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STATUS OF NOTIFIABLE ANIMAL DISEASES IN BHUTAN

1996-2013

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Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Livestock
National Centre for Animal Health
Serbithang: Thimphu

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FOREWORD

The booklet on Status of Notifiable Animal Diseases 2013 in Bhutan compiled by the Disease Prevention and Control Unit (DPCU) of the National Centre for Animal Health is a continuation of the annual publication of the status of notifiable diseases reported in Bhutan during the period. This edition gives an overview of all notifiable animal diseases reported in the country during 2013 including the spatio-temporal pattern of outbreaks from 1996 to 2013. This report is a combination of several years' outbreak data and the outbreak data recorded in the *TADinfo* online database system maintained at NCAH. The main purpose of this booklet is to provide an update on the livestock disease situation in the country for information of all stakeholders including field livestock staff, veterinarians, livestock farmers and policy makers. The information contained in this booklet could also be used for preparedness and response plans by the concerned government agencies responsible for disease prevention and control.

I would like to urge the *TADinfo* focal persons of all districts to ensure that all outbreaks of notifiable livestock diseases are entered compulsorily in the database to ensure such reports reflect the true situation in the ground. I would like to thank all the Program Directors of RLDCs, the TADinfo focal points, and all field veterinarians for their active disease reporting and investigation. I hope this edition of the disease status in the country will be useful and informative.

Dr. Kinzang Dukpa
Program Director

Table of Content

1. Introduction

Notifiable disease means a disease listed by the Veterinary Administration in the country, and that, as soon as detected or suspected, must be reported to any of the animal health service centres by the fastest means of communication to contain the disease.

Outbreaks of notifiable diseases have been reported every year from different parts of the country. A brief descriptive analysis is being attempted in this report to present the status of reported notifiable diseases reported in Bhutan during 2013 (Figure 1). The data used for this analysis were retrieved from the Veterinary Information System database (VIS) for the period from 1996 to 2010 and Trans boundary Animal Disease Information System (TAD info database) for the period 2011–2013 and were validated accordingly. Therefore, the data presented in this report can be used as baseline information in future.

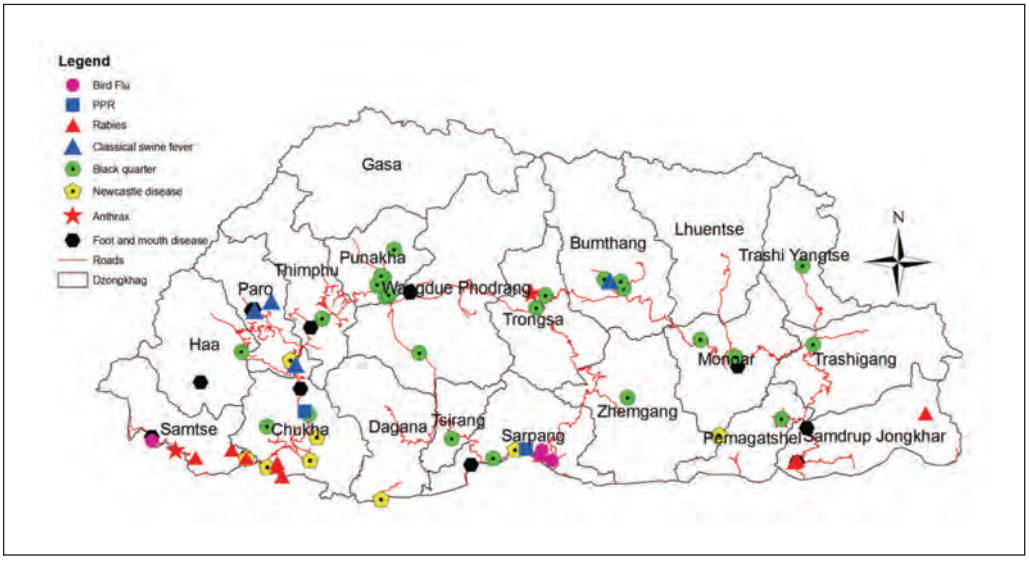

Figure 1: Distribution of reported outbreaks of notifiable animal diseases in Bhutan during 2013

2. Multiple species disease

2.1 Foot and mouth disease

Foot-and-mouth disease (FMD) is a highly infectious viral disease of cloven-hoofed species characterized by fever and vesicles in the mouth and on the muzzle, teats, and feet. In a susceptible population, morbidity approaches 100% but the disease is rarely fatal except in young and very old animals. There are 7 immunologically distinct serotypes: A, O, C, Asia 1, and SAT1, SAT2, and SAT3 (Southern African Territories). Within each serotype, there are a large number of strains that exhibit a spectrum of antigenic characteristics; therefore, more than one vaccine strain for each serotype, particularly O and A, is required to cover the antigenic diversity.

FMD is endemic and is reported from almost all parts of the country with the districts and sub-districts bordering India being at higher risk of reporting outbreaks than the interior parts of Bhutan. Serotype O is the principal FMDV serotype involved in Bhutan, consistent with the disease epidemiology in the neighboring countries in the region.

During 2013, 13 outbreaks have been reported in 11 Dzongkhags, affecting 266 cattle and two pigs when compared to 12 reported outbreaks in 2012 (Figures 2 and 3, and annexure2). Most of the outbreaks have occurred in places near the highways and near international borders. Serotype O was confirmed in all the outbreaks through Sandwich ELISA performed at NCAH. Although the source of infection was largely unknown, some outbreaks were associated with import of livestock products.

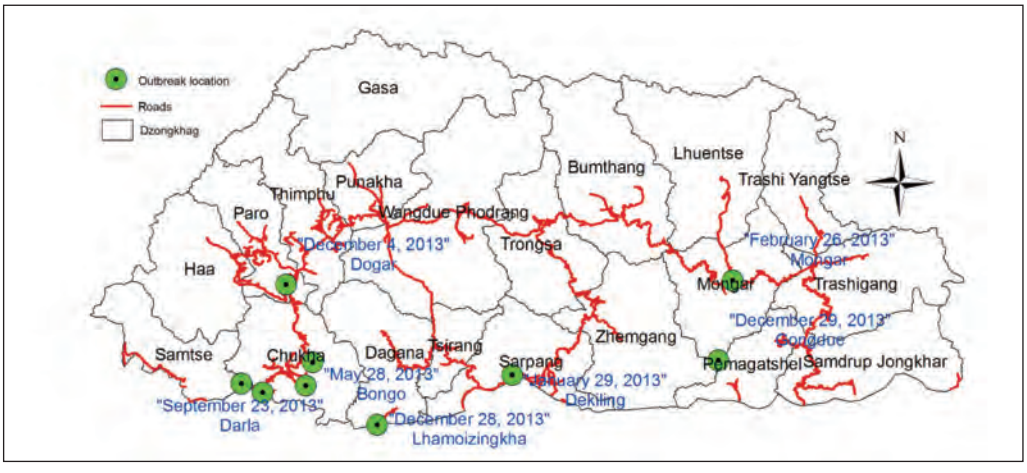

Figure 2: Distribution of FMD outbreaks in animals between January & Deccember 2013

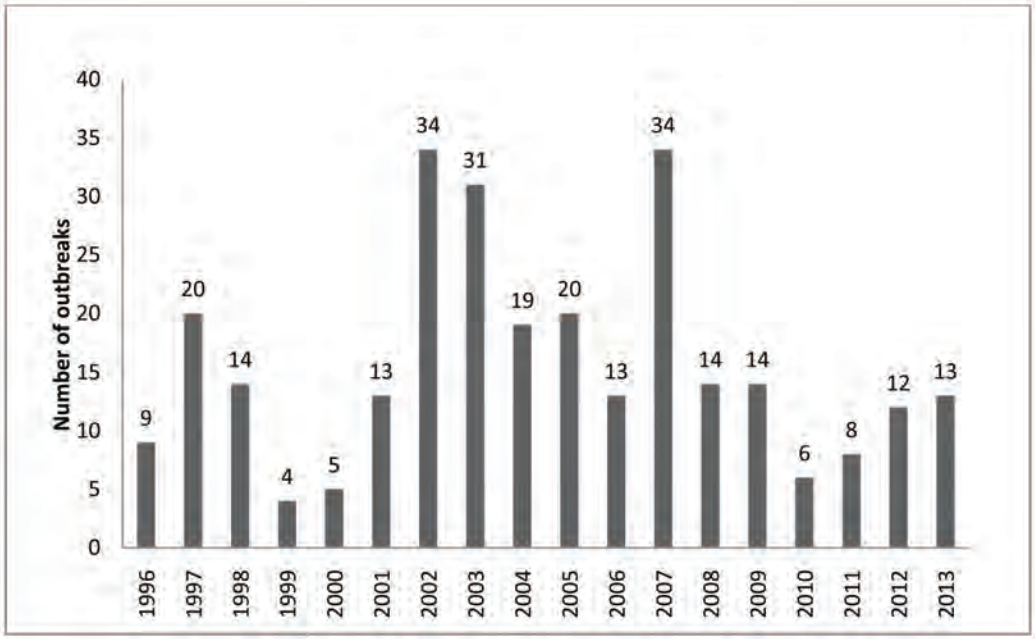

Figure 3: Annual distribution of reported FMD outbreaks in Bhutan (1996 to 2013)

A Progressive Control Pathway (PCP) approach for control of FMD is being implemented in the country with an ultimate objective to enable Bhutan reach stage 3 of the PCP by the year 2020 under the GF-TADs concept. A revised national FMD control document is under preparation to guide the FMD prevention and control program in the country.

2.2 Rabies

Rabies is a fatal zoonotic disease transmitted mainly by the bite of rabid animals, predominantly domestic dogs. Rabies was present in most parts of Bhutan until the early 1990s but has been controlled mainly through mass vaccination and restrictive elimination of dogs. Currently the disease is endemic in the southern Dzongkhags of Bhutan along the border with India.

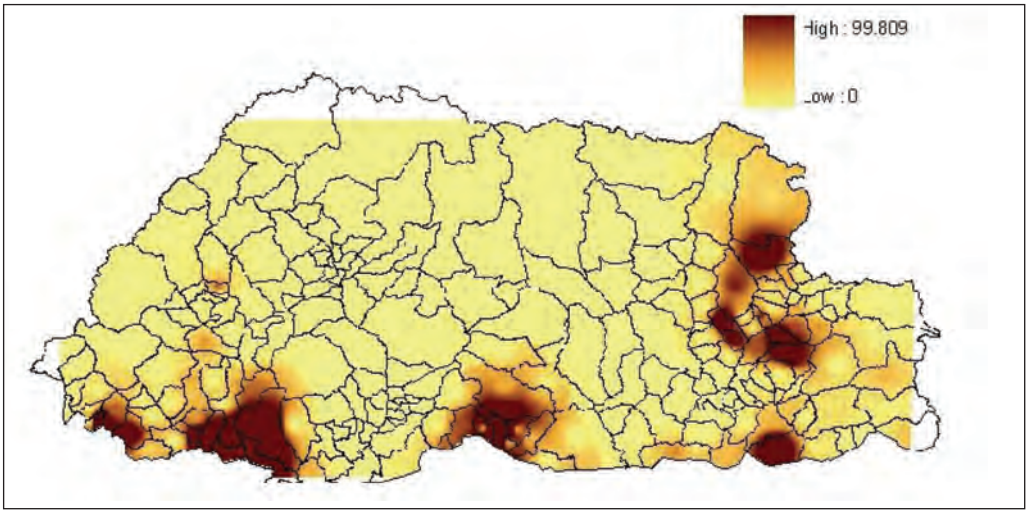

Figure 4: Spatial distribution of rabies cases in domestic animals in Bhutan during the period 1996–2009, interpolated by inverse distance weighing (IDW). The map demonstrates that there is high risk of rabies occurrence in south Bhutan especially in south west, south central and south east Bhutan along border with India.

During 2013, 21 outbreaks of rabies were reported in Chukha, Samtse, Sarpang and Samdrup Jongkhar Dzongkhags, affecting dogs (22), cattle (15) and goat (1) when compared to 17 reported outbreaks in 2012 (Figures 5 and 6 and annexure 5). Highest outbreaks were reported in Chukha Dzongkhag followed by Samtse, S/Jongkhar and Sarpang (Annexure 6).The cases in domestic animals are as a result of rabid dog bites.

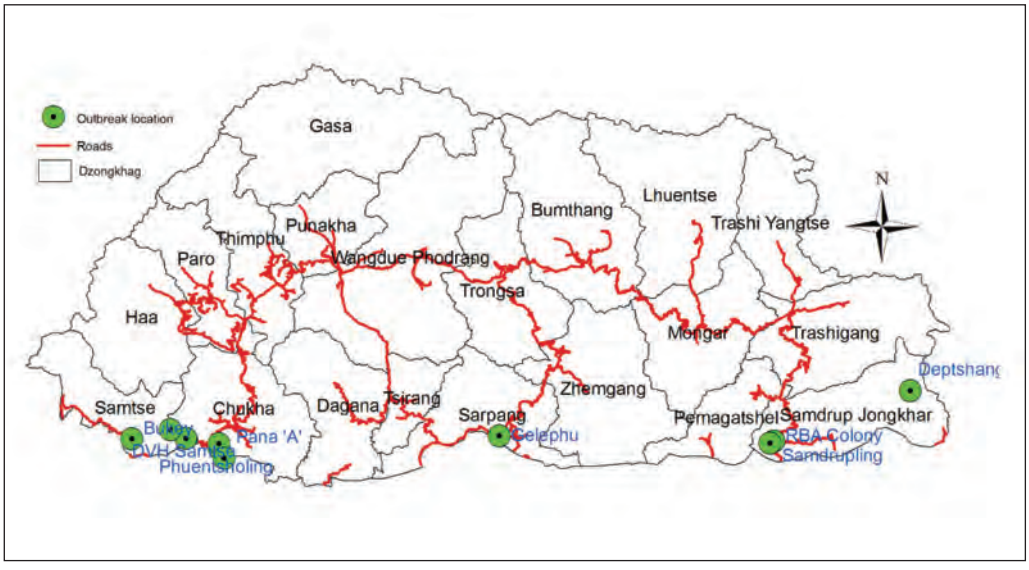

Figure 5: Distribution of reported rabies outbreaks in animals between January & December 2013

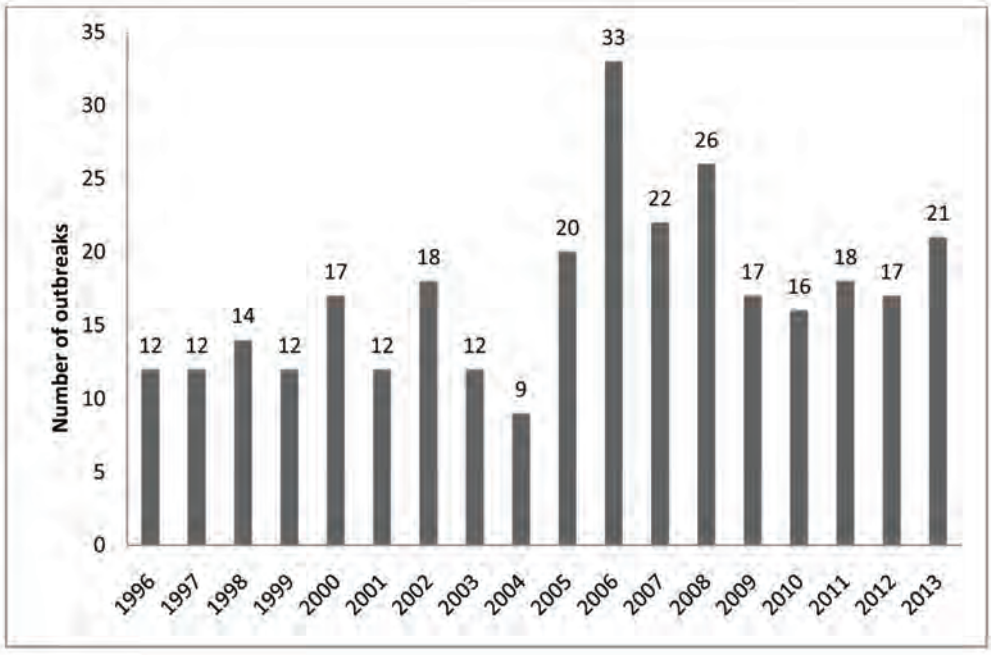

Figure 6: Annual distribution of reported rabies outbreaks in Bhutan (1996 to 2013)

In addition to the ongoing CNVR program in the country, a month long (September-October 2013) mass dog vaccination program against rabies was organized in high risk areas of south Bhutan covering 6,300 dogs and cats.

In humans, 16 deaths due to rabies (mostly children) has been reported between 2006 and 2013 with only one death in 2013.

2.3 Anthrax

Anthrax is a serious zoonotic disease caused by the spore forming bacterium *Bacillus anthracis*. Anthrax commonly presents as an acute septicemia with a high fatality rate in herbivore animals. The most common signs are sudden death, discharge of un-clotted tarry blood from natural orifices, rapid bloating and absence of rigor mortis.

In Bhutan, anthrax cases are sporadically reported in domestic animal, primarily in cattle. Occasionally, cutaneous anthrax cases have been reported in humans following contact with infected animals. The anthrax isolates 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 (Figure 7). The B lineage is less widespread and primarily associated with South Africa, but it has been reported in parts of the UnitedStates, Europe, and Asia, including the Caucasus region.

In contrast, the strains from nearby Bangladeshand India belong to the more widely dispersed A lineage.

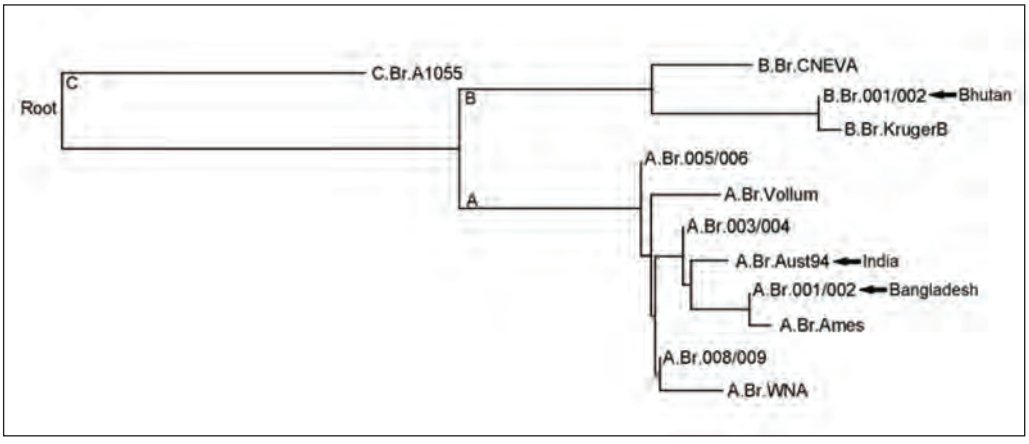

Figure 7. Phylogeny of major Bacillus anthracis groups as determined by using canonical single nucleotide polymorphisms. Arrows indicate the lineages/groups of genotyped B.anthracis isolates from India, Bangladesh , and Bhutan (Source: Thapa et al., 2014).

During 2013, three anthrax outbreaks were reported from Samtse, Trongsa and Pema Gatshel when compared to 10 reported outbreaks in 2012 (Figure 8 and Annexure 9). Outbreak in Samtse resulted in death of nine cattle while two cases each were reported in Trongsa and Pema Gatshel. No human cases were reported during 2013.

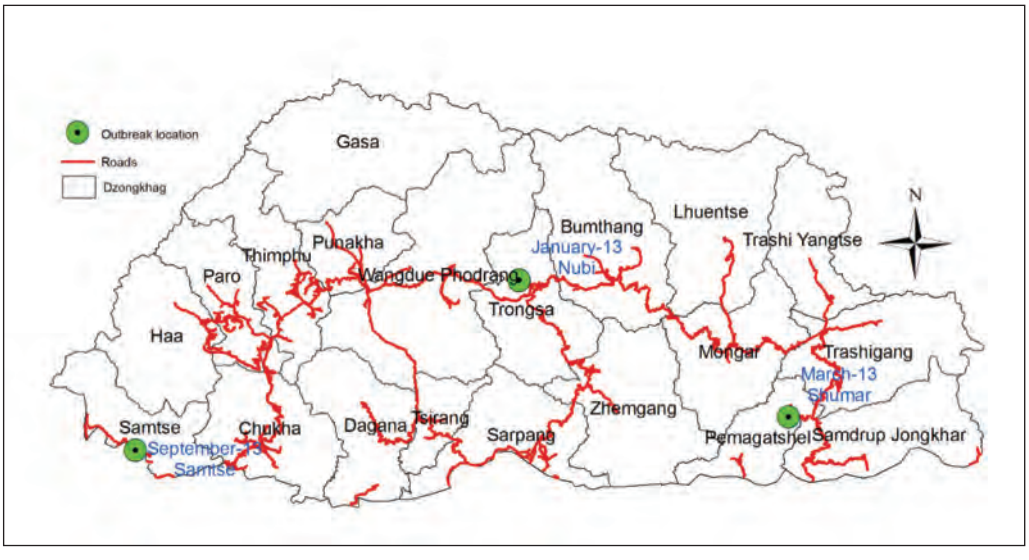

Figure 8: Distribution of reported anthrax outbreaks in animals between January & December 2013

3. Diseases in cattle

3.1 Black Quarter

Black Quarter (BQ) is an acute, febrile disease of cattle and sheep caused by *Clostridium chauvoei* andcharacterized by emphysematous swelling, usually in the heavy muscles. Spores of *Clostridium chauvoei* can remain viable in the soil for many years and the animal gets infection through ingestion of the organisms.

During 2013, a total of 25 outbreaks of BQ were reported from 14 Dzongkhags affecting 99 cattle including 92 deaths when compared to 16 reported outbreaks in 2012 (Figures9 and 10, annexure 11). BQ outbreaks have been reported throughout the year without much seasonal variation.

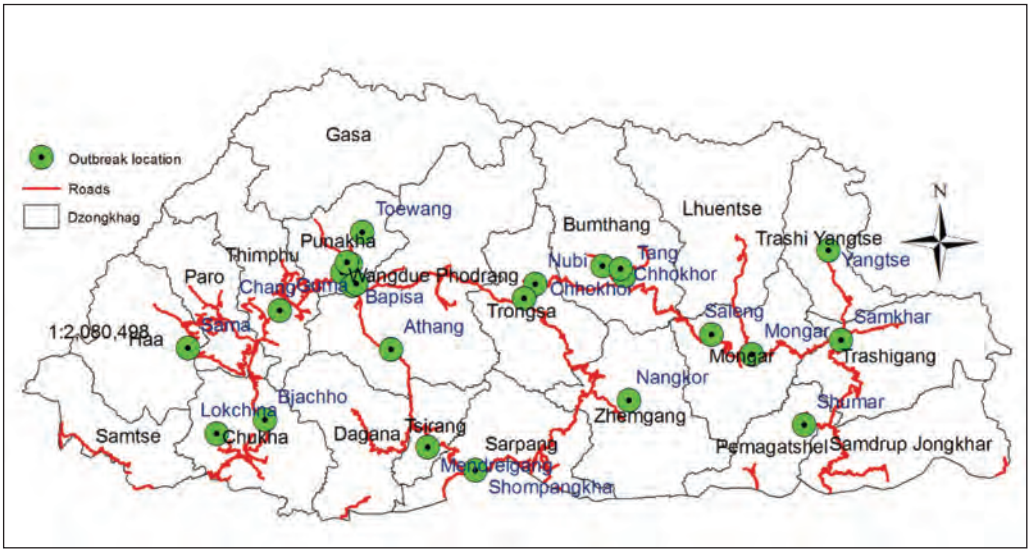

Figure 9: Distribution of reported BQ outbreaks in animals between January & December 2013

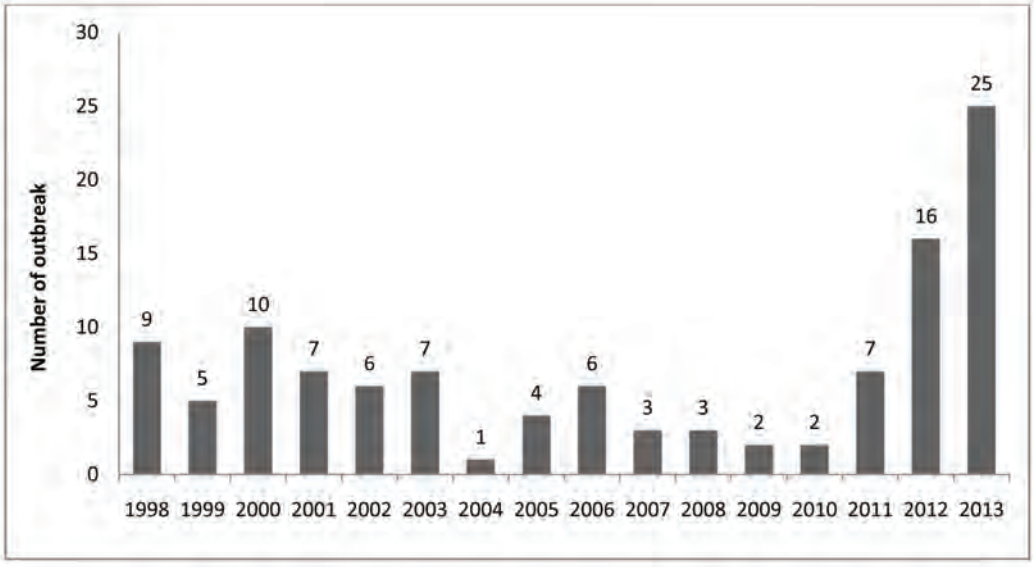

Figure 10: Annual distribution of reported BQ outbreaks in animals in Bhutan (1998 to 2013)

4. Diseases in pigs

4.1 Classical Swine fever

Classical swine fever (CSF) is a contagious febrile disease of pigs caused by CSF virus of the genus Pestivirus, family *Flaviviridae*. The main source of infection is the pig—either live animals (movement of infected pigs) or through illegally imported pig meat and meat products that find their way into the porcine food chain through the feeding of waste food (e.g., Swill feeding).

Only sporadic cases of CSF are reported in village pigs in Bhutan. Although CSF vaccine is available, vaccination has been very limited due to practical field difficulties in the village pigs. However, pigs in the government farms are regularly vaccinated and the piglet distribution to the farmers are done after vaccination at the farms. A recent study has demonstrated sero-prevalence of CSFV about 62% and 52% in the government and backyard farms (due to vaccination), respectively, but no direct evidence of CSFV infections was found, either by clinical signsor virus isolation.

During 2013, four outbreaks have been reported in Bumthang, Paro and Wangdue when compared to only one outbreak in 2012 (Figure 11 and Annexure 14).

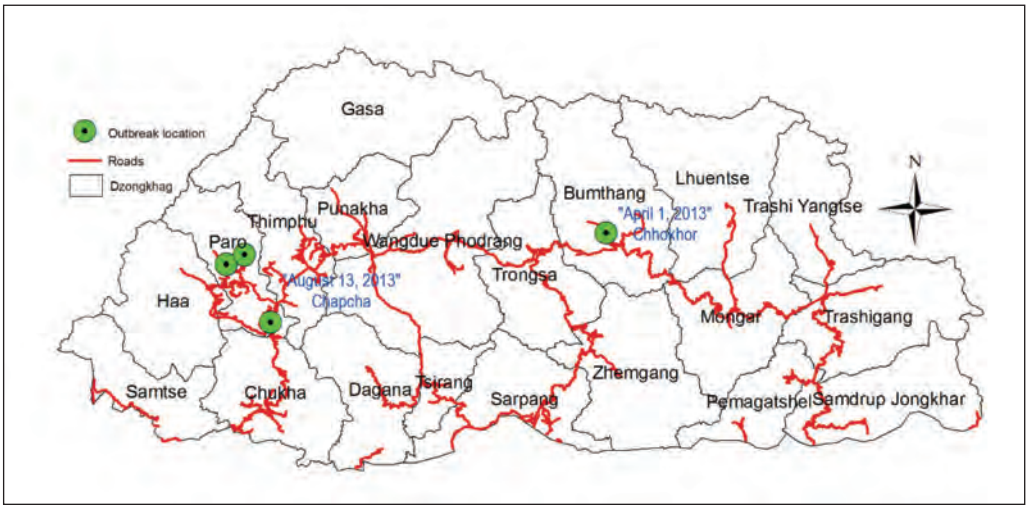

Figure 11: Distribution of classical swine fever outbreaks in pigs between January & December 2013

5. Diseases in poultry

5.1 Highly Pathogenic Avian Influenza

Bhutan reported its first HPAI H5N1 outbreak on 23 February 2010 to the OfficeInternational Des Epizooties (OIE). The disease was first detected on 18th February 2010 atRinchending village, Chukha district in free-ranging poultry that was subsequently confirmedby the High Security Animal Disease Laboratory (HSADL) Bhopal, India and the NationalInstitute of Animal Health (NIAH), Bangkok, Thailand. Subsequently, at least seven separateoutbreaks of HPAI H5N1 were confirmed in twenty-one locations of six districts in 2011,2012 and 2013.All of these outbreaks in Bhutan were rapidly contained following the implementation of the National Influenza Pandemic Preparedness Plan (NIPPP) and standard operating procedures (SOPs) for response to HPAI outbreak.

During 2013, two outbreak of HPAI was recorded in January and affected three villages in two Geogs (Gelephu and Chuzargang) under Sarpang Dzongkhag (Figure 12, annexure 17). A total of 76 cases were reported,and 832 birds destroyed to contain outbreak (Annexure 17). The first outbreak occurred at Namkhaling village in Gelephu on 15 Jan 2013, Pelrithang village on 18 January followed by second separate outbreak at Shawapang village (Chuzargang geog) on 18 Jan 2013. The third isolated outbreak in 2013 was reported on 2 February at Dungkhar B village, Yoeseltse geog, Samtse. All the outbreaks were confirmed using RT-PCR test at the National Centre for Animal Health, Serbithang, Bhutan and subsequently confirmed at the High Security Animal Disease Laboratory Bhopal, India.

The phylogenetic analysis of the first Bhutan isolates belonged to 'Qinghai like lineage' virus clade 2.2 (sub clade 2.2.3) and shared common progenitor virus with the 2010 Bangladesh virus. Based on the evidence of phylogeny and molecular markers, it was concluded that the outbreaks in Bhutan and Bangladesh in 2010 were due to independent introductions of the virus probably through migratory birds.The outbreaks during 2012 in Chukha, Thimphu and Mongar involved clade 2.3.2.1 which is antigenically similar to the 2011 chicken virus clade of India.

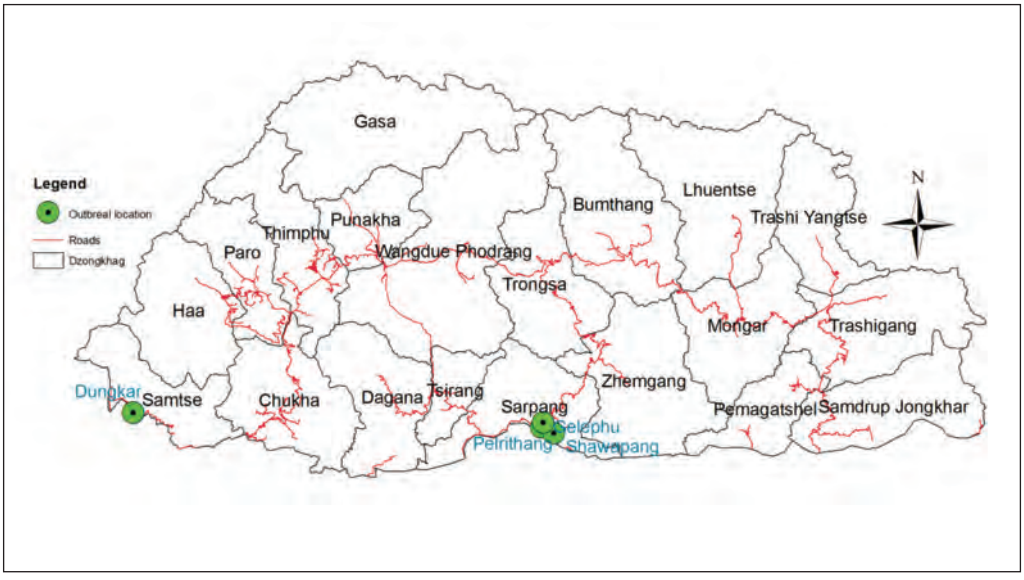

Figure 12: Distribution of HPAI (H5N1) outbreaks in poultry in Bhutan during 2013

5.2. Newcastle disease

Newcastle (NCD) is an acute viral disease of domestic poultry and many other bird species caused by Newcastle disease virus, synonymous with avian paramyxovirus-1.

NCD incidence in poultry is reported sporadically in Bhutan and cause morbidity and mortality of poultry birds, but most cases remain unreported due to small and scattered nature of flocks in the villages. Also vaccination against NCD in government poultry farms is mandatory, but in village poultry vaccination is limited due to the small and scattered nature of flocks.

During 2013, nine outbreaks were reported from six Dzongkhags (Figures 13 & 14, annexure 16).The increased report of NCD cases in poultry is associated with increased surveillance activities for HPAI wherein tests for both avian influenza viruses and NCD are conducted simultaneously. Thus, the detection rate of NCD virus in poultry has increased due to active surveillance for avian influenza viruses.
Status of outbreaks of NCD between 1998 and 2012

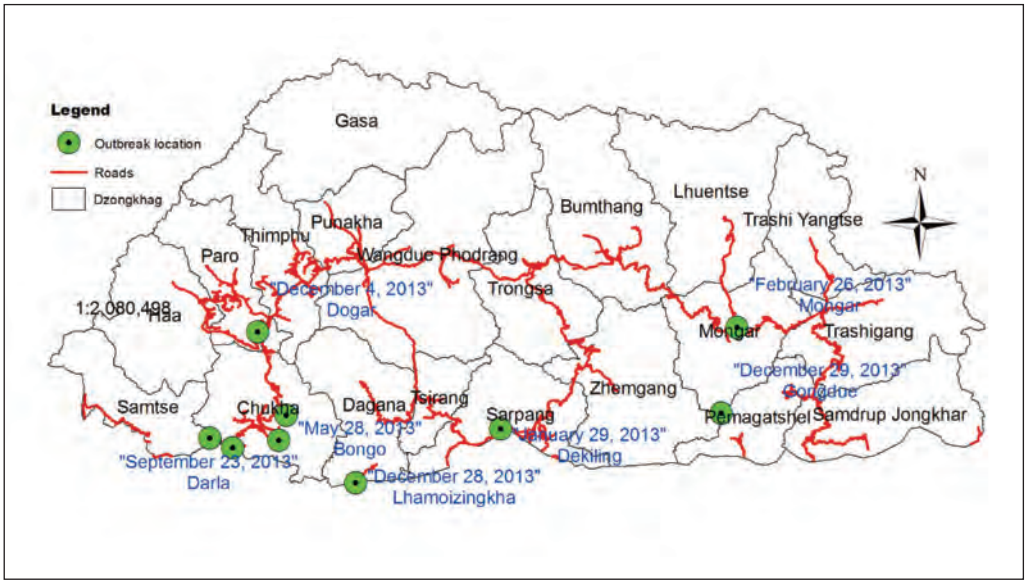

Figure 13: Distribution of reported NCD outbreaks in poultry between January & December 2013

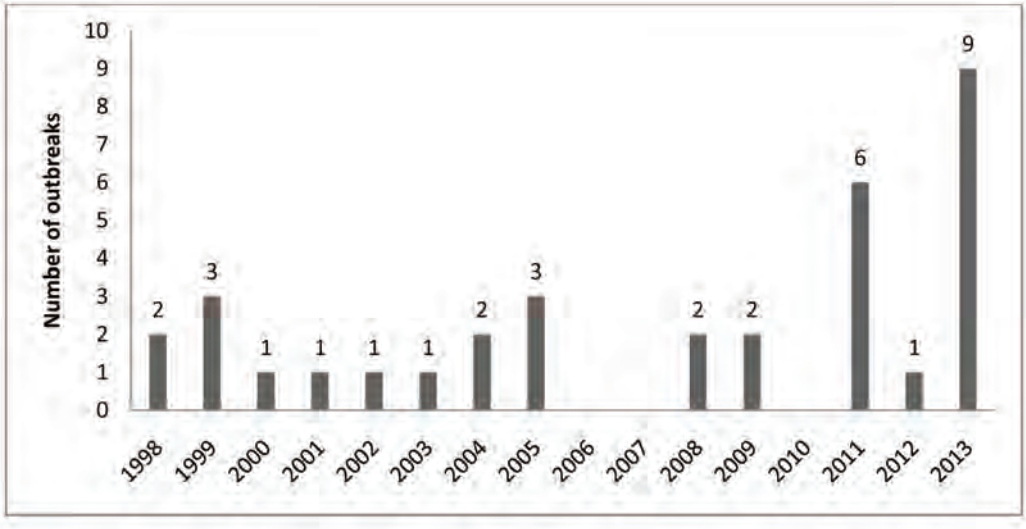

Figure 14: Annual distribution of reported NCD outbreaks in poultry (1998 to 2013)

6. Diseases in goat

6.1. *Peste des petits ruminants* (PPR)

Peste des petits ruminants (PPR) is a highly contagious and economically important disease of small ruminants caused by morbillivirus, family *Paramyxoviridae*. The first clinical description of PPR was made in 1942 in West Africa. In Bhutan, first outbreak of PPR in goat was reported on 15 July in 2010at CHPCL Chukha dog pound where the *tsethar* goats were stationed.

During 2013, PPR outbreak was reported in the same dog pound area at CHPCL, Bjapcho Geog, under Chukha Dzongkhag on 30 May 2013 where tsethar goats were kept in the pound (Figure 16). Out of 87 goats in the shelter, 41 were affected including 25 deaths(annexure 19). The source of outbreak was believed to be from the introduction of new goats in the existing stock. Later, four animals in a herd of 26 goats in a research station (RNR-RDC, Bhur in Gelephu, Sarpang district) also came down with the disease in November 2013.

Figure 15: Mucopurent discharges from eyes, nostril and greenish watery diarrhoes of PPR affected goats (Picture: Sangay Rinchen, RLDC Tsimasham)

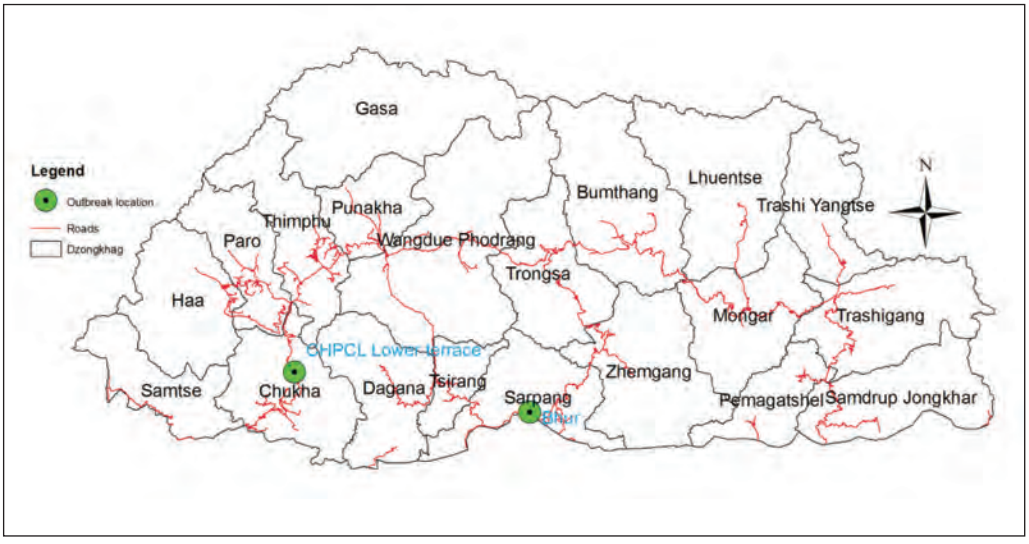

Figure 16: Distribution of reported PPR outbreaks in goats in Bhutan during 2013

PPR virus isolate in Bhutan were characterized at the World Reference Laboratory (WRL) Pirbright, UK and was belonged to lineage IV which is similar to the isolates from Nepal and Tibet. The surveillance and disease control program will be initiated in the country in line with the global elimination program for PPR.

Acknowledgements

The NCAH would like to acknowledge all the TADinfo focal units of RLDC, SVL and DVH for their prompt reporting and update of the disease outbreaks in their locality in the TADInfo database system. The centre would also like to urge all animal health staff and veterinarians to compulsorily undertake flash reporting of all notifiable diseases and enter the outbreak data into the TADinfo database so that the annual health report produced by NCAH reflects the disease situation in the country more accurately.

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8. Annexes

Annexure 1: Details of FMD outbreaks during 2011 and 2012 (Source: TADInfo database, NCAH).

Date of out break	Village	Geog	Dzongkhag	Species	Cases	Deaths
Feb 23, 2011	Sertsho	Toetsho	T/Yangtse	Cattle	26	0
Mar 23, 2011	Bhur	Bhur	Sarpang	Cattle	7	2
April 18, 2011	Saureni	Samtse	Samtse	Cattle	15	1
June 28, 2011	Dorikha, Kowna	Sama	Haa	Cattle	8	0
June 2, 2011	Gaybekha	Daga	Wangdue	Cattle	11	0
July 2, 2011	Lomneykha	Chapcha	Chukha	Cattle	2	0
July 20, 2011	Sarpangtar	Shompangkha	Sarpang	Cattle	13	0
Sep 9, 2011	Belbotay	Sipsu	Samtse	Cattle	20	0
Sept 14, 2011	Titring	Tading	Samtse	Cattle	69	0
Feb 6, 2012	Jangsaby	Dzome	Punakha	Cattle	27	0
Feb 10, 2012	Jagarthan	Lamgong	Paro	Cattle	8	0
May 9, 2012	P/ling	P/ling	Chukha	Cattle	33	5
July 27, 2012	Titring	Tading	Samtse	Cattle	146	2
Aug 21, 2012	Richanglo	Gomdar	S/Jongkhar	Cattle	47	1
Aug 20, 2012	Gonong	Shingkhar Lauri	S/Jongkhar	Cattle	30	1
Aug 4, 2012	Thothang	Shingkhar Lauri	S/Jongkhar	Cattle	30	1
Sept 3, 2012	Pusa	Sakteng	Trashigang	Cattle	30	0
Sept 7, 2012	Borangmang	Sakteng	Trashigang	Cattle	43	0
Sept 2, 2012	Khelphu	Merak	Trashigang	Cattle	111	12
Oct16, 2012	Giri Gaon	Sipsu	Samtse	Cattle	72	1
Oct 16, 2012	Penjorling A	Sipsu	Samtse	Cattle	19	0
Oct 16, 2012	Penjorling A	Sipsu	Samtse	Buffalo	4	0
Oct 16, 2012	Peljorling B	Sipsu	Samtse	Cattle	119	1
Oct 16, 2012	Jogimara	Sipsu	Samtse	Cattle	14	0
Oct 16, 2012	Hangay	Sipsu	Samtse	Cattle	50	0
Oct16, 2012	Hangay	Sipsu	Samtse	Buffalo	5	0
Oct 18, 2012	Khelphu	Merak	Trashigang	Cattle	387	3

Date of out break	Village	Geog	Dzongkhag	Species	Cases	Deaths
Nov 15, 2012	Mujuwa/ Tundara	Namgyel Chhoeling Samtse	Cattle	24	0	
Nov 15, 2012	Mujuwa/ Tundara	Namgyel Chhoeling Samtse	Buffalo	4	0	
Nove 26, 2012	Dagphel	Nangkor	Zhemgang	Cattle	3	1
Nov 28, 2012	Torsatar	Phuentsholing	Chukha	Cattle	8	0
Nove 28, 2012	Torsatar	Phuentsholing	Chukha	Pig	1	0
Dec 26, 2012	Jangsa	Ugentse	Samtse	Cattle	12	0
Total					**1398**	**31**

Annexure 2: Detail of Foot and Mouth Disease outbreak during 2013 (Source: TADinfo)

Date of out break	Village	Geog	Dzongkhag	Species	Cases	Deaths
Feb13, 2013	Khasadrapchu	Mewang	Thimphu	Bovine	2	0
Jan 7, 2013	Jagarthan	Lamgong	Paro	Bovine	6	0
May 29, 2013	Bunakha	Chapcha	Chukha	Bovine	10	0
June 6, 2013	Phuentsholing	Phuntsholing	Chukha	Bovine	4	0
Sept 30, 2013	Phuentsholing	Phuntsholing	Chukha	Bovine	16	0
Oct 10, 2013	Shebji	Sombeykha	Haa	Swine	1	0
Oct 10, 2013	Shebji	Sombeykha	Haa	Bovine	100	5
Oct 8, 2013	Pajab herd	Sama	Haa	Bovine	78	1
Nov 18, 2013	Dangloe	Lamgong	Paro	Bovine	5	0
Nov 18, 2013	Dangloe	Lamgong	Paro	Swine	1	0
Dec 11, 2013	Phakpashi	Drepung	Mongar	Bovine	3	0
Dec 18, 2013	Samdrujongkhar	Dewathang	S/Jongkhar	Bovine	13	7
Dec 24, 2013	Yarpheling	Sengye	Sarpang	Bovine	12	0
Dec 29, 2013	Chaebakha	Nyisho	W/Phodrang	Bovine	10	0
Dec 30, 2013	Narphung	Jangchhubling	S/ Jongkhar	Bovine	2	0
Dec 30, 2013	Labarbotay/ Lengthey Chargharey	Samtse	Bovine	5	0	

Annexure 3: Details of reported rabies outbreaks in domestic animals in Bhutan during 2011 (Source: TADInfo system, 2011)

Date of	Month of outbreak	Place	Geog	Dzong-khag	Species	Cases
11/01/2011	January	RBA camp	Gelephu	Sarpang	Dog	1
11/01/2011	January	Puranobasti	Gelephu	Sarpang	Pig	1
11/01/2011	January	Puranobasti	Gelephu	Sarpang	Cattle	1
11/01/2011	January	Puranobasti	Gelephu	Sarpang	Cattle	1
11/01/2011	January	Kabretar	Phuentsholing	Chhukha	Dog	1
9/02/2011	February	Tali Dratshang	Gelephu	Sarpang	Dog	1
25/2/2011	February	Samtse	Samtse	Samtse	Cat	1
3/02/2011	February	Phuentsholing	Phuentsholing	Chhukha	Dog	1
21/03/2011	March	Gelephu	Gelephu	Sarpang	Cattle	1
24/03/2011	March	Gelephu	Gelephu	Sarpang	Dog	1
30/03/2011	March	Phuentsholing	Phuentsholing	Chhukha	Dog	1
22/04/2011	April	Gelephu	Gelephu	Sarpang	Dog	1
28/04/2011	April	Phuentsholing	Phuentsholing	Chhukha	Cat	1
2/05/2011	May	Bukey	Samtse	Samtse	Dog	1
2/05/2011	May	Bukey	Samtse	Samtse	Cattle	2
4/05/2011	May	Hot Spring	Jigmichhoe-ling	Sarpang	Dog	1
8/06/2011	June	Kamai Bhanjang	Tading	Samtse	Sheep	2
8/06/2011	June	Kamai Bhanjang	Tading	Samtse	Goat	4
8/08/2011	August	Sarpang	Sarpangtrar	Sarpang	Dog	1
8/08/2011	August	Sarpang	Sarpangtrar	Sarpang	Dog	1
8/08/2011	August	Hiley	Hiley	Sarpang	Dog	1
8/08/2011	August	Gelephu	Gelephu	Sarpang	Dog	1
9/09/2011	September	Phuentsholing	Phuentsholing	Chhukha	Horse	1
21/09/2011	September	Phuentsholing	Phuentsholing	Chhukha	Dog	1
5/09/2011	September	Kuwapani	Hiley	Sarpang	Cattle	1
5/09/2011	September	Kuwapani	Hiley	Sarpang	Dog	1
5/09/2011	September	Kuwapani	Hiley	Sarpang	Dog	1

Date of	Month of outbreak	Place	Geog	Dzong-khag	Species	Cases
5/09/2011	September	Kuwapani	Hiley	Sarpang	Cat	1
9/09/2011	September	Phuentsholing	Phuentsholing	Chhukha	Dog	1
5/09/2011	September	Dubeni	Lokchina	Chhukha	Horse	1
24/10/201	October	Darla	Darla	Chhukha	Dog	1
10/10/2011	October	Sibsuni	Lhamoi zingkha	Dagana	Cattle	2
10/10/2011	October	Sibsuni	Lhamoi zingkha	Dagana	Dog	3
20/10/2011	October	Kuwapani	Hiley	Sarpang	Cattle	1
17/10/2011	October	Bisti	Hiley	Sarpang	Cattle	1
25/12/2011	December	Phuentsholing	Phuentsholing	Chhukha	Dog	1

Annexure 4: Details of reported rabies outbreaks in domestic animals in Bhutan during 2012 (Source: TADInfo system, 2012)

Date of outbreak	Month	Place of outbreak	Geog	Dzongkhag	Species	Cases
1/02/2012	February	Dorji Phu	Deorali	Dagana	Cattle	3
1/02/2012	February	Dorji Phu	Deorali	Dagana	Goat	1
1/02/2012	February	Dorji Phu	Deorali	Dagana	Dog	1
1/02/2012	February	Dorji Phu	Deorali	Dagana	Pig	1
6/02/2012	February	Samtse	Samtse	Samtse	Cattle	1
11/02/2012	February	Juprey	Bhur	Sarpang	Dog	2
12/03/2012	March	Patabari	Shompangkha	Sarpang	Cattle	2
2/04/2012	April	Phuentsholing	Phuntsholing	Chukha	Cat	1
25/06/2012	June	RBA Colony	Dewathang	S/Jongkhar	Dog	1
25/07/2012	July	Tsangchhu	Phuntsthothang	S/Jongkhar	Cattle	1
6/08/2012	August	Yub_Khezo	Jamkhar	T/yangtse	Cattle	1
13/08/2012	August	Golanti	Langchhenphu	S/Jongkhar	Dog	1
13/08/2012	August	Golanti	Langchhenphu	S/Jongkhar	Cattle	1
4/09/2012	Sept	S/Jongkhar	Dewathang	S/Jongkhar	Dog	1
4/09/2012	Sept	Laring	Hiley	Sarpang	Cat	1
12/09/2012	Sept	Golanti	Langchhenphu	S/Jongkhar	Cattle	1

Date of outbreak	Month	Place of outbreak	Geog	Dzongkhag	Species	Cases
8/10/2012	October	Phuentsholing	Phuntsholing	Chukha	Dog	1
25/10/2012	October	Gelephu	Gelephu	Sarpang	Dog	1
10/10/2012	October	RBA Colony	Dewathang	S/Jongkhar	Dog	1
10/10/2012	October	Chumkuna	Phuntsholing	Chukha	Dog	1
27/10/2012	October	Kuwapani	Hiley	Sarpang	Goat	1
15/11/2012	Nov	Chenari	Dewathang	S/Jongkhar	Cattle	1
15/11/2012	Nov	Chenari	Dewathang	S/Jongkhar	Cat	1
15/11/2012	Nov	Chenari	Dewathang	S/Jongkhar	Dog	1
13/11/2012	Nov	Gelephu	Gelephu	Sarpang	Cattle	1

Annexure 5: Detail of reported rabies outbreaks in domestic animals during 2013 (Source: TADinfo)

Date of outbreaks	Village	Geog	Dzongkhag	Species	Death
January 7, 201	Gelephu	Gelephu	Sarpang	Canine	1
January 5, 2013	Phuentsholing	Phuntsholing	Chukha	Canine	1
January 12, 2013	Phuentsholing	Phuntsholing	Chukha	Canine	1
February 24, 2013	Phuentsholing	Phuntsholing	Chukha	Canine	1
February 22, 2013	BCCL Colony	Samphelling	Chukha	Bovine	1
January 18, 2013	Sarkitar	Samtse	Samtse	Canine	1
March 12, 2013	DVH Samtse	Samtse	Samtse	Bovine	1
March 28, 2013	Phuentsholing	Phuntsholing	Chukha	Canine	1
April 2, 2013	Phuentsholing	Phuntsholing	Chukha	Canine	2
April 4, 2013	Samtse	Samtse	Samtse	Canine	1
February 26, 2013	BCCL Colony	Samphelling	Chukha	Bovine	1
May 22, 2013	Malaybasay	Samphelling	Chukha	Canine	1
June 12, 2013	Lower Toribari	Phuntsholing	Chukha	Bovine	1
April 2, 2013	Deptshang	Serthig	S/Jongkhar	Bovine	5
July 24, 2013	Phuentsholing	Phuntsholing	Chukha	Canine	1
October 8, 2013	Pana 'A'	Samphelling	Chukha	Bovine	1
November 14, 2013	RBA Colony	Dewathang	S/Jongkhar	Canine	1
November 25, 2013	Bukey	Samtse	Samtse	Bovine	1
December 17, 2013	Samdrupling	Dewathang	S/Jongkhar	Bovine	1

Annexure 6: Species wise reported cases of rabies in 2013

Dzongkhag	Outbreak	Cases	Bovine	Canine	Caprine
Chukha	9	16	4	12	0
Samtse	6	6	3	3	0
S/Jongkhar	4	9	7	2	0
Sarpang	2	7	1	5	1
Total	21	38	15	22	1

Annexure 7: Details of reported anthrax outbreaks in domestic animals in Bhutan (1998–2012) (Source: VIS and TADInfo system NCAH).

Year	Out break*	Death	Species affected	Geog	Dzongkhag
1998	2	2	Cattle	Kazhi	Wangdue
1999	3	9	Cattle, Pig	Dzomi, Khaling	Punakha, Tiashigang
2000	3	6	Cattle	Samtse, Phuentsholing,	Samtse, Chhukha
				Silambi	Mongar
2001	2	3	Cattle	Samtse, Tsirangtoe	Samtse, Tsirang
2002	2	2	Cattle	Yoseltse	Samtse
2004	1	3	Cattle	Yoseltse	Samtse
2005	1	20	Cattle	Lhamoizingkha	Dagana
2006	1	12	Cattle	Bjachho,	Chhukha,
				Lhamoizingkha	Dagana
2007	2	6	Cattle	Rupisa	Wangdue
2008	1	2	Cattle	Chapcha	Chhukha
2009	1	1	Cattle	Trong	Zhemgang
2010	2	45	Cattle,horses, pigs, cats	Nangla, Bji	Zhemgang, Haa
2011	2	14	Cattle	Nichula, Patshaling	Dagana, Tsirang
2012	10	19	Cattle	Nubi, Kanglung, Sangacholing , Uesu, Katsho, Tseza, Phuentsholing	Trongsa, Trashigang, Samtse, Haa, Dagana, Chhukha
Total	33	144			

**number of outbreaks reported and year 2003 have not reported anthrax*

Annexure 8: Reported anthrax cases in animals in Bhutan (2011 – 2012) (Source: TADInfo system, NCAH)

Date	Village	Geog	Dzongkhag	Cases
June 9, 2011	Nichula	Nichula	Dagana	13
July 9, 2011	Beteni school	Patshaling	Tsirang	1
January 16, 2012	Mikche	Nubi	Trongsa	3
February 18, 2012	Yonphula	Kanglung	Trashigang	3
February 26, 2012	Lower Ghathia	Chargharey	Samtse	1
February 26, 2012	Rongthung	Kanglung	Trashigang	1
March 21, 2012	Tselungkha	Uesu	Haa	1
March 22, 2012	Bali	Katsho	Haa	1
April 17, 2012	Willing	Nubi	Trongsa	1
February 28, 2012	kongkha	Phuntsholing	Chukha	2
September 15, 2012	Kalizimgkha	Tseza	Dagana	1
December 6, 2012	Pelrithang	Gelephu	Sarpang	1
January 12, 2013	Bjee	Nubi	Trongsa	1

Annexure 9: Detail of reported anthrax outbreaks in animals during 2013 (Source: TADinfo)

Date of outbreak	Village	Geog	Dzongkhag	Species	Cases	Deaths
January 12, 2013	Bjee	Nubi	Trongsa	Bovine	1	1
March 29, 2013	Bartsheri	Shumar	Pemagatshel	Bovine	1	1
September 12, 2013	Mecheytar	Samtse	Samtse	Bovine	13	9

Annexure 10: Details of reported BQ outbreaks animals in Bhutan between 2011 and 2012 (Source: TADInfo system, NCAH).

Date of outbreak	Villages	Geog	Dzongkhag	Cases	Death
April 8, 2011	Ngashigarkha	Rubesa	Wangdue	1	1
May 5, 2011	NNBF, Tashiyangphu	Khaling	Trashigang	2	2
May 25, 2011	Zampe	Wangchang	Paro	1	1
June 3, 2011	NNBF,	Khaling	Trashigang	1	1
	Tashiyangphu				
June 5, 2011	NNBF, Tashiyangphu	Khaling	Trashigang	1	1
July 27, 2011	Jachhegpo	Yangtse	Trashiyangtse	1	1
August 12, 2011	Tongchen	Yangtse	Trashiyangtse	1	1
Sept 19, 2011	Amtse	Gangzur	Lhuentse	1	1
Dec 20, 2011	Dorjibee	Chhokhor	Bumthang	1	1
Feb 3, 2012	Chongzhik	Shengana	Punakha	3	2
Feb 11, 2012	Semji	Nubi	Trongsa	1	1
Feb 13, 2012	Gonpawoong	Dechhenling	Pemagatshel	5	5
March 16, 2012	Rizor	Udzorong	Trashigang	2	1
March 9, 2012	Kongkha	Phuentsholing	Chukha	1	1
March 9, 2012	Wangdigatshel	Phuentsholing	Chukha	4	4
May 2, 2012	Choilicop	Samtse	Samtse	2	1
April 10, 2012	Cheeyul	Getana	Chukha	6	1
July 4, 2012	Gangkha	Nahi	Wangdue	4	4
March 2, 2012	Mirichemo School	Bongo	Chukha	4	4
Sept11, 2012	NNBF, Tashiyangphu	Khaling	Trashigang	1	1
Oct 13, 2012	Bjasa	Goenkhame	Gasa	3	3
Oct 20, 2012	NNBF, Tashiyangphu	Khaling	Trashigang	1	0
Nov 18, 2012	NNBF, Tashiyangphu	Khaling	Trashigang	1	1
Sept 21, 2012	Willing	Nubi	Trongsa	1	1
Nov 15, 2012	Goling	Nangkor	Zhemgang	4	4
Total				**53**	**44**

Annexure 11: Detail of reported Black Quarter outbreak in animals during 2013 (Source: TADinfo)

Date of outbreak	Village	Geog	Dzongkhag	Species	Cases	Deaths
Jan 8, 2013	Namling	Saleng	Mongar	Bovine	2	2
Jan 25, 2013	Jarogang	Athang	Wangdue Phodrang	Bovine	9	8
Feb 7, 2013	Silipang	Guma	Punakha	Bovine	1	0
Jan 8, 2013	Gangjug	Saleng	Mongar	Bovine	5	0
Mar 10, 2013	Willing	Nubi	Trongsa	Bovine	1	0
Feb 2, 2013	Dzomesa	Dzome	Punakha	Bovine	2	2
Feb 6, 2013	Gangtramo	Talo	Punakha	Bovine	3	3
Feb 6, 2013	Labtsakha	Talo	Punakha	Bovine	1	1
Fe 26, 2013	PWD Colon	Bapisa	Punakha	Bovine	1	1
Feb 28, 2013	Tshachhup	Toewang	Punakha	Bovine	12	12
Mar 9, 2013	Chadokha	Lokchina	Chukha	Bovine	14	14
Mar 29, 2013	Bartsheri	Shumar	Pemagatshel	Bovine	1	1
April 3, 2013	Ramatoto	Chang	Thimphu	Bovine	1	1
May 21, 2013	Tshangkha	Tangsibji	Trongsa	Bovine	1	1
June 19, 2013	Pamlamfrang	Samkhar	Trashigang	Bovine	1	0
June 28, 2013	Alubari	Bjachho	Chukha	Bovine	1	1
April 16, 2013	Shangling	Nangkor	Zhemgang	Bovine	21	21
July 2, 2013	Alubari	Bjachho	Chukha	Bovine	1	1
July 11, 2013	Pakhaygaun	Shompangkha	Sarpang	Bovine	4	4
Mar 4, 2013	Kadam	Mongar	Mongar	Bovine	1	0
July 26, 2013	Chazam	Samkhar	Trashigang	Bovine	1	0
Aug 26, 2013	Phungputhoe	Yangtse	Trashi Yangtse	Bovine	1	0
Aug 1, 2013	Norgang	Chhokhor	Bumthang	Bovine	1	0
Sept 6, 2013	BS farm	Chhokhor	Bumthang	Bovine	1	1
Sept 1, 2013	sheep farm	Tang	Bumthang	Bovine	1	1
Sept 3, 2013	Sisithangka	Sama	Haa	Bovine	1	1
Sept 25, 2013	Riserboo	Mendrelgang	Tsirang	Bovine	7	7
Nov 28, 2013	Thangu	Thedtsho	Wangdue Phodrang	Bovine	3	3
Dec 10, 2013	Thangu	Thedtsho	Wangdue Phodrang	Bovine	1	1
Dec 19, 2013	Tshangkha	Tangsibji	Trongsa	Bovine	1	1

Annexure 12: Details of HS outbreak in cattle in Bhutan (1998 – 2012) (Source: VIS and TADInfo system, NCAH).

Year	Out break	Cases	Death	Geog	Dzongkhag
199	2	10	9	Soe, Tang	Thimphu, Bumthang
2000	1	10	4	Pagli	Samtse
2001	1	1	0	Dogar	Paro
2002	2	50	0	Jamkhar, Phuentsholing	Tashiyangtse, Chhukha
2004	4	44	29	Shompangkha, Sarpang,	BjachhoChhukha
2005	2	20	17	Athang, Nichula	Wangdue, Dagana
2006	2	20	18	Shompangkha	Sarpang
2007	1	2	2	Shingkhar	Zhemgang
2008	2	14	8	Logchina	Chhukha
2011	2	32	29	Dungna, Rupisa	Chhukha, Wangdue
2012	1	6	6	Rupisa	Wangdue

*Number of reported outbreaks. Year 1999, 2003, 2009 and 2010 have not reported any outbreaks

Annexure 13: Details of CSF outbreaks in pigs in Bhutan (1998 – 2012) (Source: VIS and TADInfo system, NCAH)

Year	Out break*	Cases	Death	Geog	Dzongkhag
1999	1	9	7	Bjachho	Chhukha
2001	1	21	15	Balam	Mongar
2003	1	4	4	Tsento	Paro
2005	5	121	88	Wangchang, Lungyni,	Paro, Punakha,
				Chhubu, Thedtsho,	Wangdue, Pemagatshel
				Nanong	
2010	1	2	2	Chhubu	Punakha
2011	1	4	4	Rupisa	Wangdue
2012	1	1	1	Guma	Punakha
Total	10	162	121		

*Number of reported outbreak. Year 1998, 2000, 2002, 2004, and 2006 to 2009 have not reported any outbreaks

Annexure 14: Detail of reported Swine Fever outbreak in pigs during 2013 (Source: TADinfo)

Date of outbreak	Village	Geog	Dzongkhag	Species	Cases	Deaths
April 1, 2013	Bapalathang	Chhokhor	Bumthang	Swine	1	1
Aug12, 2013	Chhukha	Lamgong	Paro	Swine	1	1
Aug 13, 2013	Damchu	Chapcha	Chukha	Swine	2	1
Nov 20, 2013	Phumu	Doteng	Paro	Swine	9	2

Annexure 15: Details of NCD outbreaks at the Geog level in Bhutan during 2011–2012 (TADInfo system, NCAH).

Date of outbreak	Cases	Deaths	Geog	Dzongkhag
January 3, 2011	5	5	Chargharey	Samtse
January 10, 2011	3	2	Samtse	Samtse
March 24, 2011	7	7	Bongo	Chukha
June 1, 2011	11	10	Wangchang	Paro
July 29, 2011	20	12	Tang	Bumthang
September 20, 2011	40	37	Tsholingkhar	Tsirang
March 23, 2011	100	100	Chapcha	Chukha
September 13, 2012	5	5	Kikhorthang	Tsirang
Total	186	178		

Annexure 16: Detail of reported Newcastle disease outbreak in poultry during 2013 (Source: TADinfo)

Date	Village	Geog	Dzong-khag	Species	Cases	Deaths
May 28, 2013	Toktokha	Bongo	Chukha	Avian	97	97
May 23, 2013	Phuentsholing	Phuntsholing	Chukha	Avian	260	210
Feb 26, 2013	RNR EC Mongar	Mongar	Mongar	Avian	3	2
Sept 11, 2013	Lower Toribari	Phuentsholing	Chukha	Avian	300	200
Sept 14, 2013	Wangdi Gasel	Phuentsholing	Chukha	Avian	170	100
Dec 4, 2013	Khamdra	Dogar	Paro	Avian	20	15
Dec 29, 2013	Yangbari	Gongdue	Mongar	Avian	82	77
Sept 23, 2013	Gurung Drangra	Darla	Chukha	Avian	10	6
Jan 29, 2013	Chuwabari	Dekiling	Sarpang	Avian	10	7
Dec 28, 2013	Dangragaon	Lhamoizingkha	Dagana	Avian	194	194

Annexure 17: Detail of Highly Pathogenic Avian Influenza (H5N1) outbreak in poultry during 2013 (Source: TADinfo)

Date of outbreak	Village	Geog	Dzongkhag	Species	Cases	Deaths
Jan 15, 2013	Gelephu	Gelephu	Sarpang	Avian	50	50
Jan 25, 2013	Shawapang	Chhuzagang	Sarpang	Avian	6	6
Jan 18, 2013	Pelrithang	Gelephu	Sarpang	Avian	8	8
Feb 2, 2013	Dungkhar B	Yoeseltse	Samtse	Avian	2	2

Annexure 18: Details of IBD outbreaks in Bhutan (1998 – 2012) (Source: VIS and TADInfo system, NCAH)

Date of report	Cases	Deaths	Geog	Dzongkhag
March 3, 1998	??	??	Chang	Thimphu
November 29, 2001	250	200	Saleng	Mongar
March 15, 2004	200	120	Gelephu	Sarpang
September 25, 2006	520	520	Gelephu	Sarpang
June 11, 2009	478	478	Bhur	Sarpang
August 5, 2009	413	313	Gozhing	Dagana
August 26, 2010	497	173	Talo	Punakha
October 13, 2010	1200	1200	Kikorthang	Tsirang
May 20, 2011	30	30	Lhamoizingkha	Dagana
Total	3588	3034		

Annexure 19: Detail of PPR outbreak in goats between 2010 to 2013 (Source: TADinfo)

Date of outbreak	Village	Geog	Dzongkhag	Species	At risk	Deaths
June 15 2010	CHCPL Dog pound	Bjachho	Chukha	Goat	84	27
May 30 2013	CHCPL Dog pound	Bjachho	Chukha	Goat	87	41
Nov 13 2013	RC-Bhur	Bhur	Sarpang	Goat	26	4

LABORATORY DIAGNOSTIC CAPACITY
Ministry of Agriculture and Forests
Department of Livestock
National Centre for Animal Health, Serbithang
(2014)

Test	Disease/conditions
Agent identification	Anthrax
	Leptospirosis
	Trichinellosis
	Trypanosomiasis
	Bovine anaplasmosis
	Bovine babesiosis
	Bovine cysticercosis
	Theileriosis
	Trypanosomiasis
	Equine piroplasmosis
	HS
Enzyme linked immunosorbent assay	FMD (NSP, LPB)
	Avian mycoplasmosis
	IBD (Gumboro disease)
	CBPP
	PPR (antibody, antigen capture)
	CSF
	Toxoplasmosis
	EIA
	IBR
	Paratuberculosis/Johne's disease
	Rabies
	Brucellosis
	AI
	BVD
	CDV
	Canine parvovirus
LFIC (field rapid test)	FMD

Test	Disease/conditions
	AI (A, H5)
	ND
	IBD
	O157 E coli
	Rabies
	PPR
Dot ELISA	CDV
	Canine parvovirus
	Leptospirosis
Polymerase chain reaction	FMD (multiplex serotyping)
	AI (A, H5N1, H7N9)
	ND
	Brucellosis
	PRRS
	Leptospirosis
Parasite egg count (qualitative/ quantitative)	Nematodes
	Trematodes
	Cestodes
Skin scrapping test	Fungal spores and mycelium
	Mites
Ectoparasite identification	Tick
	Mite
	Louse
	Flies
	Fleas
Intra-dermal test	Bovine tuberculosis
Slide agglutination test	Brucellosis
	Mycoplasmosis
	Salmonellosis
Haemagglutination test	AI (H7 Anhui)
	ND
Fluorescence antibody test	Rabies

Test	Disease/conditions
Immunohistochemistry	Canine distemper
Biochemical test	Macro mineral estimation (Mg, Ca, iP)
	Blood sugar
	Bilirubin
	Urine analysis
	Blood biochemistry
Toxicology test	Aflatoxin, ochratoxin, fuminosin
Culture and drug sensitivity test	Major bacterial pathogen
	Biochemical characterization
Pepsin digestion test	Trichinellosis

Abbreviations

A	AI type A	H5N1	AI subtype H5N1
AI	Avian influenza	H7N9	AI subtype H75N9
Anhui	AI haemagglutinin H7 Chinese strain	HS	Haemorrhagic septicaemia
BVD	Bovine viral diarrhoea	IBD	Infectious bursal disease
CBPP	Contagious bovine pleuropneumonia	IBR	Infectious bovine rhinotracheitis
CDV	Canine distemper virus	LPB	Liquid phase blocking
CSF	Classical swine fever	ND	Newcastle disease
E coli	Escherichia coli pathogenic strain 0157	NSP	Non-structural protein
EIA	Equine infectious aenemia	PPR	Peste des petits ruminants
FMD	Foot and mouth disease	PRRS	Porcine reproductive respiratory syndrome
H5	AI subtype haemagglutinin H5		

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