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

STATUS OF NOTIFIABLE ANIMAL DISEASES IN BHUTAN

2011–2012

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FOREWORD

The publication of Status of Notifiable Animal Diseases in Bhutan by the Disease Prevention and Control Unit (DPCU) of the National Centre for Animal Health is an important achievement of the unit. This edition gives an overview of all notifiable animal diseases reported in the country from 1998 to 2012 and status of outbreaks during 2011 and 2012. From this year, the DPCU will also compile and circulate the 'Fortnightly Livestock Disease Updates in Bhutan' electronically. The main purposes of this bulletin and e-bulletin are to update our livestock field staff on the status of important livestock disease situation in the country and prepare for prevention and response plan accordingly. Therefore, I would like to request all the field colleagues to report any disease outbreak recorded in your locality for incorporating in our e-bulletin for immediate dissemination to other field colleagues.

I hope this edition of the disease status in the country will be useful and informative.

Dr. Narapati Dahal

Offtg. Program Director

1. Introduction

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

In Bhutan, Livestock Act of Bhutan 2001 and the Livestock Rules and Regulation of Bhutan 2008 have listed Rinderpest, Foot and mouth disease, Rabies, Black quarter, Hemorrhagic septicemia, Anthrax, Classical swine fever, Highly pathogenic avian influenza, Newcastle disease, Infectious Bursal disease, Mareks disease, Glanders, Dourine, Sheep pox and Contagious bovine pleuropneumonia as notifiable livestock diseases. However, the Livestock Rules and Regulation of Bhutan 2008 are being currently amended to keep in conformity with the international animal health standards. Some of the above listed diseases (e.g. Rinderpest, Glanders, Dourine, Sheep pox and Contagious bovine pleuropneumonia) will be removed from the notifiable disease lists based on the epidemiology of its occurrence (has not reported for many years in Bhutan) whereas disease like rinderpest has been eradicated globally and even declared freedom from infection in 2011.

The notifiable disease outbreaks have been reported every year from different parts of the country. A brief descriptive analysis is being attempted in this report to present the time series and status of important reported notifiable diseases in Bhutan between 1998 and 2012. The data used for this analysis were retrieved from the Veterinary Information System database (VIS) for the period from 1998 to 2010 and Transboundary Information System (TADInfo database) for the period 2011−2012 and were validated accordingly. In addition, data for Foot and mouth disease (FMD) and rabies for the period from 1996 to 2008 were retrieved from Dr. Kinzang Dukpa and Dr. Tenzin's PhD thesis, respectively, and their published papers. Therefore, the data presented in this report can be used as baseline information in future.

2. Multiple species diseases

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 animals. There are 7 immunologically distinct serotypes: A, O, C,

Asia 1, and SAT (Southern African Territories) 1, 2, and 3. 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.

Status of FMD between 1996 and 2012

FMD is endemic in Bhutan and is reported from almost all parts of the country with the districts and sub-districts bordering India being at higher risk of disease than the interior parts of Bhutan (Dukpa et al., 2011a). A total of 277 outbreaks of FMD were recorded at the sub-district level from the 1 January 1996 to 31 December 2012 (average of 17 outbreaks per year) (Dukpa et al., 2011a; VIS, 2010; TADInfo system, 2012).

Nineteen of the 20 Dzongkhags have reported FMD outbreaks in animals between 1996 and 2012 with increased incidences in the three Dzongkhags in southern Bhutan (Samtse, Chukha, and Sarpang). Chukha Dzongkhag (n=60, 21.7%) had the highest number of outbreaks followed by Sarpang (n=35, 12.6%), Samtse (n=25, 9%), and Thimphu (n=19, 6.94%) (Fig. 1). Tsirang Dzongkhag (n=2, 0.7%) had the lowest number of outbreaks and has not reported any outbreaks since 1998 (Dukpa et al., 2011b; TADInfo system, 2012).

Serotype O is the principal FMDV serotype involved in Bhutan, consistent with the disease epidemiology in the neighbouring countries in the region (See Fig.1) (Dukpa et al., 2011b).

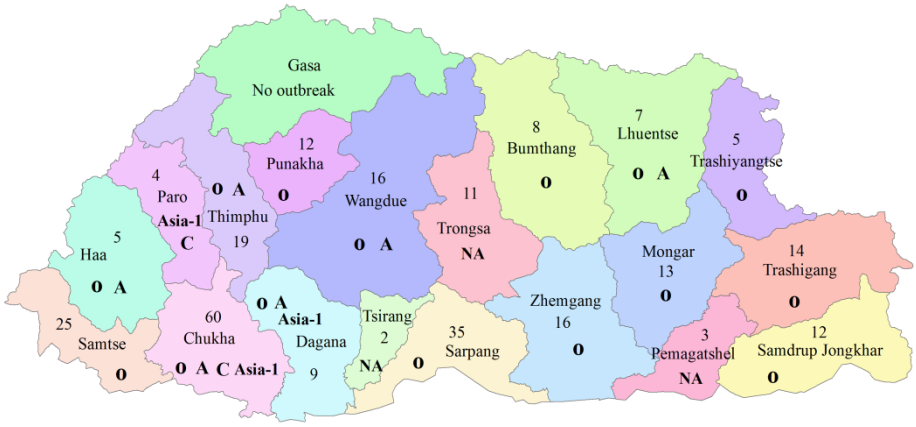

Figure 1: Reported number of FMD outbreaks at the Dzongkhag level in Bhutan between 1996 and 2012 (numerical number indicate the number of outbreak) and distribution of FMDV serotypes (O, A, C, Asia-1) in Bhutan (1982 to 2012). NA indicates serotype information not available (Dukpa et al., 2011b; VIS, 2010; TADInfo system, 2012).

Figures 2 and 3 show the annual pattern of outbreak between 1996 and 2012 with high number of outbreaks reported in 2002 (n=34), 2003 (n=31) and 2007 (n=34) (Dukpa et al., 2011b; TADInfo system, 2012).

FMD outbreaks have been reported throughout the year with higher incidence in the month of August (n=38) and lowest in November (n=10).

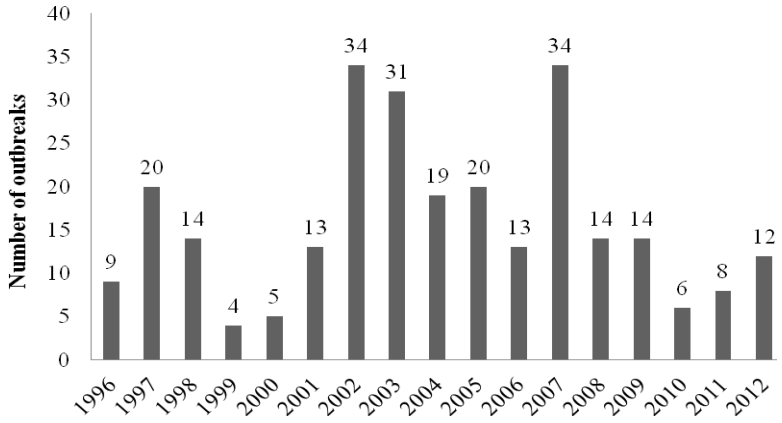

Figure 2: Annual distribution of FMD outbreaks in Bhutan (1996 to 2012) as already mentioned above.

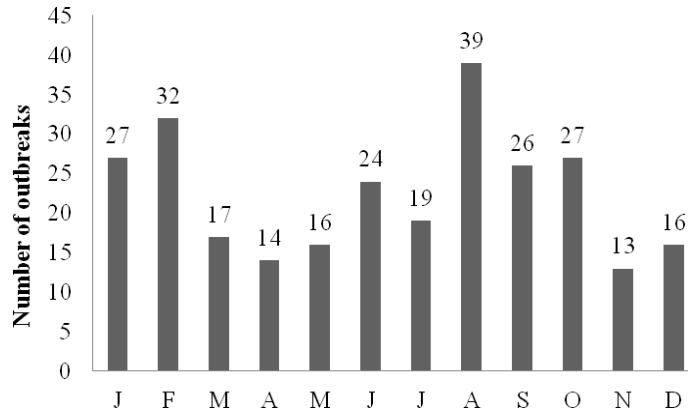

Figure 3: Monthly distribution of FMD outbreaks in Bhutan (1996 to 2012) already mentioned above.

A total of 17141 domestic animals: cattle (16739, 98%), pigs (214), sheep (130), goats (45) and buffalo (13) were reported to have been affected with FMDV during the 17-year period (1996 to 2012) (Dukpa et al., 2011b; VIS, 2010; TADInfo system, 2012).

And several numbers of affected animals have died due to disease, which had huge economic impacts to the farmers as well as to the government.

Figure 4: Clinical case of FMD in cattle and its lesions in foot and mouth (Picture courtesy: Dr. Tenzin)

Outbreak trend in the years 2011 and 2012

During 2011 and 2012, twenty outbreaks of FMD (8 outbreaks in 2011 and 12 in 2012) have been reported at the sub-district level and affected 1398 domestic animals with 31 deaths (see Fig. 5 and Annexure 1). The source of these outbreaks remains largely unknown. However, those outbreaks along the border areas is presumed to have originated from common source (across the border) as the disease was prevalent in the bordering villages in India prior to detection of outbreaks in Bhutan.

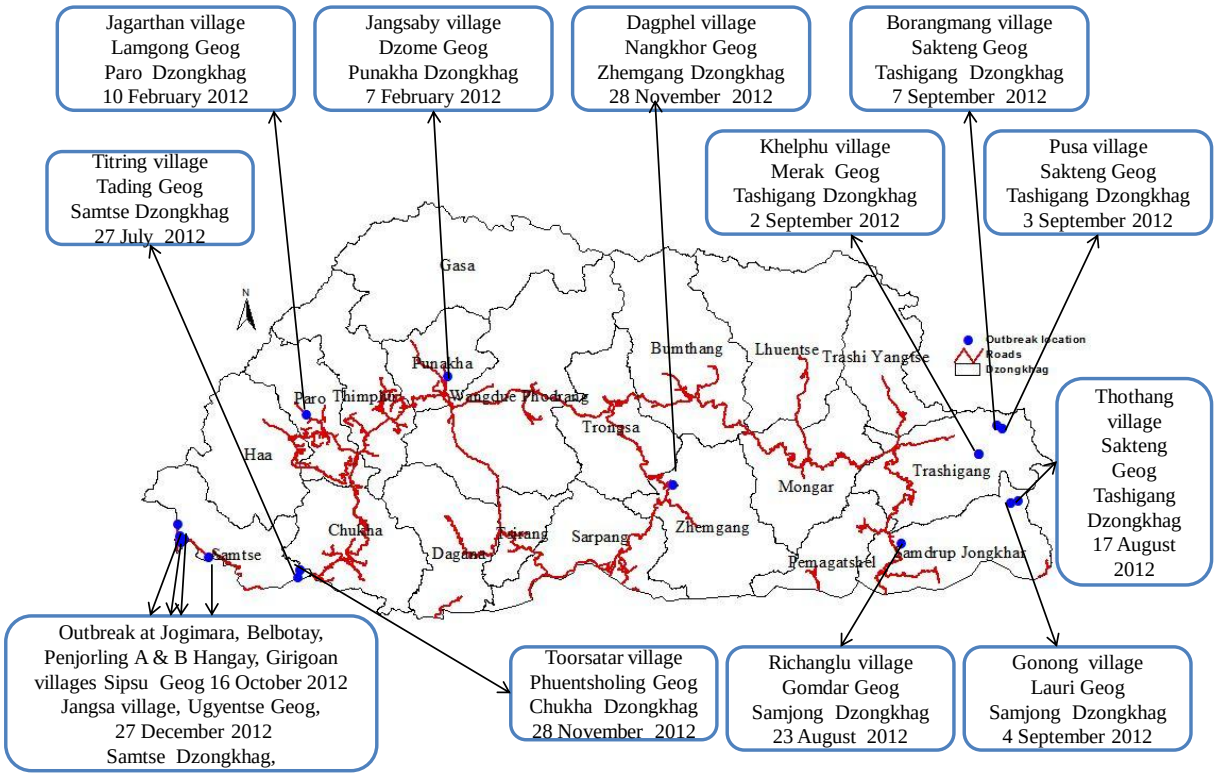

Figure 5: Distributions of reported FMD outbreaks in domestic animals during 2012 (Source: TADInfo system, 2012).

2.2. Rabies

Rabies is a fatal zoonosis transmitted mainly by the bite of rabid animals, predominantly domestic dogs. Globally rabies kills an estimated 55,000 people annually (1 death every 10 minutes) and affects mostly children below 15 years of age (Knobel et al., 2005). Most human rabies deaths are reported from developing countries in Asia (n=31000) and Africa (n=24000).

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.

Status of rabies from 1996 to 2012

Fifty-nine of the 205 geog (sub-districts) reported rabies in animals from 1996 to 2012 with increased incidences in the four districts in southern Bhutan (Samtse, Chukha, Sarpang, Samdrup Jongkhar), an area located close to the border towns of India (Fig. 6) (Tenzin et al., 2011).

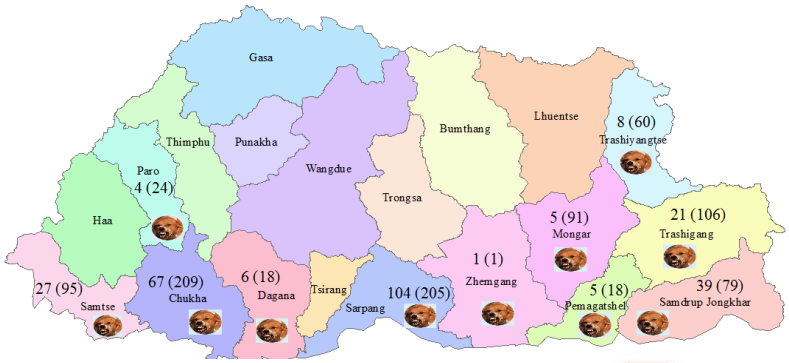

Figure 6: Distribution of reported rabies outbreak at the Dzongkhag level in Bhutan (1996–2012). The numerical number indicates the number of reported rabies outbreak and the number in the enclosed bracket ( ) is the reported number of rabies cases in dogs and other domestic animals (1996 – 2012). (Source: Tenzin et al., 2010; 2012; TADInfo database, NCAH).

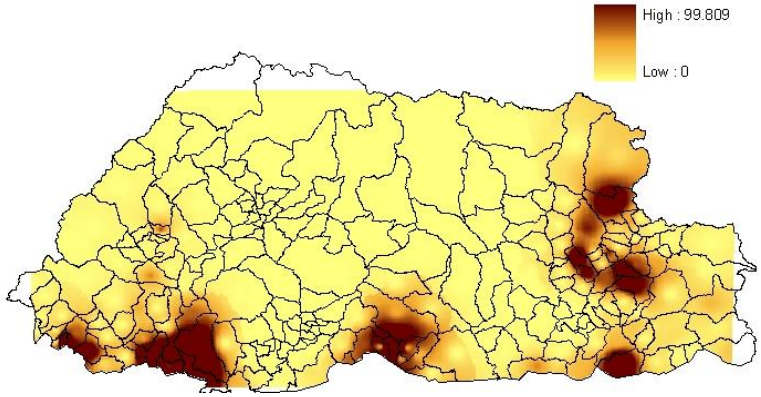

Figure 7: Spatial distribution of rabies cases in domestic animals in Bhutan during the period 1996–2009, interpolated by inverse distance weighing (IDW). The map demonstrates that there is high risk of rabies occurrence in south Bhutan especially in south west, south central and south east Bhutan along border with India (Source: Tenzin et al., 2012).

A total of 905 rabies cases were reported during the 17-year period (1996 – 2012), of which cattle and domestic dogs accounted for 53% (479/905) and 40% (358/905) of the cases, respectively. The remaining 7% of the cases (68/905) were reported in horses, cats, pigs, goats and sheep (see Annexure 21) (Tenzin et al., 2011b; Tenzin et al., 2012; TADInfo system, 2012).

Figure 8: Death of farm animals due to rabies (Picture courtesy: Dr. Tenzin)

The trend of the rabies outbreak in domestic animal was almost stable from 1996 to 2005, but the incidence increased during 2006 and 2008, contributed by major rabies outbreak in eastern Bhutan during 2006 and in Chhukha and Samtse Dzongkhags in 2008 (Tenzin et al., 2010 a,b) (see Fig. 9). The outbreaks remain stable between 2009 and 2012 with 17 outbreaks reported every year (See Fig. 9). Rabies outbreaks were found to have been reported throughout the year with more reports during spring and summer months (Fig. 10 and 11).

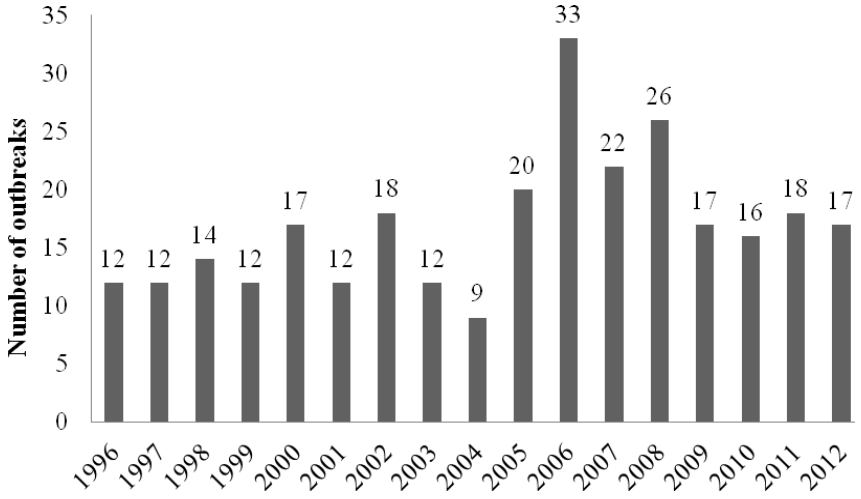

Figure 9: Annual pattern of reported rabies outbreaks in Bhutan at the village level (1996 – 2012) (Tenzin et al., 2011; TADInfo dataabse, 2012)

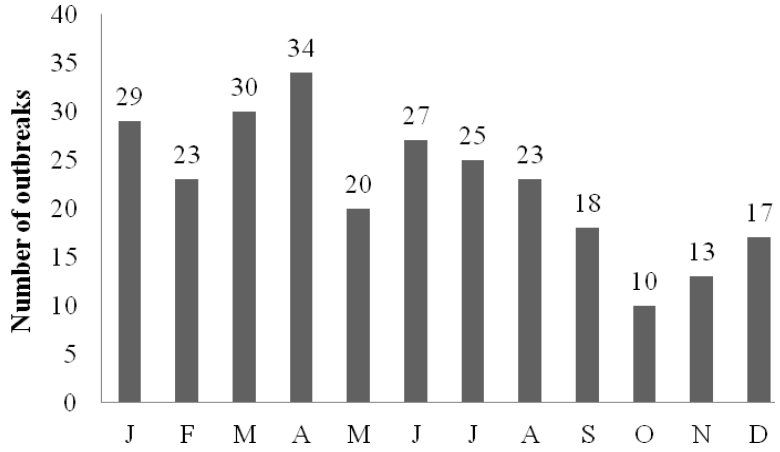

Figure 10: Monthly distribution of reported rabies outbreak in Bhutan (1996 – 2012) (Source: Tenzin et al., 2011;TADInfo database, 2012).

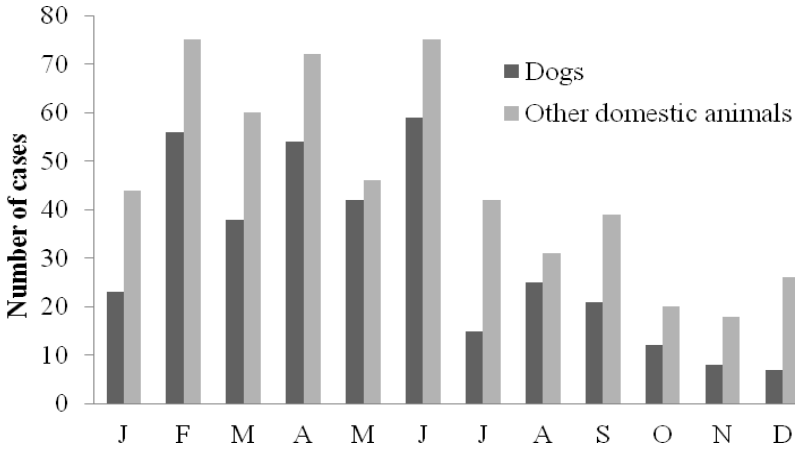

Figure 11: Monthly distribution of reported rabies cases in dogs and other domestic animals (cattle, horses, cat, goat, pig, sheep) in Bhutan (1996 – 2012) (Source: Tenzin et al., 2011; TADInfo database, 2012).

Sporadic human deaths from rabies were also reported in the south rabies endemic Dzongkhags of Bhutan. For instance, 15 human deaths (mostly children) were reported between 2006 and 2011, accounting for about 2.1 deaths per 100 000 population with 5 deaths reported in 2011. No human rabies deaths have been reported during 2012 (Annual Health Bulletin 2011; Tenzin et al., 2012). However, all human rabies cases were diagnosed based on dog bite history and typical clinical signs of rabies and no samples were tested to confirm the diagnosis.

Outbreak trend of rabies in 2011 and 2012

During 2011 and 2012, 35 rabies outbreaks were reported from 15 geogs under Samtse, Chukha, Dagana, Chukha and Samdrup Jongkhar Dzongkhags (see Fig. 10 and 12, Annexure 3 and 4). The trend of the reported numbers of outbreaks remained stable at about 17 outbreaks each year between 2009 and 2012 and were mainly reported from

the previously rabies endemic areas in south Bhutan except in Tading geog under Samtse where it was reported for the first time. An isolated case of rabid cow in Jamkhar under Trashiyangtse was associated with movement of rabies infected cow from Dewathang (cow might have been bitten by raid dog in Dewathang) to Jamkhar (see Annexure 3 and 4). The details of rabies outbreaks during 2011 and 2012 are shown in Fig. 12 and Annexure 3 and 4. In humans, five human rabies death were reported from south rabies endemic Bhutan, but no cases were reported in 2012.

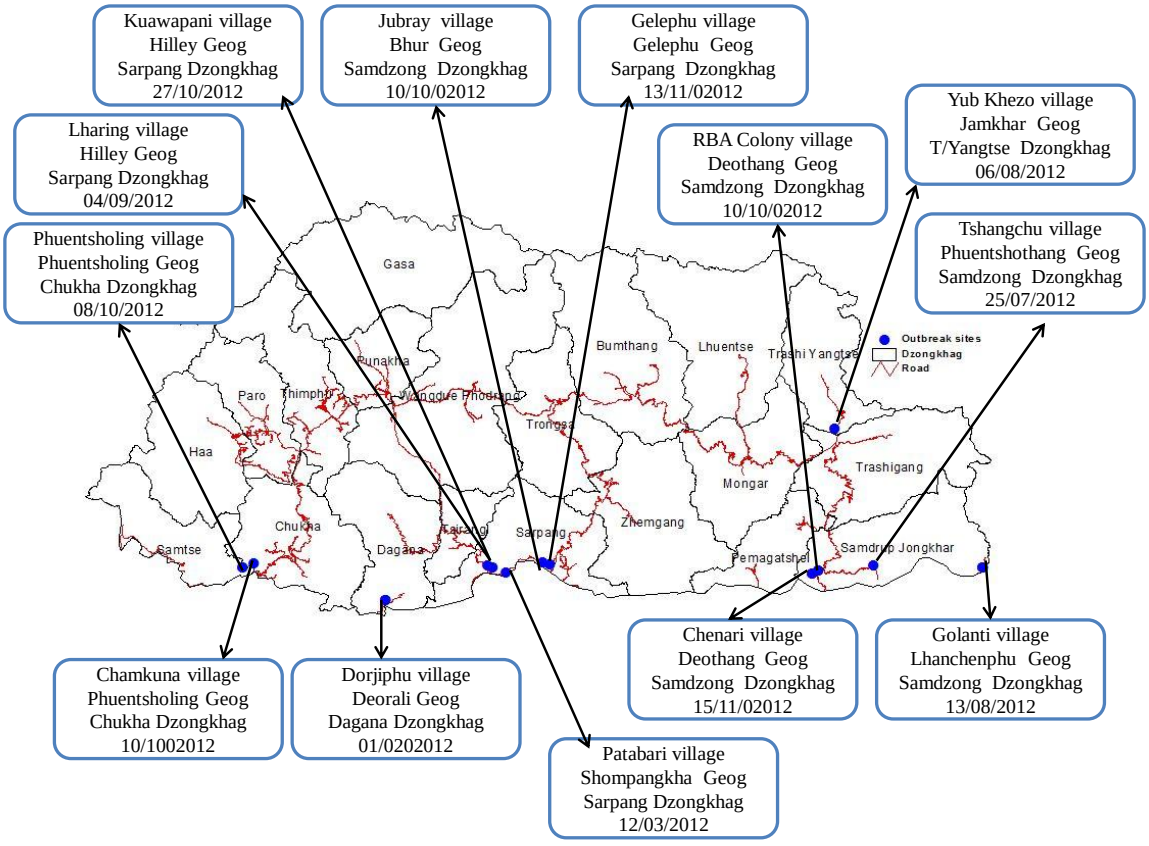

Figure 12: Distribution of reported rabies outbreaks in domestic animals in Bhutan during 2012 (Source: TADInfo system, 2012)

The rabies cases in domestic animals are diagnosed based on clinical signs, epidemiology and later confirmed by laboratory test conducted in the field (using rapid antigen detection test) as well as using fluorescent antibody test (See Fig. 13).

Figure 13: Collection of brain sample for rapid antigen test and FAT (Picture courtesy: Dr. Tenzin)

A nation-wide catch-neuter-vaccinate-release (CNVR) program has been implemented since 2009 and is implemented throughout the country for the prevention and control of rabies. During the first phase (September 2009 to June 2012, inclusive) of the program, a total of 38,575 dogs have been sterilized and vaccinated in 20 Dzongkhags with an estimated coverage of 73%. The second phase (July 2012 to June 2015) of the program is ongoing and is expected to cover > 80% of the dog population in Bhutan. The program has also covered about 700 dogs across the border (Dathgari and Jaigon town) in India during 2012.

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 unclotted tarry blood from natural orifices, rapid bloating and absence of *rigor mortis*.

Status of anthrax between 1998 and 2012

In Bhutan, anthrax cases are sporadically reported in domestic animal, primarily in cattle. Between 1998 and 2012, anthrax outbreaks have been reported in Samtse, Dagana, Chukha, Zhemgang, Wangdue, Mongar, Trashigang, Tsirang, Trongsa, Haa and Sarpang (Fig. 14 and Annexure 5) (VIS, 2009; TADInfo system, 2012). However, a major anthrax outbreak occurred at Kagtong village under Ngangla geog, Zhemgang Dzongkhag in 2010. The disease affected 14 households and caused death of 25 cattle, 8 horses, 4 pigs and 6 cats. In addition, nine people had contacted cutaneous form of anthrax through handling or eating the meat from the animals died due to anthrax, and one person died due to suspected pulmonary form of anthrax (Fig. 15). The outbreak in Kaktong in Zhemgang was controlled by mass antibiotic treatment, ring vaccination of domestic animals, mass awareness campaign and safe

disposal of carcasses and meat derived from infected animals. Anthrax has also caused human deaths in Trongsa in 1989 and Wangdue in 1998 through consumption of meat derived from anthrax infected animals (VIS, 2009).

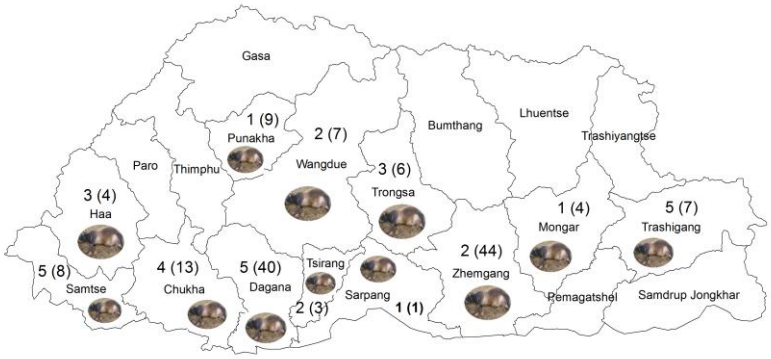

Figure 14: Reported anthrax outbreak in animals in Bhutan at the Dzongkhag level (1998 – 2012). The numerical numbers indicate the number of outbreaks whereas the number within the bracket ( ) indicate the number of cases in domestic animals (Source: VIS, 2009 and TADInfo database, 2012).

Figure 15: Sudden death, rapid bloating and discharge of unlclotted blood from the nostrils in animal carcasses; characteristic skin lesion (eschar) on hand and leg in human (cutaneous form of anthrax in human) (picture courtesy: Dr. NK Thapa).

Outbreak trend of anthrax in 2011 and 2012

Anthrax cases in animals have re-emerged in the recent years. For instance, during 2012, 11 outbreaks of anthrax have been reported in Trongsa, Trashigang, Samtse, Haa, Dagana, Sarpang and Chhukha and caused reported deaths of 21 cattle as compared to only two outbreaks in 2011 (Fig. 16 and Annexure 6). However, some cases may have gone unreported both in animals and in humans due passive reporting system and absence of clear control guidelines.

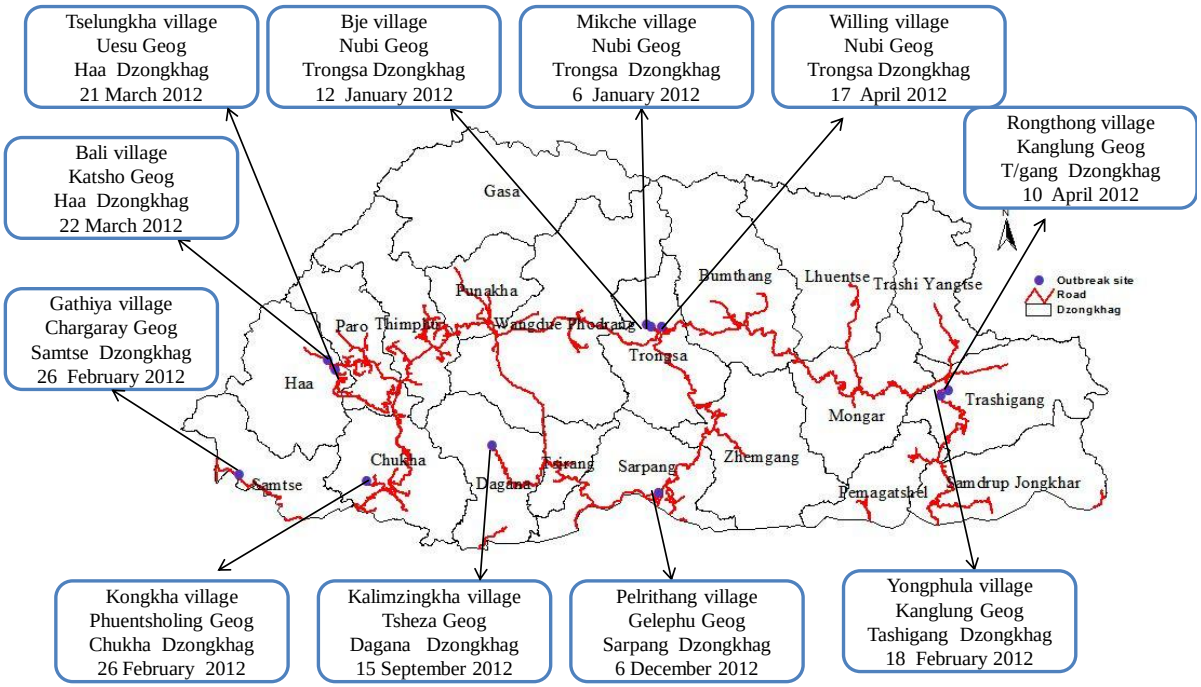

Figure 16: Reported anthrax outbreak in animals in Bhutan during 2012 (Source: TADInfo database, NCAH).

Anthrax in animals is diagnosed based on clinical signs (e.g. sudden deaths, discharge of unclotted tarry blood discharge from natural orifice), rapid bloating, and further confirmed by laboratory test (Fig. 17).

Figure 17: Tarry blood discharge from nostril in anthrax infected carcases and rod shaped chain *B. anthracis* organism observed under microscope (Picture courtesy: Dr. Kuenzang Gyeltshen)

Anthrax is usually controlled through massive antibiotic treatment and ring vaccination of animals in the outbreak areas. No routine vaccination is being conducted in Bhutan except in the outbreak areas for continues 3 years. Vaccination should be discontinued if no cases are reported in 3 years time. Anthrax spore vaccine is produced at the NCAH and distributed to the Dzongkhags based on the need and disease epidemiology.

It is also important that the farmers are made aware about the signs and symptoms of anthrax in animals and proper zoo sanitary measures to follow during the outbreak as most of the farmers open carcasses and consume meat derived from dead animals.

3. Diseases in cattle

3.1. Black Quarter

Black quarter (BQ) or Blackleg is an acute, febrile disease of cattle and sheep caused by *Clostridium chauvoei* and characterized by emphysematous swelling, usually in the heavy muscles (clostridial myositis). Spores of *Clostridium chauvoei* remain viable in the soil for many years and are the source of infection. The animal gets infection through ingestion of the organisms.

Status of Black Quarter disease between 1998 and 2012

In Bhutan, BQ outbreaks have been reported sporadically from Bumthang, Chhukha, Dagana, Gasa, Haa, Samtse, Sarpang, Wangdue, Lhuentse, Trashigang, Mongar, Paro, Punaka, Trongsa and Zhemgang. Figures 18 and 19 demonstrate the annual and seasonal pattern of reported BQ outbreak in Bhutan between 1998 and 2012. There is no seasonal variation in its occurrence and have been found to be reported throughout the year.

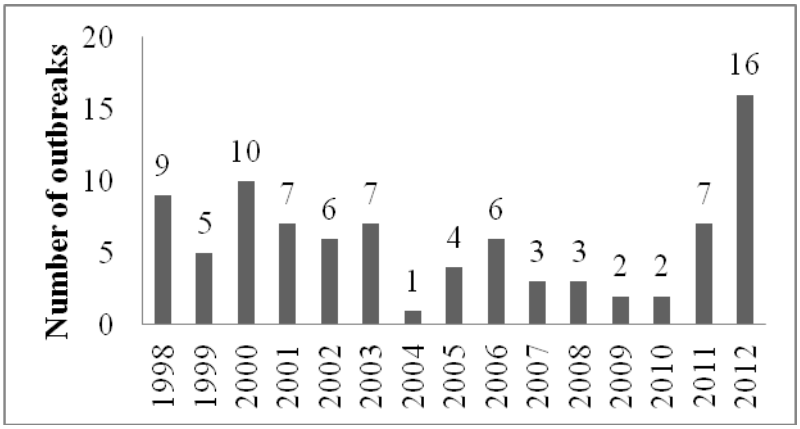

Figure 18: Annual distribution of reported BQ outbreaks in animals in Bhutan (1998 – 2012) (Source: VIS and TADInfo databse, NCAH).

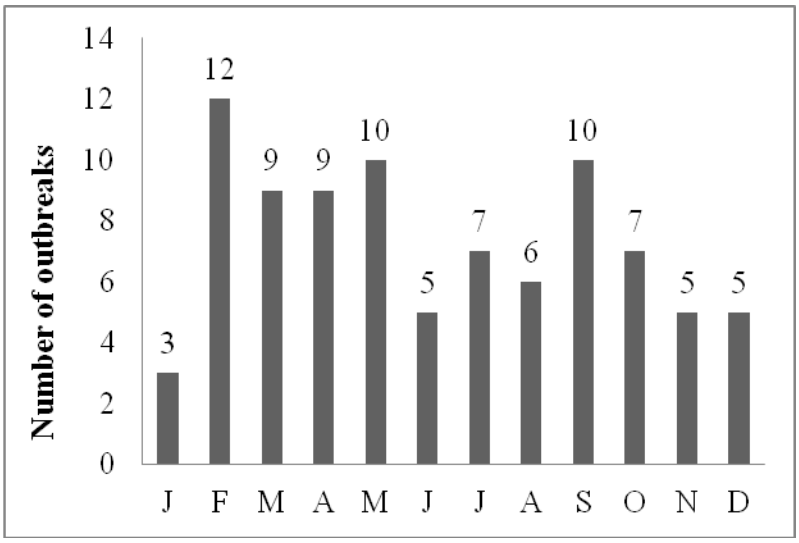

Figure 19: Monthly distribution of reported BQ outbreaks in animals in Bhutan (1998 – 2012) (Source: VIS and TADInfo database, NCAH)

Outbreak trend of BQ in 2011 and 2012

During 2011, eight outbreaks of BQ have been reported in Trashigang, Trashiyangtse, Lhuentse, Bumthang, Paro, and Wangdue Dzongkhags, and caused deaths of 10 cattle whereas 16 outbreaks have been reported from different Dzongkhags during 2012 and caused death of 34 cattle (Annexure 7) (TADInfo system). The spatio-temporal distribution of BQ outbreaks during 2012 is shown in Fig. 20.

BQ vaccine is produced at the NCAH, Serbithang and is being distributed in the field for annual vaccination program

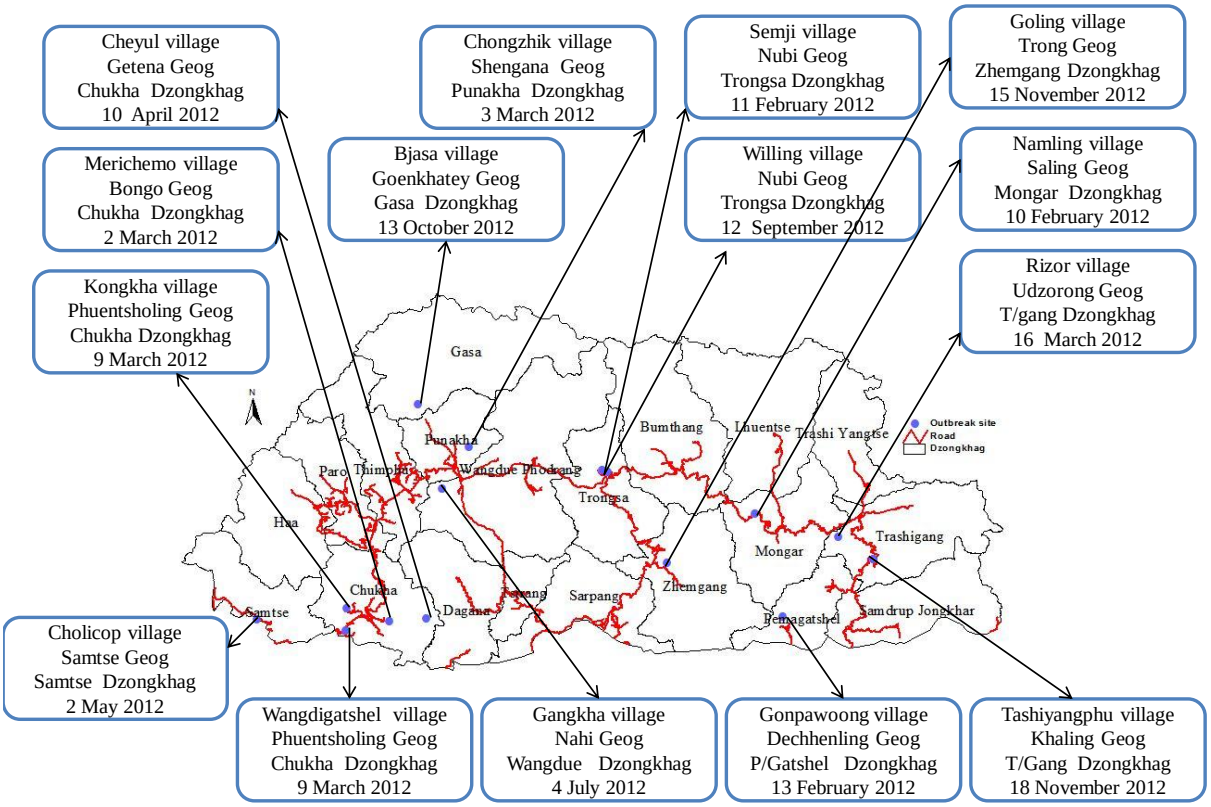

Figure 20: Distribution of reported BQ outbreak in animals in Bhutan during 2012 (Source: TADInfo database, NCAH).

3.2. Hemorrhagic septicaemia

Hemorrhagic septicemia (HS) is an acute, highly fatal disease of cattle caused by particular serotypes of *Pasteurella multocida.* HS is seen infrequently in swine and even less commonly in sheep and goats. Although HS may be seen at any time of year, is commonly occurring during the rainy season. The disease causes severe economic losses through morbidity and mortality and can be prevented by vaccination.

Status of HS outbreaks between 1998 and 2012

In Bhutan, HS is sporadically reported in cattle every year. A total of 20 outbreaks have been reported between 1998 and 2012 with a report of 209 cases and 122 deaths of cattle (Annexure 8). During 2011 and 2012, three HS

outbreaks have been reported at Dungna and Rubesa geogs under Chukha and Wangdue Dzongkhags, respectively (Annexure 8). A total of 35 cattle have died during this outbreak. HS is diagnosed based on clinical signs as well as by laboratory test.

HS vaccine is produced at the NCAH, Serbithang and is being distributed in the field for annual vaccination program.

4. Swine Diseases

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 (eg. Swill feeding). The new outbreaks of CSF will have serious economic impact in densely populated pig farming areas and in those countries that are free from infection.

Only sporadic cases of CSF are reported in village pigs in Bhutan. The sero-surveillance studies carried out in 1999 indicated a sero-prevalence of 5.8% in the survey area in Bhutan (Raika, 1999). Although CSF vaccine is being produced and available at NCAH, vaccination has been very limited due to practical field difficulties in the village pigs. Pigs in the government farms are regularly vaccinated (first launched in 1974) and are free from disease.

Status of CSF outbreaks between 1998 and 2012

A total of 10 outbreaks have been reported between 1998 and 2012 and caused death of 121 pigs in the villages of Bhutan. The distribution of CSF outbreaks in Bhutan between 1998 and 2012 is shown in Annexure 9

During 2011 and 2012, only two outbreak of CSF has been reported in Wangdue and Punakha (see Annexure 9). CSF is diagnosed based on clinical signs and also by laboratory test.

5. Poultry diseases

5.1. Highly Pathogenic Avian Influenza

The first outbreak of the Highly Pathogenic Avian Influenza (HPAI) H5N1 (Bird flu) in Bhutan was first reported on 17 February, 2010 at Rinchending, Phuentsholing geog under Chukha Dzongkhag. A total of 5379 poultry birds were culled, 800 eggs destroyed, 578 coops burnt to control the disease in 2010. The outbreak affected 517 poultry farmers in 35 villages (Animal Health Bulletin, 2010). The disease was successfully controlled using 3-D operation (depopulation of birds, disposal, and decontamination) in the outbreak areas.

However, the outbreaks continued to occur in backyard poultry farms in four Dzongkhags (Chhukha, Thimphu, Mongar, and Dagana) during late 2011 and in 2012 (Fig. 21). The chronology and distribution of the H5N1 outbreaks during 2011 and 2012 is shown in Fig. 21.

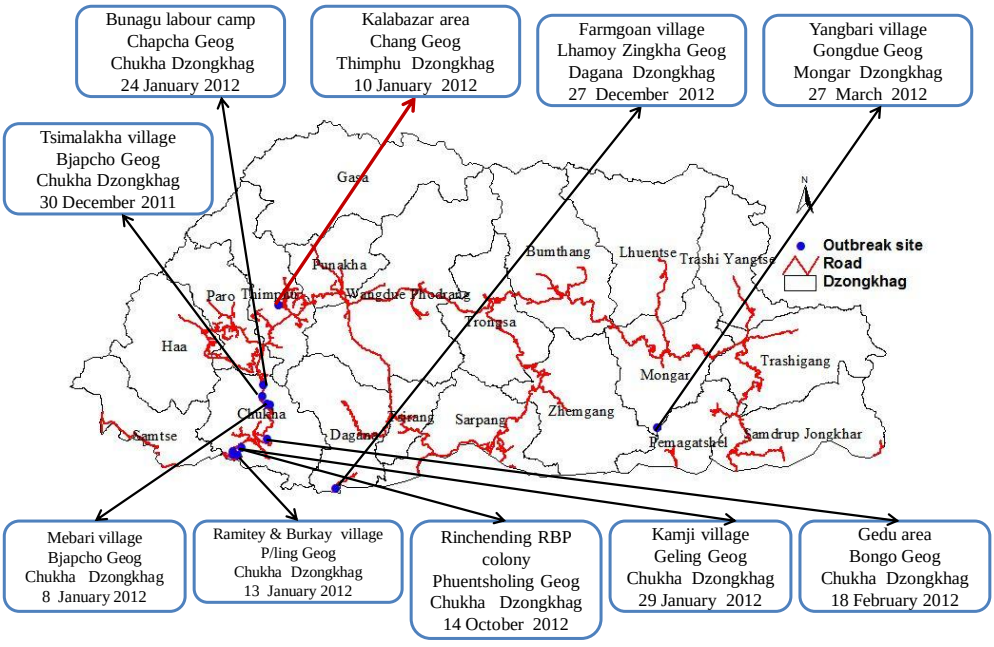

Figure 21: Distribution of HPAI (H5N1) outbreaks in poultry in Bhutan during 2011 and 2012 (Source: TADInfo database, 2012).

During 2011, the first outbreak was reported on 30 December 2011 in Tsimalaka village under Chhukha Dzongkhag and spread to nearby villages especially around the road points and high way. The 3D operations were conducted to contain the spread of the disease. On 13 January 2012, another outbreak of H5N1 was confirmed at Ramitey and the nearby village Wangdigatshel (15 February 2012) under Phuentsholing geog.

The disease was then reported in Bunakha (in GREF labour camp) under Chapcha geog in Chukha on 24 January 2012. Later, the disease was reported from Kamji village (reported on 29 January 2012) under Geling geog and then from Gedu area (was confirmed on 18th February 2012) under Bongo geog. The 3D operations were conducted in all these outbreaks areas to contain the disease. The last outbreak under Chukha Dzongkhag occurred at Burkhey village under Sampheling geog on 3 March 2012.

Under Thimphu Dzongkhag, the first outbreak occurred on 10th January 2012 at the Kala Bazaar (in a colony of temporary settlement, where the people live in dense proximity and rear poultry birds), Chang geog following outbreak at Tshimalakha in Chukha. As soon as the disease was confirmed, the 3D operation was carried out to contain the disease. The source of the outbreak was unknown but believed to be due to illegal imports of infected poultry meat.

On 27 March 2012, an isolated outbreak was reported at Yangbari village under Mongar Dzongkhag. The disease was confirmed by RT-PCR conducted at NCAH as well as from Bhopal. However, no 3D operation has been implemented since all birds have died within short period of infection. The source of this outbreak was from importation of infected poultry meat from across the border by the labourers.

On 14 October 2012, another outbreak was confirmed in a backyard poultry farm at Rinchending (Kharbandi), Phuentsholing geog under Chukha Dzongkhag. The outbreak occurred among Tsethar birds in RBP colony. The 3D operation was conducted to contain the outbreak.

The last outbreak during 2012 occurred at Farmgaon village under Lhamoizingkha geog in Dagana on 27 December 2012. The 3D operation was conducted to contain the outbreak. Although no definitive source could be confirmed in this outbreak, was believed to have occurred due to importation of infected poultry birds from across the border. Later, another case was detected at Majhigaon village (9 January 2013) under the same geog in Dagana.

The basis for diagnosis of H5N1 was based on characteristics clinical signs (rapid death, cyanosis of comb and wattle, subcutaneous haemorrhage, salivation often accompanied by bloody discharge) and by laboratory confirmation. The samples collected from all outbreak areas were tested positive to rapid test against Avian Influenza

A virus and H5 colloidal tests and latter confirmed H5N1 using RT-PCR test conducted at the National Centre for Animal Health, Serbithang and at the High Security Animal Disease Laboratory Bhopal, India.

5.2. Newcastle disease

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

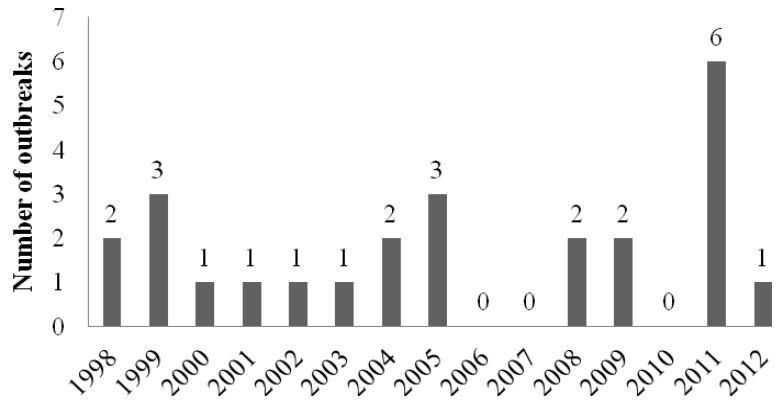

Figure 22: Annual distribution of reported NCD outbreaks in poultry in Bhutan (1998 – 2012) (Source: VIS and TADInfo system)

NCD incidence in poultry is reported sporadically in Bhutan and cause morbidity and mortality of poultry birds. A total of 25 isolated outbreaks have been reported between 1998 and 2012 in Thimphu, Samtse, Chhukha, Paro, Sarpang, Samdrup Jongkhar, Tsirang, Bumthang, Trongsa and Wangdue Dzongkhags (See Fig. 22). However, most of the ND cases remain unreported due to small and scattered nature of flocks in the villages.

Six NCD outbreaks have been reported during 2011 from Samtse, Paro, Bumthang and Tsirang and one outbreak in 2012 from Tsirang Dzongkhag (see Annexure 9). Most of the cases are diagnosed based on clinical signs. Effective surveillance system is required to detect the cases.

The disease can be prevented by vaccination. Thermostable vaccine (I_2 strain) was introduced in Bhutan in 1999—2000, typically administered to poultry by mass application in drinking water to chick at the age of 7-10 weeks and then booster administration every 3 to 4 months. Concurrently, NDV1 and R_2B vaccines were also used in the poultry farms and commercial farms. Vaccination against NCD in government poultry farms is mandatory, but in village chickens vaccination is poor due to the small and scattered nature of flocks.

5.3. Infectious Bursal Disease

Infectious bursal disease (IBD) or Gumboro is highly contagious disease of poultry, caused by a birnavirus (infectious bursal disease virus; IBDV). The virus is shed in the feces and transferred from house to house by fomites and difficult to eradicate from premises. The contaminated farm has to be disinfected thoroughly after depopulation to control the disease. Live vaccines of chicken embryo or cell-culture origin and of varying low pathogenicity can be administered by eye drop, drinking water, or SC routes at 1–21 days of age to prevent from the diseases.

Gumboro disease in chicken in Bhutan was first reported in poultry breeding farm at Paro in 1993-1994 and then at Lingmethang poultry farm in 2001, introduced through importation of chicks. About 16,473 birds were depopulated in these two farms to control the disease. Since then it has been sporadically reported in the village chickens or semi-commercial farms in Bhutan. The details of reported IBD in Bhutan between 1998 and 2011 are shown in Annexure 10. Only one outbreak of IBD was reported in Daragoan village under Lhamoizingkha, Dagana in 2011. However, many cases may have gone unreported due to passive reporting system and scattered nature of poultry farming in Bhutan.

6. Conclusions

During 2011 and 2012, the major notifiable disease outbreaks reported in the country was Bird flu that affected three Dzongkhags of Chhukha, Thimphu and Dagana. The disease had huge economic impacts to both the farmers and the government in terms of loss of poultry birds and production as result of containment program and government expenses on surveillance and control program. Other notifiable diseases that increased its incidence and spread during 2011 and 2012 as compared to past were, FMD, Anthrax and BQ.

7. Way Forward to strengthen the reporting system for notifiable diseases

- The reporting of notifiable disease outbreak is important for minimizing the impact of disease to the community/government and also to help the planners to institute a better preventive and control programs.
- The reporting should be done as promptly as possible to institute rapid response and to contain the outbreak.
- The disease profile should be updated regularly in TADInfo database by the TADInfo focal unit
- Whenever a notifiable disease is reported it has to be followed up weekly and reported to the Regional

Livestock Development Centre and NCAH every month till the disease has subsided.

- Reporting of notifiable disease is mandatory on the part of the owners and veterinary personnel and should be taken seriously.

Acknowledgements

The DPCU 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.

8. Annexes

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

Date of outbreak	Village	Geog	Dzongkhag	Species	Cases	Deaths
February 23, 2011	Sertsho	Toetsho	Trashiyangtse	Cattle	26	0
March 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
September 9, 2011	Belbotay	Sipsu	Samtse	Cattle	20	0
September 14, 2011	Titring	Tading	Samtse	Cattle	69	0
February 6, 2012	Jangsaby	Dzome	Punakha	Cattle	27	0
February 10, 2012	Jagarthan	Lamgong	Paro	Cattle	8	0
May 9, 2012	Phuentsholing	Phuentsholing	Chukha	Cattle	33	5
July 27, 2012	Titring	Tading	Samtse	Cattle	146	2
August 21, 2012	Richanglo	Gomdar	S/Jongkhar	Cattle	47	1
August 20, 2012	Gonong	Shingkhar Lauri	S/Jongkhar	Cattle	30	1
August 4, 2012	Thothang	Shingkhar Lauri	S/Jongkhar	Cattle	30	1
September 3, 2012	Pusa	Sakteng	Trashigang	Cattle	30	0
September 7, 2012	Borangmang	Sakteng	Trashigang	Cattle	43	0
September 2, 2012	Khelphu	Merak	Trashigang	Cattle	111	12
October 16, 2012	Giri Gaon	Sipsu	Samtse	Cattle	72	1
October 16, 2012	Penjorling A	Sipsu	Samtse	Cattle	19	0
October 16, 2012	Penjorling A	Sipsu	Samtse	Buffalo	4	0
October 16, 2012	Peljorling B	Sipsu	Samtse	Cattle	119	1
October 16, 2012	Jogimara	Sipsu	Samtse	Cattle	14	0
October 16, 2012	Hangay	Sipsu	Samtse	Cattle	50	0
October 16, 2012	Hangay	Sipsu	Samtse	Buffalo	5	0
October 18, 2012	Khelphu	Merak	Trashigang	Cattle	387	3
November 15, 2012	Mujuwa/Tundara	Namgyel Chhoeling	Samtse	Cattle	24	0
November 15, 2012	Mujuwa/Tundara	Namgyel Chhoeling	Samtse	Buffalo	4	0
November 26, 2012	Dagphel	Nangkor	Zhemgang	Cattle	3	1
November 28, 2012	Torsatar	Phuentsholing	Chukha	Cattle	8	0
November 28, 2012	Torsatar	Phuentsholing	Chukha	Pig	1	0
December 26, 2012	Jangsa	Ugentse	Samtse	Cattle	12	0
Total					**1398**	**31**

Annexure 2: Total number of reported rabies cases in animals in Bhutan (1996 – 2012)

(Source: Tenzin et al., 2012; TADInfo system, 2012).

Year	Cattle	Dog	Horse	Cat	Pig	Goat	Sheep	Total
1996	8	10	0	0	0	0	0	18
1997	16	2	0	0	0	0	0	18
1998	28	32	0	0	0	0	0	60
1999	26	13	2	0	2	1	0	44
2000	15	4	1	0	1	0	0	21
2001	19	1	0	0	1	1	0	22
2002	26	20	1	0	0	0	0	47
2003	9	8	0	0	1	0	0	18
2004	12	4	2	0	2	0	0	20
2005	21	26	2	0	0	0	0	49
2006	138	103	5	3	2	0	0	251
2007	28	12	0	1	1	2	0	44
2008	72	65	4	7	2	2	0	152
2009	29	17	0	3	1	0	0	50
2010	9	8	0	0	0	0	0	17
2011	10	22	2	3	1	4	2	44
2012	13	11	0	3	1	2	0	30
Total	479	358	19	20	15	12	2	905

Annexure 3: Details of reported rabies outbreaks in domestic animals in Bhutan during 2011

(Source: TADInfo system, 2011)

Date of outbreak	Month	Place of outbreak	Geog	Dzongkhag	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	Phuntsholing	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	Phuenstholing	Phuenstholing	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	Jigmichhoeling	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	Sarpangtrar	Shompangkha	Sarpang	Dog	1
8/08/2011	August	Sarpangtrar	Shompangkha	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
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
24/10/2011	October	Darla	Darla	Chhukha	Dog	1
10/10/2011	October	Sibsuni	Lhamoizingkha	Dagana	Cattle	2
10/10/2011	October	Sibsuni	Lhamoizingkha	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	Phuntsholing	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	Trashiyangtse	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	September	S/Jongkhar	Dewathang	S/Jongkhar	Dog	1
4/09/2012	September	Laring	Hiley	Sarpang	Cat	1
12/09/2012	September	Golanti	Langchhenphu	S/Jongkhar	Cattle	1
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	November	Chenari	Dewathang	S/Jongkhar	Cattle	1
15/11/2012	November	Chenari	Dewathang	S/Jongkhar	Cat	1
15/11/2012	November	Chenari	Dewathang	S/Jongkhar	Dog	1
13/11/2012	November	Gelephu	Gelephu	Sarpang	Cattle	1

Annexure 5: Details of reported anthrax outbreaks in domestic animals in Bhutan (1998–2012) (Source: VIS and TADInfo system, NCAH).

Year	Outbreak*	Death	Species affected	Geog	Dzongkhag
1998	2	2	Cattle	Kazhi	Wangdue
1999	3	9	Cattle, Pig	Dzomi, Khaling	Punakha, Trashigang
2000	3	6	Cattle	Samtse, Phuentsholing, Silambi	Samtse, Chhukha, 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, Lhamoizingkha	Chhukha, 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	11	20	Cattle	Nubi, Kanglung, Sangacholing , Uesu, Katsho, Tseza, Phuentsholing , Gelephu	Trongsa, Trashigang, Samtse, Haa, Dagana, Chhukha, Sarpang
Total	34	145			

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

Annexure 6: 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 7: Details of reported BQ outbreaks 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, Tashiyangphu	Khaling	Trashigang	1	1
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
September 19, 2011	Amtse	Gangzur	Lhuentse	1	1
December 20, 2011	Dorjibee	Chhokhor	Bumthang	1	1
February 3, 2012	Chongzhik	Shengana	Punakha	3	2
February 11, 2012	Semji	Nubi	Trongsa	1	1
February 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
September 11, 2012	NNBF, Tashiyangphu	Khaling	Trashigang	1	1
October 13, 2012	Bjasa	Goenkhame	Gasa	3	3
October 20, 2012	NNBF, Tashiyangphu	Khaling	Trashigang	1	0
November 18, 2012	NNBF, Tashiyangphu	Khaling	Trashigang	1	1
September 21, 2012	Willing	Nubi	Trongsa	1	1
November 15, 2012	Goling	Nangkor	Zhemgang	4	4
Total				**53**	**44**

Annexure 8: Details of HS outbreak in cattle in Bhutan (1998 – 2012) (Source: VIS and TADInfo system, NCAH).

Year	Outbreak	Cases	Death	Geog	Dzongkhag
1998	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, Bjachho	Sarpang, Chhukha
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 9: Details of CSF outbreaks in pigs in Bhutan (1998 – 2012) (Source: VIS and TADInfo system, NCAH)

Year	Outbreak*	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, Chhubu, Thedtsho, Nanong	Paro, Punakha, Wangdue, Pemagatshel
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 10: 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 11: 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		

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