shortly before the animal collapses and dies. Un-clotted blood may exude from body openings and the body may not stiffen after death. Sub-acute form may be accompanied by progressive fever, depression, in-appetence, weakness, prostration, and death.

In horses or sometimes in ruminants there may be digestive upsets and colic, fever, depression and sometimes swelling. These symptoms may last for up to four days before death results.

In carnivores when the animal feeds on an infected source there may be an intestinal form of the disease with fever and cramps from which animals sometimes recover.

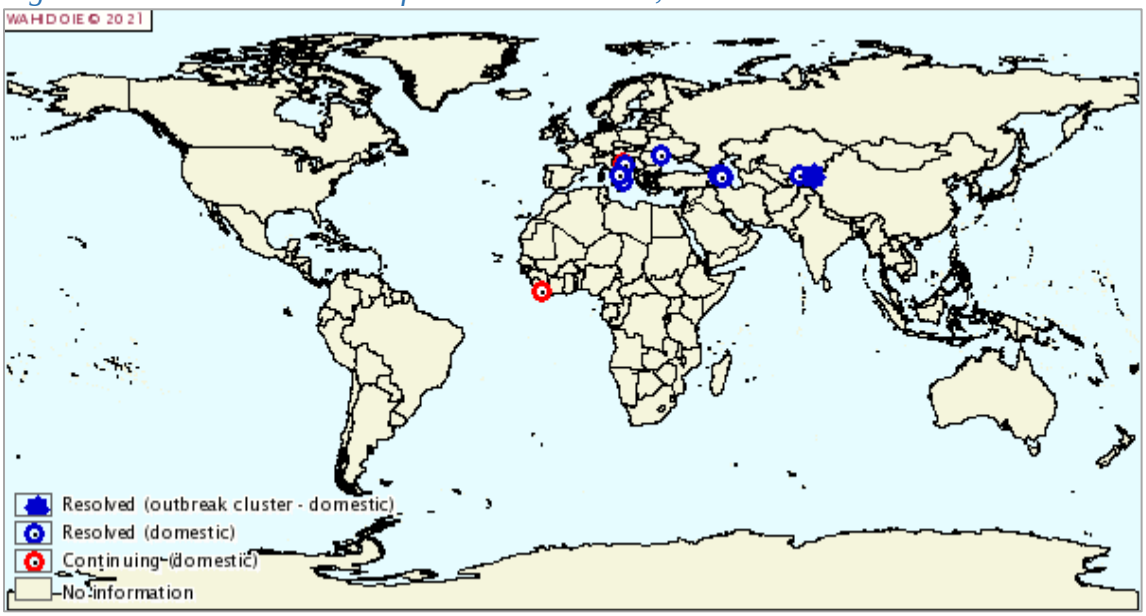
In humans, more than 95% of anthrax cases take the cutaneous form and result from handling infected carcasses or hides, hair, meat, or bones from such carcasses. The disease manifests itself in three distinct patterns (cutaneous, gastrointestinal, and inhalational). The most common is a skin infection, where people become infected handling animals or animal products that contain spores. This can happen to veterinarians, agricultural workers, livestock producers or butchers dealing with sick animals, or when infection has been spread by wool or hides. *Bacillus anthracis* is not invasive and requires a lesion to infect. The spores enter the body through cuts or scratches in the skin and cause a local infection that if not controlled may spread throughout the body. The digestive form occurs when the spores are eaten. Tragically people who lose their animals may

also lose their lives trying to salvage something and consuming the meat from an animal that died. Potentially the deadliest form is by inhalation. This has been called 'wool sorters disease' since spores on hides or hair could be inhaled. While inhalation anthrax is rare in nature, anthrax spores have been developed and used as a biological weapon. Clearly, preventing the disease in animals will protect human public health.

3.1.2. Geographical Distribution

Anthrax is found all over the world on all continents except Antarctica. There are endemic areas with more frequent outbreaks, other areas are subject to sporadic outbreaks in response to unusual weather patterns which can cause spores that were dormant in the soil to come to the surface where they are ingested by ruminants, germinate and cause illness.
Outbreak distribution of anthrax in the world during the calendar year 2020 is as shown in the figure below.

Figure 7: Global distribution of Anthrax outbreaks, 2020.

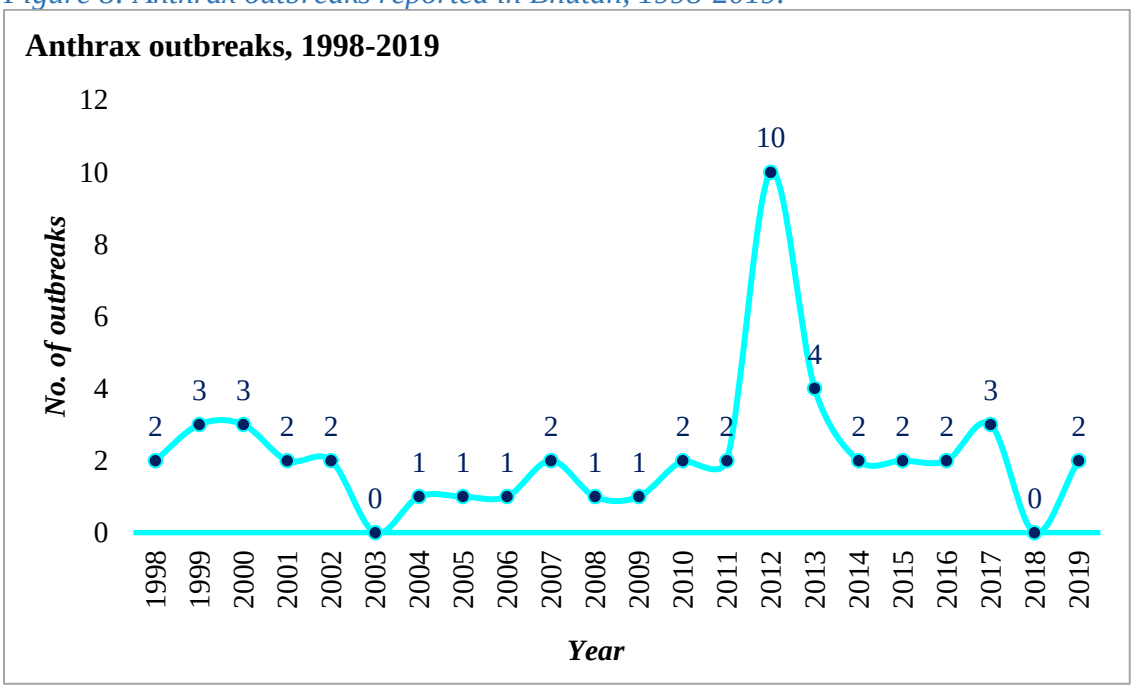


Source: WAHIS, January 2021

3.1.3. Past outbreaks in Bhutan

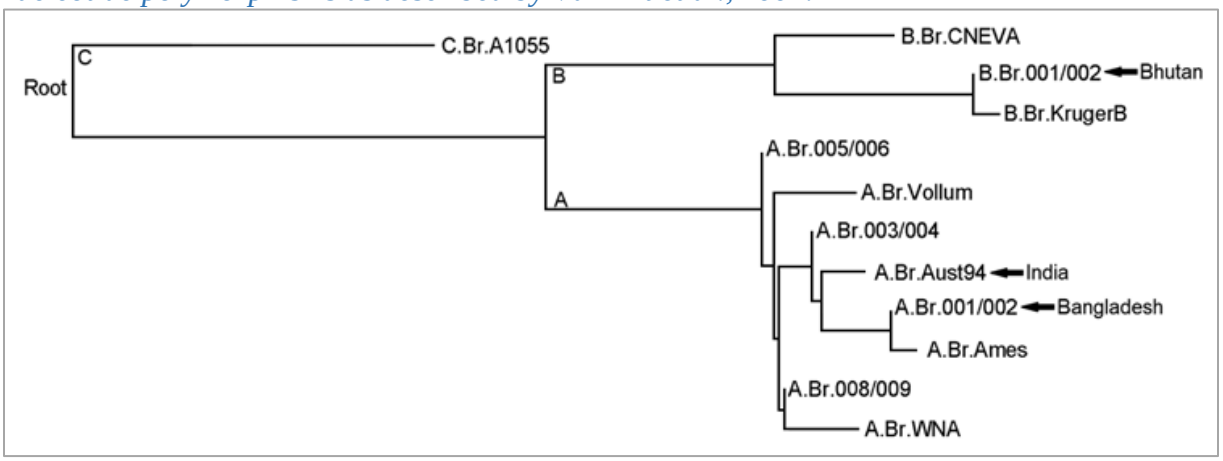
In Bhutan, anthrax cases are sporadically reported in cattle. Occasionally, cutaneous anthrax cases have been reported in humans following contact with infected animals.
Outbreaks of anthrax in Bhutan were recorded since 1998, and a total of 48 outbreaks were reported till 2019. Between 1998 and 2019, Anthrax outbreak was not reported in 2003 and 2018. The number of outbreaks remained consistent over the period of 20 years, except for the calendar year 2012, during which 10 separate outbreaks were recorded (see figure 8).

Figure 8: Anthrax outbreaks reported in Bhutan, 1998-2019.



Data source: The status of notifiable animal diseases in Bhutan, 2019

Figure 9: Phylogeny of major Bacillus anthracis groups as determined by using canonical single nucleotide polymorphisms as described by Van Ert et al., 2007.



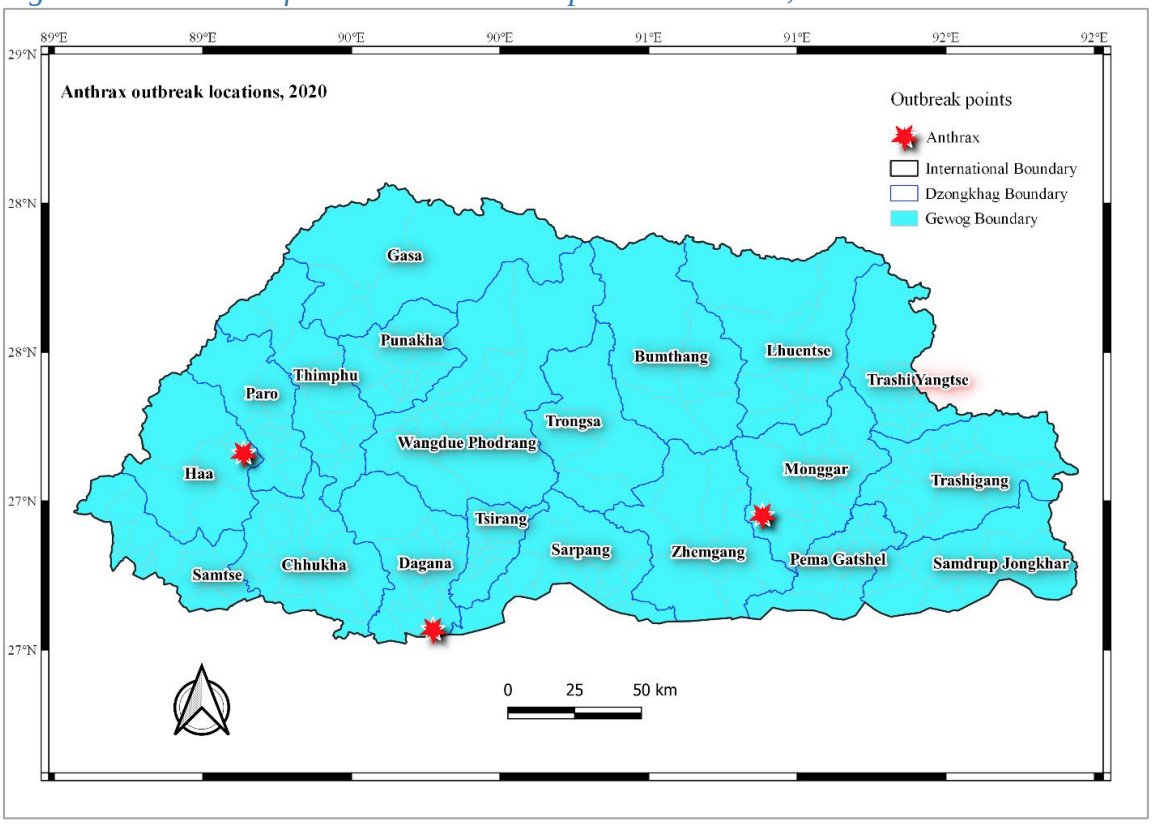
Source: Thapa et al., 2014

The anthrax isolate in Bhutan were found to be part of the multilocus variable-number tandem repeat analysis B1 lineage (genotype 83) and canonical single-nucleotide polymorphism subgroup B. Br 001/002 (see figure 9). The B lineage is less widespread and primarily associated with South Africa, but it has been reported in parts of US, Europe and Asia, including Caucasus region. In contrast, the strains from nearby countries, Bangladesh and India, belong to the more widely dispersed A lineage.

3.1.4. Status in Bhutan – 2020

During the calendar year 2020, three outbreaks of anthrax were reported from three dzongkhags: Monggar, Dagana and Haa (see figure 10). A total of 22 cattle and a pig succumbed to the infection (see annexure 1).

Figure 10: Location of anthrax outbreaks reported in Bhutan, 2020.



3.2. Black quarter (BQ)

3.2.1. The Disease

Black quarter, also known as blackleg or quarter evil or quarter ill is an infectious bacterial disease most commonly caused by *Clostridium chauvoei*, a Gram-positive, rod-shaped, anaerobic, and motile bacteria, and can produce environmentally persistent spores when conditions are not ideal for growth. These spores can remain in the soil for years in an inactive state, and return to their infectious form when consumed by grazing livestock.

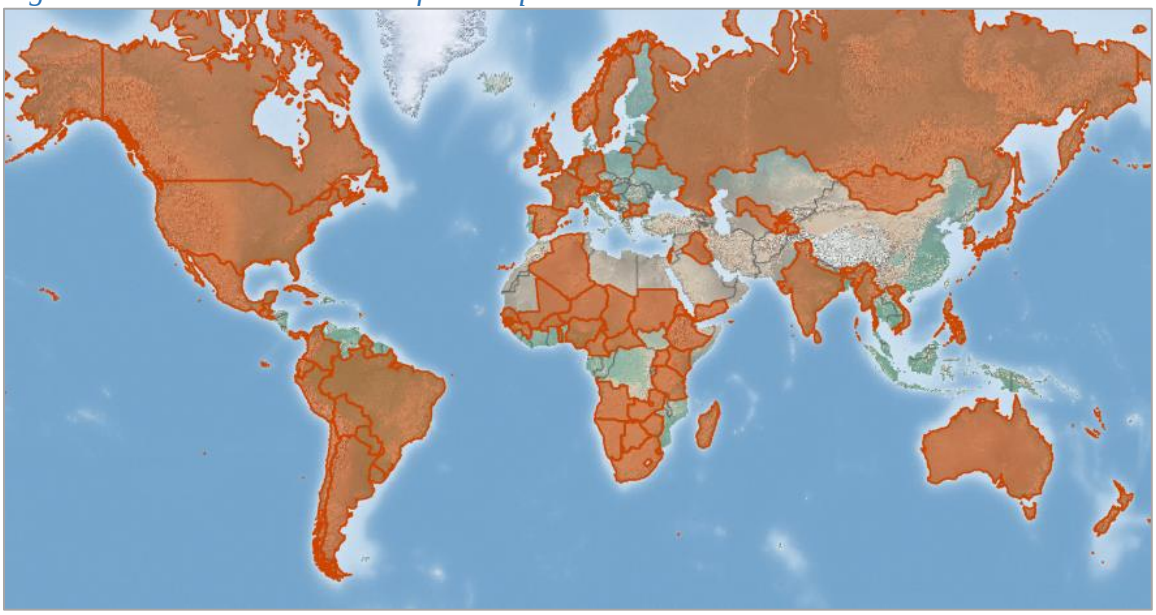
It is seen in livestock all over the world, usually affecting cattle, sheep, and goats. Most losses due to blackleg occur when the cattle are between the ages of six months and two years, although it can occur when they are as young as two months. Typically, cattle that have a high feed intake and are well-conditioned tend to be the most susceptible to blackleg. Furthermore, many blackleg cases occur during the hot and humid summer months or after a sudden cold period, but cases can occur at any time during the year.

When infection begins, the animal may develop a fever, and the affected limb can feel hot to the touch. The limb usually swells significantly, and the animal can develop lameness on the affected leg. *C. chauvoei*, when growing and reproducing can produce a large amount of gas as a metabolic byproduct which builds up in infected tissue, usually large muscles, and causes the tissue to make a crackling or popping sound - Crepitation (the sensation of air under the skin) – when pressed. Large gas-filled blisters can also form, which can be extremely painful as they build up in the tissues.

Once clinical signs develop, the animal may only live a short while, sometimes as few as 12 hours. Occasionally, cattle succumb to the disease without showing any symptoms, and only a necropsy reveals the cause. During a necropsy, a diagnosis is usually made very quickly, as the affected muscle is usually mottled with black patches, which are dead tissue, killed by the toxins the bacteria release when they infect live tissue. If viewed under a microscope, small rod-like bacteria can be seen to confirm the diagnosis.

3.2.2. Geographical Distribution

Figure 11: Global distribution of black quarter.



Source: CAB International

The distribution of black quarter or black leg is worldwide. The above figure shows the global distribution of BQ outbreaks and cases compiled by the Centre for Agriculture and Bioscience International (CABI), updated on 10 January 2020 (see figure 11).

3.2.3. Past outbreaks in Bhutan

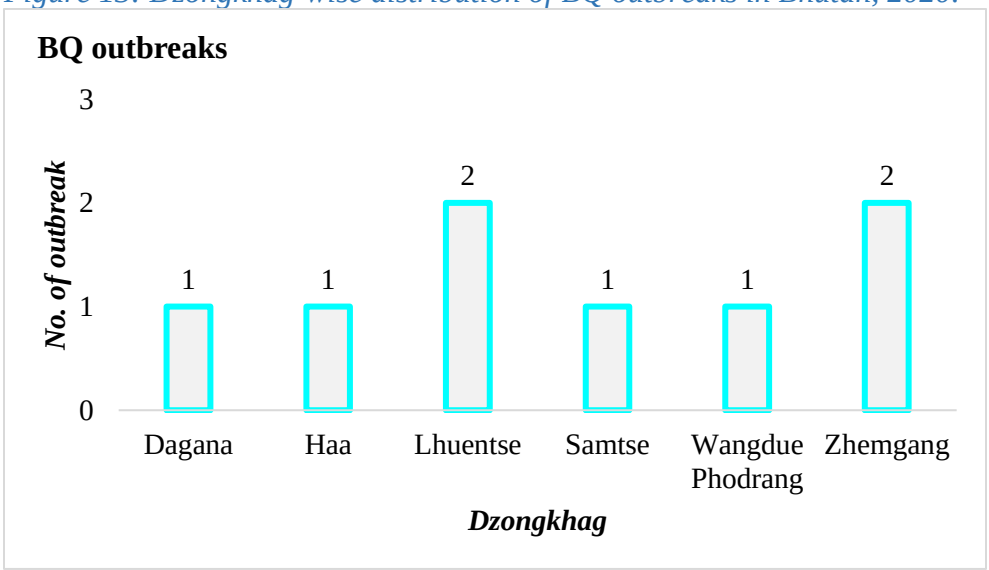
Black quarter outbreaks were recorded in Bhutan since 1998, and until 2019, a total of 156 outbreaks were reported (see figure 12) – annual average of 7 outbreaks. During this entire period, 1998-2019, outbreak of BQ was not reported in 2018. Major number of outbreaks were reported between 2012 and 2014: 16 outbreaks in 2012, 25 in 2013 and 18 in 2014, representing about 38% of the total outbreaks recorded (see figure 12).

Figure 12: BQ outbreaks reported in Bhutan, 1998-2019.

Data source: The status of notifiable animal diseases in Bhutan, 2019

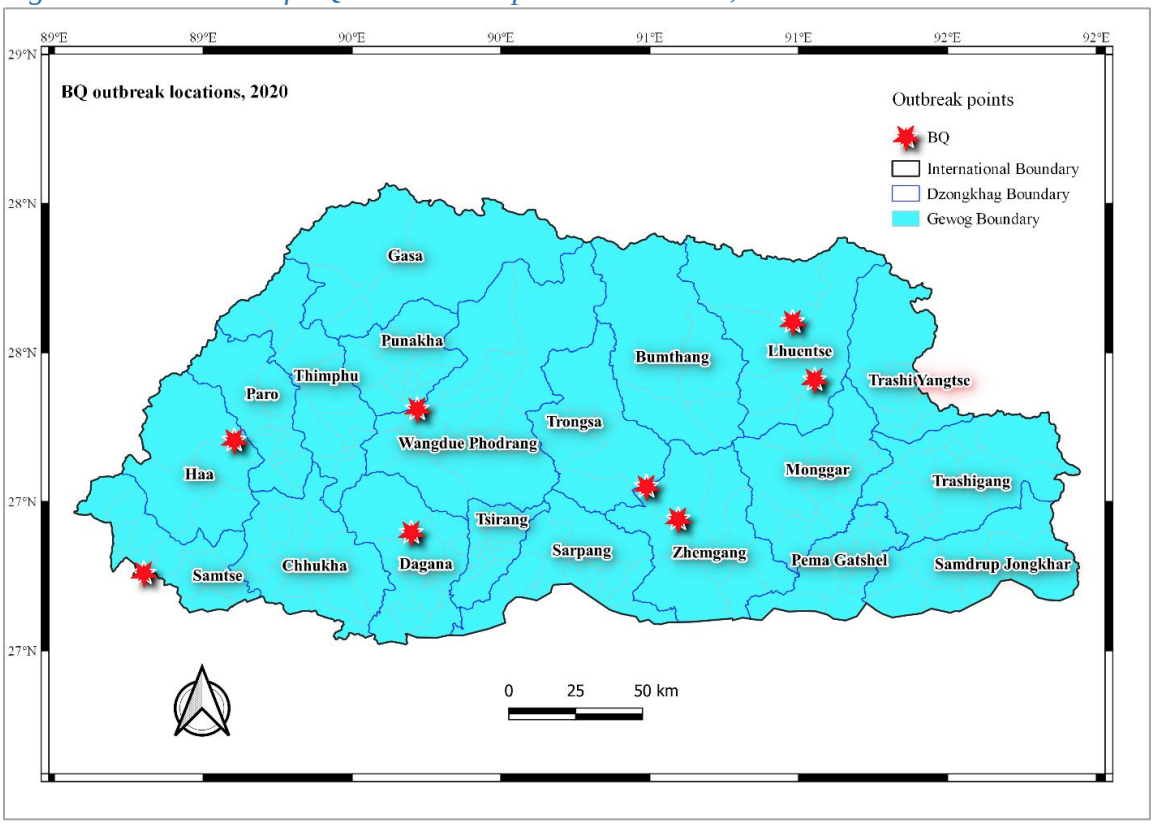
3.2.4. Status in Bhutan – 2020

Figure 13: Dzongkhag-wise distribution of BQ outbreaks in Bhutan, 2020.



During the year 2020, 8 outbreaks of black quarter were reported from 6 dzongkhags: 2 each from Lhuentse and Zhemgang, and 1 each from Dagana, Haa, Samtse and Wangdue Phodrang (see figure 19&20). A total of 21 cattle were infected, of which 18 died (apparent CFR = 85.7%) (see annexure 2).

Figure 14: Location of BQ outbreaks reported in Bhutan, 2020.



3.3. Foot and mouth disease (FMD)

3.3.1. The Disease

FMD is caused by a virus of the family Picornaviridae, genus *Aphthovirus*. There are seven immunologically distinct serotypes: A, O, C, SAT-1, SAT-2, SAT-3 and Asia-1, and they do not confer cross-immunity. The global distribution of these serotypes is not even:

- Serotypes A and O can be found in most FMD endemic regions, with the exception of southern Africa
- The Asia 1 serotype can be found in the FMD endemic regions of Asia
- The African buffalo is the natural host for the Southern African Territories (SAT) serotypes. Serotypes SAT 1 and SAT 2 can be found throughout Africa, while SAT 3 is limited to southern and a small area in eastern Africa
- FMDV serotype C has not been detected since 2004 (in Kenya and Brazil), so it is possible that this serotype is no longer circulating.

Mutation from error-prone RNA replication, recombination, and host selection generate constant new FMDV variants.

All domestic cloven-hoofed animals are susceptible, including cattle, pigs, sheep, goats and buffalo, and all wild cloven-hoofed animals are also susceptible, including deer, antelope, wild pigs, elephant, giraffe and camelids. African buffalo are the only wildlife species to play a significant role in the epidemiology of FMD.

Strains of FMD virus that infect cattle have been isolated from wild pigs and deer. Rats, mice, guinea pigs and armadillos can be infected experimentally.

Transmission of the disease occurs as follows:

- Direct contact between infected and susceptible animals
- Direct contact of susceptible animals with contaminated inanimate objects (hands, footwear, clothing, vehicles, etc.)
- Consumption (primarily by pigs) of untreated contaminated meat products (swill feeding)
- Ingestion of contaminated milk (by calves)
- Artificial insemination with contaminated semen
- Inhalation of infectious aerosols
- Airborne, especially temperate zones (up to 60 km overland)

Incubation period is 2–14 days, and for the purposes of the OIE Terrestrial Animal Health Code, the incubation period for FMD is 14 days.

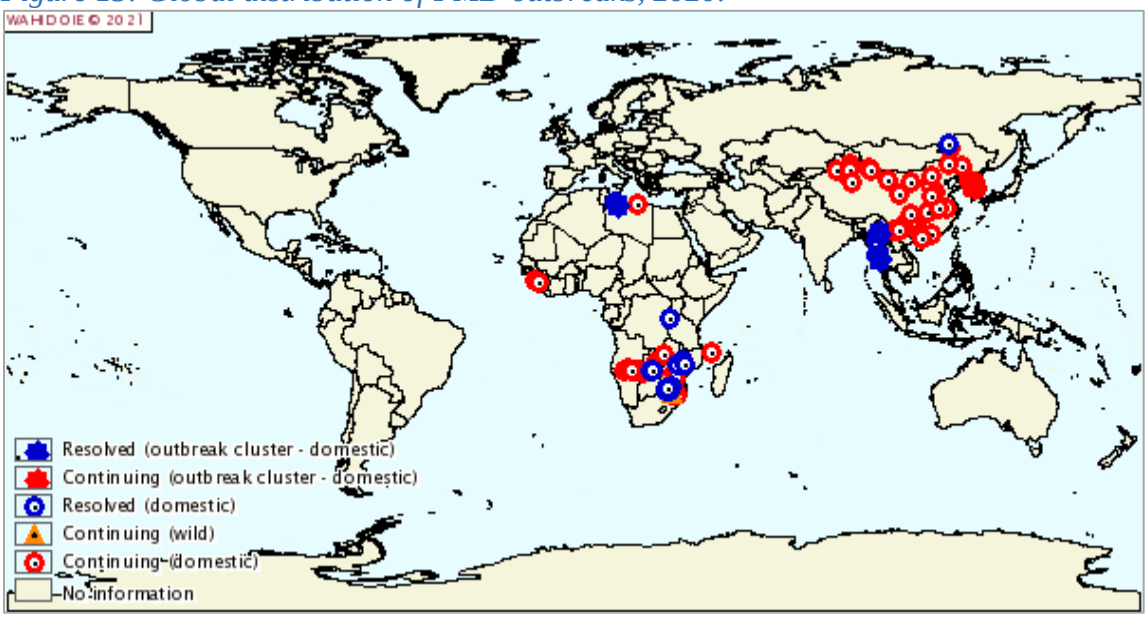
The severity of clinical signs varies with the strain of virus, exposure dose, age and breed of animal, host species and degree of host immunity, and signs can range from mild or inapparent to severe. Morbidity may approach 100%, and mortality in general is low in adult animals (1–5%) but higher in young calves, lambs and piglets (20% or higher). Recovery in uncomplicated cases is usually about two weeks. Generally observed signs of the disease are pyrexia, anorexia, shivering, reduction in milk production, smacking of the lips, grinding of the teeth, drooling, lameness, etc.

Typical lesions are vesicles or blisters on the tongue, dental pad, gums, cheek, hard and soft palate, lips, nostrils, muzzle, coronary bands, teats, udder, snout of pigs, corium of dewclaws and inter-digital spaces. During postmortem, erosions on rumen pillars in ruminants and gray or yellow streaking in the heart from degeneration and necrosis of the myocardium in young animals of all species (‘tiger heart’) will be observed.

3.3.2. Geographical Distribution

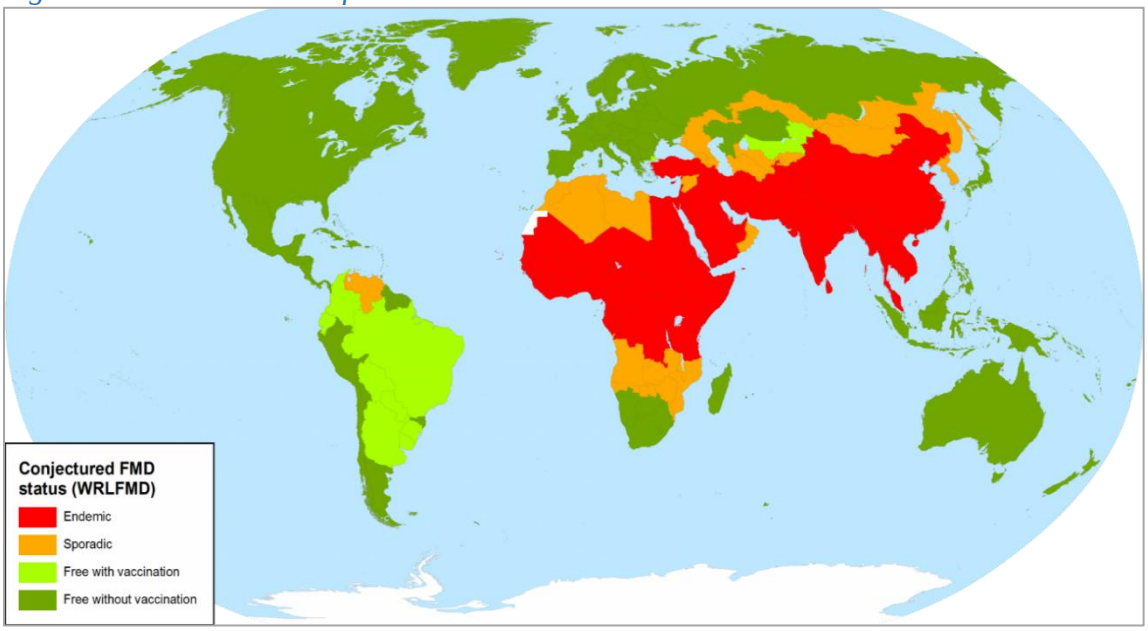
Foot-and-mouth disease has been eradicated from North America, some Pacific nations and Western Europe. The disease is endemic across a large swath of Eurasia, the Middle East, Africa and a few countries in South America (see figure 16). FMD outbreak distribution in the world during the calendar year 2020 is as shown in the figure below (see figure 15).

Figure 15: Global distribution of FMD outbreaks, 2020.



Source: WAHIS, January 2021

Figure 16: Global status of FMD.



Source: WRLFMD

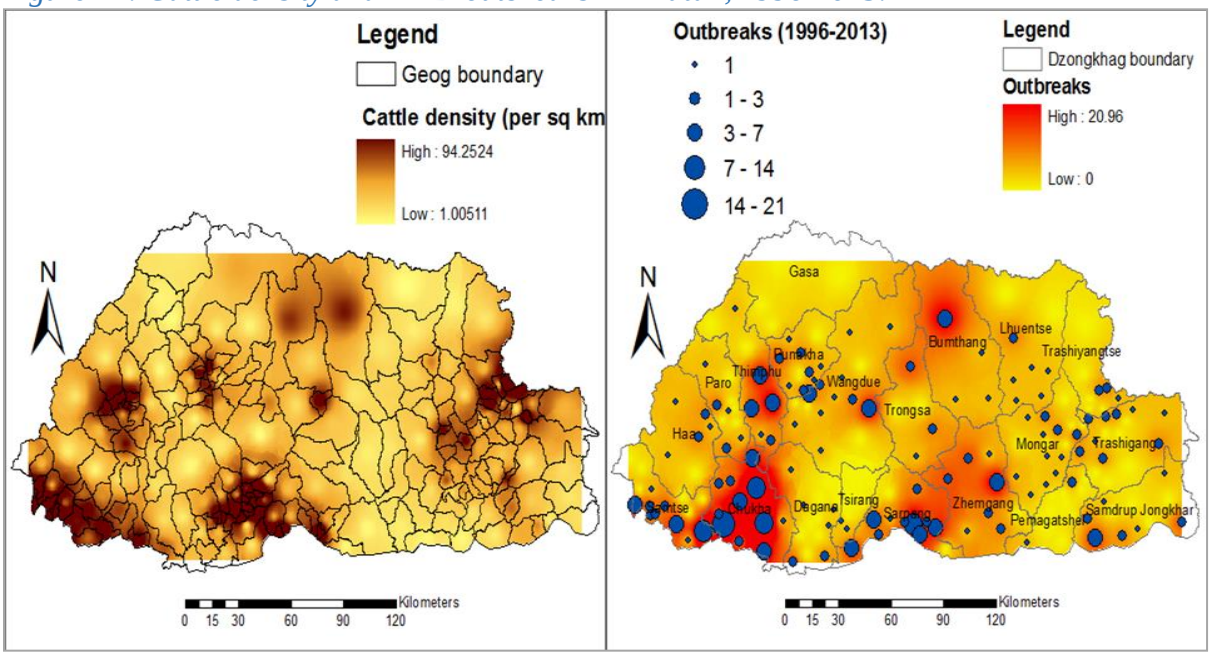
3.3.3. Past outbreaks in Bhutan

FMD is endemic in Bhutan and is reported from almost all parts of the country (see figure 17). Serotype O is the principal FMDV serotype involved in Bhutan, consistent with the disease epidemiology in the neighboring countries in the region. As per the review of laboratory reports from World Reference Laboratory for FMD (WRLFMD), Pirbright, UK, the temporospatial distribution of FMD serotypes in Bhutan are summarized below.

- Serotype O is the most recorded serotype in the country. The Pan Asia strain of the Middle East–South Asia (ME–SA) topotype of type O is reported since 2003. The outbreaks reported from Samtse and Paro dzongkhags in 2017 were associated with serotype O
- Serotype A was identified in Bhutan in 1982 and 1984, and again in 2002 and 2003. It was also identified in 2017 from Chhukha and Samdrup Jongkhar districts
- Serotype Asia I was identified in Bhutan in 1986 and then in 2002
- Serotype C was last identified in Bhutan in 1991

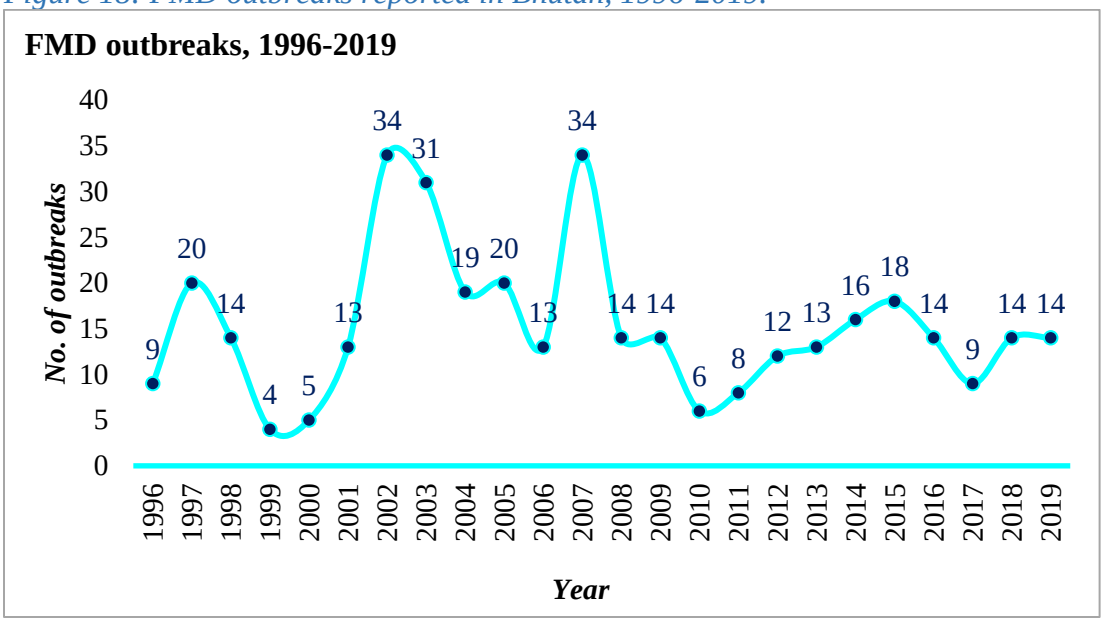
Foot and mouth disease outbreaks were recorded in Bhutan since 1996; a total of 368 separate outbreaks were reported till 2019 (see figure 18) – annual average of 15 outbreaks.

Figure 17: Cattle density and FMD outbreaks in Bhutan, 1996-2013.



Source: Dr Tenzin (from 'The status of notifiable animal diseases in Bhutan 2019')

Figure 18: FMD outbreaks reported in Bhutan, 1996-2019.



Data source: The status of notifiable animal diseases in Bhutan, 2019

3.3.4. Status in Bhutan – 2020

During the calendar year 2020, a total of three outbreaks were reported, one each from Trashigang, Paro and Dagana dzongkhags (see figure 19). A total of 29 cattle were affected; however, no mortality was reported (see annexure 3).

The incursion and spread of foot and mouth disease (FMD) in Bhutan occur mainly through:

- mixing of animals through sharing of common grazing area
- trade of live animals and animal products within the country
- poor management practices
- inadequate regulatory system and
- seasonal migration of livestock.

To define the strategies based on risk zones and establish disease status in the country, the country is divided into three risk zone – High, Medium and Low – based on the disease epidemiology, proximity to neighbouring countries and FMD outbreaks data (2011-2019) (see figure 20). The disease risk zones guide the strategies for surveillance, vaccination and animal movement regulation. To increase the efficiency of the FMD prevention and control programme in the country, the risk zones shall be reviewed periodically based on the disease status and epidemiology.

Figure 19: Location of FMD outbreaks reported in Bhutan, 2020.

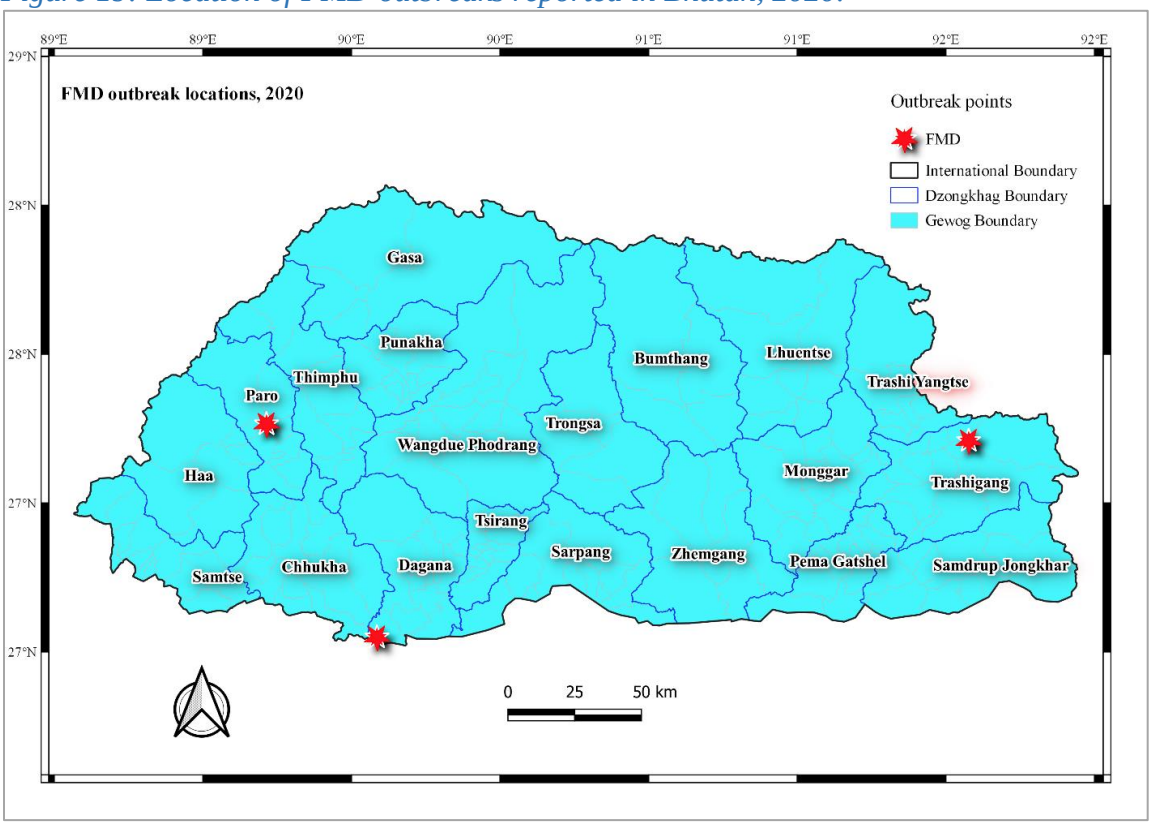
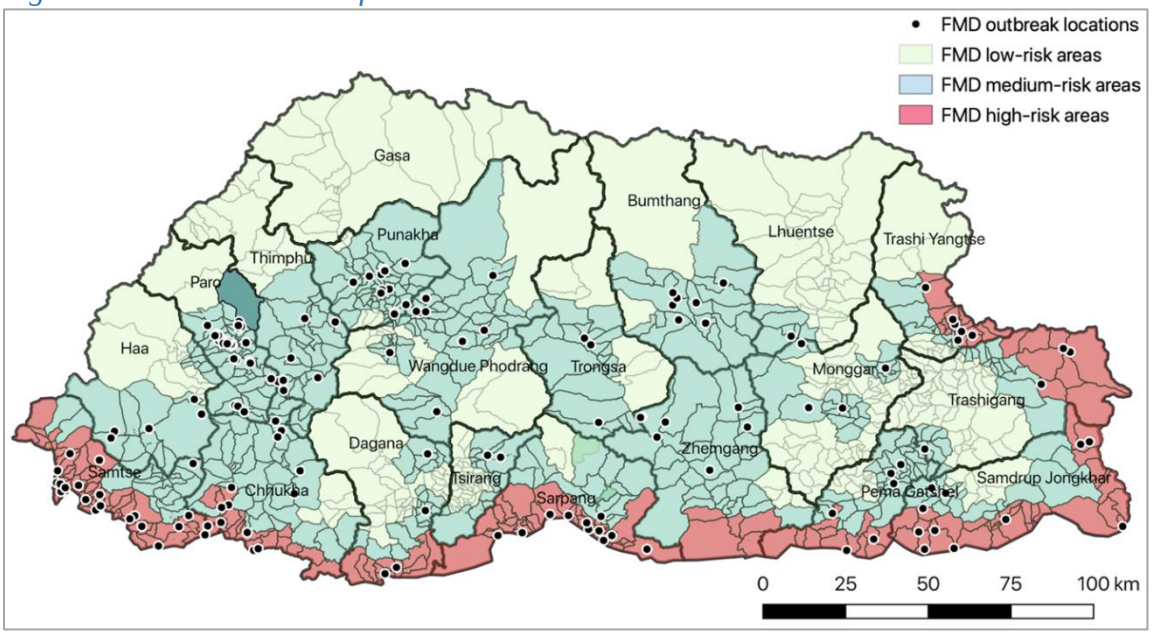


Figure 20: FMD risk zones for Bhutan.



Source: National FMD Prevention and Control Plan 2020

3.4. Rabies

3.4.1. The Disease

Rabies is caused by neurotropic RNA viruses of the genus *Lyssavirus* in the family Rhabdoviridae of the order Mononegavirales and is transmissible to all mammals. Twelve distinct *lyssavirus* species can be distinguished within the genus, namely classical rabies virus (RABV), Lagos bat virus (LBV), Mokola virus (MOKV), Duvenhage virus (DUVV), European bat lyssaviruses type-1 (EBLV-1) and type-2 (EBLV-2), Australian bat lyssavirus (ABLV), Aravan virus (ARAV), Khujand virus (KHUV), Irkut virus (IRKV), West Caucasian bat virus (WCBV), Shimoni bat virus (SHIBV). Of all the lyssaviruses known to date, RABV is the most important one for public and animal health.

All mammals are susceptible to varying degrees, particularly members of the order Carnivora and Chiroptera. A broad spectrum of animals can be infected experimentally with rabies virus.

Rabies virus can be transmitted between mammals, whether they belong to the same or different species. It is primarily transmitted through the saliva of an infected animal - infection occurs primarily via bite wounds, or infected saliva entering an open cut or wound or mucous membrane, such as those in the mouth, nasal cavity, or eyes.

Occasional, albeit rare, transmission by inhalation of infected aerosol has been described.

The incubation period varies from a few days to more than 7 years. For the purposes of the OIE Terrestrial Code the incubation period is considered to be 6 months.

Clinical observations may only lead to a suspicion of rabies because signs of the disease are not pathognomonic and may vary greatly from one animal to another.

All lyssa viruses cause clinical disease indistinguishable from classical rabies. Typical signs include sudden behavioural changes that can lead to increased aggression and progressive paralysis leading to death. Clinical rabies could be presented in two different forms: *furious rabies* when animals show aggressive behaviour, and *dumb or paralytic rabies* that refers to infected animals in which the behavioural changes are minimal, and the disease is manifested principally by paralysis.

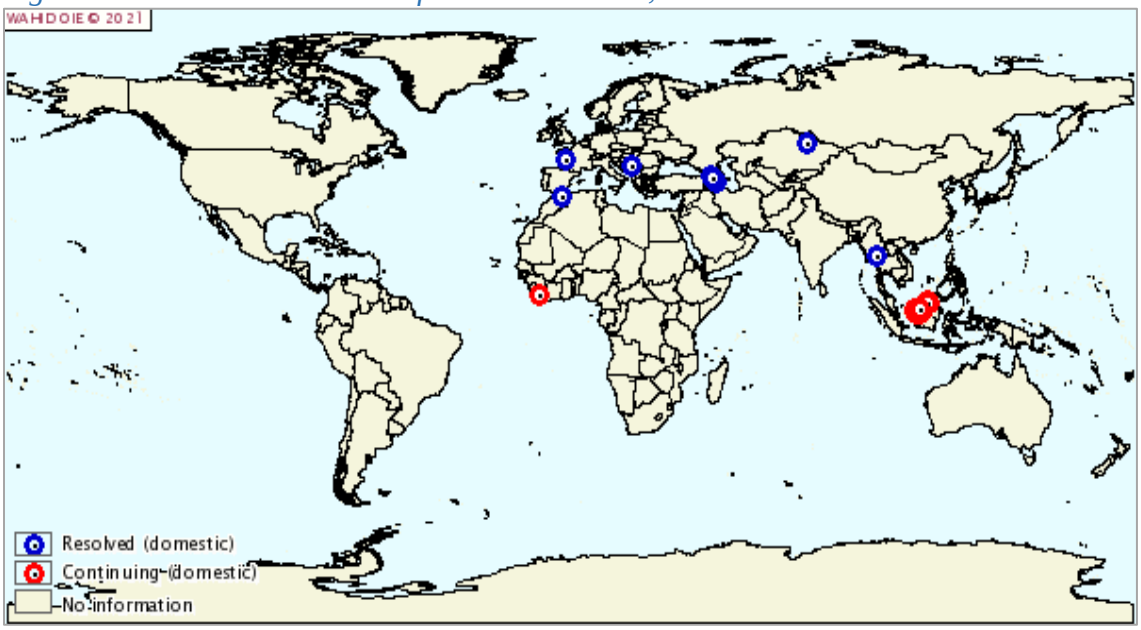
The typical histological signs, found in the central nervous system, are multifocal, mild, polioencephalo-myelitis and craniospinal ganglionitis with mononuclear perivascular infiltrates, diffuse glial proliferation, regressive changes in neuronal cells and glial nodules. Negri bodies can be seen in some but not all cases.

3.4.2. Geographical Distribution

About 99% of rabies cases are dog-mediated and the burden of disease is disproportionally borne by rural poor populations. Dog-mediated rabies has been eliminated from Western Europe, Canada, the United States of America, Japan and some Latin American countries. Australia and many Pacific island nations have always been free from dog-mediated rabies. These countries may still report imported cases and incur costs for maintaining disease freedom or surveillance of endemic transmission in wildlife. Rabies is a major burden in Asia, with an estimated 35,172 human deaths per year. India accounts for 59.9% of rabies deaths in Asia and 35% of deaths

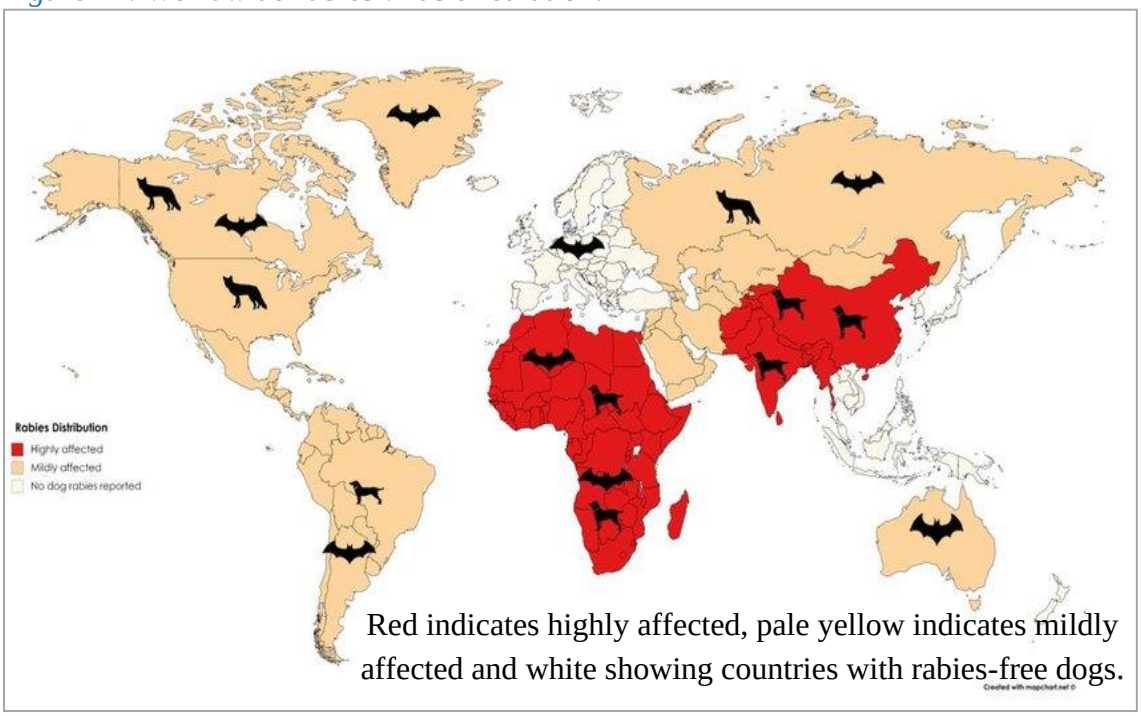
globally. An estimated 21,476 human deaths occur each year in Africa due to dog-mediated rabies.

Figure 21: Global distribution of rabies outbreaks, 2020.



Source: WAHIS, January 2021

Figure 22: Worldwide rabies virus circulation.

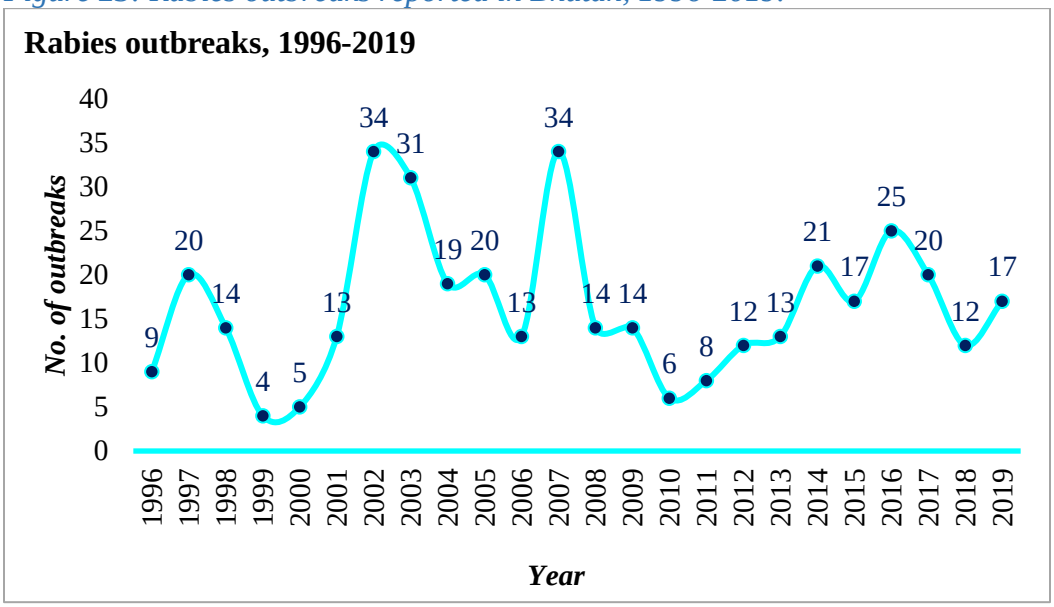


Source: Abraham et al., 2017

3.4.3. Past Outbreaks in Bhutan

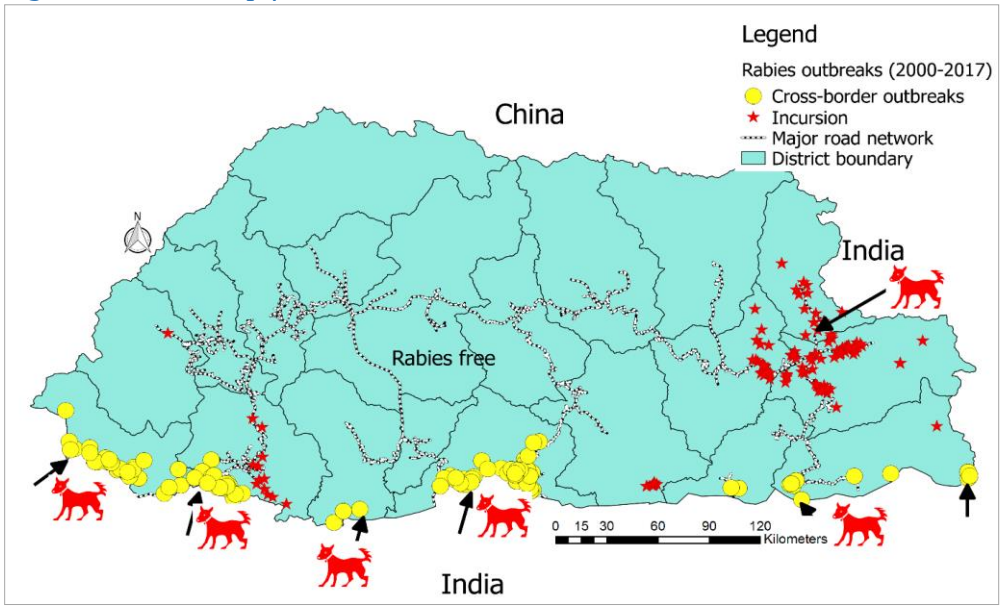
Between 1996 and 2019, a total of 395 outbreaks of rabies (annual average of 16 outbreaks) were reported from across the country (see figure 23) – affecting mainly the southern and eastern districts of Bhutan and further incursion, as shown in figure 24**,** which was based on the rabies cases reported between 2000 and 2017.

Figure 23: Rabies outbreaks reported in Bhutan, 1996-2019.



Data source: The Status of notifiable animal diseases in Bhutan, 2019

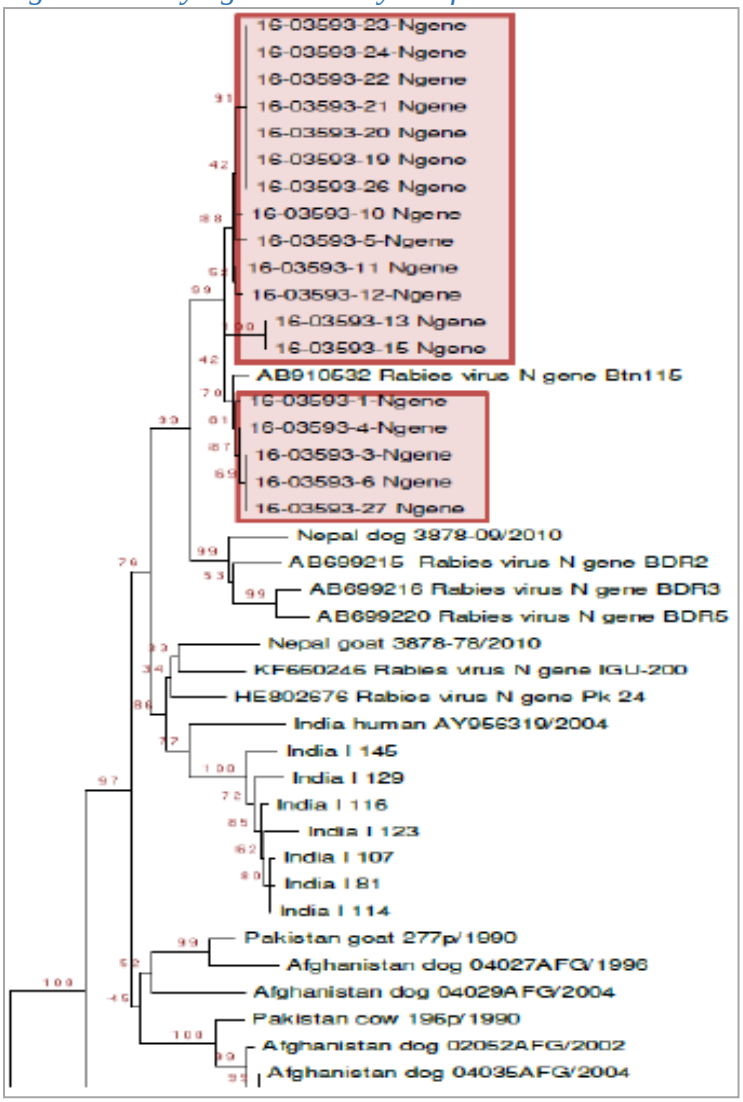
Figure 24: Risk map for rabies virus incursion into Bhutan.



Source: Dr Tenzin (from 'The status of notifiable animal diseases in Bhutan 2019')

As per Tenzin et al. (2011), phylogenetic analysis of rabies virus based on N gene indicates that Bhutan viruses belong to the Arctic-related clade which is widely circulating in northern India (see figure 25).

Figure 25: Phylogenetic analysis of rabies virus.



In humans, 17 deaths due to rabies had been reported between 2006 and 2016. No human rabies cases were reported in 2014, 2015, 2017, 2018 and 2019, however, a 3-year-old girl in Norboogang gewog of Samtse dzongkhag lost her life to a probable case of rabies on 11 November 2020. In line with the global target of achieving zero dog-mediated human rabies death by 2030; Bhutan implements various activities enlisted in the Stepwise Approach Towards Rabies Elimination (SARE), the planning tool developed by FAO, GARC and WHO to support countries in planning the progressive control of dog-transmitted human rabies.

3.4.4. Status in Bhutan – 2020

During the calendar year 2020, twenty outbreaks of rabies were reported, affecting 69 villages in 36 gewogs under 8 dzongkhags (see figure 26).

Figure 26: Location of rabies outbreaks reported in Bhutan, 2020.

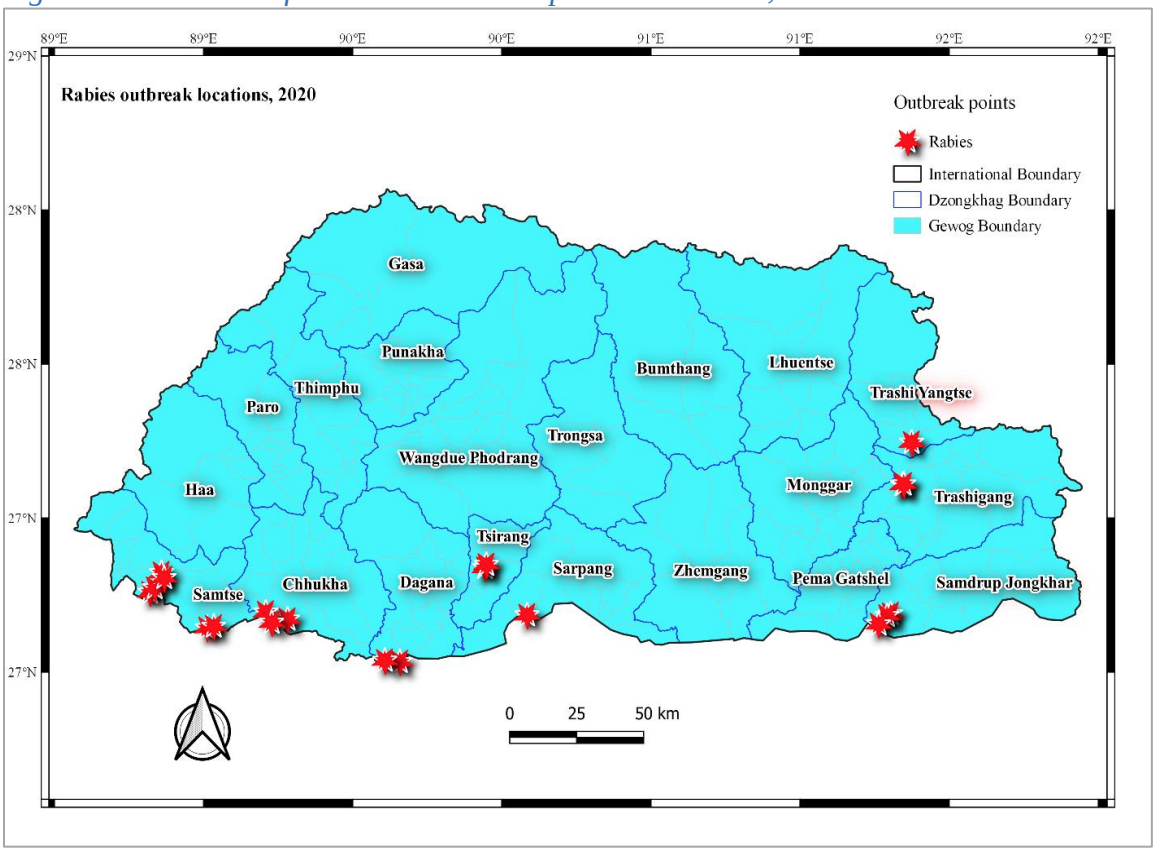
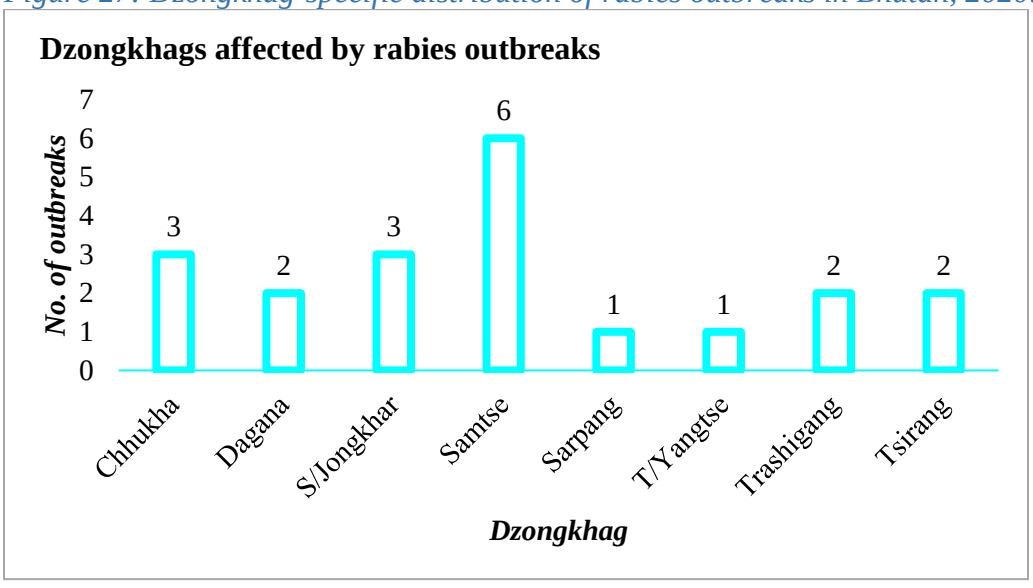
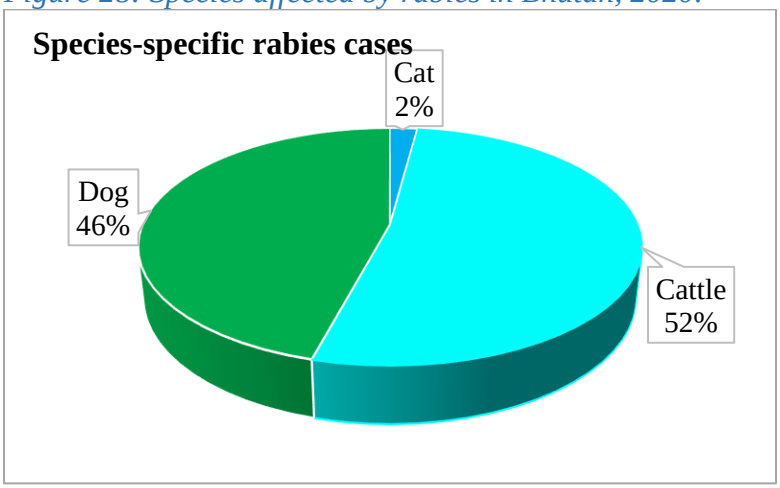


Figure 27: Dzongkhag-specific distribution of rabies outbreaks in Bhutan, 2020.



Samtse dzongkhag reported the highest number of outbreaks (n=6) forming 30% of the total, followed by Samdrup Jongkhar and Chhukha reporting 3 each, and others (see figure 27). Almost all the affected dzongkhags lie along the southern and eastern border sharing porous border with the rabies endemic north-east states of India (see figure 26).

Figure 28: Species affected by rabies in Bhutan, 2020.



A total of 48 cases were reported; 25 cattle (52%), 22 dogs (46%) and a cat (2%) (see figure 28).

Figure 29: Temporal (monthly) distribution of rabies cases in Bhutan, 2020.

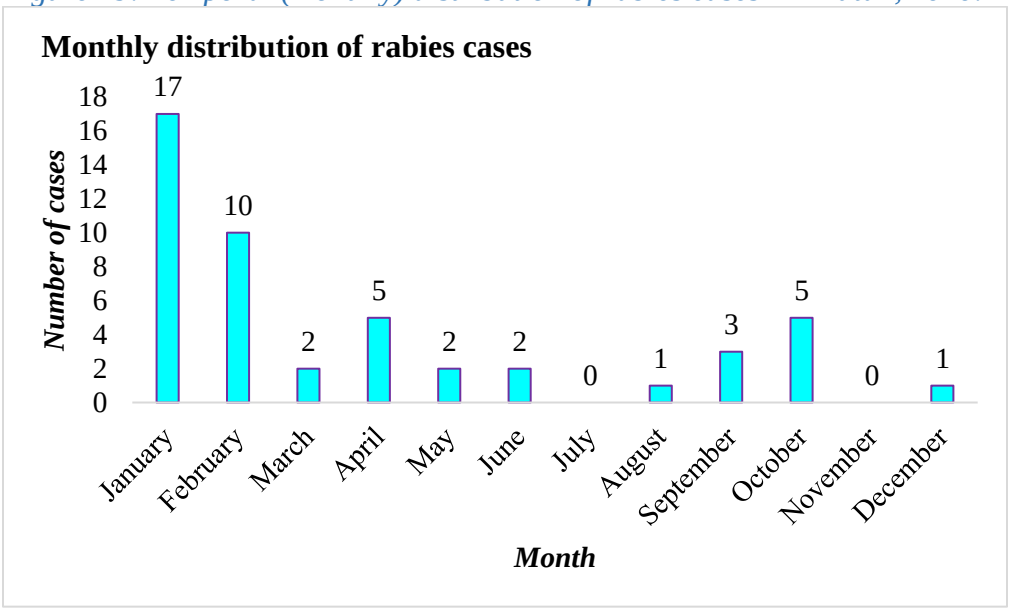


Figure 29 shows the monthly distribution of rabies cases reported in Bhutan during the calendar year 2020. It depicts that the highest number of cases was recorded in January (n=17), followed by February (n=10), October (n=5), etc. Except for July and November, all other months recorded at least an outbreak of rabies.

4. BOVINE DISEASES

4.1. Haemorrhagic septicaemia (HS)

4.1.1. The disease

Haemorrhagic septicaemia is a major disease of cattle and buffaloes characterised by an acute, highly fatal septicaemia with high morbidity and mortality. The disease is caused by certain serotypes of *Pasteurella multocida*, a Gram-negative coccobacillus residing mostly as a commensal in the nasopharynx of animals. The Asian serotype B:2 and the African serotype E:2 (Carter and Heddleston system), corresponding to the newer 6:B and 6:E classification (Namioka-Carter system), are mainly responsible for the disease.

In many Asian countries HS disease outbreaks mostly occur during the climatic conditions typical of monsoon (high humidity and high temperatures). Cattle and water buffaloes (*Bubalus bubalis*) are the principal hosts of hemorrhagic septicaemia, and it is widely considered that buffaloes are the more susceptible. Although outbreaks of hemorrhagic septicaemia have been reported in sheep, goats and swine, it is not a frequent or significant disease. Infrequent cases have been reported in deer, camels, elephants, horses, donkeys and yaks. North American range bison may also be infected. Cattle, water buffalo, and bison appear to be the reservoirs of infection.

P. multocida is transmitted by direct contact with infected animals and on fomites. Cattle and buffalo become infected when they ingest or inhale the causative organism, which probably originates in the nasopharynx of infected animals. In endemic areas, up to 5% of cattle and water buffalo may normally be carriers. The worst epidemics occur during the rainy season, in animals in poor physical condition. Stresses such as a poor food supply are thought to increase susceptibility to infection, and close herding and wet conditions seem to contribute to the spread of the disease.

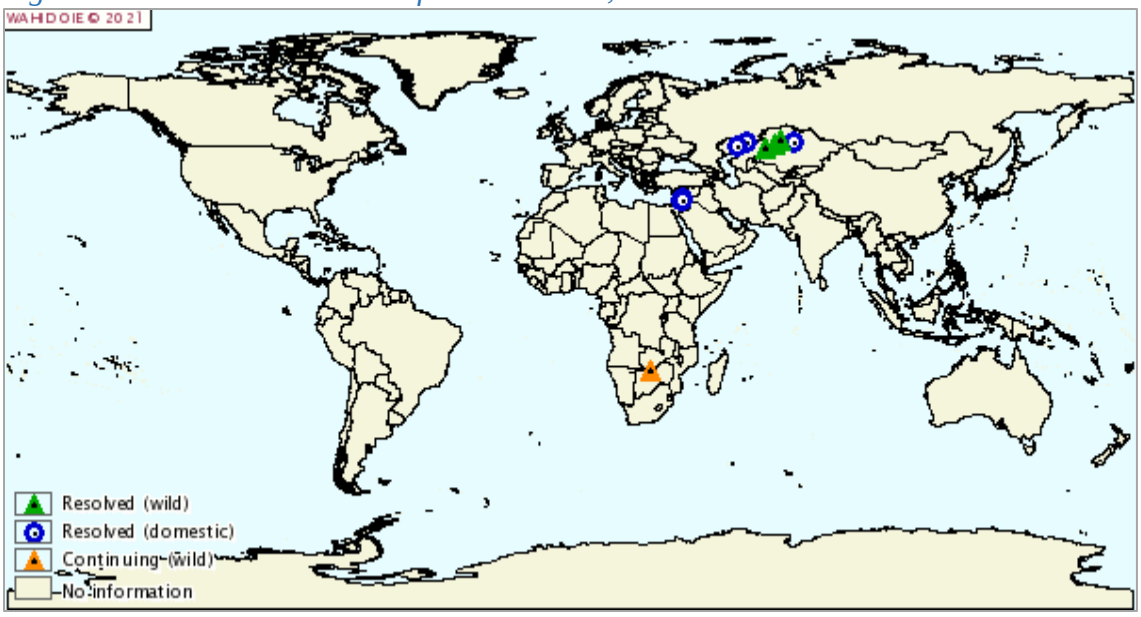
Most cases in cattle and buffalo are acute or per-acute. A fever, dullness, and reluctance to move are the first signs. Salivation and a serous nasal discharge develop, and oedematous swellings become apparent in the pharyngeal region; these swellings spread to the ventral cervical region and brisket. Respiratory distress occurs, and the animal usually collapses and dies 6–24 hours after the first signs are seen. Either sudden death or a protracted course up to 5 days is also possible.

The season of the year, rapid course, and high herd incidence, with fever and oedematous swellings indicate typical HS. The incubation period varies from 3–5 days. Morbidity depends on immunity and environmental conditions, including both weather and husbandry; morbidity is higher when animals are herded closely, in poor condition, or exposed to wet conditions. Mortality is nearly 100% unless the animal is treated very early in the disease; few animals survive once they develop clinical signs. Antibiotic treatment is effective if it is started very early, during the pyrexic stage.

4.1.2. Geographical distribution

Hemorrhagic septicaemia is an important disease in Asia, Africa, some countries in southern Europe, and the Middle East. It has never been confirmed in Mexico, Central or South America. The B:2 serotype has been seen in southern Europe, the Middle East, Southeast Asia, Egypt, and the Sudan. The E:2 serotype has been reported in Egypt, the Sudan, the Republic of South Africa, and several other African countries. Confirmed outbreaks have been reported in one bison herd in the United States; however, there is no evidence that the disease spread to neighbouring cattle. The following figure shows the outbreaks of HS reported to OIE from across the world during the last decade (see figure 30).

Figure 30: Global distribution of HS outbreaks, 2010-2020.

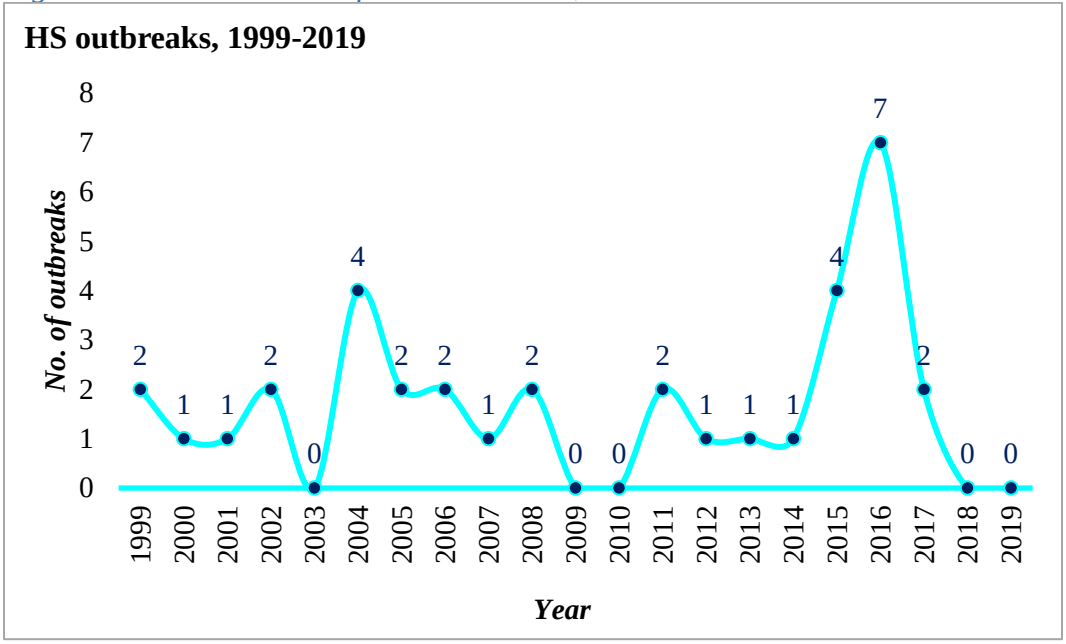


Source: WAHIS, January 2021

4.1.3. Past outbreaks in Bhutan

Outbreak of hemorrhagic septicaemia in Bhutan was recorded since 1999, and till 2018, a total of 35 outbreaks were reported from across the country. Between 1999 and 2019, no outbreak was reported during the calendar years 2003, 2009, 2010, 2018 and 2019. The calendar year 2016 recorded the highest number of HS outbreaks in the country (n=7). The following figure shows the number of HS outbreaks reported in Bhutan between 1999 and 2019 (see figure 31).

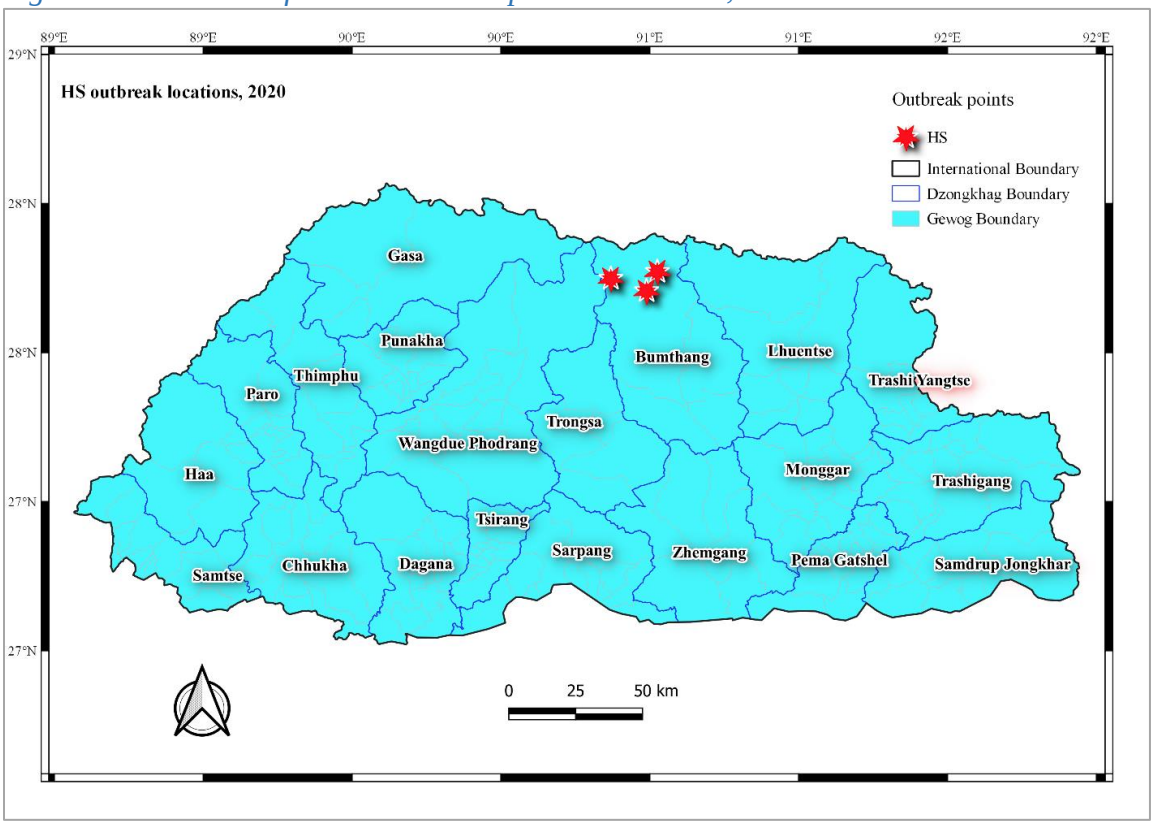
Figure 31: HS outbreaks reported in Bhutan, 1999-2019.



Data source: The status of notifiable animal diseases in Bhutan, 2017

4.1.4. Status in Bhutan – 2020

Figure 32: Location of HS outbreaks reported in Bhutan, 2020.



The calendar year 2020 recorded 3 outbreaks of hemorrhagic septicaemia, all in yak herds on seasonal migration between winter and summer pastures. A total of 38 yaks in Tamakhora, Dhur hot spring and Kharsa areas under Chhoekhor gewog of Bumthang dzongkhag (see figure 32) were affected (apparent CFR=100%) (see annexure 5). All these outbreaks were suspected to have occurred due to seasonal migration related stress and the herds not having received the annual vaccination against HS, which the dzongkhag livestock sector conducts on annual basis.

4.2. Lumpy skin disease (LSD)

4.2.1. The disease

Lumpy skin disease (LSD) is a poxviral disease affecting cattle and water buffalo. It is caused by the lumpy skin disease virus (LSDV), a member of the genus *Capripoxvirus* (CaPV) within the family Poxviridae. Lumpy skin disease virus shares the genus with sheep pox virus (SPPV) and goat pox virus (GTPV), which are closely related, but phylogenetically distinct. There is only one serological type of LSDV, and LSD, SPP and GTP viruses cross-react serologically. The large, double-stranded DNA virus is very stable, and very little genetic variability occurs.

Lumpy skin disease is host-specific, causing natural infection in cattle and Asian water buffalo *(Bubalus bubalis),* although the morbidity rate is significantly lower in buffalo than in cattle. Some LSDV strains may replicate in sheep and goats. Although mixed herds of cattle, sheep and goats are common, to date no epidemiological evidence on the role of small ruminants as a reservoir for LSDV has been reported. Clinical signs of LSD have been demonstrated after experimental infection in impala *(Aepyceros melampus)* and giraffe *(Giraffa camelopardalis).* The disease has also been reported in an Arabian oryx *(Oryx leucoryx)* and springbok *(Antidorcas marsupialis).*

The morbidity varies from 2 to 45 percent and is lower in Asian water buffaloes. Mortality in cattle is usually less than 10 percent, but can be higher in certain breeds, age groups or in high milk producing cows.

Presence of growing numbers of naïve (i.e., not immune) animals, abundance of active blood-feeding vectors, and uncontrolled animal movements are usually drivers for extensive LSD outbreaks. The primary case is usually associated with the introduction of new animal(s) into, or in close proximity to a herd.

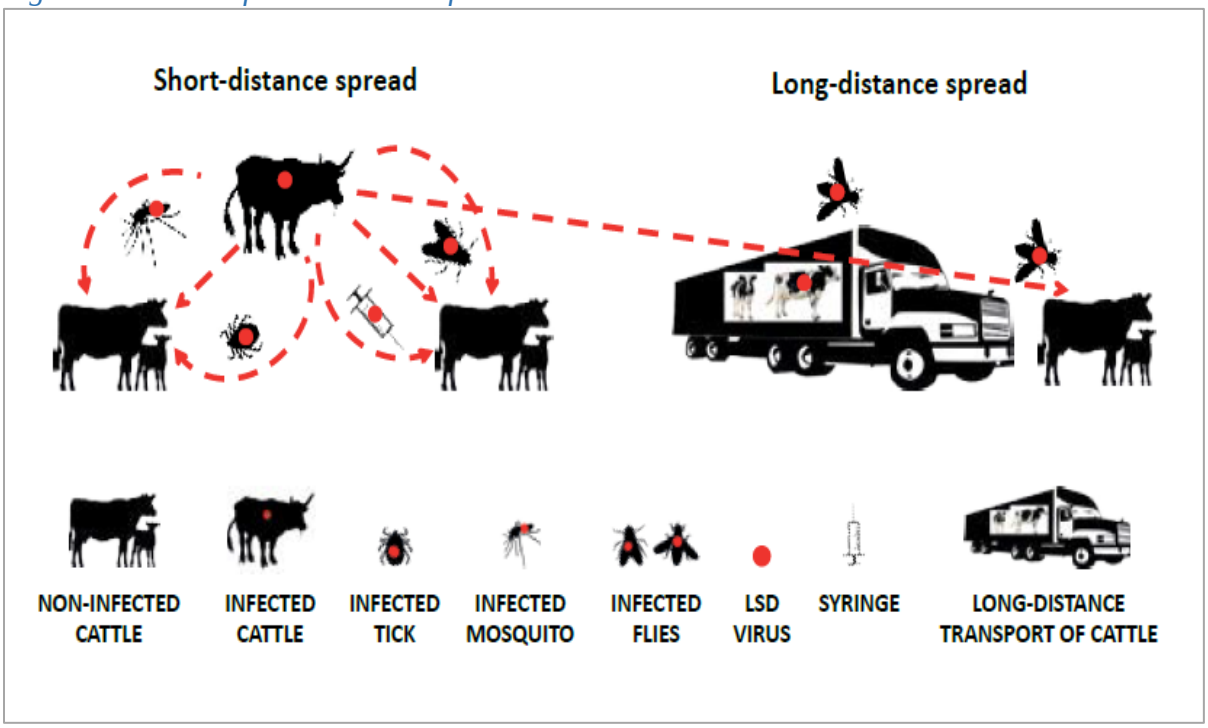
The incubation period in experimentally infected animals varies between four and seven days, but in naturally infected animals it may be up to five weeks. Clinical signs include:

- Lachrymation and nasal discharge – usually observed first
- Subscapular and pre-femoral lymph nodes become enlarged and are easily palpable
- High fever (>40.50C) may persist for approximately a week
- Sharp drop in milk yield
- Appearance of highly characteristic, nodular skin lesions of 10-50 mm in diameter
- Sometimes, painful ulcerative lesions develop in the cornea of one or both eyes, leading to blindness in worst cases

- Skin lesions in the legs and on top of the joints may lead to deep subcutaneous infections complicated by secondary bacterial infections and lameness
- Pneumonia caused by the virus itself or secondary bacterial infections, and mastitis are common complications
- Subclinical infections are common in the field.

The following figure illustrates the mode of transmission of LSDV (see figure 33).

Figure 33: Mode of transmission of LSDV.



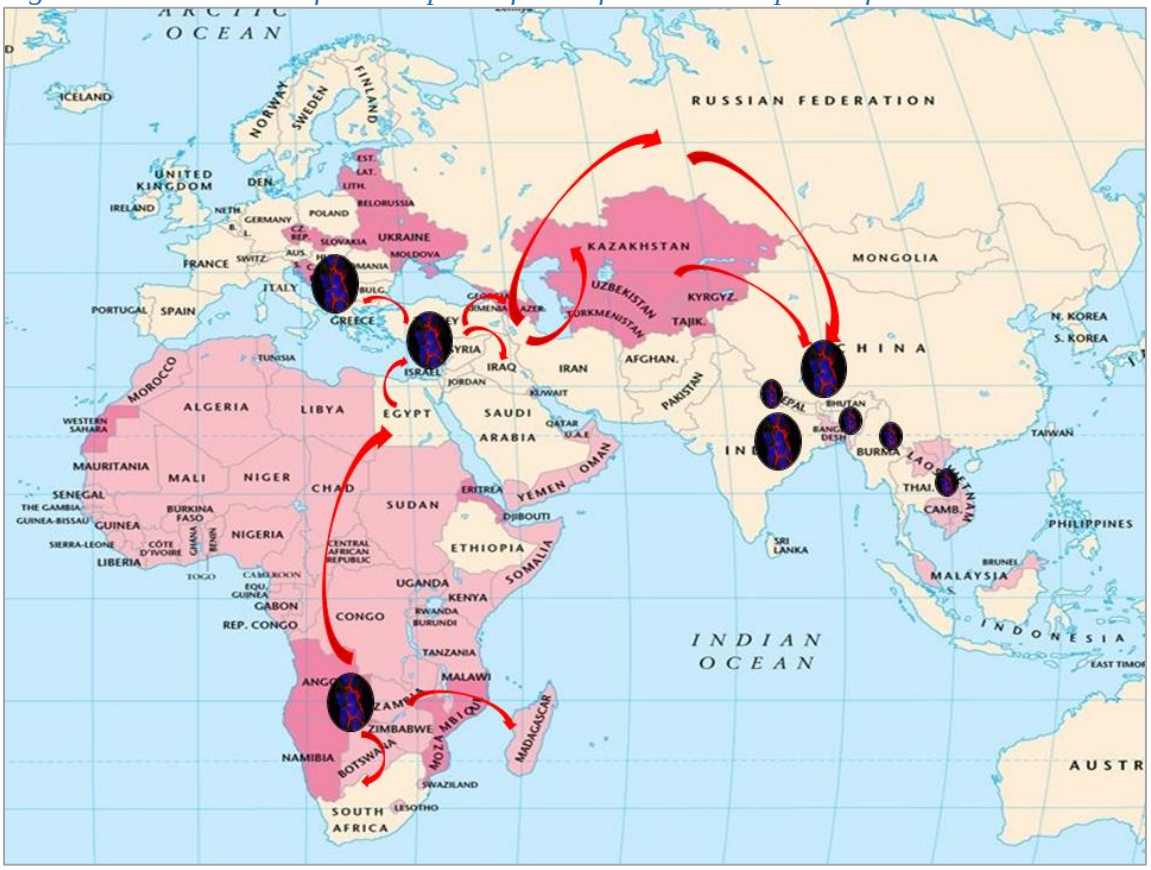
Source: Tuppurainen et al., 2017.

4.2.2. Geographical distribution

Since the first observation of the disease in Zambia in 1929, LSD has spread progressively and extensively throughout Africa, the Middle East, Southeastern Europe, Central Asia, and more recently South Asia and China.

The following figure show the spread of LSD from its origin in Africa to the Middle East, Europe and Asia, with rapid spread occurring since 2013 (see figure 34).

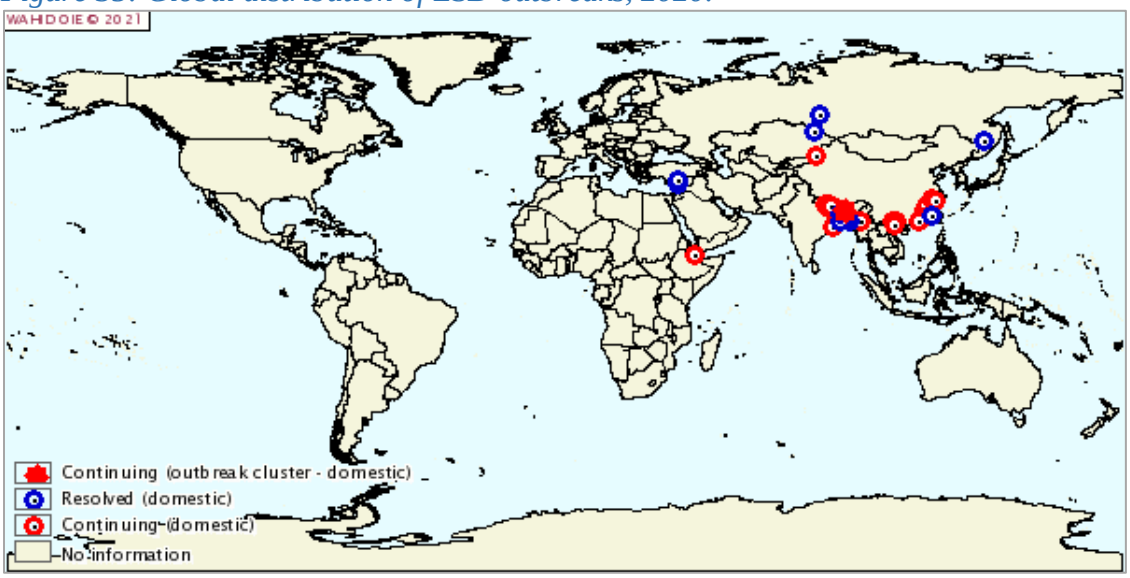
Figure 34: Illustration of LSDV spread from Africa to other parts of the world.



LSD continues to spread further within Asia. As of December 2020, the disease had reached:

- Russian Federation (2015)
- Kazakhstan (2016)
- Bangladesh (July 2019)
- India (Aug 2019)
- China (Aug 2019)
- Nepal (Jul 2020)
- Viet Nam (Oct 2020)
- Myanmar (Nov 2020)

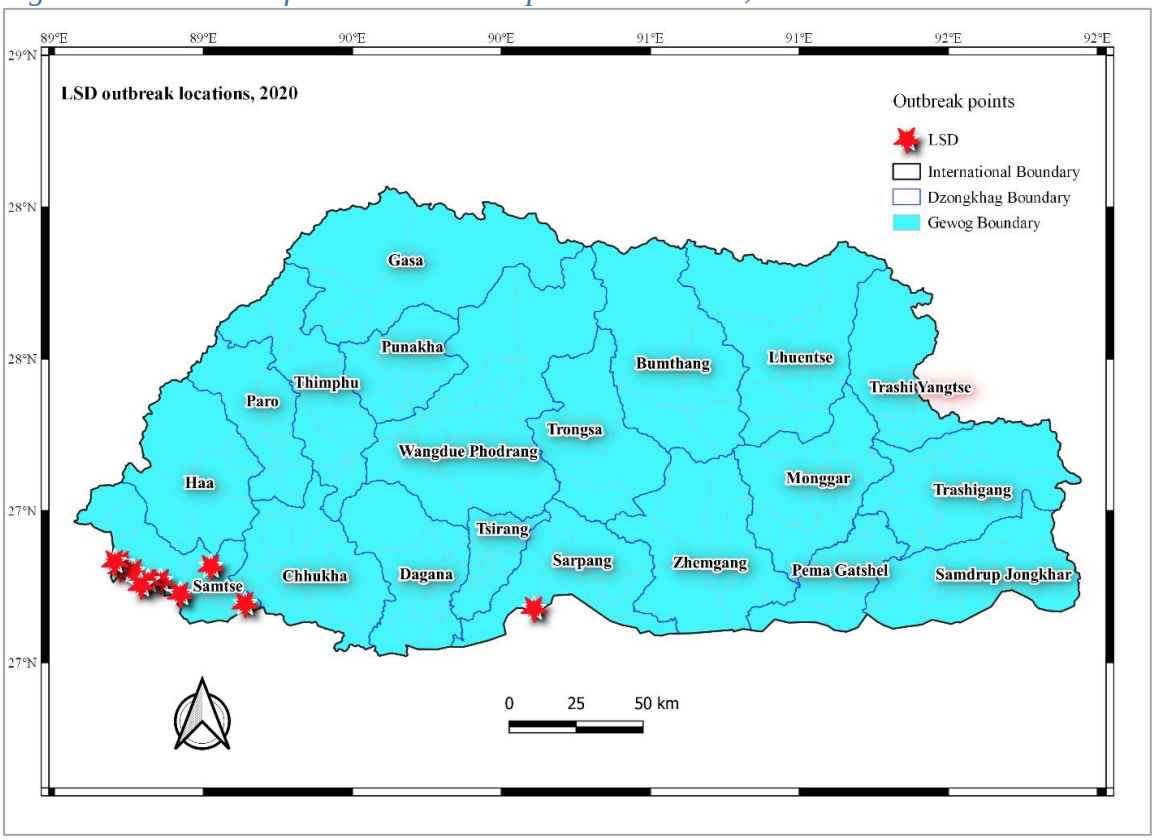
Figure 35: Global distribution of LSD outbreaks, 2020.



Source: WAHIS, January 2021

4.2.3. First outbreaks in Bhutan – 2020

Figure 36: Location of LSD outbreaks reported in Bhutan, 2020.



Samtse dzongkhag reported the first suspected outbreak of the lumpy skin disease (LSD) in Bhutan in September 2020 and the cases were confirmed as LSD on 5 October 2020 by the

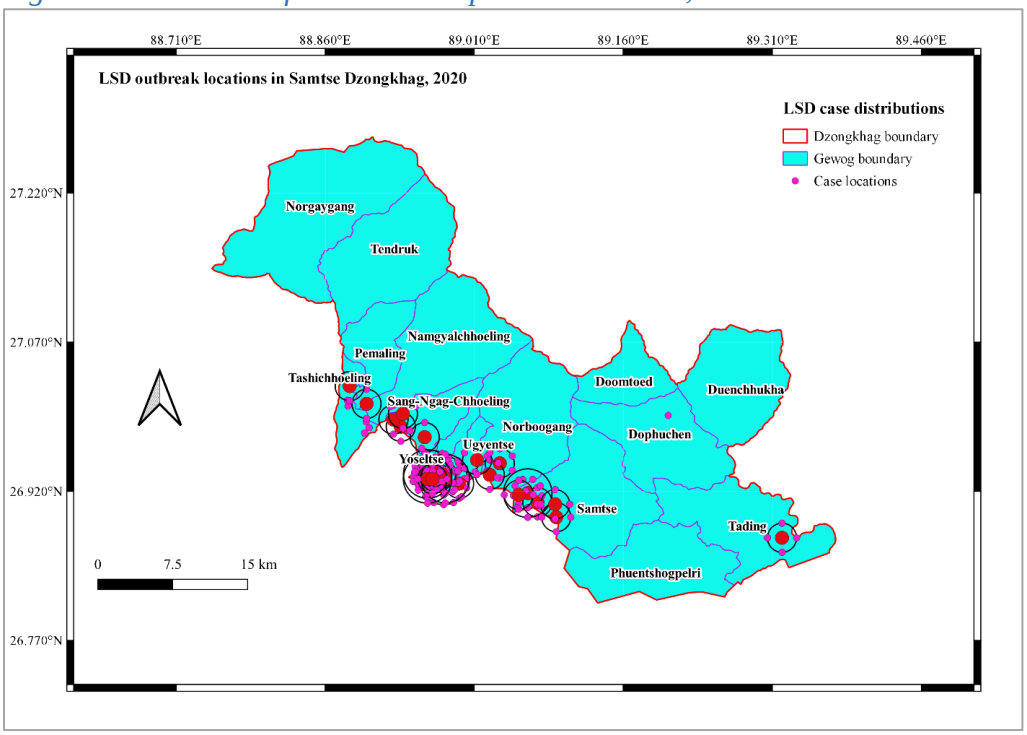
National Veterinary Laboratory (NVL) of National Centre for Animal Health (NCAH), Department of Livestock (DoL).

On 18 September 2020, another outbreak of LSD was reported from Shompangkha gewog of Sarpang dzongkhag. In these two districts, Samtse and Sarpang (see figure 36), a total of 11 outbreaks were reported affecting 160 cattle, and 3 died of the infection (apparent CFR = 1.87%) (see annexure 6).

4.2.4. LSD outbreak in Samtse – a brief description

Following confirmation of LSD in Samtse, under the guidance of the NCAH, Serbithang, a detailed outbreak investigation was conducted by the Regional Livestock Development Centre (RLDC), Tsimasham, led by the Thromde Veterinary Hospital and Satellite Laboratory (TVH&SL), Phuentshogling, and in collaboration with the Dzongkhag Livestock Sector (DLS), Samtse dzongkhag.

Figure 37: Location of LSD cases reported in Samtse, 2020.



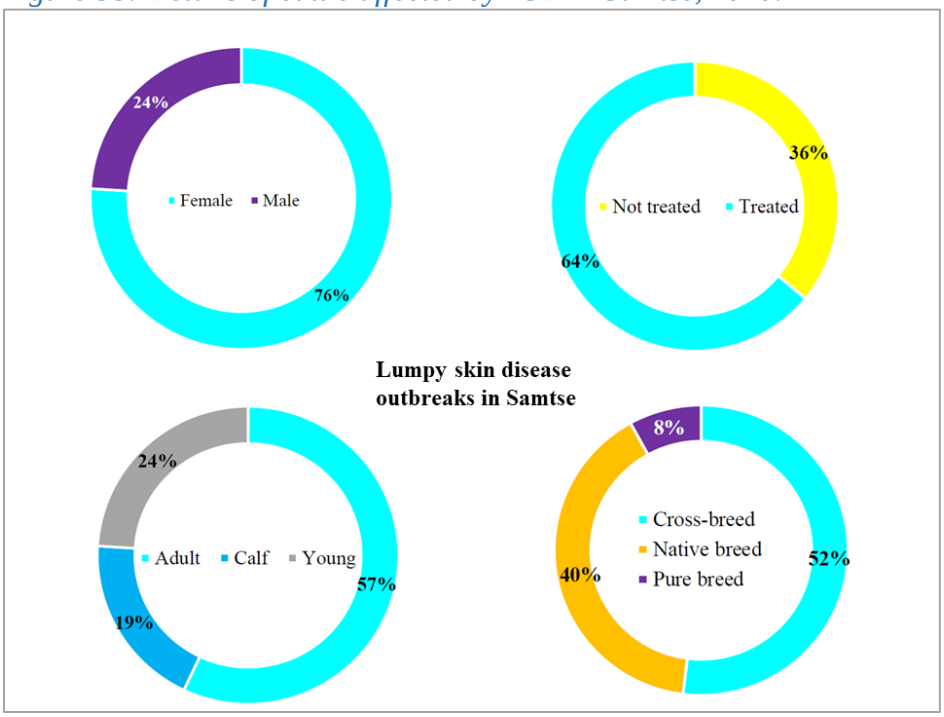
Data source: Disease outbreak investigation team

A brief descriptive analysis and the findings are presented in the following (Data source: Disease outbreak investigation team).

- A total of 152 cattle were affected in 44 villages of 10 gewogs (see figure 37), and 2 of the affected animals died due to the infection (apparent CFR = 1.31 %)
- Symptomatic and supportive treatments were provided to 97 cattle (64 %) (see figure 38)
- 57 percent of the affected cattle were adult (n=87), followed by 24 % young (n=36) and 19 % calf (n=29) (see figure 38)

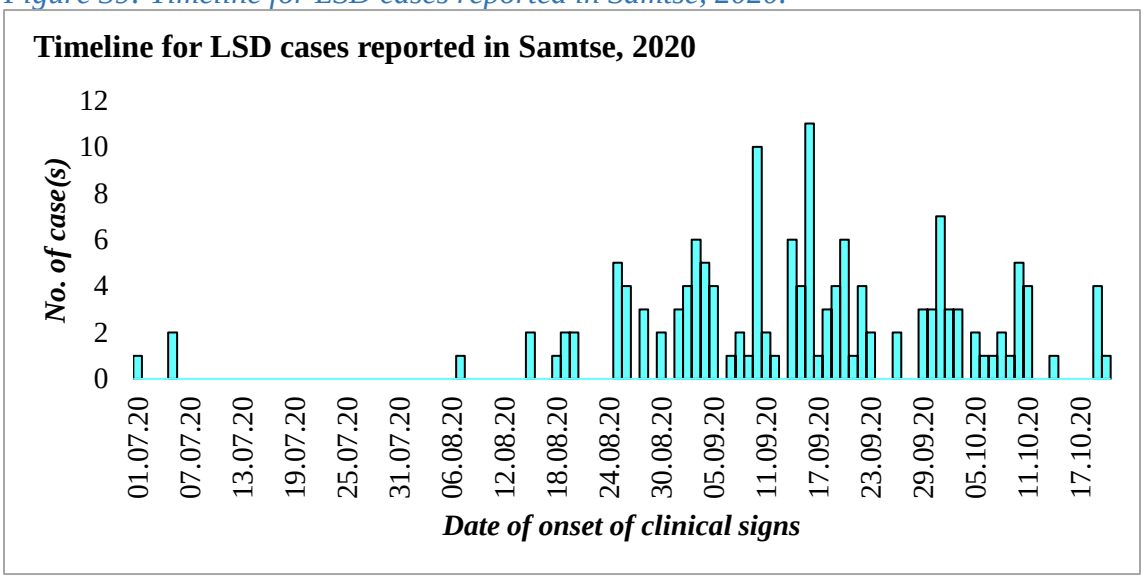
- 76 percent of the affected animals were female (n=115) (see figure 38)
- 52 percent of the cattle affected crossbreeds, followed by 40 % native breeds and 8 % pure breeds (see Figure 38)
- The index case date was found to be 1 July 2020 and the last case on 20 October 2020 (see figure 39).

Figure 38: Details of cattle affected by LSD in Samtse, 2020.



Data source: Disease outbreak investigation team

Figure 39: Timeline for LSD cases reported in Samtse, 2020.



Data source: Disease outbreak investigation team

5. CAPRINE AND OVINE DISEASE

5.1. Peste des petits ruminants (PPR)

5.1.1. The Disease

It is caused by Peste des petits ruminant virus (PPRV) classified in the family Paramyxoviridae, genus *Morbillivirus*. By means of nucleic acid sequencing, PPRV can be differentiated into four lineages (1–4). It is antigenically similar to rinderpest virus.

Goats (predominantly) and sheep are susceptible to the infection by PPRV. Cattle and pigs develop inapparent infections and do not transmit disease.

Spread of the disease occurs by following means:

- Mainly by aerosols or direct contact between animals living in close quarters.
- Fomites: bedding, feed and water troughs.
- Seasonal variations: more frequent outbreaks during the rainy season or the dry cold season

The incubation period is typically 4–6 days but may range from 3–10 days. For the purposes of the OIE Terrestrial Animal Health Code, the incubation period for the PPR is 21 days.

Acute form of the disease manifests through sudden rise in body temperature (40–41°C); serous nasal discharge becoming muco-purulent and resulting, at times, in a profuse catarrhal exudate which crusts over and occludes the nostrils; erosive lesions in the oral cavity with excessive salivation and necrotic stomatitis with halitosis; Congestion of conjunctiva, crusting on the medial canthus and sometimes profuse catarrhal conjunctivitis; Severe, watery, blood-stained diarrhoea in later stages; bronchopneumonia evidenced by coughing – rales and abdominal breathing; and sometimes abortion. Per-acute form is frequently observed in goats - especially situations of immuno-naïve introductions into instances of circulating PPRV – where it's manifested by high fever, depression and death. Sub-acute form is commonly seen in experimentally infected animals.

Following lesions are associated with PPR:

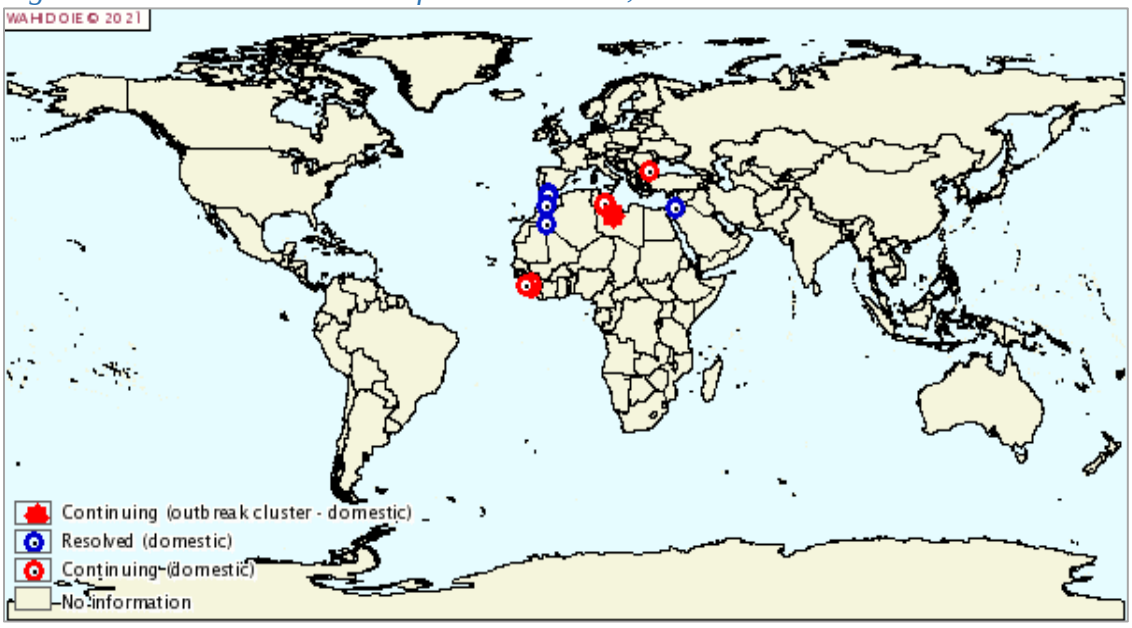
- Small streaks of haemorrhages and sometimes erosions: in the first portion of the duodenum and the terminal ileum.
- Necrotic or haemorrhagic enteritis with extensive necrosis and sometimes severe ulceration of Peyer's patches.
- Congestion around the ileo-caecal valve, at the caeco-colic junction and in the rectum; 'Zebra stripes' of congestion in the posterior part of the colon.
- Bronchopneumonia is a constant lesion.
- Congestion and enlargement of spleen and liver

5.1.2. Geographical distribution

PPR was first described in 1942 in Côte d'Ivoire, West Africa. Since then, the disease has spread to large regions in Africa, the Middle East, Asia and Europe. Today, more than 70 countries are affected or at high risk and many more are without an official PPR status. PPR infected and at-

risk countries are home to approximately 1.7 billion heads – around 80 percent – of the global population of sheep and goats.

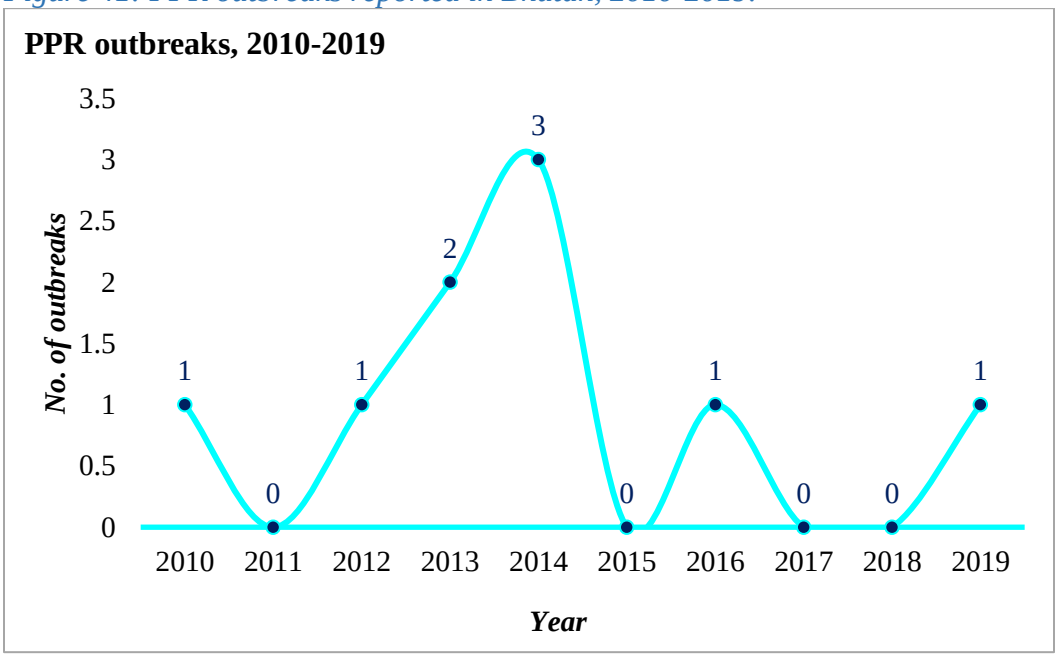
Figure 40: Global distribution of PPR outbreaks, 2020.



Source: WAHIS, January 2021

5.1.3. Past outbreaks in Bhutan

Figure 41: PPR outbreaks reported in Bhutan, 2010-2019.



Data source: The status of notifiable animal diseases in Bhutan, 2019

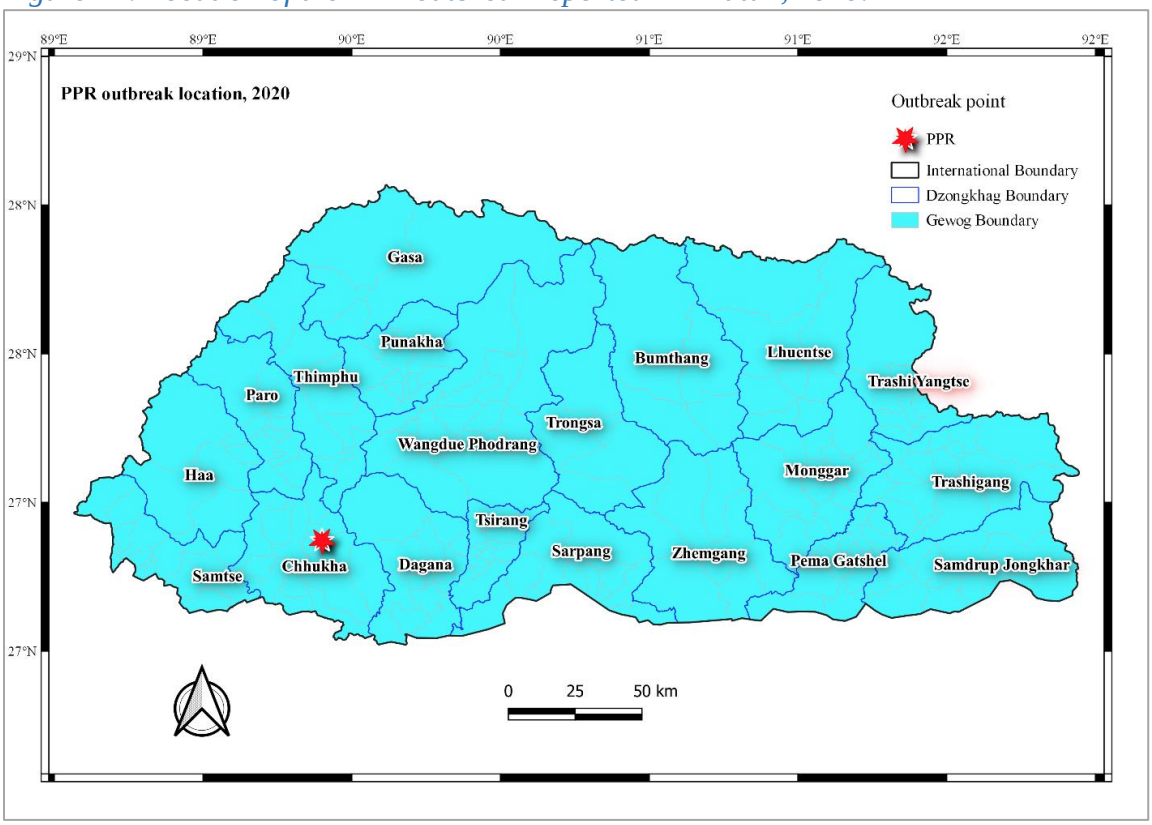
Peste des petits ruminants (PPR) was first reported in Bhutan in June 2010 from Chhukha dzongkhag, from an animal holding facility for goats kept for Tshethar (goats rescued from imminent slaughter from Bhutan-India border areas). Between 2010 and 2019, 9 separate outbreaks were reported in Bhutan; no outbreak was reported in 2011, 2015, 2017 and 2018 (see Figure 41).

The first PPR virus involved in 2010 outbreak was found to be lineage 4 which is antigenically related to PPRV characterized from Nepal and Tibet Autonomous Region of China. The outbreak in Dagana and Sarpang in 2014 and 2016, respectively, were observed soon after the legal import of animals from India by the department of livestock.

5.1.4. Status in Bhutan – 2020

In September 2020, an outbreak of PPR was reported from the Tshethar – goats rescued from imminent slaughter by religious people or group or organization – farm located at Wangchu area, Bjagchho gewog, Chhukha dzongkhag (see figure 42). Out of 57 goats present in the facility, 10 were observed to be affected (apparent morbidity = 18 percent), of which 6 died: apparent CFR and mortality are 60 and 11 percent respectively (see annexure 7).

Figure 42: Location of the PPR outbreak reported in Bhutan, 2020.



6. SWINE DISEASE

6.1. Classical swine fever (CSF)

6.1.1. The disease

Classical swine fever (CSF), also known as hog cholera, is a contagious viral disease of domestic and wild swine. It is caused by a virus of the genus *Pestivirus* of the family Flaviviridae, which is closely related to the viruses that cause bovine viral diarrhoea in cattle and border disease in sheep. There is only one serotype of CSF virus (CSFV).

The most common method of transmission is through direct contact between healthy swine and those infected with CSF virus. The virus is shed in saliva, nasal secretions, urine, and feces. Contact with contaminated vehicles, pens, feed, or clothing may spread the disease. Animals that are chronic carriers of the disease (persistently infected) may show no clinical signs of illness but may shed the virus in their feces. Offspring of infected sows can become infected in the uterus and can shed the virus for months.

Pigs and wild boar are the only natural reservoir of CSFV. All feral and wild pigs including European wild boar are susceptible. CSFV has been detected in a white-lipped peccary *(Tayassu pecari),* and experimental infections have been established in common warthogs *(Phacochoerus africanus),* bush pigs *(Potamochoerus larvatus)* and collared peccaries *(Tayassu tajacu).* There is no evidence that CSFV infects humans.

The disease has acute and chronic forms, and can range from severe, with high mortality, to mild or even unapparent. In the acute form of the disease, in all age groups, there is fever, huddling of sick animals, loss of appetite, dullness, weakness, conjunctivitis, constipation followed by diarrhoea, and an unsteady gait. Several days after the onset of clinical signs, the ears, abdomen and inner thighs may show a purple discoloration. Animals with acute disease die within 1-2 weeks. Severe cases of the disease appear very similar to African swine fever.

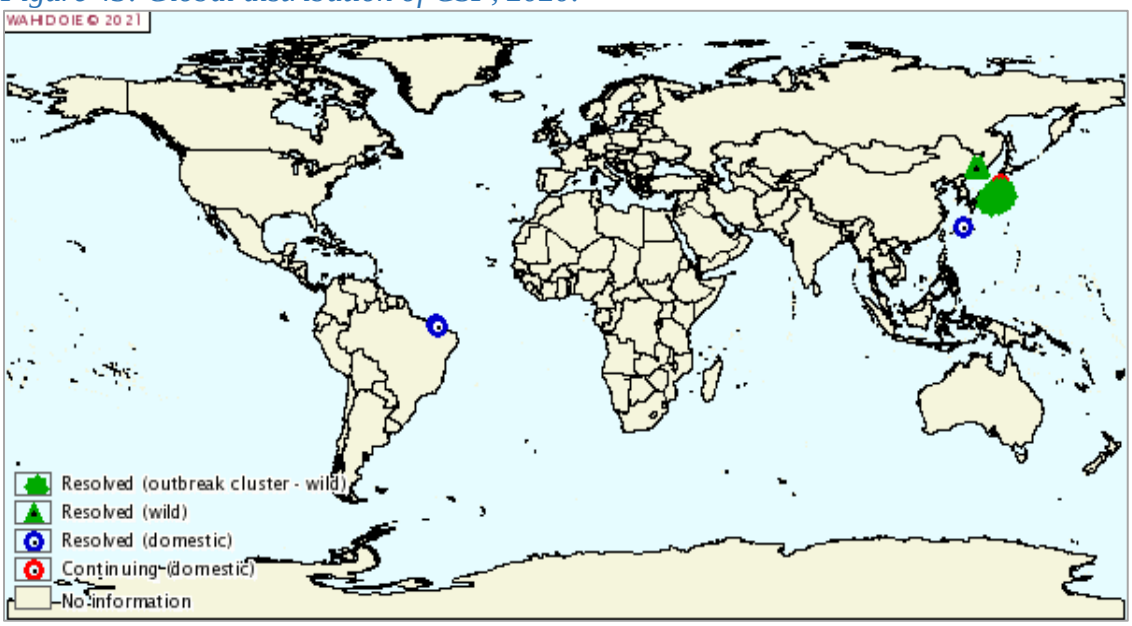
With low virulence strains, the only expression may be poor reproductive performance and the birth of piglets with neurologic defects such as congenital tremor.

Swine exposed postnatally have an incubation period of 2–14 days, and often 3–7 days in acute cases. Swine are usually infective between post-infection days 5 and 14, but up to 3 months in cases of chronic infections.

6.1.2. Geographical distribution

CSF is found in Central and South America, Europe, and Asia and parts of Africa. North America, Australia and New Zealand are currently free of the disease. In the 1990's large CSF outbreaks occurred in The Netherlands (1997), Germany (1993-2000), Belgium (1990, 1993, 1994) and Italy (1995, 1996, 1997).

Figure 43: Global distribution of CSF, 2020.

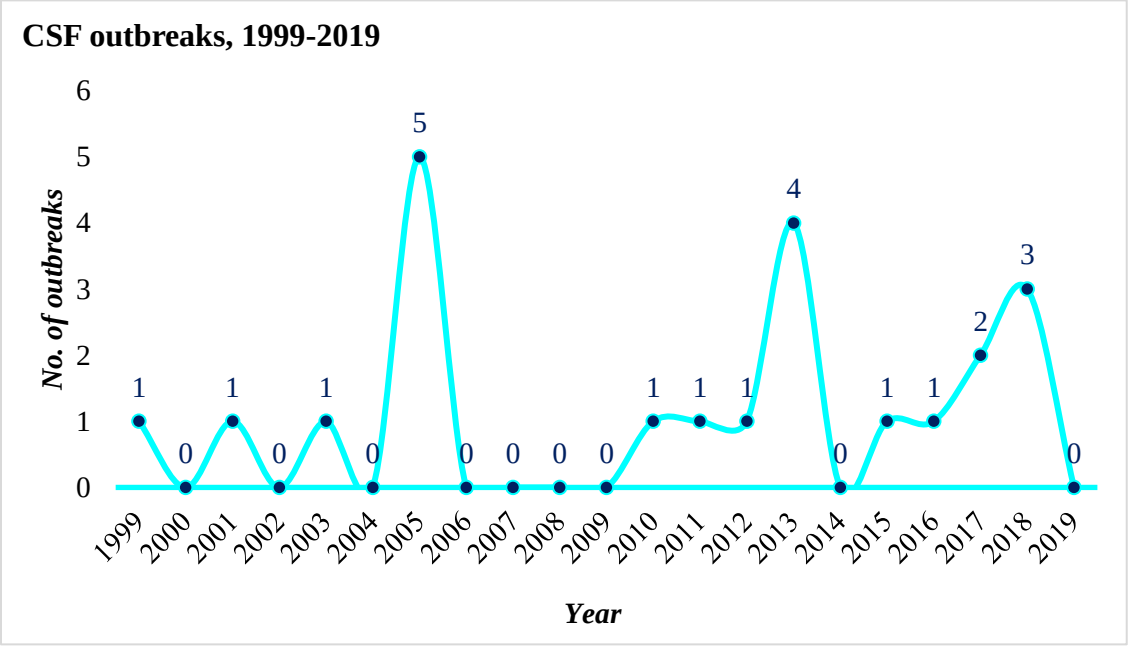


Source: WAHIS, January 2021

6.1.3. Past outbreaks in Bhutan

Outbreaks of classical swine fever (CSF) was recorded since 1999, and until 2018, a total of 22 outbreaks were reported (see figure 44).

Figure 44: CSF outbreaks reported in Bhutan, 1999-2019.



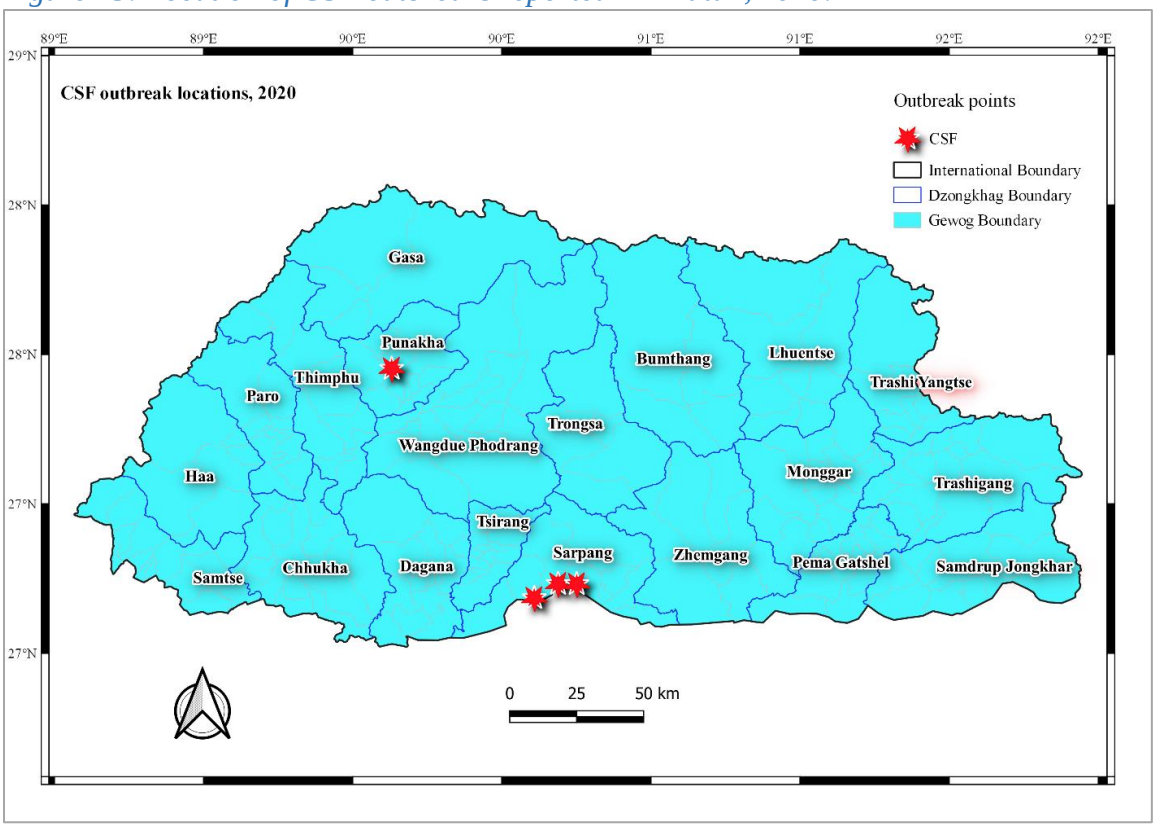
Data source: The status of notifiable animal diseases in Bhutan, 2018

CSF cases have been sporadically reported from backyard village pig farms. Vaccination against CSF is uncommon in rural backyard farms due to the challenges concerning handling of free-range pigs. However, pigs in the government farms and private breeding farms are vaccinated as scheduled, and piglet distribution to farmers is done only after the vaccination.

6.1.4. Status in Bhutan – 2020

During the calendar year 2020, 4 outbreaks of CSF were reported in the country (see figure 45), affecting 16 pigs (apparent mortality = 100%). An outbreak was reported each from Kabisa gewog of Punakha dzongkhag, and Dekiling, Shompangkha and Samtenling gewogs of Sarpang dzongkhag (see annexure 8).

Figure 45: Location of CSF outbreaks reported in Bhutan, 2020.



7. EQUINE DISEASE

7.1. Strangles

7.1.1. The disease

It is an infectious, contagious disease of Equidae characterized by abscessation of the lymphoid tissue of the upper respiratory tract.

The causative organism, *Streptococcus equi equi*, is highly host-adapted and produces clinical disease only in horses, donkeys, and mules. It is a gram-positive, capsulated β-hemolytic Lancefield group C coccus, which is an obligate parasite and a primary pathogen. *S equi equi* is highly contagious and produces high morbidity and low mortality in susceptible populations.

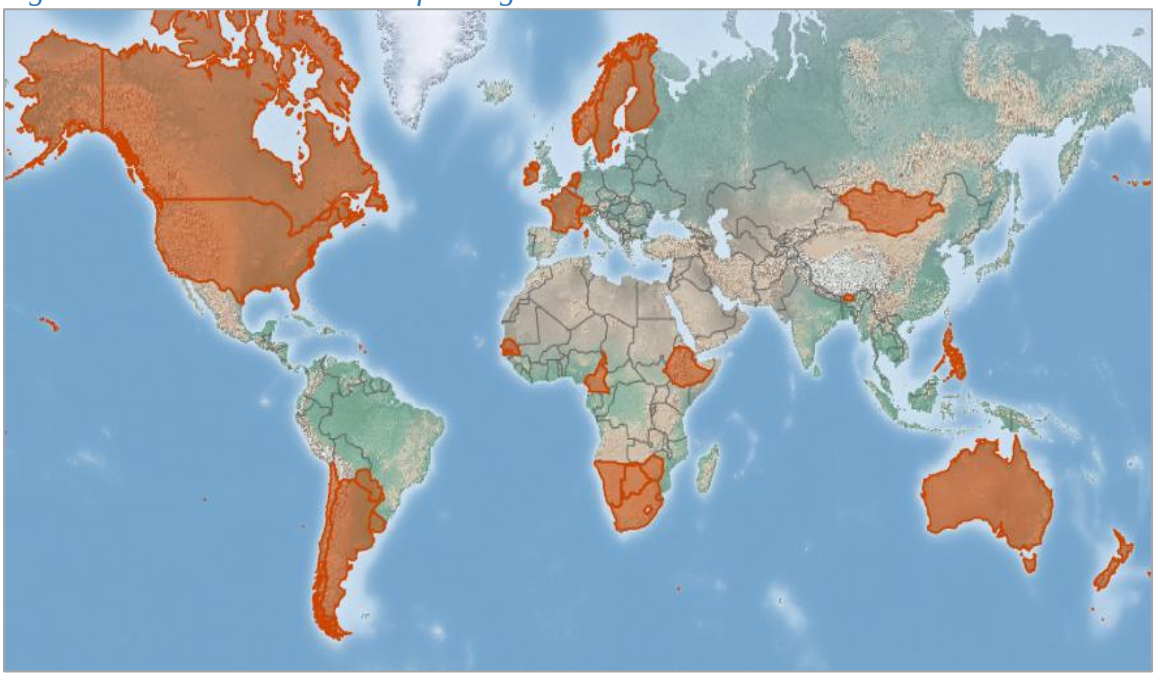
Transmission occurs via fomites and direct contact with infectious exudates. Carrier animals are important for maintenance of the bacteria between epizootics and initiation of outbreaks on premises previously free of disease. Survival of the organism in the environment depends on temperature and humidity; it is susceptible to desiccation, extreme heat, and exposure to sunlight and must be protected within mucoid secretions to survive. Under ideal environmental circumstances, the organism can survive ~4 week outside the host.

The incubation period of strangles is 3–14 days, and the first sign of infection is fever (103°–106°F [39.4°–41.1°C]). Within 24–48 hours of the initial fever spike, the horse will exhibit signs typical of strangles, including mucoid to mucopurulent nasal discharge, depression, and submandibular lymphadenopathy. Horses with retropharyngeal lymph node involvement have difficulty swallowing, inspiratory respiratory noise (compression of the dorsal pharyngeal wall), and extended head and neck. Older animals with residual immunity may develop an atypical or catarrhal form of the disease with mucoid nasal discharge, cough, and mild fever. Metastatic strangles ("bastard strangles") is characterized by abscessation in other lymph nodes of the body, particularly the lymph nodes in the abdomen and, less frequently, the thorax.

7.1.2. Geographical distribution

Strangles is the most frequently diagnosed infectious disease of horses worldwide. The following figure shows the global distribution of BQ outbreaks and cases compiled by the Centre for Agriculture and Bioscience International (CABI), updated on 10 January 2020.

Figure 46: Global distribution of strangles.



Source: CAB International

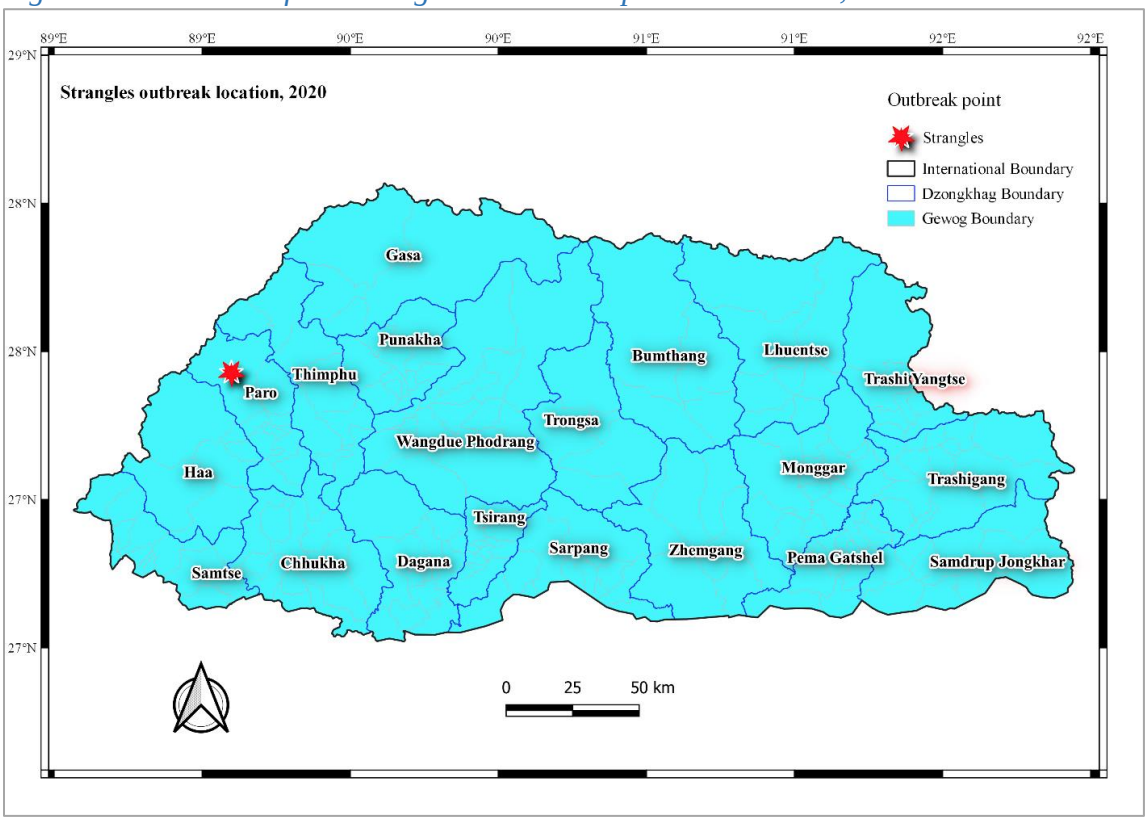
7.1.3. Past outbreaks in Bhutan

In October 2019, an outbreak of Strangles was reported from Barshong village of Naro gewog, Thimphu dzongkhag. During the outbreak, out of total susceptible population of 111 horses in the locality, 77 were affected (apparent morbidity = 69.4%) and 4 of them succumbed to the infection (apparent CFR = 5.2%). The outbreak was controlled successfully through the implementation of disease prevention and control measures such as isolation and prompt treatment (symptomatic) of affected horses, movement restriction, awareness, etc.

7.1.4. Status in Bhutan – 2020

The calendar year 2020 recorded one outbreak reported from Tsento gewog of Paro dzongkhag (see figure 47). Out of 393 susceptible horses, 232 were affected (apparent morbidity = 59%) and 2 died (apparent CFR = 0.86%, apparent mortality = 0.5%) (see annexure 9).

Figure 47: Location of the strangles outbreak reported in Bhutan, 2020.



8. AVIAN DISEASES

8.1. Infectious bursal disease (IBD)

8.1.1. The disease

Infectious bursal disease, also known as Gumboro, is an immuno-suppressive disease of domestic poultry caused by a *birnavirus*. There are three types of IBD: the highly virulent (vv IBD), the US IBD and the subclinical IBD.

The domestic fowl is the natural host; sub-clinical infection may occur in turkeys.

Chickens infected with the IBD virus shed the virus in their feces. Feed, water, and poultry house litter become contaminated. Other chickens in the house become infected by ingesting the virus. Because of the resistant nature of the IBD virus, it is easily transmitted mechanically among the farms by people, equipment and vehicles.

The incubation period is very short: two to three days. Mortality commences on the third day of infection, reaches a peak by day four, then drops rapidly, and the surviving chickens recover a state of apparent health after five to seven days.

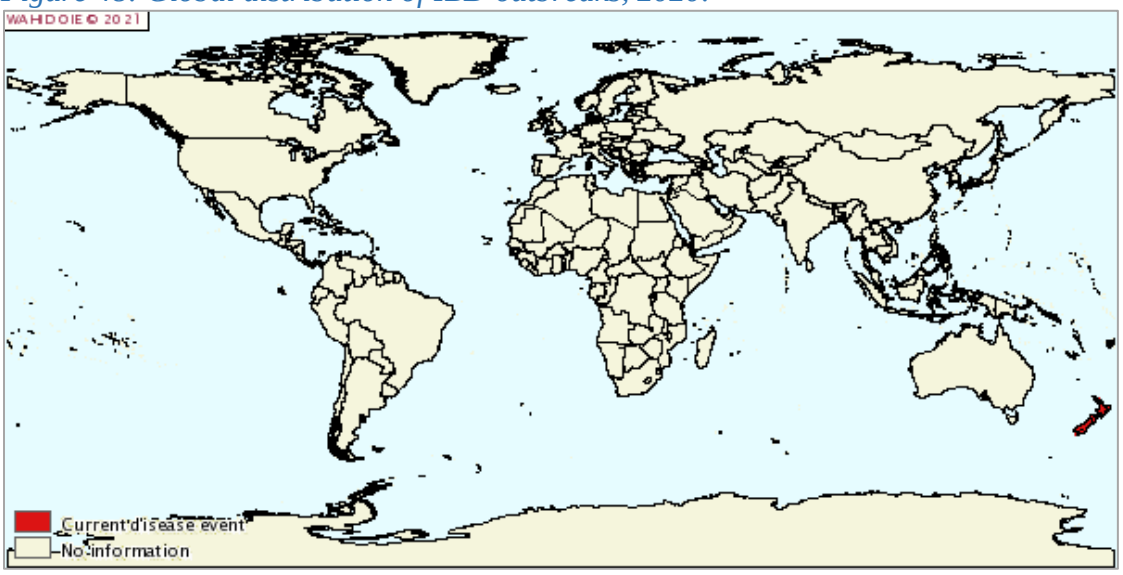
Disease is most common in 3 to 6 weeks old birds; however severe infection occurs in Leghorn up to 18 weeks. One of the earliest signs is for birds to pick at their own vent. Other signs include infection by opportunist germ which are not normally pathogenic; poor body weights and feed conversions; reluctance to move; depression; anorexia ruffled feathers; trembling; watery diarrhoea; and sudden death.

Post-mortem findings include enlarged cloacal bursa, swollen and haemorrhagic, and it is atrophied in recovered birds; skeletal muscles dark with haemorrhages (especially thigh and pectoral muscles); thymus opaque with thickened gelatinous capsule; liver may be swollen; kidneys swollen and fatty; and increased mucus in the intestines.

8.1.2. Geographical distribution

The first report of a specific disease affecting the bursa of Fabricius in chickens was made by Cosgrove in 1962. The first cases were observed in the area of Gumboro, in Delaware (United States of America), which is the origin of the name, although the terms 'IBD' or 'infectious bursitis' are more accurate descriptions.

Figure 48: Global distribution of IBD outbreaks, 2020.

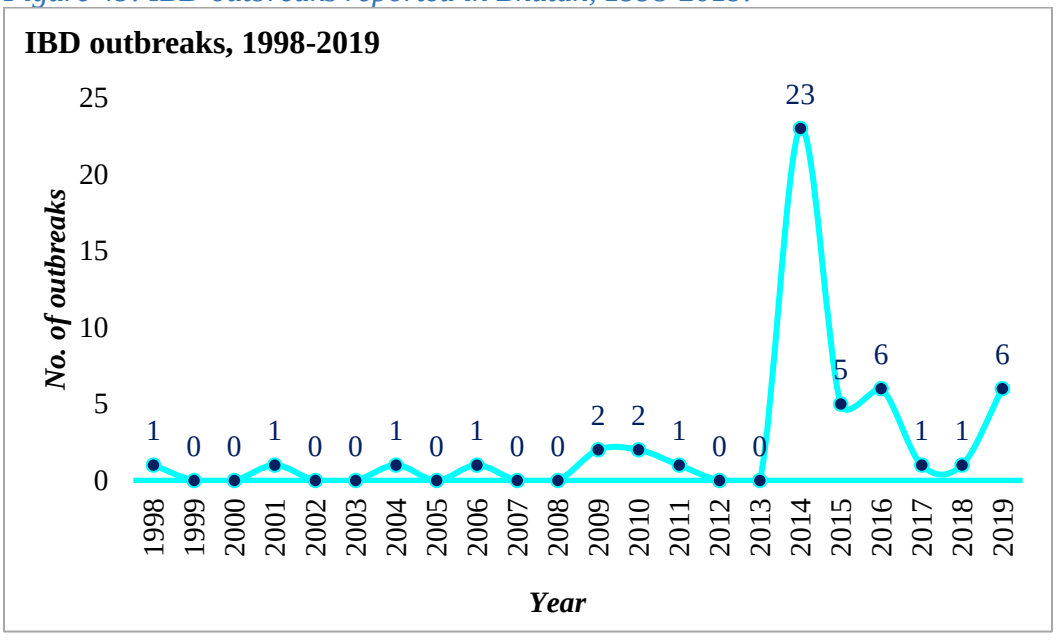


Source: WAHIS, January 2021

8.1.3. Past outbreaks in Bhutan

Between 1998 and 2019, a total of 51 outbreaks of infectious bursal disease (IBD) were reported in Bhutan, averaging 2 outbreaks per year. The highest number of IBD outbreaks was recorded in 2014 (n = 23) forming 45 percent of the total outbreaks recorded in 22 years (see figure 49).

Figure 49: IBD outbreaks reported in Bhutan, 1998-2019.

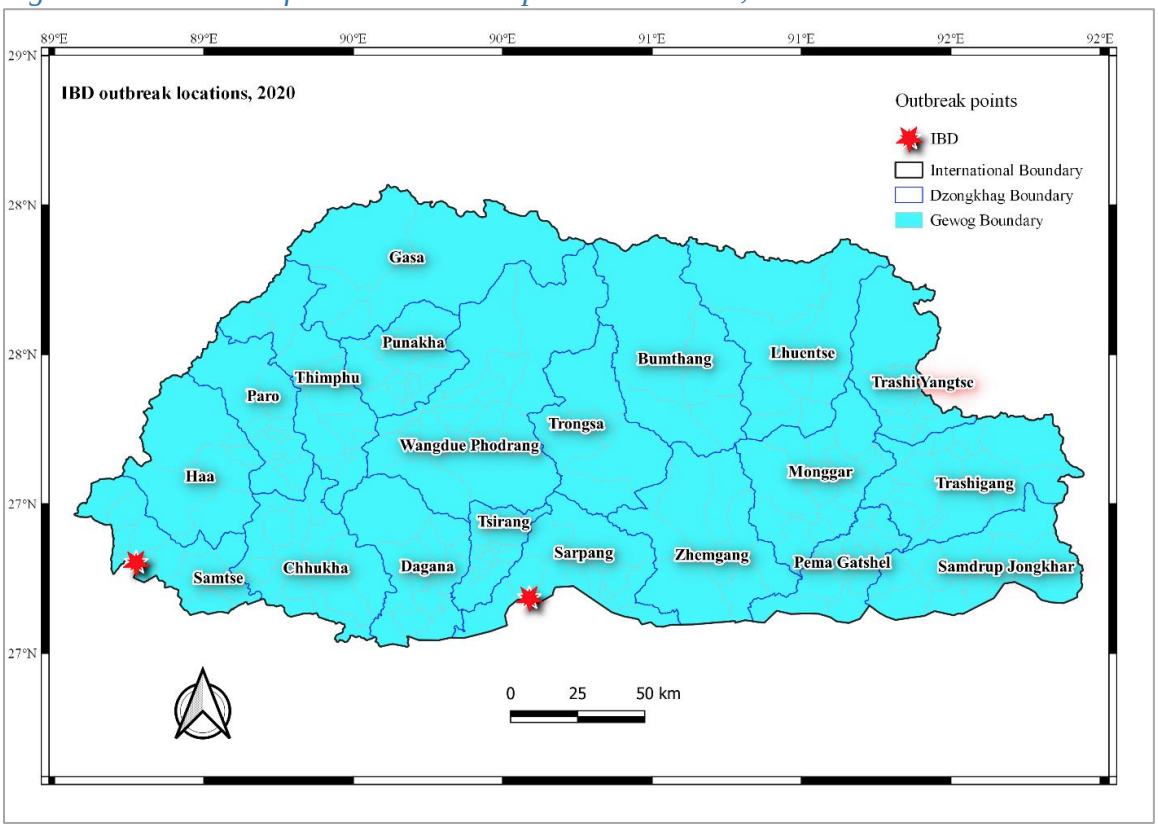


Data source: The status of notifiable animal diseases in Bhutan, 2019

8.1.4. Status in Bhutan – 2020

In 2020, a total of 2 outbreaks of infectious bursal disease (IBD) were reported, one each from Samtse and Sarpang dzongkhags (see figure 50). Out of 1244 domestic chickens affected, 211 died of the infection (apparent CFR = 17 %) (see annexure 10).

Figure 50: Location of IBD outbreaks reported in Bhutan, 2020.



8.2. Newcastle disease (ND)

8.2.1. The disease

The disease is caused by Newcastle disease virus (NDV), a member of the family Paramyxoviridae in the genus *Avulavirus*. There are ten serotypes of avian paramyxoviruses designated APMV-I to APMV-10 and ND virus has been designated APMV-1. NDV has also been categorised into five pathotypes based on clinical signs in infected chickens, designated: a) viscerotropic velogenic, b) neurotropic velogenic, c) mesogenic, d) lentogenic or respiratory and e) asymptomatic.

Many species of birds, both domestic and wild are affected. Chickens are highly susceptible to disease; turkeys do not tend to develop severe signs. Wild birds and waterfowl may harbor virus sub-clinically. Humans may become infected; manifested by unilateral or bilateral reddening, excessive lachrymation, oedema of the eyelids, conjunctivitis and sub-conjunctival haemorrhage.

Transmission of the infection occurs by following mechanisms:

- Direct contact with secretions of infected birds; principally via ingestion (faecal/oral route) and inhalation
- Fomites: feed, water, implements, premises, human clothing, boots, sacks, egg trays/crates, etc.
- Survival of agent is prolonged by presence of faeces, as in soiled eggshells
- Hatching chicks may be infected through egg for some NDV strains; transmission of highly virulent isolates is uncommon.

Incubation period is 2–15 days with an average of 5–6 days; some species may be over 20 days. For the purposes of the OIE Terrestrial Animal Health Code, the incubation period for ND is 21 days.

Lentogenic strains are usually associated with subclinical disease marked by mild respiratory disease; coughing, gasping, sneezing and rales. Mesogenic strains may cause acute respiratory disease and neurologic signs in some species.

Velogenic strains commonly cause severe disease in chickens with mortality; signs being respiratory and/or nervous. Initial clinical signs vary but include lethargy, inappetence, ruffled feathers, oedema and conjunctivitis. As the disease progresses birds may develop greenish or white watery diarrhoea, dyspnoea and inflammation of the head and neck often with cyanotic discoloration. In later stages of disease, neurologic signs may be manifested as: tremors, tonic/clonic spasms, wing/leg paresis or paralysis, torticollis, and aberrant circling behaviour. Sharp drop in egg production is also observed; eggs contain a watery albumin and appear misshapen with abnormally coloured, rough or thin shells. Birds that survive serious infection may develop neurologic and partial or complete cessation of egg production. Morbidity and mortality rates may approach 100% in unvaccinated chickens.

Velogenic strains produce significant gross lesions, some of which are enlisted below:

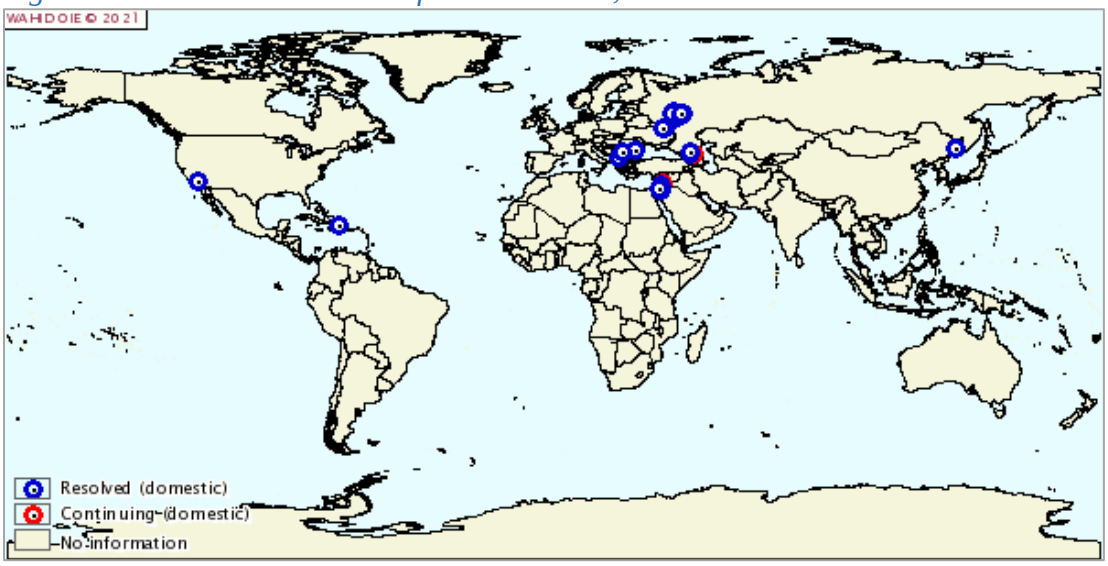
- Swelling of periorbital area or entire head
- Oedema of the interstitial or peritracheal tissue of the neck; especially at the thoracic inlet
- Congestion and sometimes haemorrhages in the caudal pharynx and tracheal mucosa; diphtheritic membranes may be evident in the oropharynx, trachea and oesophagus
- Petechiae and small ecchymoses on the mucosa of the proventriculus, concentrated around the orifices of the mucous glands
- Oedema, haemorrhages, necrosis or ulcerations of respiratory/digestive lymphoid tissue, including cecal tonsils and Peyer's patches

8.2.2. Geographical distribution

The disease was discovered in Indonesia in 1926, but is named after Newcastle-onTyne, England, where it occurred in 1927. It is also called ranikhet, pseudofowl pest, and avian pneumoencephalitis. Found throughout the world, the disease has been currently controlled in

Canada, the United States and some western European countries. It continues in parts of Africa, Asia and South America. However, since wild birds can sometimes carry the virus without becoming ill, outbreaks can occur anywhere that poultry is raised.

Figure 51: Global distribution of ND outbreaks, 2020.

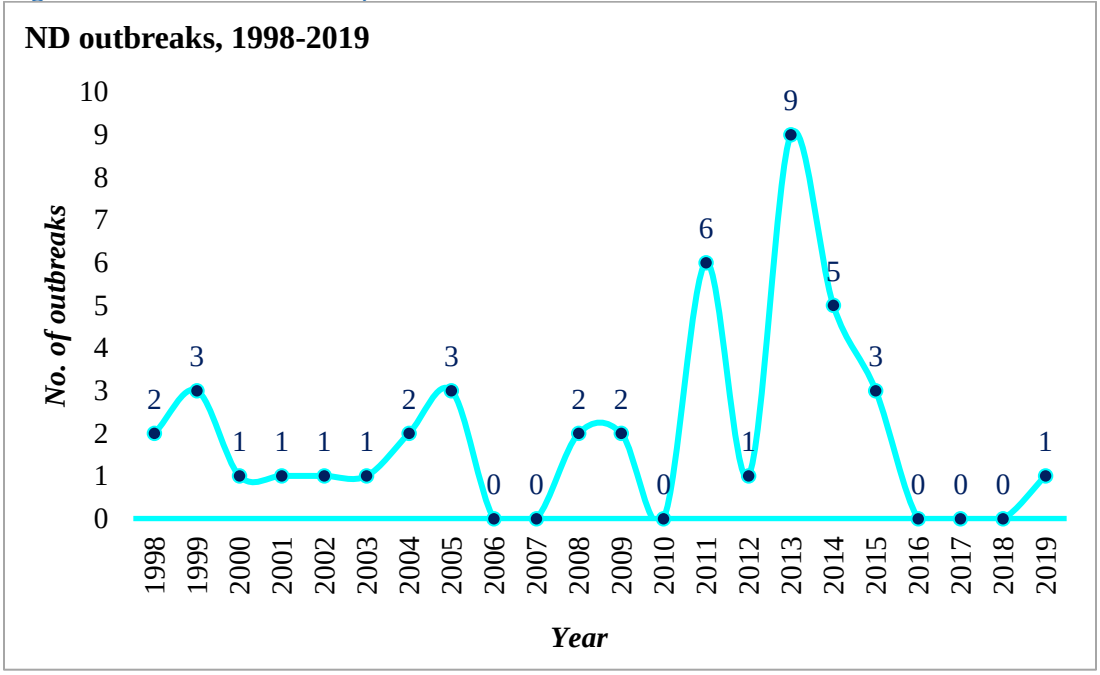


Source: WAHIS, January 2021

8.2.3. Past outbreaks in Bhutan

The Newcastle disease (ND) cases and outbreaks in Bhutan were recorded since 1998, following which sporadic outbreaks were reported from across the country.

Figure 52: ND outbreaks reported in Bhutan, 1998-2019.



Data source: The status of notifiable animal diseases in Bhutan, 2019

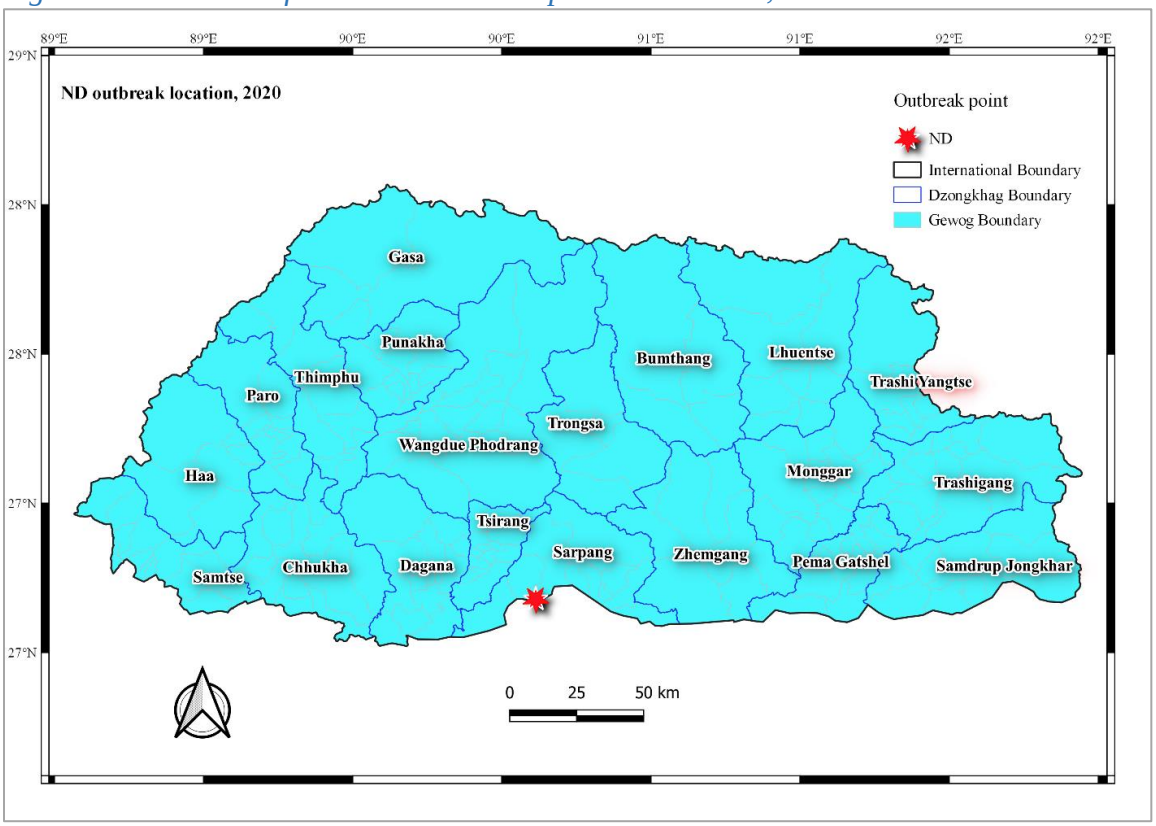
With the growth in poultry production sector, import of exotic poultry breeds and the trend of breeding within the country increased, therefore, avian disease incidences had also increased. There was an increase in ND outbreak incidences between 2011 and 2014, and then progressively declined. Scheduled vaccination against ND has been carried out in the farms across the country, irrespective of the size and scale of production.

Between 1998 and 2019, a total of 43 outbreaks of ND were reported, averaging 2 outbreaks annually (see figure 52).

8.2.4. Status in Bhutan – 2020

In 2020, an outbreak of ND was reported from Shompangkha gewog of Sarpang dzongkhag (see figure 53) affecting 52 domestic chickens, of which 29 died (apparent CFR = 56%) (see annexure 11).

Figure 53: Location of the ND outbreak reported in Bhutan, 2020.



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ANNEXURE

Annexure 1: Anthrax outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	13/01/2020	Changchangma	Silambi	Monggar	Cattle	4	4	1
2	13/01/2020	Changchangma	Silambi	Monggar	Cattle	6	6	0
3	29/01/2020	Yari	Silambi	Monggar	Cattle	5	5	0
4	29/01/2020	Sherpong	Silambi	Monggar	Cattle	5	5	0
5	14/06/2020	Chakramari	Nichula	Dagana	Cattle	2	2	1
6	19/07/2020	Tshaphel School	Uesu	Haa	Pig	1	1	1

Annexure 2: Black quarter outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	11/01/2020	Tsakaling	Yoseltse	Samtse	Cattle	1	1	1
2	11/01/2020	Dungkar	Yoseltse	Samtse	Cattle	1	1	0
3	04/02/2020	Dungbi	Trong	Zhemgang	Cattle	1	1	1
4	01/04/2020	Shobling	Nangkor	Zhemgang	Cattle	1	1	1
5	03/07/2020	Damthang	Bji	Haa	Cattle	2	2	1
6	25/09/2020	Jalang	Minjey	Lhuentse	Cattle	3	3	1
7	26/09/2020	Thamba	Gangzur	Lhuentse	Cattle	7	5	1
8	01/10/2020	Kalizingkha	Tseza	Dagana	Cattle	1	1	1
9	11/11/2020	Bajo	Thedtsho	Wangdue Phodrang	Cattle	4	3	1

Annexure 3: Foot and mouth disease outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	03/02/2020	Depay	Phongmed	Trashigang	Cattle	2	0	1
2	27/02/2020	Rezhi	Lamgong	Paro	Cattle	8	0	1
3	29/02/2020	Rezhi	Lamgong	Paro	Cattle	3	0	0
4	20/04/2020	Tintaley	Lhamoi Dzingkha	Dagana	Cattle	9	0	1
5	20/04/2020	Devitar	Lhamoi Dzingkha	Dagana	Cattle	7	0	0

Annexure 4: Rabies outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	01/01/2020	Domphu	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
2	01/01/2020	Borbila	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
3	01/01/2020	Rekhey	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
4	05/01/2020	Gomtu	Phuentshogpelri	Samtse	Cattle	1	1	1

5	07/01/2020	Borbila	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
6	09/01/2020	Sarpangtar	Shompangkha	Sarpang	Dog	1	1	1
7	11/01/2020	Rekhey	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
8	11/01/2020	Town	Dewathang	Samdrup Jongkhar	Dog	1	1	0
9	12/01/2020	Domphu	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
10	12/01/2020	Army camp	Dewathang	Samdrup Jongkhar	Dog	1	1	0
11	15/01/2020	Town	Dewathang	Samdrup Jongkhar	Dog	1	1	0
12	16/01/2020	Reshore	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
13	16/01/2020	Reshore	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
14	16/01/2020	Reshore	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
15	21/01/2020	Bangtsho	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
16	21/01/2020	Army camp	Dewathang	Samdrup Jongkhar	Dog	1	1	0
17	28/01/2020	Rekhey	Dewathang	Samdrup Jongkhar	Dog	1	1	0
18	02/02/2020	Town	Dewathang	Samdrup Jongkhar	Dog	1	1	0
19	07/02/2020	Kanglung college	Kanglung	Trashigang	Cattle	5	5	1
20	09/02/2020	Lhendupling	Ugyentse	Samtse	Dog	1	1	1
21	16/02/2020	Pemathang	Gosarling	Tsirang	Dog	1	1	1
22	16/02/2020	Reshore	Dewathang	Samdrup Jongkhar	Cattle	1	1	0
23	18/02/2020	Army camp	Dewathang	Samdrup Jongkhar	Dog	1	1	0
24	03/03/2020	Pasakha	Phuentshogling	Chhukha	Dog	1	1	1
25	16/03/2020	Pemathang	Gosarling	Tsirang	Cattle	1	1	0
26	21/04/2020	Rahaldara	Phuentshogling	Chhukha	Dog	1	1	1
27	21/04/2020	Darjaygang	Phuentshogling	Chhukha	Cattle	1	1	0
28	21/04/2020	Khesangteri	Dewathang	Samdrup Jongkhar	Cattle	1	1	1
29	21/04/2020	Sadumadu	Phuentshogling	Chhukha	Dog	1	1	0
30	04/05/2020	Rinchending	Phuentshogling	Chhukha	Dog	1	1	0
31	08/05/2020	Pelrithang	Gosarling	Tsirang	Dog	1	1	1
32	14/04/2020	Dholay	Phuentshogpelri	Samtse	Dog	1	1	1
33	06/06/2020	Kanglung	Kanglung	Trashigang	Dog	1	1	1
34	16/06/2020	Dewathang town	Dewathang	Samdrup Jongkhar	Dog	1	1	1
35	05/08/2020	Bainangkhar	Tongmajangsa	Trashi Yangtse	Cattle	1	1	1
36	15/09/2020	NHDCL colony	Dewathang	Samdrup Jongkhar	Cat	1	1	1

37	01/10/2020	Balaytar	Lhamoi Dzingkha	Dagana	Cattle	1	1	1
38	12/10/2020	Baghigaon	Lhamoi Dzingkha	Dagana	Dog	1	1	1
39	01/09/2020	Rinchenphu A	Yoseltse	Samtse	Dog	1	1	1
40	11/09/2020	Lamjumsa	Norboogang	Samtse	Dog	1	1	1
41	01/10/2020	Rinchenphu A	Yoseltse	Samtse	Cattle	1	1	0
42	05/10/2020	Rinchenphu A	Yoseltse	Samtse	Dog	1	1	0
43	25/10/2020	Lamjumsa	Norboogang	Samtse	Cattle	1	1	1
44	21/12/2020	Toribari	Phuentshogling	Chhukha	Cattle	1	1	1

Annexure 5: Hemorrhagic septicaemia outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	30/04/2020	Tamakhora	Chhoekhor	Bumthang	Yak	4	4	1
2	27/09/2020	Dhur Tshachhu	Chhoekhor	Bumthang	Yak	10	10	1
3	14/10/2020	Kharsa	Chhoekhor	Bumthang	Yak	14	14	1

Annexure 6: Lumpy skin disease outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	01/07/2020	Dorokha B	Dophuchen	Samtse	Cattle	1	0	1
2	11/10/2020	Pakhagoan	Namgaycholling	Samtse	Cattle	1	0	1
3	19/08/2020	Multiple	Norboogang	Samtse	Cattle	10	0	1
4	10/09/2020	Manidara	Pemaling	Samtse	Cattle	2	0	1
5	04/08/2020	Multiple	Samtse	Samtse	Cattle	7	1	1
6	25/08/2020	Multiple	Samtse	Samtse	Cattle	23	1	0
7	05/07/2020	Multiple	Sang-Ngag-Chhoeling	Samtse	Cattle	11	0	1
8	18/09/2020	Dargaythang	Shompangkha	Sarpang	Cattle	1	0	1
9	18/09/2020	Multiple	Tading	Samtse	Cattle	4	0	1
10	18/08/2020	Multiple	Tashichhoeling	Samtse	Cattle	8	0	1
11	19/08/2020	Multiple	Ugyentse	Samtse	Cattle	8	0	1
12	15/08/2020	Multiple	Yoseltse	Samtse	Cattle	84	1	1

Annexure 7: Peste des petits ruminants outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	12/09/2020	Wangchhu	Bjagchho	Chhukha	Goat	10	6	1

Annexure 8: Classical swine fever outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	23/01/2020	Sirigang	Kabisa	Punakha	Pig	8	8	1
2	09/05/2020	Maenchuthang	Dekiling	Sarpang	Pig	1	1	1
3	18/05/2020	Gadenchoeling	Shompangkha	Sarpang	Pig	6	6	1
4	15/05/2020	Samtenling	Samtenling	Sarpang	Pig	1	1	1

Annexure 9: Strangles outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	17/01/2020	Shana	Tsento	Paro	Horse	28	0	1
2	17/01/2020	Shari	Tsento	Paro	Horse	121	0	0
3	24/01/2020	Balakha	Tsento	Paro	Horse	28	1	0
4	24/01/2020	Jetsuphu	Tsento	Paro	Horse	3	0	0
5	25/01/2020	Gunitsawa	Tsento	Paro	Horse	11	0	0
6	25/01/2020	Santsham	Tsento	Paro	Horse	1	0	0
7	26/02/2020	Shari	Tsento	Paro	Horse	40	1	0

Annexure 10: Infectious bursal disease outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	11/02/2020	Sadhuzhima	Sang-Ngag-Chhoeling	Samtse	Chicken	22	21	1
2	04/07/2020	Dargaythang	Shompangkha	Sarpang	Chicken	1222	190	1

Annexure 11: Newcastle disease outbreaks reported in Bhutan, 2020.

S.N.	Index case	Village	Gewog	Dzongkhag	Species	Case	Death	Outbreak
1	27/01/2020	Gomchula B	Shompangkha	Sarpang	Chicken	52	29	1

Annexure 12: Laboratory diagnostic capacity at NCAH, as of January 2021

Sl. No.	Disease	Bhutan*	OIE**
A	**Bacterial Diseases**		
1	Anthrax	Agent identification, PCR	-
2	Antimicrobial resistance	Disk diffusion	Disk diffusion, MIC (Agar dilution and broth micro dilution)
3	Avian mycoplasmosis	ELISA, SAT	SAT, HAI
4	Bovine brucellosis	RBT, MRT, ELISA, Conventional PCR	RBT, CF, ELISA, FPA
5	Bovine tuberculosis	IDT	IDT, IFN gamma
6	Colibacillosis	Agent identification	-

Sl. No.	Disease	Bhutan*	OIE**
7	Contagious Caprine Pleuropneumonia (CCPP)	Multiplex real time PCR	PCR
8	*Erysipelas*	Agent identification, PCR	
9	Haemorrhagic septicaemia (HS)	Agent identification, Conventional PCR, Multiplex real time PCR	Agent identification
10	Leptospirosis	MAT	MAT
11	Mastitis	CMT, WST, agent identification	Cell count
12	*Mycoplasma hyopneumoniae*	ELISA	ELISA
13	Paratuberculosis (JD)	ELISA	ELISA, DHT
14	Salmonellosis	Agent identification	-
15	Staphylococcal infection	Agent identification	-
16	Strangles	Agent identification	
17	Streptococcal infection	Agent identification	
B	**Fungal Diseases**		
1	Fungal infections	Agent identification	-
C	**Viral Diseases**		
1	African swine fever (ASF)	Real time PCR	Real time PCR
2	Avian Influenza (Type A, H5N1, H7N9), H5N8	Real time RT-PCR, HAI, Rapid test	VI, AGID, HAI
3	Bovine viral diarrhoea (BVD)	ELISA	Agent identification
4	Canine distemper (CD)	Rapid test, ELISA	-
5	Canine parvovirus (CPV)	Rapid test	-
6	*Capripox*	Multiplex real time PCR	PCR
7	Classical swine fever (CSF)	Real time RT-PCR, ELISA	ELISA, FAVN, NPLA
8	Contagious bovine pleuropneumonae (CBPP)	ELISA	ELISA, CF
9	Crimean Congo haemorrhagic fever (CCHF)	ELISA, IF test	-
10	Equine Influenza (EI)	Rapid test, ELISA	AGID, ELISA
11	Foot and mouth disease (FMD)	ELISA, real time RT-PCR, Rapid test	ELISA, VN, CF
12	Infectious bovine rhinotracheitis (IBR)	ELISA	Agent identification, ELISA, PCR, VN
13	Infectious bursal disease (IBD)	ELISA, Rapid test, Histopathology	ELISA, AGID
14	Lumpy skin disease (LSD)	Real time PCR	
15	Newcastle disease (NCD)	Rapid test, Real time RT-PCR	VI, HAI
16	Peste des petits ruminants (PPR)	Rapid test, ELISA, Multiplex real time PCR	VN, ELISA
17	Pigeon paramyxovirus (PPMV)	Real time RT PCR	-
18	Porcine circovirus	ELISA	……..
19	Porcine reproductive and respiratory syndrome (PRRS)	Real time RT-PCR	ELISA, IFA, IPMA

Sl. No.	Disease	Bhutan*	OIE**
20	Rabies	Rapid test, FAT, RIAD, VNT	ELISA, VN
D	**Parasitic Diseases**		
1	Bovine anaplasmosis	Agent identification	CAT, CF
2	Bovine babesiosis	Agent identification	CF, ELISA, IFA
3	Bovine cysticercosis	Agent identification	Agent identification
4	Equine piroplasmosis	Agent identification	ELISA, IFA, CF
5	Fascioliasis	Agent identification, ELISA	Agent identification
6	Histomoniasis	Agent identification	
7	Taeniasis	Agent identification, PCR	
8	Theileriosis	Agent identification	Agent identification, IFA
9	Toxoplasmosis	ELISA	Agent identification
10	Trichinellosis	Agent identification	Agent identification, ELISA
11	Trypanosomiasis	Agent identification	IFA
E	**Mycotoxin Screening**		
1	Aflatoxin	ELISA, Rapid test	-
2	Fumonisin	ELISA, Rapid test	-
3	Ochratoxin	ELISA, Rapid test	-
F	**Mineral estimation**		
1	P, Ca and Mg	Spectrophotometry, ELISA	-
*Test of practical value, **OIE prescribed test			

Annexure 13: Livestock vaccines distributed in Bhutan, fiscal year 2019-2020

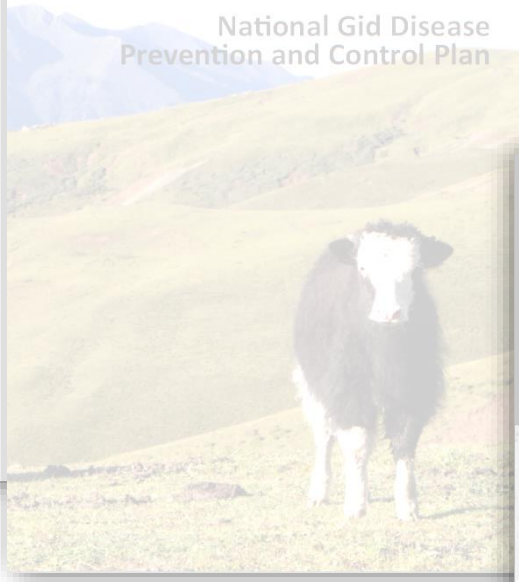
S. N.	Dzongkhags/ Central Units	Locally produced		Imported									
		Anthrax	CSF	FMD Oil	HS-BQ	IBD	Fowl Pox	NDB_1	$ND R_2B$	MD	Rabisin	DH PPi + L	PPR
	Dzongkhags												
1	Bumthang			5500	2500						800		
2	Chhukha		350	9000	600	170200	14000	89900	10000		2250		1500
3	Dagana		950	14800	5800	44800	2000	41800	3000		1650		
4	Gasa										300		
5	Haa			4000	1390	3000		2000					
6	Lhuentse			5000	6500	9000		9000	9000	8000	600		
7	Monggar			5000	6000	54000	24000	53000	18000		1000		
8	Paro		80	15350	900	94600	29000	52400	45000		1000		
9	Pemagatshel			3000		20000		10600	11000		1500		
10	Punakha			19000	4000	21000	5000	14000	14000		1400		400
11	Samdrup Jongkhar			5000		20000		20000	10000	20000	1800		300
12	Samtse		300	23000	8000	305000		200000	100000	30000	1400		700
13	Sarpang		1070	25000	8750	670000	210000	282000	250000		3500		

S. N.	Dzongkhags/ Central Units	Locally produced		Imported									
		Anthrax	CSF	FMD Oil	HS-BQ	IBD	Fowl Pox	NDB_1	ND R_2B	MD	Rabisin	DHPPi + L	PPR
14	Thimphu			5200	510	70600	26000	29800	24500		1700		
15	Trashigang			5000	1500	15000		10000	10000		1100		
16	Trashiyangtse			5000		20000		7000	7000		550		
17	Trongsa			700	1500	3000	4000	3000	3800		300		
18	Tsirang		850	11000	2200	300000	80000	195000	110000		2700	25	
19	Wangdue Phodrang		260	10500	2300	72600		28600	24000		1200	2	150
20	Zhemgang			1000	7000	20000	7000	5600	9500		200		
	Central Units												
21	NDRDC, Yusipang			100									
22	BSF, Bumthang												
23	NJBC, Samtse												
24	NNBF, Trashiyangphu												
25	NPRDC, Sarpang					57400	24000	23000	18800	194000			
26	NPBC, Yusipang		2410	1300									
27	NSBC, Bumthang			300									
28	NPiRDC, Gelephu		2350	1300									
29	CRC, Wangkha			200	400								
30	RPPBC, Lingmethang		1450	1000		9600	6000	3400	3500	90000			
31	RMBF, Arong												
32	RMBF, Wangdigang			200	200								
33	RPBC, Paro									200000			
34	NVH, Motithang					200				500	3300		
35	Private Poultry Farm					11400		9600	3600	55000			
36	Com Layer Farm, Sarpang			200	200	90000	40000	30000	50000	20000			
37	BLDC, Samrang			200		20000		18000	10000				100
38	Sertsham Farm, Lhuentse			650	200	1800	1000	1400	1800	1500			
39	RLDC Wangdue										400		
40	RLDC Tsimasham										6000	12	
41	RLDC Zhemgang												
42	RLDC Kanglung	150						20000			8900		
43	NDPM&RCP										3450		
44	CNR, Lobesa							600					
45	Local Use / Campaign											6	
46	NHDRC, Jakar											16	

S. N.	Dzongkhags/ Central Units	Locally produced		Imported									
		Anthrax	CSF	FMD Oil	HS-BQ	IBD	Fowl Pox	NDB_1	ND R_2B	MD	Rabisin	DHPPi + L	PPR
	Total doses distributed	150	10070	177500	60450	2103200	472000	1159100	746500	619000	47000	61	3150

Guidelines for Preparedness, Surveillance and Control of Anthrax in Human and Animals in Bhutan

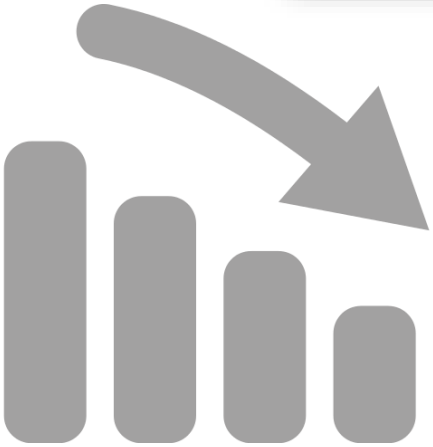
National Gid Disease Prevention and Control Plan



National Centre for Animal Health
Department of Livestock
Ministry of Agriculture & Forests
Royal Government of Bhutan

National Rabies Prevention and Control Plan

SECOND EDITION



NATIONAL INFLUENZA PANDEMIC PREPAREDNESS PLAN
&
STANDARD OPERATING PROCEDURES

NIPPP & SOPs
2020

DEPARTMENT OF LIVESTOCK
Ministry of Agriculture & Forests
Royal Government of Bhutan

National
Peste des Petits Ruminants (PPR)
Prevention, Control, and Eradication Plan
2020

NPPR-PCEP
2020

NATIONAL FOOT AND MOUTH DISEASE PREVENTION AND CONTROL PLAN - 2020

National Centre for Animal Health
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