National Centre for Animal Health

Annual Progress Report

FY 2020 – 2021

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ROYAL GOVERNMENT OF BHUTAN
Ministry of Agriculture and Forests
Department of Livestock
NATIONAL CENTRE FOR ANIMAL HEALTH
Serbithang: Thimphu

Date: 25th July 2021

FOREWORD

The National Centre for Animal Health, Serbithang, Department of Livestock, Ministry of Agriculture and Forests, is pleased to release the Centre's Annual Progress Report for the Financial Year 2020 – 2021. The report highlights the progress, achievements, and experiences while undertaking the mandate of animal health services in the country. As the national competent centre for animal health, the centre has a very crucial role in supporting various animal health programmes under the livestock sector, with the ultimate objective of enhancing livestock production and food security in the country.

I, on behalf of the management of the National Centre for Animal Health, Serbithang, would like to acknowledge the Director and the Chief of various Divisions under the Department of Livestock for their continuous guidance and support to the Centre.

My sincere heartfelt appreciation goes to all the Regional Directors, Programme Directors, Dzongkhag Livestock Officers, Farm managers, and all the Veterinarians and Veterinary paraprofessionals for their continued support in the successful implementation of animal health programmes in their respective jurisdictions.

I also extend appreciation to the Department of Public Health and Bhutan Agriculture and Food Regulatory Authority for their continued support and cooperation in the prevention and control of animal diseases, and relevant international partners for their technical and financial supports rendered for the implementation of animal health activities in the country.

Lastly, I would like to thank all the Unit Heads and the staff at the Centre for their invaluable contributions in achieving the Centre's mandates, and more importantly, for documenting all the activities undertaken and coordinating to publish this document as an annual event.

Tashi Delek!

Dr R.B. Gurung
Programme Director

EXECUTIVE SUMMARY

During the financial year 2020 – 2021, the National Centre for Animal Health (NCAH), Serbithang, Thimphu, collected and processed a total of 3,552 samples and 8,843 different laboratory tests were performed for routine diagnosis, disease outbreaks, disease screening, surveillance and research activities.

New laboratory diagnostic techniques were introduced in the Centre for diagnosis of important emerging animal diseases such as Lumpy skin disease (LSD), Capripox, African swine fever (ASF), etc. The national external quality assurance system (NEQAS) was also coordinated and conducted for the four Regional Livestock Development Centres (RLDCs), for *Brucella* Rose Bengal Test (RBT).

In strengthening disease prevention, control and elimination programmes in the country, the Centre, in collaboration with other relevant stakeholders, developed the National African Swine Fever Prevention and Control Plan 2021, the National Lumpy Skin Disease Prevention and Control Plan 2021, and the Standard Guideline for Listing of Notifiable Animal Diseases in Bhutan.

Vaccinations, routine or responsive, being one of the most important and common strategies for prevention, control and elimination of various infectious animal diseases, the Centre, during the FY 2020 – 2021, produced 7,200 doses of Classical swine fever vaccine and 2,876 doses of Anthrax vaccines, and procured livestock and poultry vaccines of worth BTN 6.5 M, and distributed them to the Dzongkhags and relevant Central agencies.

The Centre carried out on-time procurement and distribution of veterinary medicines and equipment to various animal health centres across the country. Veterinary medicines worth BTN 20.156 M and equipment worth BTN 15.66 M were procured and distributed to Dzongkhags and relevant agencies. Due to the Covid-19 pandemic and consequent movement restrictions, the Livestock Central Store in Phuentshogling was moved to the NCAH and operated to maintain uninterrupted animal health services delivery in the country.

The Centre, with the support from Waste Management and Stray Dog Population Control Flagship Programme, conducted mass dog population management campaigns in Paro, Bumthang, Tsirang and Trashigang dzongkhags; the average coverage of 87.5 per cent was achieved. Depending on the rabies endemicity and risk of outbreaks, the Centre supported mass dog vaccination campaigns in rabies high-risk gewogs under Samtse, Chhukha and Pema Gatshel; 89.62 per cent coverage in stray dog population was achieved. The centre also procured 30,000 numbers of microchip worth BTN 3.00 M to initiate Digital Identification and Traceability System (DITS) in dogs in the country.

In collaboration with relevant stakeholders, the Centre coordinated observation of the 14th World Rabies Day 2020, themed *"End Rabies: Collaborate, Vaccinate ",* through mass dog

vaccination campaigns and advocacy programmes. The World Antimicrobial Awareness Week 2020, with the slogan "Antimicrobials: handle with care" and the theme “United to preserve antimicrobials", was observed through a one-health advocacy meeting.

The Centre, in collaboration with various relevant stakeholders, carried out or initiated several disease surveillance and animal health research activities: in collaboration with the National Institute of Infectious Diseases, Japan – studies on important zoonotic diseases like Anthrax, Rabies and Crimean-Congo Hemorrhagic Fever (CCHF); National Highland Development Programme – prevalence of gid in yaks and *T. multiceps* in yak watchdogs and wild canids in all the highland areas; and National Organic Flagship Programme – Survey on ethnoveterinary medicines and practices in Bhutan.

In response to the COVID-19 pandemic, the centre participated through a one-health approach to face the pandemic; some veterinarians and laboratory professionals from the Centre were actively involved in the capacity of National Technical Advisory Group (TAG) members for COVID-19 and the laboratory surveillance team at the Royal Centre for Disease Control, MoH respectively. The centre also collected samples of dogs owned by the quarantined people for testing against COVID-19 at RCDC.

With the Covid-19 pandemic affecting the implementation of multiple activities during the previous financial year, activities for the FY 2020 – 2021 were planned strategically anticipating the lockdowns and movement restrictions during reported local transmission of COVID cases. Therefore, most of the planned activities could be implemented without much difficulty; however, a few activities targeting the southern districts or involving participants from these COVID high-risk areas, planned for implementation if the COVID situation improves, could not be executed.

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1. BACKGROUND

The National Centre for Animal Health (NCAH), Serbithang, is located about 12 kilometres away from Thimphu, the capital city of Bhutan. Initially, the Centre started as a Diagnostic Laboratory in 1978 in Chhubachu, Thimphu. Later, under the aegis of the United Nations Development Programme and Food and Agriculture Organization project, it was named as Royal Veterinary Diagnostic Laboratory (RVDL) and shifted to Serbithang in 1981. It was subsequently strengthened under European Union project assistance between 1991 and 1999 and was renamed as Royal Veterinary Epidemiology Centre (RVEC). In 2005, RVEC was renamed as National Centre for Animal Health (NCAH) and is one of the central programmes under the Department of Livestock (DoL), Ministry of Agriculture and Forests (MoAF). The Centre is responsible for animal disease diagnosis, disease prevention and control programme, and providing technical backstopping to Dzongkhags and livestock commodity centres. The Centre has a campus area of 8.8259 acres and has 39 staff. The Centre provides an excellent environment for aspiring leaders in animal health.

1.1. Mandates

- To function as the national referral laboratory for animal health.
- To function as the national centre for veterinary epidemiology.
- To ensure availability of quality veterinary medicines, vaccines and equipment.
- To function as an institute for capacity development in animal health.

1.2. Functions

- Develop, implement, and evaluate disease prevention and emergency response plans for livestock diseases and zoonoses.
- Support development of policies, strategies, and plans for animal health.
- Coordinate, monitor, and evaluate disease prevention and control programmes.
- Prioritize and research animal health.
- Liaise with national and international agencies for technical collaborations.
- Plan, coordinate, and conduct disease surveillance and animal health research in liaison with relevant agencies.
- Maintain and disseminate animal health and epidemiological information regularly.
- Provide referral services on laboratory diagnostic activities.
- Support capacity development in animal health programmes.
- Coordinate and implement antimicrobial resistance (AMR) studies in the veterinary sector through a one-health approach.
- Implement, monitor, and evaluate the management of veterinary medicines, vaccines, and equipment at the national level.
- Coordinate and implement stray dog population management programmes in the country.

1.3. Organogram

The Centre coordinates all national level animal health programmes in collaboration with the four Regional Livestock Development Centres (RLDCs) – Tsimasham, Wangdue Phodrang, Zhemgang and Kanglung; the Dzongkhag Livestock Sectors of twenty dzongkhags, and other relevant stakeholders.

The main functional units under the Centre are:

- Laboratory Services Unit (LSU)
- Disease Prevention and Control Unit (DPCU)
- Drug, Vaccines and Equipment Unit (DVEU)
- Biological Production Unit (BPU)
- Dog Population Management Unit (DPMU)

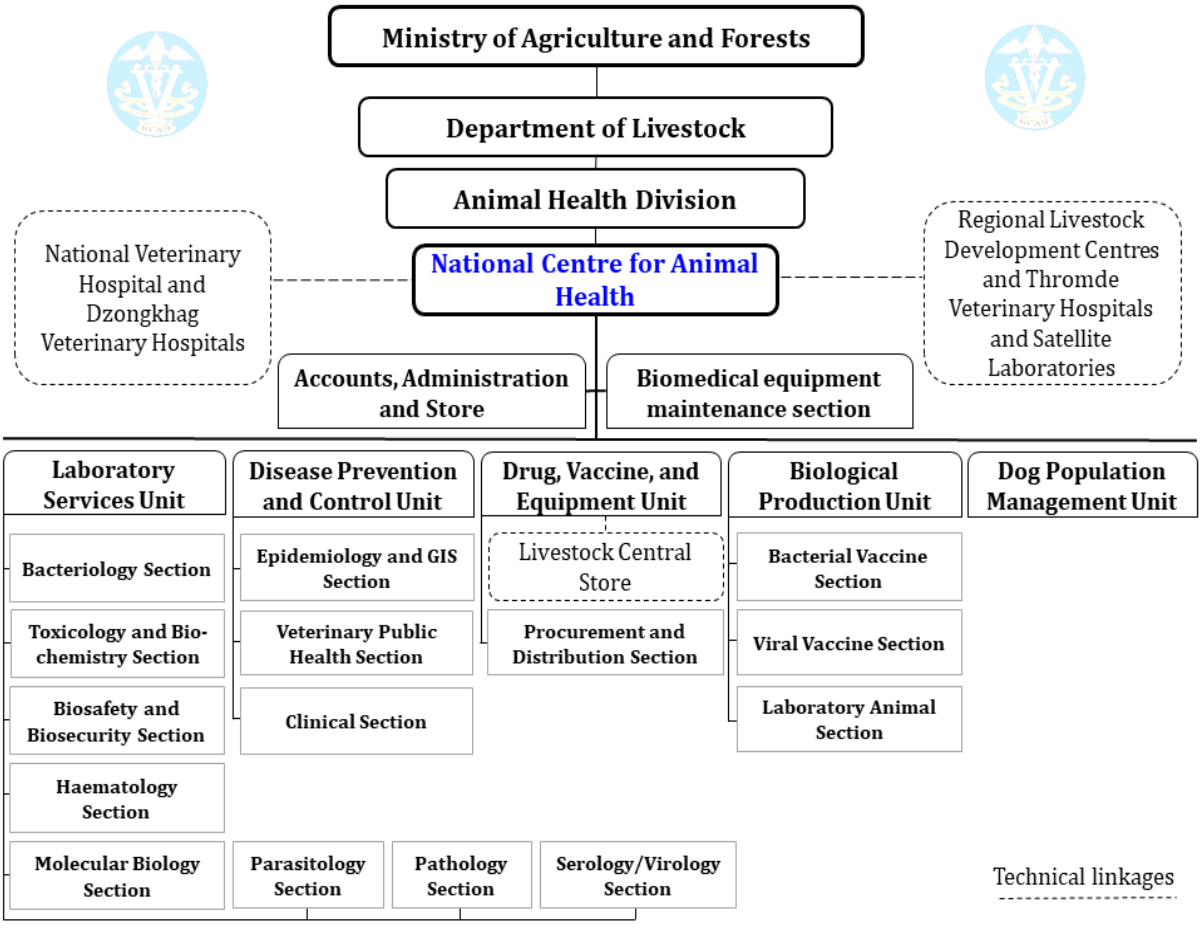


Figure 1: Organogram of NCAH

2. KEY ACHIEVEMENTS

The National Centre for Animal Health, Serbithang under the guidance of the Animal Health Division, Department of Livestock and through the support of Regional Livestock Development Centres, Dzongkhag Livestock Sectors, Livestock Commodity Centres, and other stakeholders achieved the following milestones during the FY 2020 – 2021.

2.1. Establishment and strengthening of laboratory diagnostic capacity

During the fiscal year, 2020 – 2021, a total of 3,552 samples were received or collected and 8,843 different laboratory tests were performed for routine diagnosis, disease outbreaks, disease screening, surveillance and research activities.

The following new diagnostic technologies for important diseases were established:

- Establishment of Cell culture facilities: installation of the CO2 incubator and trial conducted.
- Bacterial diagnostics techniques:
  - Isolation and identification of *Streptococcus equi*, *Campylobacter spp, Actinomyces spp, Moraxella spp, Escherichia fergusonii, Serratia rubideae, Proteus mirabilis, Clostridium perfringens* and *Enterococci.*
  - Antimicrobial sensitivity testing for *S. aureus*, *Escherichia fergusonii, Serratia rubideae, Proteus mirabilis, Campylobacter, Salmonella* and *Clostridum perfringens*
  - Detection of extended-spectrum beta-lactamases producing bacteria – *E. coli, Serratia rubideae* and *Proteu mirabilis.*
- Mycology diagnostic techniques: Isolation and identification of *Malassezia spp*
- Molecular diagnostics techniques: Real-time PCR for *Capripox, Pasteurella multocida*, *Mycoplasma*, ASF, PPR and LSD
- Serological diagnostic techniques: Porcine circovirus 2

2.2. Strengthened Disease Prevention and Control Programme in the country

2.2.1. Development of national disease prevention and control plans and guidelines

The Centre, in collaboration with other stakeholders, developed the following important animal health and disease prevention and control plan documents:

- Developed the National African Swine Fever Prevention and Control Plan 2021.
- Developed the National Lumpy Skin Disease Prevention and Control Plan 2021.
- Developed the Standard Guideline for Listing of Notifiable Animal Diseases in Bhutan.

2.2.2. Coordination of major disease outbreak investigations and containment

In collaboration with other stakeholders, the Centre coordinated in responding to the rapid containment of the following notifiable and emerging animal disease outbreaks in the country:

- African swine fever
- Anthrax
- Black quarter

- Foot-and-mouth disease
- Goat pox
- Haemorrhagic septicaemia
- Infectious bursal disease
- Lumpy skin disease
- Peste des petits ruminants
- Rabies

2.2.3. Strengthened animal disease information system

- Maintained validated data on notifiable and emerging animal disease outbreaks reported in Bhutan and submitted as immediate and six-monthly reports to the World Organization for Animal Health (OIE) through the WAHIS interface.
- Kept the field professionals and other stakeholders updated about the animal disease situations in the country on a real-time, near real-time basis, through the official webpage and fortnightly e-bulletins, respectively.
- Following collation and analysis of data concerning notifiable and emerging diseases reported in Bhutan, the Centre published the "Status of notifiable animal diseases in Bhutan, 2019".
- Management of Veterinary Information System (VIS) and animal health data validation carried out for the calendar years, 2016 to 2020.

2.3. Strengthened veterinary medicine, vaccine and equipment procurement, distribution and management system

2.3.1. Veterinary medicine and equipment procurement and distribution

- The fast-track tendering for medicines and vaccines for FY 2020-2021 was carried out and completed during FY 2019-2020.
- Although the supply chain was disrupted globally due to the COVID-19 pandemic, the unit was able to procure 95.6% of the total veterinary medicines (130/136) for which the supply orders were placed. The Veterinary medicines worth BTN 20.156 M were procured against the approved budget of BTN 18.5M during the FY 2020 – 2021. Similarly, the unit successfully procured 109 equipment/non-drug items from a total of 113 items worth BTN 15.66 M. A total of 7 items (6 medicines and 1 equipment) were procured through direct procurement.
- Veterinary medicines worth BTN 15.49 M were distributed to Dzongkhags, Central Farms/Agencies and other non-departmental agencies and Projects. Similarly, veterinary equipment/non-drug items worth BTN 13.03 M including cold chain equipment were distributed to Dzongkhags and Central agencies.
- After Phuentshogling was identified as a COVID-19 red zone, the Livestock Central Store (LCS) was translocated to the NCAH and managed the store for 7 months providing

uninterrupted supply of all essential medicines, equipment and non-drug items to all the animal health centres across the country.

- The Centre procured 7 types of cold chain equipment worth BTN 7.4 M through EU-RDCCRP and distributed to Dzongkhags, Central Farms and Agencies.
- Recognizing the importance of practising work safety measures at the store to protect the workers as well as the material they are dealing with, the unit secured a budget and procured Personal Protective Equipment (PPE) and spill kits worth BTN 0.14M for LCS. The unit had also developed a draft SOP to guide the staff of the LCS in handling the medicines in compliance with standard protocols to ensure the safety of the staff and optimize drug management.

2.3.2. Veterinary medicine information management system

- The Centre in collaboration with Drug Regulatory Authority (DRA) developed DRUK MED, a mobile application enlisting all the medicines and related information, through the fund support from the Fleming Fund Country Grant Project.
- The Centre had included report generation features in the G2C database for management of Veterinary medicines and equipment and completed TOT training for the East and East-central regions.
- A sum of BTN 0.9 M was secured through the Country Grant Fleming Fund Project for the enhancement of the VIS database to capture antimicrobial use prescription data. The enhancement work has been already started.

2.3.3. Vaccine procurement and distribution

- During FY 2020 – 21, vaccines worth BTN 6.5 M was procured against the approved budget of BTN 1.5 M, which is 333.3% above the approved budget. The additional amount of BTN 5M was met from the DVEU budget for the procurement of equipment (BTN. 4.32M) through EU-RDCCRP and DPM Flagship Programme (BTN 0.68 M for 30,000 doses of rabies vaccine).
- The Centre produced a total of 7,200 doses of Classical swine fever vaccine and 2,876 doses of Anthrax vaccine.

2.4. Dog population management and mass dog vaccination programme

- The Dog Population Management (DPM) activity was implemented in Paro, Bumthang, Thimphu and Tsirang dzongkhags; the average sterilisation coverage in these dzongkhags was 87.5%.
- Through the community engagement strategy of the DPM programme, a total of 1179 dogs were adopted by individuals in the DPM implemented dzongkhags. 453 free-roaming community dogs were handed over by the community members for sterilisation in the DPM implemented dzongkhags.
- During DPM campaigns, a total of 2,837 pet dogs were sterilised, and 3,586 dogs were registered.

- Mass Dog Vaccination was conducted in rabies endemic gewogs of Samtse, Chhukha and Pema Gatshel. A total of 6,376 animals (17.8% cats, 82.1 % dogs) were vaccinated. The overall vaccination coverage during the campaigns in stray dogs was 89.62 %.
- Feral dog management activities were carried out in Motithang, Kuenselphodrang and Tango-Cheri areas. A total of 153 dogs were removed from these areas.
- Procured 30,000 numbers of microchip worth BTN 3.00 M to initiate Digital Identification and Traceability System (DITS) in dogs in the country.

2.5. Disease surveillance and animal health research

During FY 2020 – 2021, the Centre got 14 animal health research activities endorsed by the Livestock Technical Advisory Committee (LTAC) of the department of livestock (DoL). Technical staff at the Centre were involved in the publication of 11 journal articles in various national and international scientific journals.

2.6. One Health activities

The Centre coordinated or collaborated on several one-health activities in the country:

- Participated in the capacity of the Technical Advisory Group members and laboratory surveillance team members to respond against the COVID-19 pandemic in Bhutan.
- Coordinated the observation of the World Rabies Day 2020 in Bhutan.
- Coordinated the observation of the World Antimicrobial Awareness Week 2020 in Bhutan.

2.7. Capacity building

To enhance the skills and expertise of the laboratory and animal health staff in the country, the Centre conducted multiple training programmes for the veterinarians and veterinary paraprofessionals in the country. The trainings included, Rabies diagnosis by FAT, WHONET, LIMS, sample collection, storage of transport of samples for AMR surveillance in broilers and layers, culture isolation and AST for *Campylobacter, Enterococci, Salmonella* and *E.coli* and maintenance of ATCC.

2.8. Financial achievement

During the FY 2020 – 2021, the Centre was allocated with a total budget of 66.622 million Ngultrums, of which 66.507 million Ngultrum was utilised, translating to the total annual budget utilisation of 99.83 per cent.

3. LABORATORY SERVICES UNIT (LSU)

The LSU functions as the national veterinary referral laboratory in the country. It is mandated with providing referral laboratory services besides its routine diagnostic services. The unit has the capacity for advanced diagnostic tests such as Enzyme-linked immunosorbent assay (ELISA), Fluorescent antibody test (FAT) and molecular assays for emerging and re-emerging infectious diseases like Foot and Mouth Disease (FMD), Highly Pathogenic Avian Influenza (HPAI), Classical Swine Fever (CSF), African Swine Fever (ASF), Brucellosis, Porcine Respiratory & Reproductive Syndrome (PRRS), Rabies, Porcine Circovirus Type 2, Capripox, Lumpy Skin Disease (LSD), etc.

The laboratory is also equipped with real-time Polymerase chain reaction (PCR) technology. The unit has Bio-safety level 2 plus facilities for the safe handling of high-risk pathogens. In addition, the unit is responsible for monitoring and evaluating biosafety and biosecurity in the veterinary laboratories in the country. The unit is also responsible for the collaboration of advance level diagnostic research with international reference laboratories and institutes. It is also mandated to carry out laboratory-based surveillance/research. The lab is also the national referral lab for Antimicrobial Resistance (AMR) in animal health in the country.

Main mandates

- Providing referral veterinary laboratory diagnostic services to the clients
  - Provide routine veterinary laboratory diagnostic services, support clinical services, animal health programmes and One-Health activities in the country;
  - Serve as the national referral laboratory for diagnosis of animal diseases in the country
- Major livestock disease surveillance/survey
  - To lead/coordinate and conduct laboratory-based animal health research activities in the country.
- Coordination and implementation of Biosafety and Bio-security programmes
  - Implement and monitor bio-safety measures and good laboratory practices in all veterinary laboratories in the country.
- Strengthening and enhancement of laboratory diagnostic capacities
  - To serve as the focal laboratory for antimicrobial resistance monitoring in animals in the country;
  - To participate in regional proficiency testing for specific diagnostic methods;
  - To technically backstop regional, satellite and district veterinary laboratories in the country;
  - Introduction of new diagnostic tests/up-gradation of diagnostic tests for the emerging and re-emerging diseases in the country;
  - To liaise, collaborate and establish efficient laboratory networks with the outside agencies like National Food Testing Laboratory, BAFRA; Clinical Laboratory, JDWNRH; Royal Centre for Disease Control, MoH; and Wildlife Clinic, Nature Conservation Division, DoFPS;
  - To liaise, collaborate and establish efficient laboratory networks with the international reference laboratories such as OIE and WHO Referral Laboratories.

- Laboratory skill enhancement
  - To develop human resource capacity by conducting the diploma course in laboratory technology in collaboration with other relevant institutions;
  - Conduct refresher courses and up-gradation courses for laboratory technicians.

Human resources (overall)

The followings are the available human resource in the Laboratory Services Unit as of 30th June 2021 (Table 1).

Table 1: Overall human resource capacity of LSU.

Specialization	Sections	Number
Animal Health Specialist- III (Pathologist)	Pathology	1
Sr. Laboratory Officer	Microbiology/ Molecular biology; Biosafety & Biosecurity/ Biochemistry & toxicology	2
Sr. Laboratory Technician	Parasitology/ Serology & Virology / Bacteriology	3
Laboratory Technicians	Serology & Virology/ Haematology/ Biochemistry & Toxicology/ Pathology	4
Laboratory Attendant	General	1
Total		11

A. Bacteriology Section

Diagnostic capacities

- Bacterial culture and identification using sheep blood agar, MacConkey agar and other selective media and various biochemical tests;
- Fungal culture and identification using Sabouraud agar;
- Staining techniques – Gram, Giemsa, Methylene blue, Ziehl-Neelsen/Acid-fast, Leishman, Lactophenol, Spore staining and Capsule staining;
- Species identification of important bacterial pathogens in Bhutan – *Salmonella sp., E. coli, Staphylococcus spp., Bacillus anthracis, Clostridium sp., Pasteurella, Pseudomonas sp., Erysipelas rhusiopathiae, Brucella sp., Aeromonas hydrophila, Enterococcus spp, Campylobacter spp* and *Streptococcus sp.*;
- Enumeration of bacteria – total aerobic count by pour plate technique and spread plate technique, total Coli count by pour plate technique and spread plate technique, Most Probable Number (MPN) technique;
- Detection of Mycobacterium species by acid-fast technique;

- Agglutination tests: Slide agglutination test (SAT), Tray agglutination test (TAT) and Micro-titre plate agglutination test (MAT);
- Detection of mastitis in milk samples through the California mastitis test (CMT), Cell count and Whiteside test (WST);
- Antimicrobial susceptibility test (AST), disk diffusion method;
- Intra-dermal test for bovine tuberculosis (TB) using purified protein derivatives (PPD).

Human resources

- Ms Puspa Maya Sharma, Sr. Laboratory Officer
- Mr Tenzinla, Sr. Laboratory Technician
- Ms Tshewang Dema, Laboratory Technician

B. Biochemistry and Toxicology Section

Diagnostic capacities

- Rapid tests for Aflatoxin in animal feed;
- Quantitative estimation of mycotoxins (Aflatoxin, Ochratoxin, Fumonisin) in animal feeds;
- Mineral estimation for Ca, Mg and P in the serum;
- Qualitative urine analysis;
- Qualitative and quantitative biochemistry.

Human resources

- Dr NK Thapa, AHS II
- Ms Dechen Wangmo, Sr. Laboratory Officer
- Ms Ugyen Pema, Laboratory Technician

C. Biosafety and Biosecurity Section

Main activities

- Planning, Coordination and Implementation of Biosafety and Bio-security plans;
- Technical monitoring of Biosafety and Biosecurity measures;
- In house training on biosafety and Biosecurity;
- Reporting and Monitoring;
- Sample referral to collaborating laboratories;
- Compilation of routine and research laboratory test kits, reagents, consumables procurement;
- Monitoring the functionalities of the equipment.

Human resources

- Ms Dechen Wangmo, Sr. Laboratory Officer

D. Haematology Section

Diagnostic capacities

The haematological parameters and tests commonly conducted in this section are:

- Haemoglobin estimation (Hb);
- Packed Cell Volume (PCV);
- Total Red Blood Cell Count (TRBCC);
- Total White Blood Cell Count (TWBCC);
- Differential Leukocyte Count (DLC);
- Erythrocyte Indices – MCV, MCHC and MCH;
- Erythrocyte Sedimentation Rate (ESR);
- Wet film examination for blood parasites like microfilaria and trypanosome.

Human resources

- Dr NK Thapa, AHS-II
- Ms Tshewang Dema, Laboratory Technician

E. Molecular Biology Section

Diagnostic capacities

- Real-time PCR for AI Type A, (H5, N1, H7, N8) FMD, CSF, ASF, PRRS (EU and NA), Pigeon Paramyxovirus (PPMV) and ND.

Human resources

- Ms Puspa Maya Sharma, Sr. Laboratory Officer
- Ms Dechen Wangmo, Sr. Laboratory Officer
- Ms Kelzang Lhamo, Laboratory Technician

F. Pathology Section

Diagnostic capacities

- To conduct post-mortem examination and diagnosis in animals like poultry, ruminants, canine, feline, equine, swine species and wild animals including reptiles and fish;
- To perform histopathological examination and diagnosis through processing and examination of slides (H&E, Grams, ZN, pigment staining and pearls staining);
- To perform immuno-histochemistry;
- To conduct post-mortem examination and diagnosis in the wildlife.

Human resources

- Dr NK Thapa, Animal Health Specialist – II
- Ms Pasang Bida, Laboratory Technician

- Mr Tenzinla, Sr. Laboratory Technician

G. Parasitology Section

Diagnostic capacities

- Identification of parasites through direct technique;
- Identification of parasites through qualitative tests (Sedimentation and Floatation methods);
- Identification of parasites through quantitative tests (Stoll method);
- Urine sedimentation test for nematodes;
- Skin scraping examination using 10% KOH digestion method;
- Blood parasite examination;
- Pepsin digestion test;
- Faecal culture (simple tube method, culture tube method, Baermann's method);
- Tick identification (stereo-zoom method);
- Post-mortem recovery of helminths, post-mortem worm count;
- Microfilaria identification from blood (modified Knott's method);
- Worm staining & preservation;
- ELISA for Fasciola;
- Isolation and identification of Taeniid eggs from faeces and soil samples.

Human resources

- Ms Ugyen Pema, Laboratory Technician
- Ms Tshewang Dema, Laboratory Technician

H. Serology Section

Diagnostic capacities

- Antibody ELISA for FMD, Brucellosis, Rabies, ND, IBD, CSF, Infectious bovine rhinotracheitis (IBR), Leptospirosis, Contagious bovine pleuropneumonia (CBPP), Contagious caprine pleuropneumonia (CCPP), Porcine reproductive and respiratory syndrome (PRRS), Johne's disease (JD), Avian leucosis complex (ALC) and Peste des petits ruminants (PPR);
- Antigen ELISA for CSF and PPR;
- Typing ELISA (sandwich) for FMD.

Human resources

- Mr Dawa Tshering, Sr. Laboratory Technician

I. Virology Section

Diagnostic capacities

- Rapid antigen detection tests for Avian Influenza type A, H5, Newcastle disease (ND) virus, Infectious Bursal Disease (IBD), Foot and Mouth Disease (FMD) and Rabies.
- FAT for diagnosis of Rabies.

Human resources

- Mr Purna Bahadur Rai, Sr. Laboratory Technician

3.1. Diagnostic services provided

3.1.1. Tests performed at NVL

During the fiscal year, 2020 – 2021, a total of 3,552 samples were received or collected and 8,843 laboratory tests were performed for routine tests, disease outbreaks, disease screening, surveillance and research activities (Table 2).

Table 2: Summary of samples received, and tests performed at NVL.

Section	Samples Received	Tests conducted
Toxicology	75	332
Biochemistry	43	70
Parasitology	928	1350
Clinical Pathology/Haematology	235	740
Bacteriology/Mycology	572	3,557
Post-mortem	111	108
Histopathology	580	1096
Serology	819	1022
Virology	54	71
Molecular	210	497
Total	3,552	8,843

A. Bacteriology Section

About 572 different types of samples were received/collected and 3,557 different tests were conducted. The detail of the samples tested in the bacteriology section is shown in Table 3.

Table 3: Number of samples and tests – Bacteriology & Mycology section.

Type of specimen	Specimen Received	Types of tests	Tests conducted
Bacteriology			
Organs	155	Culture	1052
Froth swab	7	Gram stain	234
Lung swab	13	Motility	222
Cloacal swab	123	BC test	1192
Vaginal swab	10	Sensitivity test	280
Ear swab	23	Leishman stain	3
Ocular swab	37	Methylene Blue Stain	6
Other swabs	26	Inoculation test	214
Milk	50	Isolate archival	242
Caeca	40		
Abscess	1		
Blood	2		
Urine	5		
PT samples	23		
Mycology			
Skin scraping	55	Culture	57
Feed	2	Lactophenol Cotton Blue Stain	57
Total	572		3557

Significant findings

- *Moraxella spp.* in yaks, *Salmonella* in swine, *Clostridium perfringens* in avian and swine, *Escherichia fergusonii* in wild pig, *Serratia rubideae* in cat, *Proteus mirabilis*, *Malassezia* and *Rhizopus* in canines.
- MDR/ESBLs producing bacteria such as *E. coli, Serratia rubideae* and *Proteus mirabilis* were isolated.

B. Biochemistry & Toxicology section

In the Toxicology section, 75 feed samples were screened against Aflatoxins. Serum biochemistry was performed in 40 samples. In addition, 3 urine samples were tested to assess the renal health of the animals.

Details of samples and tests conducted in this section are presented in Table 4.

Table 4: Number of samples and tests – Biochemistry & Toxicology section

Type of specimen	Number	Test type	Number
Feed	75	Aflatoxin	332
Serum	40	Mineral biochemistry	104
Urine	3	Urine biochemistry	30
Total	118		466

Significant findings

- About 21 feed samples were detected with Aflatoxin;
- The sera samples from the goats at Paro quarantine showed high levels of calcium and phosphorous;
- Urine analysis revealed the presence of protein and Nitrite indicating renal ailment in the animals.

C. Haematology section

Basic haematological tests were also conducted to support the clinical diagnosis in the animals. About 235 samples were processed and 740 different tests were conducted. Details of samples and tests conducted in these sections are presented in Table 5.

Table 5: Number of samples and tests – Clinical Pathology/Haematology section.

Type of specimen	Number	Test type	Number
Blood smear	11	PCV	149
Whole blood	149	Hb	149
		DLC	160
		TRCC	77
		TWCC	77
		Knott's test	64
		Direct smear examination	64
Total	160	Total	740

D. Molecular diagnostic section

The section received/collected 210 samples and carried out 497 different types of tests as described below in Table 6.

Table 6: Number of samples and tests – Molecular Biology section.

Type of specimen	Numbers received	Type of PCR tests	Tests conducted
Organ/swabs/bone marrow	91	PRRS-Eu & NA	31
Ocular/nasal	46	CSFV	39

Tissue biopsy	6	ASF	58
Whole blood		MCCP	59
Tracheal/cloacal swab	11	PPMV	8
		Capripox	59
Epithelial/Secretions	26	FMD	44
Lung swab	6	AI	57
Cloacal swab	6	NDV	10
PT panel	18	PPR	59
		HS	63
		LSD	10
Sub Total	210		497

Significant findings

- Capripox in takins, gorals, serows and domestic goats;
- LSD in cattle;
- ASF in stray scavenging pigs;
- CSF in wild pigs.

E. Pathology section

A total of 111 animal carcasses, 557 tissue samples and 23 biopsy samples were processed, and 1,204 types of tests were conducted (Table 7).

Table 7: Number of samples and tests – Pathology section.

Type of specimen	Number	Test type	Number
Tissue, organs	557	Histopathology- H and E Staining	1073
Biopsy	23	Giemsa staining	18
Carcass	111	Methylene Blue	5
		Post-mortem/Necropsy	108
Total	691		1204

Significant findings

- Histomoniasis, IBD, Avian Leukosis Complex, Canine Distemper, Canine parvoviral infection, etc.

F. Parasitology section

A total of about 928 samples were received/processed and 1,350 tests were performed by the section. The details of tests performed by this section are shown in Table 8.

Table 8: Number of samples and tests – Parasitology section.

Type of specimen	Number	Test type	Number
Faecal samples	297	Direct examination, Sedimentation, Stoll's dilution, Floatation	666
Dog environmental samples	75	Floatation/Sieving technique by using 1:1 sugar solution.	53
Soil Samples	419	Floatation/Sieving technique by using zinc sulphate (1:1)	419
Intestinal content	34	Direct smear	34
Skin scrapping	172	10% KOH digestion	172
Liver, caeca impression smear	3	Giemsa staining	3
Diaphragm muscle	2	Pepsin digestion for *Trichinella*	2
Cyst Sample	1	Direct examination	1
Total	928		1350

Significant findings

- Detection of eggs of Fasciola, Paramphistomes, Strongyles in bovine and Taeniid in stray dogs, Ascarids and Tapeworms in poultry.

G. Serology Section

The section received/collected 819 samples and carried out 1,022 different types of tests as described below in table 9.

Table 9: Number of samples and tests – Serology section.

Type of specimen	Numbers received	Type of tests conducted	Number of tests conducted
Serum	819	PPR ELISA	61
		SAT Mycoplasma	24
		SAT Salmonella	24
		Rapid test FMD NSP	26
		FMD Serotype O ELISA	50
		FMD Serotype A ELISA	11
		FMD Serotype Asia I-ELISA	26
		RBT Brucella	150
		Brucella ELISA	91
		Porcine Circovirus Type-2	2
		IBR ELISA	89
		BVD ELISA	89
		RAPINA	379
Total	819		1022

Significant findings

- Brucella antibody from cattle in NJBC, Samtse, and CRC, Wangkha;
- CSF in pigs;
- CCHF in goats;
- IBD, Mycoplasma and Salmonella in poultry;
- PPR in Takin.

H. Virology section

The section received/collected 54 samples and carried out 71 different types of tests as described below in table 10.

Table 10: Number of samples and tests – Virology section.

Type of specimen	Numbers received	Type of tests	Tests conducted
Brain	13	FAT	12
Swab	41	FMD NSP(Rapid)	47
		Rapid AI	24
		Rapid NDV	27
		Rapid IBD	4
		Canine parvovirus	1
		CDV	3
		CPV	1
Total	54		71

Significant findings

- Rabies, FMD and Canine Parvovirus.

3.1.2. Samples referred to international laboratories

During the year various samples were referred outside to international laboratories despite lockdown and restricted travels (Table 11).

Table 11: Detail of samples referred to international laboratories.

Species	Sample type	Samples referred to	Numbers	Remarks
Rodents	Tissue Sample	AFRIMS, Bangkok	295	From Tsirang & S/Jongkhar for
	Ear Samples		59	molecular detection
	Parasites		59	of vector-borne
	Whole Blood (FTA)		59	diseases
		Sub-total	*472*	

Takin	Swab in UTM	Animal Production and Health Laboratory, Vienna; Austria	4	Gene sequencing of *Capripox*
Serow	Swab in UTM		3	
Goral	Swab in UTM	-do-	2	
Caprine	Swab in UTM	-do-	4	
	Sub-total	-do-	*13*	
Mix Species	*E. coli* isolates	The Doherty Institute, University of Melbourne, Australia	76	Whole-genome sequencing
	TOTAL		561	

3.1.3. Collection of Dog samples from quarantined owners at Paro for COVID testing

LSU collected the samples from the dogs of quarantined owners at Paro for COVID testing. The samples were tested at RCDC to rule out the COVID in the pet animals of the people who were quarantine.

Date	Owner	Station	Species	Specimen	Test	Remarks
1/6/2021	Quarantine Station	Paro	Canine	O/Nasal swab	COVID-19-Negative	Tested at RCDC, Serbithang
9/6/2021	Quarantine Station	Paro	Canine	O/Nasal swab	COVID-19-Negative	Tested at RCDC, Serbithang
16/6/2021	Quarantine Station	Paro	Canine	Nasal swab	COVID-19-Negative	Tested at RCDC, Serbithang
23/6/2021	Quarantine Station	Paro	Canine	O/Nasal swab	COVID-19-Negative	Tested at RCDC, Serbithang

3.2. Biosafety & biosecurity activities

3.2.1. Laboratory Auditing at LSU and BPU

The section coordinated the internal auditing of the LSU and BPU by forming a team. The laboratory auditing was carried out in June 2021 and the main objectives of the auditing were as follows:

- To determine overall compliance of biosafety measures practised.
- To conduct a follow-up on previous recommendations.
- To ensure any new regulatory requirements of the laboratory are followed.
- To monitor the system.

- To verify compliance of the quality management system, including SOPs and internal laboratory biosafety policies.

The main findings in the LSU included the following:

- Lack of colour-coded bins (currently the bins used were labelled only, it is preferable to use colour coded bins).
- Spill kits were not available in almost all the sections.
- Non-disposal of waste bins.
- Floor /work bench not kept clean.
- The temperature log chart was not recorded by all the sections.

The main findings in the BPU included as follows:

- No Color-coded Bins.
- Spill kits were not available.
- No SOPs for equipment handling and ingredient preparation.

3.2.2. Biosafety & biosecurity monitoring at RLDC, Wangdue Phodrang

In June 2021, RLDC Wangdue was visited by the Biosafety and Biosecurity section of the NCAH. During the inspection, it was observed that their laboratory section has strictly implemented all required and recommended biosafety measures**.** The staff were also found to be trained and well aware of Good Laboratory Practices. However, there were few issues such as HR shortage. Two lab personnel have to handle every section wherein they have to test daily routine samples and simultaneously attend field emergency cases. Therefore, it is hampering their daily monitor and coordinating the biosafety protocols in their lab.

As per the observations, the following recommendations were made:

- RLDC, Wangdue needs to appoint a Biosafety coordinator/focal person in the centre so that this officer will work closely with the NVL biosafety team concerning biosafety information sharing. NVL shall assist the centre in implementing and strengthening the Biosafety practices in their centre.
- It was observed that the laboratory setup is not up to Biosafety standard protocol but still there can be some adjustment done dividing the sections based on the risk factor involved.
- There is a need for standard operating procedures for the handling of all new equipment installed. In addition, an equipment log chart must be maintained to ensure the proper functioning of equipment and also to keep a record of the user.
- There is a need for an incident/accident report form, which should be maintained every day.
- A thermometer is needed for every fridge so that proper temperature for different test kits can be maintained as a result the quality of test kits will be maintained too.
- A sharp disposal bin should be placed in the lab.
- It is highly recommended to purchase closed-toe shoes and waterproof shoes, instead of open-toe shoes or cloth types to prevent chemical spills on foot.

3.2.3. Immunization of Laboratory personnel against Rabies

Safeguarding the health of the laboratory workers against important zoonosis is one of the main mandates of the section. As the laboratory personnel may get exposed to Rabies virus due to handling of Rabies samples from the animals, it is very essential to get immunized against the disease. Hence, an immunization programme was conducted for the staff at the NCAH. The immunization of the staff was carried out by the team from Jigme Dorji Wangchuk National Referral Hospital (JDWNRH) and the blood collection was also done by the Royal Centre for Disease Control (RCDC) before vaccination to check the immune status of the staff. In addition to the laboratory staff, the staff from DPM, NCD and Jangsa Animal Trust were also immunized. There was a total of 41 blood samples collected for the RAPINA test, out of which 22 blood samples were positive to protective antibody titre.

The AR vaccine doses were administered according to the recommendation in their manufacturing leaflet. The dose schedules recommended were as follows (0,7 & 21): 1st dose was administered on 11th May, 2nd dose on 18th May and 3rd dose on 1st June 2021. The serum will again be collected after 60 days of the first dose to assess the antibody level.

3.3. Laboratory Quality Assurance

3.3.1. Asia Pacific Regional Proficiency Testing

Molecular Diagnostics

The avian diseases PCR panel for 2020 proficiency testing consisted of 15 and 18 gamma-irradiated samples that were sent to each participating laboratory with instructions to test the samples using their standard diagnostic real-time PCR for Avian disease PT panel (Influenza A, H-type PCR and Avian paramyxovirus-1) and the swine disease PT panel (CSF, PRRS, ASF and SIV). National Veterinary Laboratory reported results for Influenza A matrix, H5, N1. The table and figure below reveal the results obtained by NVL. D1 is the code for Bhutan

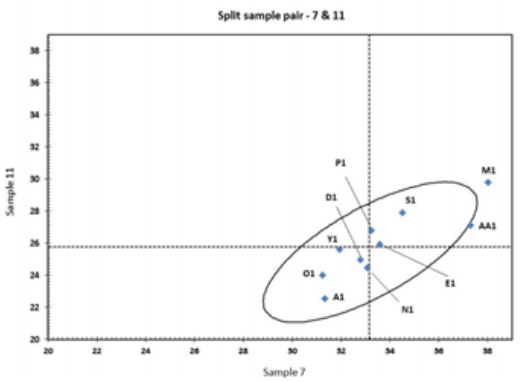
Table 12: Comparison based on the mean of the reported Ct value AIV, matrix assay, real-time PCR results.

No.	Agent	Type	A1	D1	E1	L1	M1	N1	O1	P1	S1	Y1	AA1	Median
1	A/Chicken/Philippines/0938-1/2017	H5N6	29.2	27.7	32	33.8	32.2	28.9	28.1	28.2	33	30	30	30
2	A/Chicken/Nepal/S-105-TS/2017	H5N8	31.4	33.8	34.6	36.2	38.6	33.8	30.8	34.7	34.4	35.9	31.6	34.4
3	P/Chicken/Hoa Binh/A508/2014	APMV-1	45	Und.	no Ct	0	0	0	45	45	Und.	36.6	Und.	-
4	A/Duck/Japan/AQ-HE29-52/2017	H7N9	32.5	35	34.8	0	41.7	38.4	31.7	35.2	35.6	39.5	32.2	35.1
5	A/Chicken/Nepal/LAL-407-CL/2019	H5N1	32.1	Und.	34.5	0	41.2	36.7	32.8	36.4	34.6	36	38.3	36
6	A/Chicken/Nepal/SUR-515-CB/2019	H9N2	29.6	34.6	32.7	38	37	34.3	31.1	35.1	33.5	-	32.4	33.9
7	A/Quail/Myanmar/SP232/2015	H5N1	31.3	32.8	33.6	0	38	33.1	31.2	33.2	34.5	31.9	37.3	33.2
8	P/Chicken/Philippines/16-0055-I/2016	APMV-1	45	Und.	no Ct	0	0	0	45	35.9	Und.	-	Und.	-
9	A/Duck/Japan/AQ-HE29-52/2017	H7N9	32.3	Und.	34.7	0	0	0	32.1	35.7	36.1	36.9	34	34.7
10	A/Chicken/Nepal/K-112-TS/2017	H9N2	31.7	35.8	no Ct	39	41.6	37.3	31.3	34.7	35.6	36.8	33.3	35.7
11	A/Quail/Myanmar/SP232/2015	H5N1	22.5	25	25.9	30.8	29.8	24.5	24	26.8	27.9	25.6	27.1	25.9
12	Negative		45	Und	no Ct	0	0	0	45	45	Und.	36	Und.	-
13	A/Chicken/Myanmar/1528/2017	H5N1	28.4	36	32.1	40.4	37.6	32.8	29.9	34.1	30.6	32.9	32.6	-*
14	P/Chicken/Philippines/16-0055-I/2016	APMV-1	45	Und	no Ct	0	0	0	45	36.6	Und.	-	Und.	-
15	A/Environment/Myanmar/SP443/2017	H9N2	32	36	34	37.5	41.3	35.7	30.5	35.7	37.3	37.8	32.6	35.7

Table 13: AIV matrix assay – split-sample pair 7 and 11, A/Quail/Myanmar/SP232/2015 H5N1, clade 2.3.4.2.

Laboratory	Results		Between-Laboratory	Within-Laboratory
	Sample 7	Sample 11	Z-Score	Z-Score
A1	31.3	22.5	-1.44	0.76
D1	32.8	25.0	-0.26	0.07
E1	33.6	25.9	0.26	-0.07
M1	38.0	29.8	2.77	0.35
N1	33.1	24.5	-0.33	0.64
O1	31.2	24.0	-1.02	-0.39
P1	33.2	26.8	0.42	-0.94
S1	34.5	27.9	1.15	-0.84
Y1	31.9	25.6	-0.32	-1.05
AA1	37.3	27.1	1.75	1.80

The between-laboratories and within-laboratories Z-scores are for the related pair, samples 7 and 11. A Z-score between 0 and =2 is acceptable. A Z-score between 2 and 3, or -2 and -3 is questionable

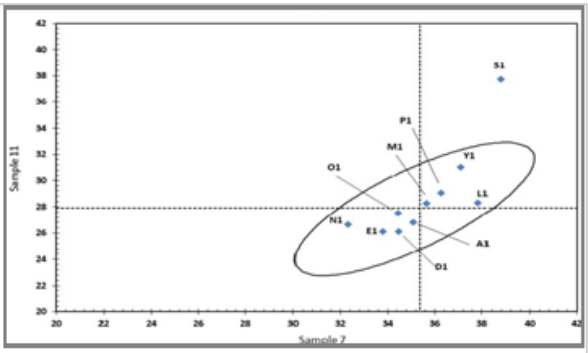


AIV matrix real-time PCR assay- Youden plot for split-sample pair 7, and 11 .

Table 14: AIV H5 real-time PCR – Within and between laboratory Z-score analyses for split-sample pair 7 and 11.

Laboratory	Results		Between-Laboratory	Within-Laboratory
	Sample 7	Sample 11	Z-Score	Z-Score
A1	35.1	26.8	-0.27	0.68
D1	34.5	26.1	-0.61	0.76
E1	33.8	26.1	-0.78	0.26
L1	37.8	28.3	0.82	1.57
M1	35.7	28.3	0.25	0.06
N1	32.3	26.7	-1.03	-1.16
O1	34.5	27.5	-0.25	-0.28
P1	36.3	29.1	0.61	-0.06
S1	38.8	37.8	3.49 §	-4.43 §
Y1	37.1	31.0	1.34	-0.87

The between-laboratories and within-laboratories Z-scores are for the related pair, sample 7 and 11. A Z-score between 0 and =2 is acceptable. A Z-score between 2 and 3, or -2 and -3 is questionable



AIV H5 real time PCR assay Youden plot for split-sample pair 7 and 11

3.3.2. EQASIA – Externa Quality Assurance in Asia

Bacteriology Diagnostics

The EQAsia project aims to improve the Quality of Bacteriology Diagnostics for Antimicrobial susceptibility testing (AMR) in the Asian region. The EQAsia project is supported by the Fleming Fund (UK Aid Programme).

The microbiology laboratory at the National Veterinary Laboratory received proficiency test panels consisting of 22 unknown samples (11 PT for *E. coli* and 11 PT for *Salmonella*). The samples were cultured and identified against *E. coli*, *Salmonella* and antimicrobial susceptibility tests. The results obtained by NVL is referred to as "Obtained Test Strain ID".

Table 15: Results of PT for E. coli obtained test strain versus expected test strain.

Strain	Obtained Test strain ID	Expected Test Strain ID
E EQASIA 21.1	E. coli	E. coli
E EQASIA 21.2	Non-E. coli	Non-E. coli
E EQASIA 21.3	E. coli	E. coli
E EQASIA 21.4	E. coli	E. coli
E EQASIA 21.5	E. coli	E. coli
E EQASIA 21.6	Non-E. coli	Non-E. coli
E EQASIA 21.7	E. coli	E. coli
E EQASIA 21.8	E. coli	E. coli
E EQASIA 21.9	E. coli	E. coli
E EQASIA 21.10	Non-E. coli	Non-E. coli
E EQASIA 21.11	E. coli	E. coli

All the eight *E. coli* isolated were tested for antimicrobial susceptibility tests against six antibiotics via the disk diffusion method. The antibiotics used were Ampicillin, Cefepime, Ceftazidime, Nalidixic acid, Gentamicin and Tetracycline. All five antibiotics test results were interpreted correctly for eight *E. coli* except for two *E. coli* where Ceftazidime was interpreted as intermediate, but the expected result was resistance. Out of five ESBLs, only one was detected. ESBL production by resistance strains was also tested and one out of five were correctly identified as ESBLs producing *E. coli*.

Table 16: Results of PT for Salmonella obtained test strain versus expected test strain.

Strain	Obtained test strain ID	Expected test strain ID
S EQASIA 21.1	Salmonella	Salmonella
S EQASIA 21.2	Salmonella	Salmonella
S EQASIA 21.3	Salmonella	Non-Salmonella
S EQASIA 21.4	Salmonella	Salmonella
S EQASIA 21.5	Salmonella	Salmonella
S EQASIA 21.6	Salmonella	Salmonella
S EQASIA 21.7	Non-Salmonella	Non-Salmonella
S EQASIA 21.8	Salmonella	Salmonella
S EQASIA 21.9	Non-Salmonella	Non-Salmonella
S EQASIA 21.10	Salmonella	Salmonella
S EQASIA 21.11	Salmonella	Salmonella

All the eight *Salmonella* were identified correctly except one which was incorrectly identified as *Salmonella* spp. All *Salmonella* spp isolated were tested for antimicrobial susceptibility tests against six antibiotics via the disk diffusion method. The antibiotics used were Ampicillin, Cefepime, Ceftazidime, Nalidixic acid, Gentamicin and Tetracycline. All six antibiotics test results were interpreted correctly for eight *Salmonella*. ESBL production by resistance strains

was also tested and two out of two were correctly identified as ESBLs producing *Salmonella*. Out of five ESBLs, only one was detected.

3.3.3. Proficiency testing on Rose Bengal Test for screening of Brucellosis in animals

Conducted by National Veterinary Laboratory, National Centre for Animal Health, Serbithang as a part of National External Quality Assurance System for regional laboratories.

Introduction

Proficiency testing (PT) is a part of a laboratory quality assurance system (QAS) to ensure a test procedure consistently produces a quality result. Proficiency testing along with various other components of QAS such as record keeping, quality control, training, evaluation, calibration, monitoring, taking corrective actions and competency assessment will contribute to quality management of a laboratory. Staff performing tests must be qualified, their competency documented, trained in the areas of specific requirement, should be able to perform the intended test and evaluate the result. Proficiency testing samples are sent to participating laboratories for a specific testing method and results are reported to the coordinating laboratory for analysis. The coordinating laboratory then collates the results and ranks participating laboratories based on their testing performance. Details of the performance of participating laboratories shall be anonymous. This anonymity allows participating laboratories to see trends in their testing performance and to compare with other laboratories. The coordinating laboratory shall individually convey the performance of each participating laboratory with details of their strength, weakness and recommendation.

Brucella RBR-PT for the fiscal year 2020-21

During the fiscal year 2020-21, as a part of national external quality assurance (NEQAS) in laboratory test performance, the National Veterinary Laboratory, National Centre for Animal Health, Serbithang organized a round of proficiency testing with regional animal health laboratories at Regional Livestock Development Centres on Rose Bengal Test for screening Brucellosis in cattle. The main objective of this PT was to assess the performance of different regional laboratories in the screening of Brucellosis in cattle. Details of coordinating and participating laboratories in PT are as follows:

- Coordinating laboratory
  - National Veterinary Laboratory, National Centre for Animal Health, Serbithang.

- Participating laboratories
  - Regional Livestock Development Centre, Kanglung
  - Regional Livestock Development Centre, Tsimasham
  - Regional Livestock Development Centre, Wangdue
  - Regional Livestock Development Centre, Zhemgang

4. DISEASE PREVENTION AND CONTROL UNIT (DPCU)

Mandates

- To formulate, implement, and monitor various nationally coordinated animal disease prevention and control programmes in the country.
- To formulate animal disease emergency response plans and guidelines for transboundary emerging animal diseases.
- To plan and implement zoonotic disease prevention and control programmes through the One-Health approach, in collaboration with the Ministry of Health.
- To maintain the notifiable and emerging livestock disease information in the country through the online database system, analyse, and communicate to the relevant stakeholders.
- To maintain the animal health information in the country through the Veterinary Information System (VIS) database, analyse, and communicate to the relevant stakeholders.
- To act as the focal agency for contact with international organizations such as the World Organization for Animal Health (OIE), FAO, WHO and Animal Production and Health Commission for the Asia Pacific (APHCA) on all matters of animal health concerns.
- Catering of clinical services to the clients from around the Centre.

Human resources

- Dr Sangay Rinchen, Senior Veterinary Officer, Head
- Dr Pelden Wangchuk, Senior Veterinary Officer
- Mr Kinzang Namgay, Senior Livestock Health Supervisor
- Ms Sonam Deki, Livestock Health Supervisor

4.1. Development of animal diseases prevention, control and elimination plans and guideline/ roadmap

The Disease Prevention and Control Unit coordinated, in collaboration with other stakeholders, the development of the following important documents which shall guide field professionals and other stakeholders to implement various animal disease prevention and control programmes in the country:

- National African Swine Fever Prevention and Control Plan 2021.
- National Lumpy skin disease Prevention and Control Plan 2021.
- The standard guideline for the listing of notifiable animal diseases in Bhutan.

4.1.1. National African Swine Fever Prevention and Control Plan 2021

Background

African swine fever (ASF), first described in the 1920s in Kenya, is a highly contagious haemorrhagic disease of wild and domestic suids with extremely high morbidity and mortality rates. It is an OIE (World Organization for Animal Health) notifiable disease due to its ability to spread rapidly and cause severe illness. ASF does not pose a risk to public health.

ASFv is unique, as it is the only known arthropod-borne DNA virus. The disease is one of the most serious transboundary animal diseases because of its high lethality for pigs, its crippling socio-economic consequences, and its propensity for rapid and unanticipated international spread.

Since 2016, a pattern of a significant increase in the number of outbreaks was identified. The disease is present in the African, European, and most recently, the Asian continent. It has never been reported in Oceania, and it was eradicated in the Americas in the '90s. Since 2016, 24% of the reporting countries and territories (48/200) have reported the disease. In Europe, the disease occurred for the first time in Moldova in September 2016, then in June 2017 in the Czech Republic, followed by Romania in July 2017 and more recently in Hungary, and Bulgaria, in April and August 2018, respectively. A recurrence of the disease in wild boars has been reported in Belgium in September 2018. In Asia, the disease was reported for the first time in China (People's Republic of) in August 2018. Later ASF outbreaks were reported from several countries in Asia: Mongolia, Democratic People's Republic of Korea, Republic of Korea, The Philippines, Malaysia, Indonesia, Timor-Leste, Papua New Guinea, Viet Nam, Lao People's Democratic Republic, Cambodia, Myanmar, India and Bhutan.

ASF is present in domestic pigs and wild boars in Europe, while Asia and Africa have notified outbreaks mainly in domestic pigs, and few cases in wild boar (300 cases reported in Asia since August 2018). During this period, Europe accounted for most outbreaks with 96% (9,756) of all outbreaks, but the highest impact in terms of animal losses was reported in Asia (1,711,677 animals lost, which is 68% of the total global reported losses for this period).

Rationale and objectives

The document is prepared after recording the first outbreak of ASF in Bhutan and considering the risk factors for the incursion of ASF virus in the country, viz., recent outbreaks in North-East states of India: Assam and Arunachal Pradesh, pig farming and production in neighbouring Indian states, pig rearing system in the country, pork import figures, the threat of sylvatic transmissions, etc.

This NASFPCP is developed to ensure that all the required resources, expertise, and services are mobilized and deployed immediately to respond to ASF outbreaks in the country and to decrease the consequent morbidity, mortality, and social disruption to the minimum. This plan is also applicable for the prevention of ASFv incursion and preparedness for emergency response.

The main objectives of this NASFPCP are:

- ✓ To prevent the incursion of the ASF virus into Bhutan.
- ✓ Rapid containment of ASF outbreaks in the country.

Risk assessment

The highest risk for ASF entry to Bhutan is associated with cross border movement of domestic and wild pigs followed by illegal import of pork and pork products. Illegal import of

pig feed, feed ingredients, and live pigs for breeding possess a moderate risk of ASF entry. The following table shows the summary of findings from the risk assessment conducted.

Sl. No.	Risk pathways	Risk estimation
1.	The legal import of live pigs, pig semen, pork, and pork products	*Low* *(Event would be unlikely to occur)*
2.	Illegal import of live pigs	*Moderate* *(Event would be nearly as likely to occur as not to occur)*
3.	Illegal import of pork and pork products	*High* *(Event would be likely to occur)*
4.	The legal import of pig feed	*Low* *(Event would be unlikely to occur)*
5.	Illegal import of pig feed & ingredients	*Moderate* *(Event would be nearly as likely to occur as not to occur)*
6.	Cross border movement of domestic and wild pigs	*Very high* *(The event is almost certain to occur)*

The strategy

During the peace period, when there is no reported ASF outbreaks in the neighbouring, preventive measures recommended are passive surveillance in domestic and wild pigs, swill feeding control, containment of scavenging and stray pigs, proper farm biosecurity maintenance, awareness and education for relevant stakeholders and capacity building for diagnostics and epidemiology.

When the outbreaks are reported in the region and the neighbouring countries, contingency measures shall be adopted, such as activation of Border Vigilance Team and Veterinary Vigilance Team to heighten the surveillance, ban on import of pigs and their products originating from high-risk countries, enhancement of laboratory capacity, upscale of farm biosecurity, awareness and education for farmers in high-risk areas and strengthening of the disease reporting system.

Once the outbreak of ASF in the country has been reported and confirmed, in the absence of vaccines and effective treatments, the only available option for ASF control and eventual elimination is stamping out by slaughter and disposal of all infected and potentially infected pigs. The main elements of a stamping-out policy for ASF are:

- Zoning of the country into infected zones, protection zones, and free zones.
- Quarantine procedures to contain the disease, including pig-movement controls and prohibitions on the sale of potentially infected pig products.
- Enhanced epidemiological surveillance for ASF.
- The immediate slaughter of infected and potentially infected pigs, and safe burial or burning of carcasses and other infected materials.
- Cleansing and disinfection of infected premises.

- Provide prompt and fair compensation to affected owners.
- Keeping infected premises/villages without pigs for a safe period.

4.1.2. National Lumpy skin disease Prevention and Control Plan 2021

Background

Lumpy skin disease (LSD) is an infectious disease of cattle caused by the LSD virus of geBTNs *Capripoxvirus* and family Poxviridae. The transmission occurs mainly mechanically by arthropod vectors, indirectly via contaminated feed and water, iatrogenically via semen and potentially through direct contact. It was also suggested that hard ticks might be involved in LSDV transmission. LSD is listed as notifiable by the OIE (World Organization for Animal Health) due to its potential for rapid spread and substantial economic impact, causing a reduction in milk production, decreased growth rate in beef cattle, temporary or permanent sterility in bulls, damage to hides and abortion.

In the south and south-east Asia, since mid-2019, Lumpy skin disease outbreaks were reported from China (People's Republic of), Chinese Taipei, Bangladesh, and India. On 29 August 2020, Nepal also reported outbreaks of LSD to OIE. The outbreak of LSD in Bhutan was, for the first time, confirmed on 5 October 2020 after testing (RT-PCR) the samples of suspected cases received from Samtse district, a district in the southwest sharing border with the West Bengal state of India.

The National Lumpy Skin Disease Prevention and Control Plan for Bhutan is being developed in response to this outbreak and considering other risk factors for incursion and spread of the LSD virus in Bhutan. The document shall guide field professionals and relevant stakeholders for the effective implementation of LSD prevention and control measures. The measures outlined in the document shall undergo periodic testing through simulation exercises and be updated from time to time as per the need.

Goal and objective

The overall goal of this document is to prevent and control the LSD outbreak in Bhutan and eventually eliminate it. Achieving this will contribute to the upliftment of rural socio-economic status through improved livestock health and production, and trading.

The objectives of this plan document are to inform policymakers and stakeholders on the nature and purposes of the LSD prevention and control programmes at national, regional and district levels, and to provide field professionals and relevant stakeholders with strategic directions to prevent, control and progressively decrease the outbreak incidences. This document shall also guide the implementation of LSD prevention and control measures by strengthening laboratory diagnostic capacity, epidemiological capacity, prevention strategy, biosecurity measures, and legal frameworks. The progress in the implementation phases shall be assessed through regular monitoring and evaluation processes.

Risk assessment

The identified risk hotspots are:

- Districts sharing a porous border with the north-eastern states of India.
- Quarantine stations along the southern border.
- Seasonal cattle migration practices and places.
- In-country cattle trading practices and places.

The risk zone identification and categorization are imperative for defining the strategies in each zone and establish disease status in the country. Based on the disease epidemiology, proximity to neighbouring countries, previous outbreaks, susceptible population, and management practices, the country is divided into three risk zones: High, Medium, and Low (Figure 2).

The disease risk zones will be used in guiding the strategies for surveillance, vaccination and animal movement regulation. However, the risk zones should be reviewed periodically based on the disease status to increase the efficiency of the disease prevention and control programme.

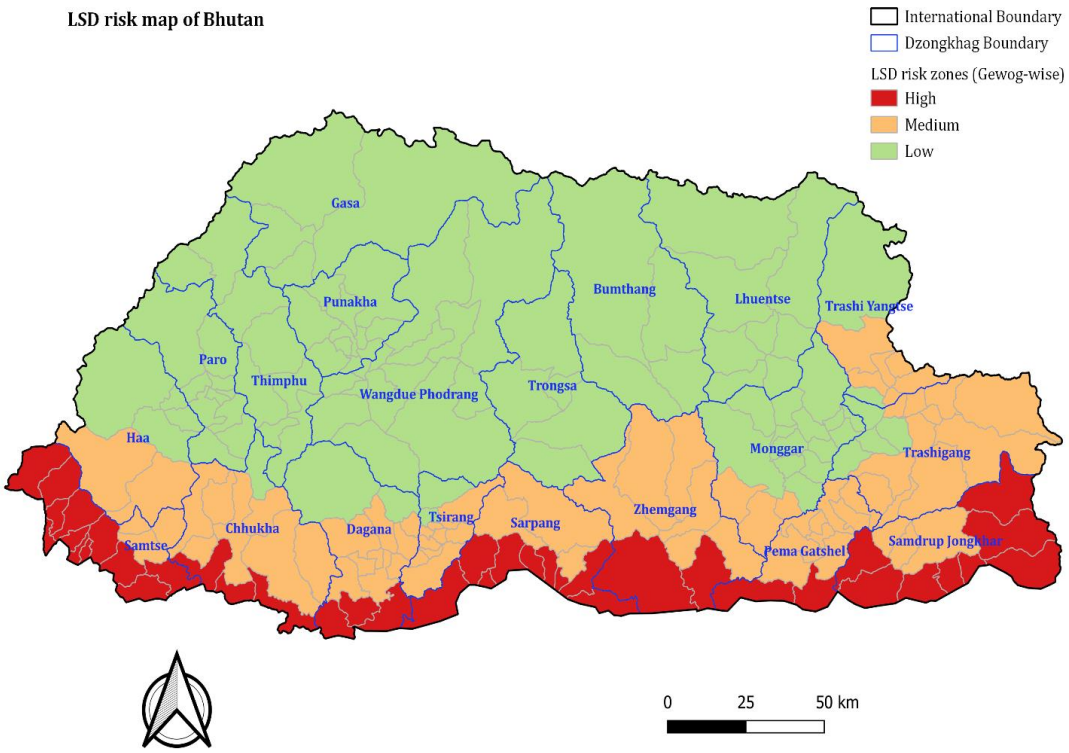


Figure 2: LSD risk map of Bhutan

Prevention and Control

Strategies for prevention and control of Lumpy skin disease in Bhutan include passive and active surveillance activities, enhanced farm biosecurity measures, capacity development in the field of diagnostics and epidemiology, vaccination, vector control, strengthened disease reporting system, awareness and education, etc.

The vaccination programme includes annual vaccination in the high-risk areas of the southern belt and responsive vaccination during disease outbreaks. Target species for vaccination against LSD are cattle and buffaloes of all age groups, and more than 90 per cent vaccination coverage should be achieved in the target areas.

4.1.3. The standard guideline for the listing of notifiable animal diseases in Bhutan.

Introduction

The purpose of the list of NADB is to have consistent animal disease reporting in Bhutan. It aids animal health officials to look after the animal health, welfare and food security of the country, and support all the stakeholders by providing technical resources and information needed to take appropriate actions to prevent the incursion and spread of the listed disease through transparent, timely and consistent manner.

The NADB helps to meet international animal disease outbreak notification obligations to the World Organization for Animal Health (OIE); supports the provision of export certifications; contributes to the knowledge of zoonotic, endemic and emerging (re-emerging) diseases; and helps in responding to control emerging (re-emerging) disease outbreak in Bhutan. The NADB also help in information sharing to public health and relevant organizations such as WHO.

The NADB focuses primarily on diseases of domesticated terrestrial and aquatic animal species; however, recognizing that wildlife, companion animals, and zoo animals potentially may play important role in disease epidemiology, reporting is required when listed diseases are found in these animals.

To guide in deciding to add (or remove) pathogenic agents to (or from) the list of notifiable animal diseases in Bhutan, this standard guideline describes the criteria for listing NADB, reporting roles, information requirements and the roles and responsibilities of concerned agencies and officials involved in this process.

The guideline

The document describes the reporting requirements, Bhutan Scientific Commission for Animal Diseases (BSCAD) and its terms of reference, criteria for inclusion of a pathogenic agent or a disease into the list and the procedure and guidance during the assessment for inclusion or deletion from the Notifiable Animal Diseases of Bhutan (NADB) list.

The criteria for the inclusion of disease in the list of notifiable animal diseases in Bhutan are as follows:

1. International or Regional spread of the pathogenic agent (via live animals or their products, vectors, or fomites) has been proven.

AND

2. Reliable means of detection and diagnosis exist, and a precise case definition is available to identify cases and allow them to be distinguished from other diseases.

AND

3.1. Natural transmission to humans has been proven, and human infection is associated with severe consequences.

OR

3.2. The disease has been shown to have a significant impact on the health of domestic animals considering the occurrence and severity of the clinical signs, including direct production losses and mortality.

OR

3.3. The disease has been shown to, or scientific evidence indicates that it would, have a significant impact on the health of wildlife considering the occurrence and severity of the clinical signs, including direct economic losses and mortality, and any threat to the viability of a wildlife population.

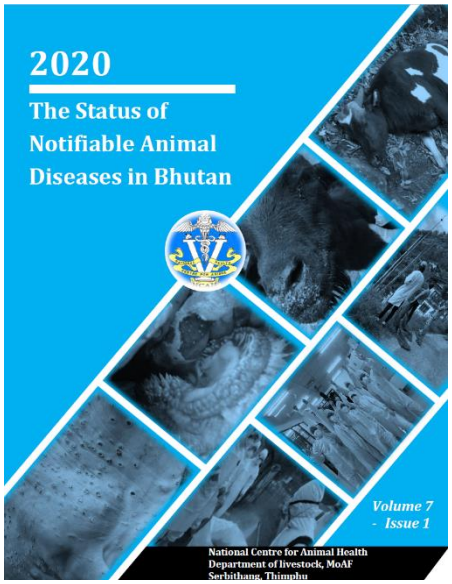
OR

3.4. The disease has met the definition of an emerging disease.

If the set of criteria is not met, the pathogenic agent shall not qualify for inclusion into the list of NADB or may be deleted from the existing list.

4.2. Strengthening of Animal Disease Surveillance and Reporting System

4.2.1. The status of the notifiable animal diseases in Bhutan, 2020.



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, 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 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 Livestock Rules and Regulations (LRR) of Bhutan 2017, the notifiable animal diseases in Bhutan comprise 18 non-zoonotic and 19 zoonotic animal diseases.

In 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.

The 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 (TADinfo), 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.

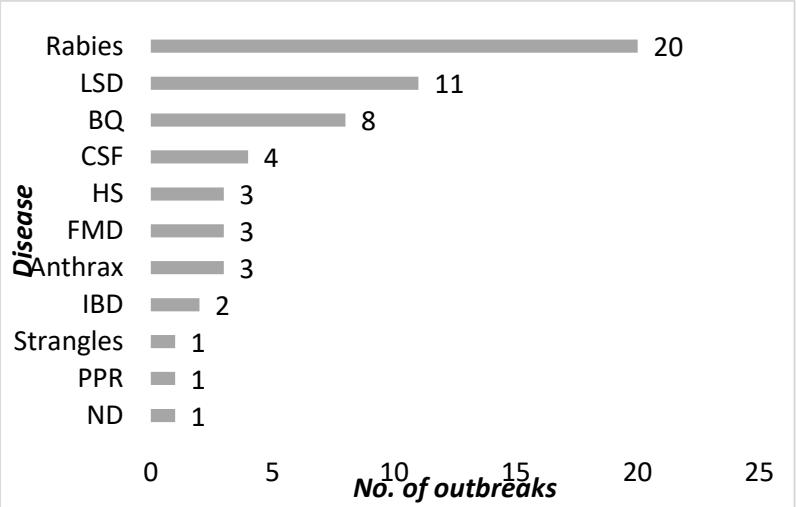


Figure 3: Disease-specific outbreaks reported in Bhutan, 2020.

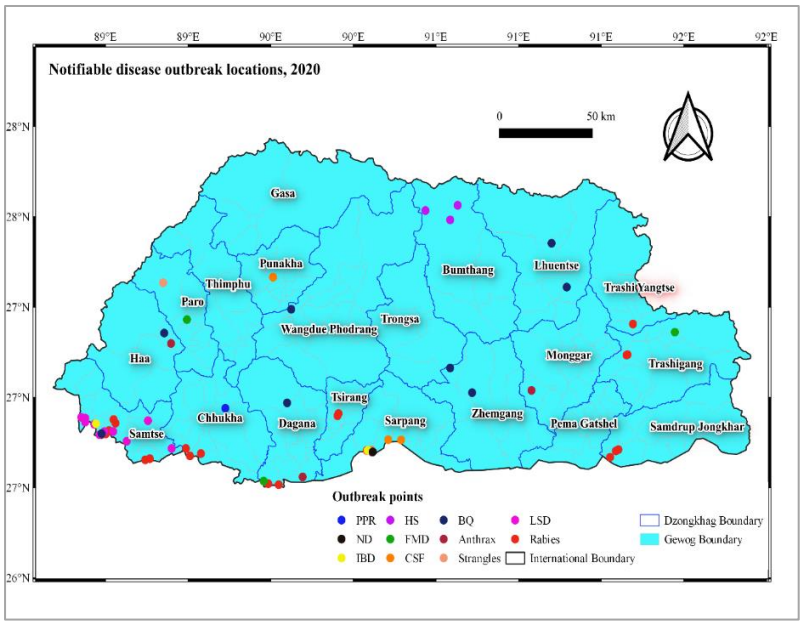


Figure 4: Spatial distribution of disease outbreaks in Bhutan, 2020

During the calendar year 2020, a total of 57 separate outbreaks were reported: 20 outbreaks are of rabies (40 per cent), 11 of LSD (19 per cent), 8 of BQ (14 per cent), and others (Figure 3). The location of different disease outbreaks is shown in Figure 4.

4.2.2. Notifiable and emerging animal disease situations in Bhutan, FY 2020 – 2021.

During the fiscal year 2020 – 2021, a total of 63 outbreaks of notifiable and emerging animal diseases were reported from 41 gewogs under 12 dzongkhags (Figure 6), affecting 2774 animals and 1400 died.

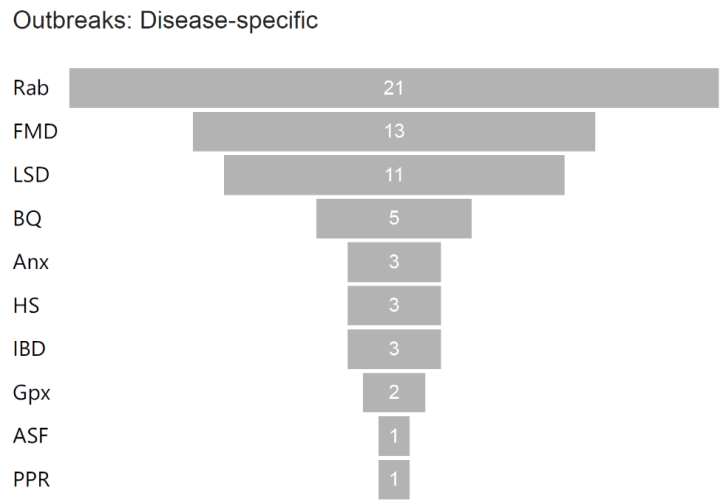


Figure 5: Disease-specific Number of outbreaks, 2020 - 2021.

10 different diseases (Figure 5) were reported, and 8 different livestock species were affected. Phuentshogling gewog, Chhukha dzongkhag reported the highest Number of disease outbreaks (n=6), followed by Norboogang gewog of Samtse dzongkhag (n=5), Darla, Chhukha (n=3), Lhamoi-Dzingkha, Dagana (n=3), Samtse, Samtse (n=3), etc.

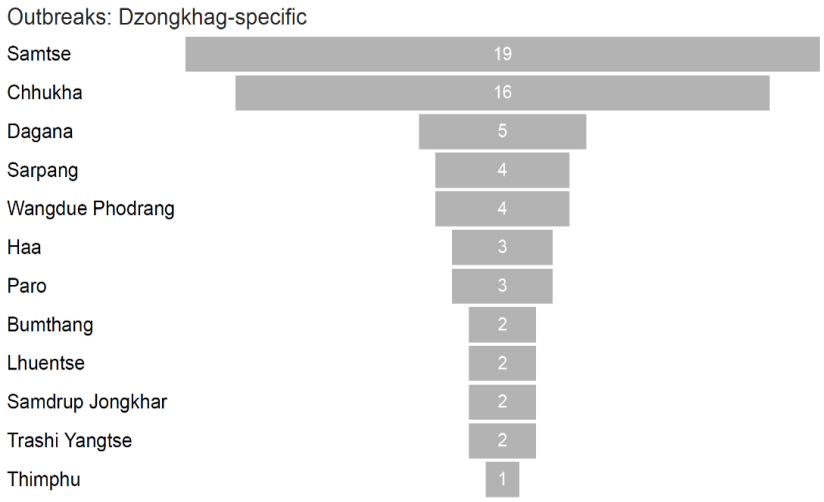
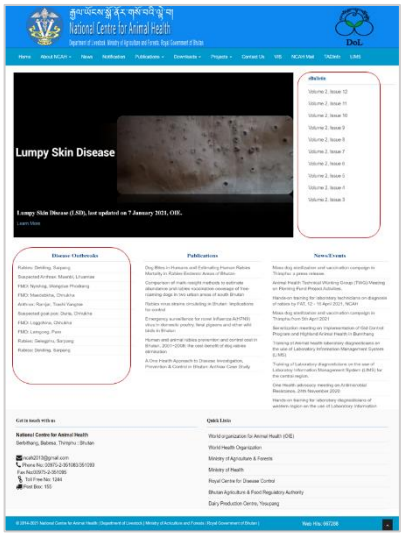


Figure 6: Dzongkhag-specific Number of disease outbreaks, 2020 - 2021.

4.2.3. Animal disease outbreak information sharing



To keep the field professionals and relevant stakeholders updated about the animal disease situations in the country, the Centre shares animal disease outbreak information on a real-time basis on the official website under the section of Disease Outbreaks. The Centre also shares disease outbreak information on a near real-time basis through fortnightly e-bulletins, copies of which are also uploaded on the official webpage under the section of e-Bulletins.

As an OIE member country, the Centre, on behalf of the country's delegate to the World Organization for Animal Health (OIE), notifies OIE regarding the outbreak of OIE-listed diseases. During the fiscal year 2020 – 2021, immediate notifications were sent during the reported outbreaks of Goat pox, Lumpy skin disease and African swine fever in the country. As required, two six-monthly reports were also submitted to the OIE sharing information about all the OIE-listed disease outbreaks recorded in the country during the reporting period.

The Centre reviewed the past animal disease outbreak flash report form and developed a new version wherein all the basic epidemiological information about the disease outbreak could be captured and shared. As a part of passive surveillance for priority animal diseases, a syndromic surveillance form was developed to collect qualitative information on the status of animal disease outbreaks in the respective dzongkhags.

4.3. Response to major animal disease outbreaks in the country

The DPCU, LSU and other technical units of the NCAH, in collaboration with the RLDCs, Dzongkhag Livestock Sectors, and other relevant stakeholders, coordinated outbreak investigation and containment of some major animal disease outbreaks reported in the country.

Following are the list of notifiable and emerging diseases reported in the country during the FY 2020 – 2021, and intervened by the Centre in various capacities to timely control and prevent the further spread into other parts of the country:

- African swine fever
- Anthrax
- Black quarter
- Foot-and-mouth disease
- Goat pox
- Haemorrhagic septicaemia
- Infectious bursal disease
- Lumpy skin disease
- Peste des petits ruminants
- Rabies

4.3.1. Investigation of the Lumpy skin disease outbreaks in Samtse

The disease

Lumpy skin disease (LSD) is caused by the Lumpy skin disease virus, a virus from the family Poxviridae and geBTNs Capripoxvirus. LSDV is highly host-specific and causes disease only in cattle and buffaloes. The transmission is mainly believed to occur through the bite of vectors (biting flies, mosquitoes and ticks). Transmission can also occur mechanically through fomites and while breeding as the virus is excreted through semen. Although the mortality rate in infected animals is low (1-5%), the morbidity rate can be as high as 45% (2-45%). The disease has an economic significance as it causes a marked reduction in the milk yield in lactating cattle, abortion in pregnant cows and anestrous in cows for several months. Bulls may become permanently infertile. The development of nodules on the skin which forms a wound after breaking is a pathognomonic lesion of the disease.

The disease was first detected in Zambia in 1929 and has gradually spread to other countries in the African continent. In 2019, LSD has spread to Eastern Asia, with outbreaks reported for the first time in China, Bangladesh and India. In the South Asian region, the first outbreak of LSD was reported in China on the 3rd of August 2019, followed by Chinese Taipei on 12th August 2019, India on 12th August 2019, Nepal on 24th June 2020 and Bangladesh on 14th July 2020.

Preparedness

Preparedness to prevent LSD introduction into the cattle population of Bhutan started by 23rd July 2020 upon receipt of email regarding the potential threat of disease introduction from the FAO country office. An emergency meeting was convened to discuss preparedness in terms of surveillance and diagnostic capacity enhancement. A notification was sent to all the livestock field offices regarding the imminent threat of disease introduction and the need for stepping up surveillance and immediate reporting of suspected cases. The NCAH accordingly contacted International Atomic Energy Agency (IAEA), Vienna for support in providing the PCR reagents.

Outbreaks in Bhutan and interventions

The first suspected case of LSD was reported from Langchenphu gewog under Samdrup Jongkhar on 21 August 2020 in six cattle. Confirmation of the outbreak could not be done as the country was under lockdown. In addition, there was no diagnostic capacity at the NCAH then. A second suspected case of LSD was reported from Tashichhoeling, Samtse on 22 September 2020. The National Centre for Animal Health received four samples from Samtse on 4 October and confirmed the outbreak on the next day. On 22 October 2020, a case of LSD was also confirmed in a sample from Shompangkha gewog, Samtse dzongkhag.

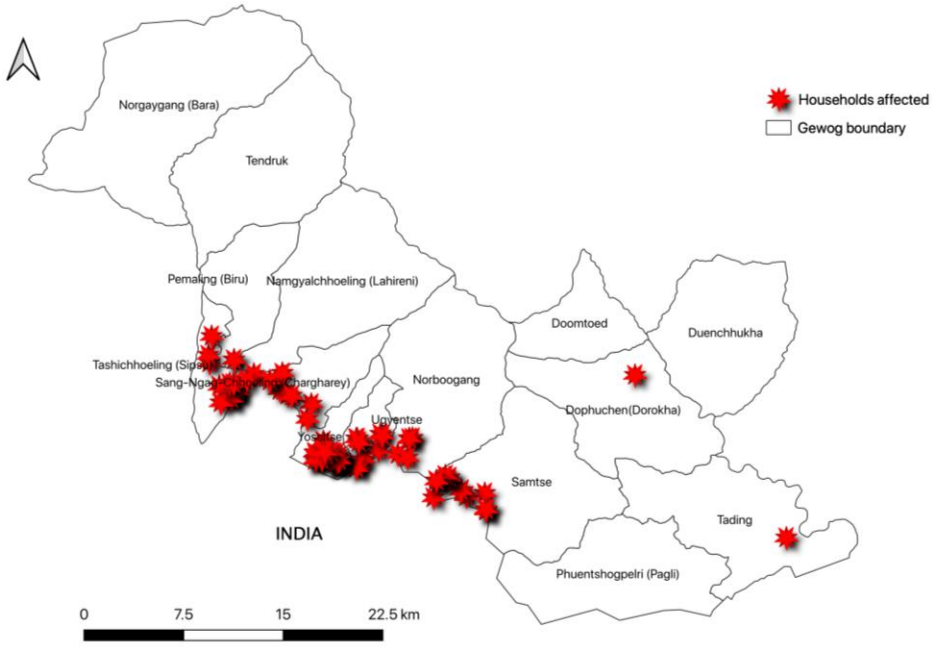


Figure 7: Spatial distribution of LSD cases in cattle in Samtse.

Since LSD is an emerging exotic disease to Bhutan, to inform the field professionals about the disease, its epidemiology, and prevention and control measures, the NCAH has sent out infographics and advisory notes on the interim measures for implementation to the field professionals and relevant stakeholders. In the meantime, the Centre initiated the development of the National LSD Prevention and Control Plan.

With the directives from the director, a detailed investigation of the outbreak in Samtse was undertaken with the help of the Regional Livestock Development Centre, Tsimasham and Dzongkhag Livestock Sector, Samtse. The following figure shows the location of LSD cases reported in Samtse dzongkhag.

4.3.2. Investigation of Capripox infection in wild animals in Bhutan.

The Capripoxvirus (CaPV) genus, one of the eight members of the subfamily Chordopoxvirinae, is composed of three important pathogens that infect only ungulates, i.e., Lumpy skin disease virus (LSDV), Goatpox virus (GTPV) and Sheeppox virus (SPPV), which are isolated from cattle, goat and sheep, respectively.

Outbreaks in Bhutan

The first outbreak of a disease in takins was reported in March 2020 from winter pasture areas under Jigme Dorji National Park (JDNP), Khamaed gewog, Gasa dzongkhag. Later, in October 2020, mortality in Himalayan gorals was reported from the Chagri monastery area in Thimphu. In the following months, Himalayan gorals and domestic goats' mortality were reported from Darla and Loggchina gewogs of Chhukha dzongkhag, and Doomtoed and Dophuchen gewogs of Samtse dzongkhag. In November 2020, mortality of Himalayan serows was reported from the lower Sangbay gewog of Haa dzongkhag (Figure 8).

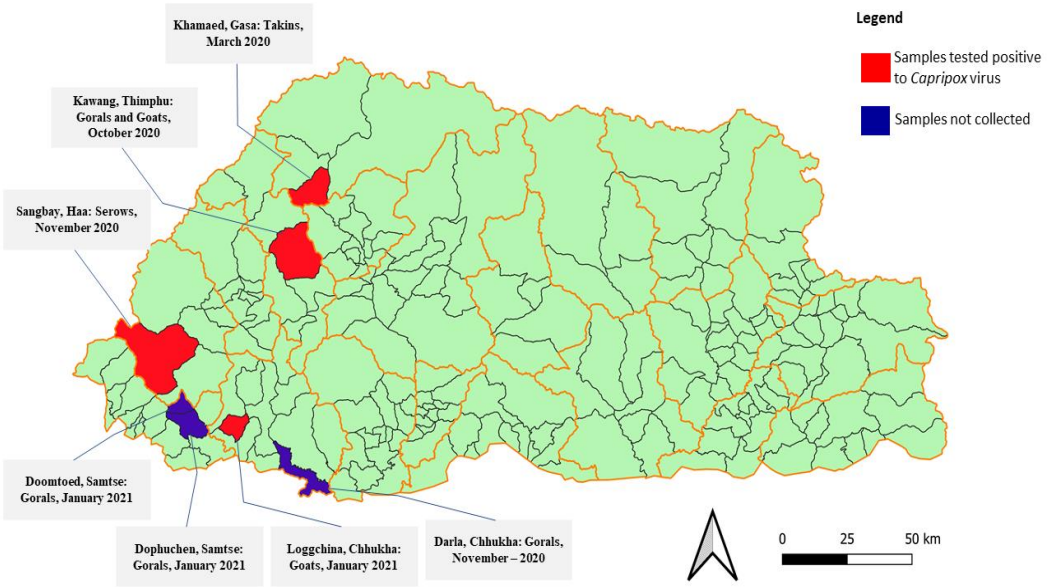


Figure 8: Spatial distribution of confirmed (clinical and laboratory-based) disease outbreaks caused by Capripox virus.

Interventions

After the report of goat pox outbreaks in wild and domestic caprids from various parts of the country, the following interventions were made by the Centre in collaboration with other stakeholders:

- Multiple rounds of disease outbreak investigations.
- Active disease surveillances.
- Diagnostic services and sample archival.
- Information sharing for preparedness and response.
- Reporting to the OIE, World Organization for Animal Health, Paris.
- Translocation of domestic goats from Chagri monastery area to BAFRA animal quarantine station in Paro and consistent vigilance and surveillance.
- Acutely sick takins were removed in Damji areas, winter pasture.

4.3.3. African swine fever outbreak in Phuentshogling, Chhukha

African swine fever (ASF) is a severe viral disease affecting domestic and wild pigs. The disease is one of the most serious transboundary animal diseases because of its high lethality for pigs, crippling socio-economic consequences, and its propensity for rapid and unanticipated international spread.

Historically, outbreaks were reported in Africa and parts of Europe, South America, and the Caribbean. Since 2007, the disease has been reported in multiple countries across Africa, Europe, and Asia, in both domestic and wild pigs. Recently, ASF outbreaks were reported from several Asian and South-East Asian Countries.

Preparedness and the first outbreak in Bhutan

In Asia, outbreaks of ASF were reported in China (PR) in August 2018, Mongolia in January 2019, Vietnam in February 2019, and so on. In response to these outbreaks in the region and to prepare for timely interventions, the drafting of the National ASF Contingency plan was initiated in February 2019. After the outbreaks of ASF reported from Assam and Arunachal Pradesh states of India between January to April 2020, national-level advocacy and sensitization about the disease were conducted, and surveillance activities were initiated in the high-risk southern districts of Bhutan.

Despite all these efforts to prevent the incursion of ASF into Bhutan, the first suspected case of ASF was reported in stray scavenging pigs from the sewerage area of Phuentshogling 6 May 2021. With strong preparedness and response plan in place, the Centre has been already equipped with laboratory diagnostic capacity to detect ASF virus. Since the carcasses identified have been putrefied and not suitable for sample collection, upon recommendation from the Centre, bone samples were referred to the NVL. On 13 May 2021, the infection was confirmed to have been caused by the ASF virus.

In Bhutan, the first case of African swine fever (ASF) was confirmed in a stray female pig from a point-of-entry (POE) area, between Bhutan and India, in Phuentshogling thromde, Chhukha district on 13 May 2021 by Real-time PCR at the National Veterinary Laboratory, National Centre for Animal Health, Serbithang, Thimphu.

Interventions

As per the draft National African Swine Fever Prevention and Control Plan 2021, the following measures were implemented:

- Outbreak investigation.
- Zoning of the areas into infection and protection zones.
- 3-D (Depopulation, Disposal and Disinfection) operations.
- Ban on imports (live pigs and their products) and movement control.
- Active surveillance.

Besides, information sharing about the disease situation to the OIE and other relevant stakeholders was carried out regularly, and the National ASF Prevention and Control Plan was finalized in consultation with all the implementing agencies.

4.4. Major collaborative programmes

4.4.1. National Highland Development Programme

A. Development of IEC materials for priority highland animal diseases

In collaboration with the National Highland Research and Development Centre (NHRDC), the lead implementing agency of the National Highland Development Programme, the National Centre for Animal Health (NCAH) has developed the infographics for the following important yak diseases (Figure 9):

- Gid/ Coenurosis
- Pyrrolizidine alkaloid poisoning
- Algae poisoning
- Hypodermosis

Figure 9: Infographics for priority yak diseases.

B. Establishment of prevalence for gid in yaks in Bhutan

Brief Methodology

The survey was conducted between February and June 2020 in all the yak-rearing highland areas of Bhutan, comprising 10 districts and 23 sub-districts (Figure 10). According to the annual livestock census 2018, there were 41,463 yaks and 9,581 hybrids in Bhutan. From a total of 879 yak herds in the highland dzongkhags, 656 different herders were selected for the survey using a simple random sampling method.

A semi-structured questionnaire was used to collect information on the number of yaks and their hybrids, Zo and Zom, of different age groups, and the numbers affected by gid disease over the last year. Other information such as yak watchdog population and management; causes of yak mortality; and knowledge, attitude and practices on gid disease and management were also gathered through the predesigned questionnaire. To complement, laboratory surveillance was also conducted in these target locations.

The data gathered through the questionnaires were entered into an electronic form created in Epi Info 7 software and exported in an excel spreadsheet. Microsoft Power Bi software was used to analyse and visualize the data. Prevalence, in this report, refers to the number of yaks and their hybrids affected by gid – observed through the exhibition of relevant clinical signs – from the total susceptible population (yaks and zo/zom of 3 years and below) in the area during the last year.

Findings

During the survey, it was found that a total of 1,222 yaks were affected by gid disease over the past year from the total susceptible population of 8,541, thus attributing to the prevalence of gid disease in yaks in Bhutan to 14.31 per cent.

At the regional level, the prevalence of gid in yaks was found to be the highest in the West Central Region (34.40 %) followed by the West Region (13.05 %), the East Central Region (12.33 %) and the East Region (0.78 %).

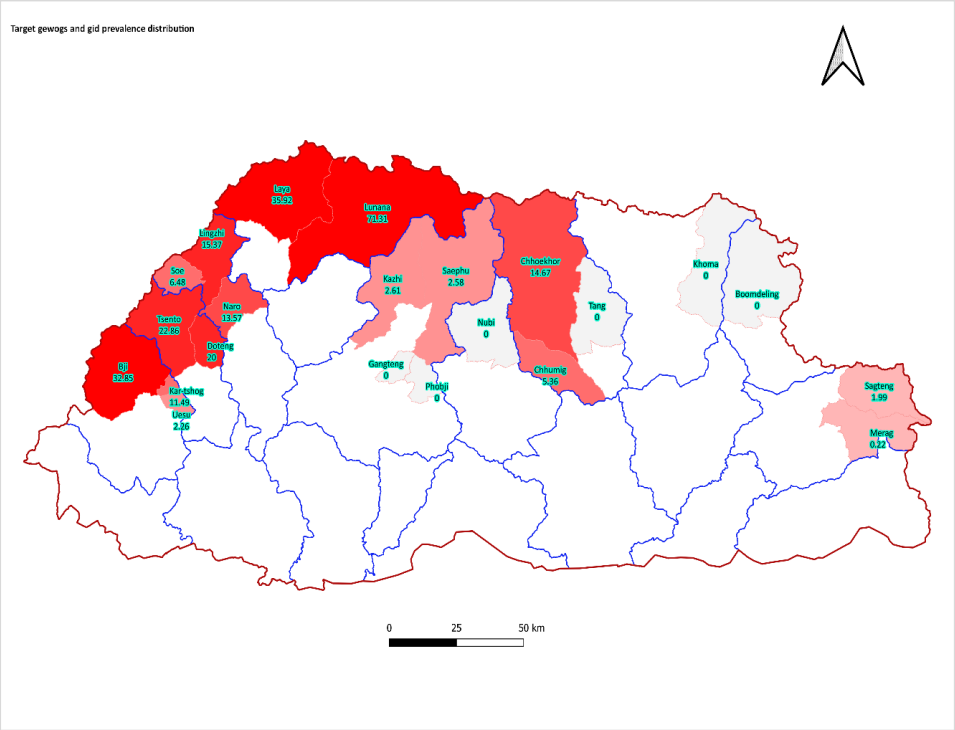


Figure 10: Map showing survey areas and gid prevalence distribution.

At the district level, the highest prevalence of gid disease in yaks was reported from Gasa dzongkhag (50.75%) followed by Paro (22.41%), Haa (19.21%), Bumthang (13.49%), Thimphu (6.88%), Wangdue Phodrang (2.58%) and Trashigang (0.99%) (Figure 2). From the 10 target dzongkhags, the gid case was not reported from Lhuentse, Trashi Yangtse and Trongsa dzongkhags.

At the gewog level, the prevalence of gid disease in yaks was found to be the highest in Lunana gewog of Gasa dzongkhag with 71.31 per cent prevalence followed by Laya (35,92 %), Bji

(32.85 %), Tsento (22.86 %), Doteng (20 %), Lingzhi (15.37 %), Chhoekhor (14.67 %), etc. (Figure 10).

C. Drafting of the National Gid Elimination Roadmap, 2020 – 2025

The main causes of yak mortality in Bhutan are fodder shortage, harsh weather, predation, accidents, yak diseases, etc. Amongst yak diseases, coenurosis, commonly known as gid, has been reported since the 1950s to be the main cause of yak calves' mortality in Bhutan. Gid is a parasitic neurological disease caused by the larval stage of *Taenia multiceps*, a dog tapeworm, mainly affecting sheep. In Bhutan, the disease is prevalent in yak calves, between 1 – 3 years, where the yak watchdogs act as the definitive host and yaks as the intermediate host. The disease has been associated with socioeconomic losses and damage to the livelihoods, food security and nutrition of vulnerable pastoralists. In long run, loss of yaks to gid disease may force pastoralists to migrate away from the highland areas in search of alternative livelihoods. These may induce poverty, social and economic instability, and conflict.

Several attempts were made in the past to prevent and control the disease. A few success stories were documented where reduction in the prevalence of gid disease in some target areas could be achieved; however, the impacts could not be sustained. Therefore, the disease remained uncontrolled in some yak rearing highland areas of Bhutan.

Investing in the elimination of gid in yaks will significantly contribute to food security, reducing poverty and consequently improving the livelihoods of Bhutan's most vulnerable pastoral and rural communities. Therefore, a national consensus has been reached on the need to prevent, control and eliminate gid in Yaks in Bhutan.

The goal of the programme is to eliminate gid in yaks in Bhutan by 2025 through strategic prevention and control measures. The programme includes a review of past interventions, adoption of the relevant strategy, current situational analysis, and intensive implementation in the target areas. The push for national elimination of gid is framed as a 5-year process running to 2025.

To guide during the implementation phase of the programme to eliminate gid in yaks in Bhutan and to keep track of the activities, this roadmap document has been developed. The technical guidance in the field shall be provided by the National Gid Prevention and Control Plan, which would be reviewed and endorsed under this programme. The annual work plans of the implementing agencies must be aligned with this roadmap to achieve the ultimate national goal of elimination of gid in yaks in Bhutan by 2025.

D. Strategic gid prevention and control programme

Objectives

- Conduct strategic deworming of yak watchdogs in selected highland communities.
- Impart awareness education to the yak herders.
- Sensitize relevant stakeholders about the gid elimination strategies.

Target areas

As per the gid prevalence data in Bhutan between 2010 and 2015, a total of 10 gewogs under five different Dzongkhag's have been reported to have gid in yaks: Bumthang Dzongkhag (Chhoekhor gewog), Gasa Dzongkhag (Laya and Lunana), Thimphu Dzongkhag (Lingzhi, Soe and Naro), Paro Dzongkhag (Tsento) and Haa Dzongkhag (Bji and Kar-tshog).

For the FY 2020 – 2021, based on the apparent gid prevalence baseline data established through a nation-wide survey and earlier reports of gid prevalence in the country, Thimphu and Bumthang were targeted for the campaign, of which three gewogs were selected: Chhoekhor (Dhur and Nasphel) under Bumthang Dzongkhag and Soe and Lingzhi under Thimphu Dzongkhag.

Main activities implemented (Figure 11)

- Sensitization of relevant stakeholders on gid disease and prevention and control measures.
- Strategic deworming of yak watchdogs and awareness for yak herders.
- Survey to assess the knowledge, attitude and practices (KAP) on gid disease and management.
- Registration of yak watchdogs.

Figure 11: Gid prevention and control programme (in pictures).

Table 17: Gid prevention and control programme achievements.

Gewog	Dzongkhag	No. of herders	No. of dogs		
			Dewormed	Sampled	Medicines dispensed
Chhoekhor	Bumthang	16	14	14	9
Chhoekhor	Bumthang	22	22	22	9

Soe	Thimphu	30	17	17	13
Lingzhi	Thimphu	28	6	6	43
Total		96	59	59	74

4.4.2. National Organic Flagship Programme

A. Study on ethnoveterinary medicines and practices in Bhutan

Objectives

- Identification and documentation of the indigenous knowledge and practices of the Ethnoveterinary health care system/ folk medicines which are declining with the practice of conventional health system.
- Provide an up-to-date compilation of traditional ways of classifying, diagnosing, preventing, treating and management of different livestock ailments in these regions.
- Compare the choices of traditional therapeutic practices over conventional health systems.

Implementing agencies

National Centre for Animal Health (NCAH) in collaboration with National Veterinary Hospital (NVH), Regional Livestock Development Centres (RLDCs) and Dzongkhag Livestock sectors (DLSs) carried out this survey.

Methodology and study design

Experienced folk healers and elderly were selected based on the recommendations and nominations made by the respective livestock officers in the dzongkhag and gewog, and local government leaders of the gewogs. Accordingly, prior consent was obtained from the individual informants. The interviewers were briefed on the non-disclosure of information shared by the interviewees and agreed on the terms – obtained in a written statement.

Focus group discussion was used, followed by an open-ended and semi-structured questionnaire and informal discussions to allow maximum participation, capture diverse knowledge and validate the information.

Data on Ethnoveterinary medicines and their practices were collected from December 2020 to May 2021 covering four Dzongkhags: Merag and Sakteng gewogs from Trashigang Dzongkhag, Langthel and Jangbi villages under Langthel gewog of Trongsa Dzongkhag, Dhur and Nasphel village under Chhoekhor gewog of Bumthang Dzongkhag, and Samar and Bji gewog from Haa Dzongkhag. These places have been selected as survey sites based on the vegetation coverage of the ethnobotanical plants as reported by the Institute of Traditional Medicine.

Identification, data collection and analysis

The reported medicinal plants were collected from the natural vegetation and home gardens. Experienced practitioners were requested to accompany in the field to indicate specimens of the medicinal plants they used, and samples were collected accordingly and transported to National Biodiversity Centre for botanical identification.

Preliminarily, the plants were identified using local names and descriptions and later identified botanically at the National Biodiversity Centre (NBC) using herbarium specimens, digital photographs of specimens, and other recorded field information (habitat type, altitude, and plant life form).

Figure 12: EVM survey in pictures.

Table 18: Number of ethnoveterinary plants and non-plants listed.

Survey Site	Plants	Non-plants
Trongsa	14	7
Trashigang	9	10
Bumthang	17	7
Haa	12	3
Total	52	27

4.5. Veterinary clinical services

In supplementation to the veterinary clinical services provided by Dzongkhag Veterinary Hospital (DVH), Thimphu, and the National Veterinary Hospital (NVH), Motithang, the Clinical Service Section of the centre caters animal health services to the domestic animals brought into the centre from nearby areas.

The table below shows the details regarding veterinary clinical services rendered by the Centre during the FY 2020 – 2021.

Category	Dog	Cat	Pig	Sheep	Cattle	Poultry	Total
Treatment	34	27	2	1	0	465	529
Deworming	52	0	5	12	11	0	80
Vaccination	47	33	0	0	0	0	80
Sterilization	11	1	30	0	0	0	42
Total	144	61	37	13	11	465	731

4.6. Secretariat works

- Coordinated compilation of annual progress report for the Centre and supporting documents for evaluation of the Centre's annual performance agreement with Animal Health Division, Department of Livestock, for the fiscal year 2019-2020.
- Coordinated planning and development of the Centre's annual performance agreement document and the work plan for the fiscal year 2020-2021.
- Coordinated mid-term review of the Centre's activities in line with the mid-reviewed annual performance agreement for the fiscal year 2020 – 2021.

5. DRUGS, VACCINES AND EQUIPMENT UNIT (DVEU)

Mandates

The main mandate of the DVEU is to coordinate the implementation of the overall management of the Essential Veterinary Drug Programme (EVDP) in the country. This mandate is implemented through various functions and activities such as:

- Timely procurement, storage and distribution of veterinary medicines, vaccines, equipment and non-drug items.
- Monitoring of medicines, vaccines and equipment supply, stock position, and storage at the Livestock Central Store (LCS) and field level.
- Maintenance of veterinary equipment and cold chain equipment.
- Audit quality control and quality assurance through testing of veterinary medicines at the Drug Regulatory Authority (DRA) approved laboratories.
- Ensure proper management of the revolving fund.
- Coordinate training and/or meetings related to Essential Veterinary Drug Programme.
- Coordinate/organize the National Veterinary Medicine Committee (NVMC) meetings.
- Liaise with DRA and take follow-up action concerning drug inspection reports.

Human resources

- Dr Ugyen Namgyel, Senior Veterinary Officer, Head
- Ms Karma Pelden Zangmo, Pharmacist
- Mr Namgay Dorji, Senior Livestock Health Supervisor

5.1. Procurement of medicines during FY 2020 – 2021

The fast-track tendering for medicines and vaccines for FY 2020 – 2021 was carried out and completed during FY 2019 – 2020 in June 2020 as per the revised EVDP management cycle. This year, we floated the tender through the e-GP system. The summary of tendering is as tabulated below:

Table 19: Summary of tendered, selected and re-tender items.

Category	Total Tendered		Total Selected		Total for Re-tender	
	Number	%	Number	%	Number	%
Veterinary Medicines	167	100	130	77.84	37	22.16

As per the tender evaluation report, a total of 130 medicine items were selected and 37 items need to be procured either through re-tender, direct procurement or using MOH tender. However, the Tender Award Committee recommended dropping 7 items out of 37 re-tender items from the procurement list as the items were non-essential and have substitutes. Further, only 10 items were recommended to procure either through direct procurement or using MOH tender. A total of 20 medicines of wildlife and aquatic were recommended to go for re-tender. Out of 10 items recommended for direct procurement, we were able to procure only 6 items. A supply order for a total of 136 medicines was placed. However, the supplier

failed to deliver 6 items and eventually only 130 medicines items were procured during the FY 2020-21.

The unit was approved with a total budget of BTN.18.5M from the total proposed budget of BTN 27M for the procurement of medicines for the FY 2020-2021. As per the indent received from the field, the unit prioritized the procurement list as per the approved budget and supply orders placed for medicines worth BTN 21.83 M. However, the suppliers could not supply medicines items worth BTN 1.674 M due to various reasons. Therefore, medicines worth BTN 20.156 M was procured for the FY 2020 – 2021. The total amount incurred for the procurement is BTN 1.654 M over the approved available budget (18.5 M). The additional amount incurred was paid from the approved budget for the procurement of equipment from EU-RDCCRP.

Table 20: Summary of the approved budget, supply orders placed and medicine procured.

Budget Proposed (BTN)	Budget Approved (BTN)	Supply orders placed (BTN)	Medicine procured (BTN)	Balance (BTN)
27.0 M	18.5M	21.83M	20.156 M	-1.654 M

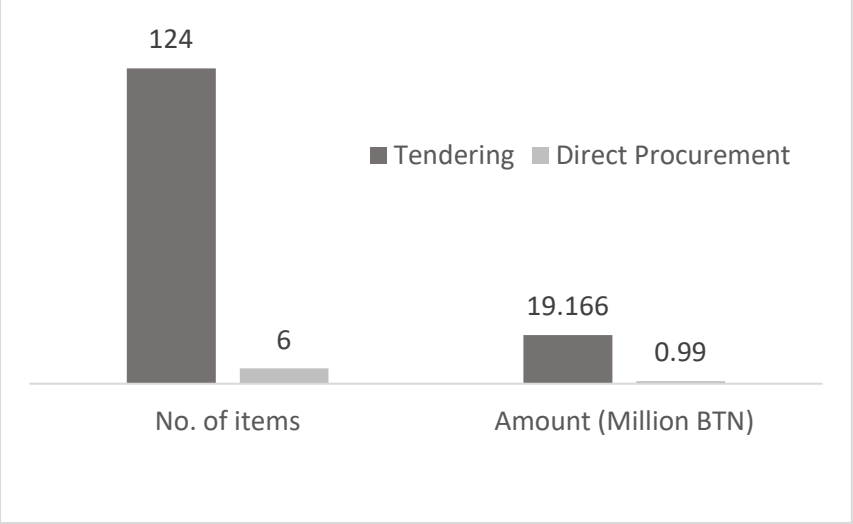


Figure 13: Graph representing the number of medicines procured through various methods.

Table 21: Details of medicine supplied, by type.

S. N.	Type	Total No. of Items tendered	No. of items supply ordered placed	No. of item with full Qty. delivered	No. of item without full Qty. delivered	No. of items failed to supply at all	Amount in BTN (M)
1	Antibiotics	21	20	16	2	2	2.47
2	Anthelmintic	10	10	8	2	0	1.85
3	External parasites	3	3	3	0	0	0.67

4	Antifungal	3	2	2	0	0	0.13
5	Antiprotozoal	3	3	3	0	0	1.92
6	Rumenotoric	1	1	1	0	0	0.12
7	Antacids	3	3	3	0	0	0.2
8	I/Uterine	1	1	1	0	0	0.06
9	Minerals	5	5	3	2	0	1.02
10	Vitamins	4	4	3	1	0	0.24
11	Infusion	6	6	4	2	0	1.21
12	External ointment/spray	3	3	3	0	0	1.22
13	Ear/eye ointment/drops	2	2	2	0	0	0.06
14	Analgesics	6	6	5	1	0	0.27
15	Antihistamine	2	2	2	0	0	0.06
16	Steroid	3	3	3	0	0	0.06
17	Hormone	11	7	3	2	2	0.23
18	Local Anaesthetics	1	1	1	0	0	0.06
19	Sedative	5	4	4	0	0	1.65
20	I/M infusion	2	2	2	0	0	0.95
21	Antiseptic	3	3	3	0	0	1.29
22	Ayurvedic	6	6	4	2	0	1.29
23	Chemical drugs	20	20	18	1	1	1.99
24	Diuretic	1	1	0	1	0	0.024
25	Anti-convulsant	2	2	1	1	0	0.06
26	Antiemetic	2	2	2	0	0	0.053
27	Cardiac Stimulant	4	2	1	1	0	0.117
28	Hemostatic	3	3	3	0	0	0.19
29	Emetics	1	0	0	0	0	0
30	Anti-dotes	1	1	1	0	0	0.034
31	Anti-diarrheal	2	2	1	1	0	0.24
32	Antineoplastic	2	2	2	0	0	0.26
33	Psychotropic substance	1	0	0	0	0	0
34	Toxoids/anti-toxin	2	1	1	0	0	0.021
35	Miscellaneous	1	1	1	0	0	0.09
36	Aquatic drugs	14	2	1	0	1	0.047
	Total	160	136	111	19	6	20.156

5.2. Procurement of equipment and non-drug items

The fast-track tendering for Veterinary equipment and non-drug items for FY 2020-2021 was completed by November 2020 as per the EVDP management cycle.

Table 22: Summary of the tender evaluation results.

Category	Total Tendered	Total Selected		Total Re-tender during the evaluation	
	Nos.	Nos.	%	Nos.	%
Veterinary Equipment & non-drug items	166	157	94.6	9	5.4

A total of 166 veterinary equipment and non-drug items were tendered for FY 2020-2021. Out of which, quotes for 157 items were selected and 9 items were recommended for re-tender. Due to the limited available budget, the evaluation committee prioritized the items for procurement based on the field requirement (essential), supply orders for only 112 items were placed and 1 item was directly procured. Out of 113 items, 4 items could not be delivered by the suppliers. A total of 109 items worth of BTN. 15.66 M were procured for the FY 2020-21. The approved budget from EU-RDCCRP for the procurement of veterinary equipment and non-drug items for the FY 2020-2021 was 21.54M. The balance of 5.88 M was utilized for the purchase of medicines, vaccines and procurement of work safety equipment at Livestock Central Store.

Table 23: Summary of the approved budget, supply orders placed, and equipment procured.

Budget Proposed (BTN)	Budget Approved (BTN)	Supply orders placed (BTN)	Equipment procured (BTN)	Balance (BTN)
19.52 M	21.54 M*	15.79M	15.66 M	+5.88 M

**BTN 6M for medicines and vaccines.*

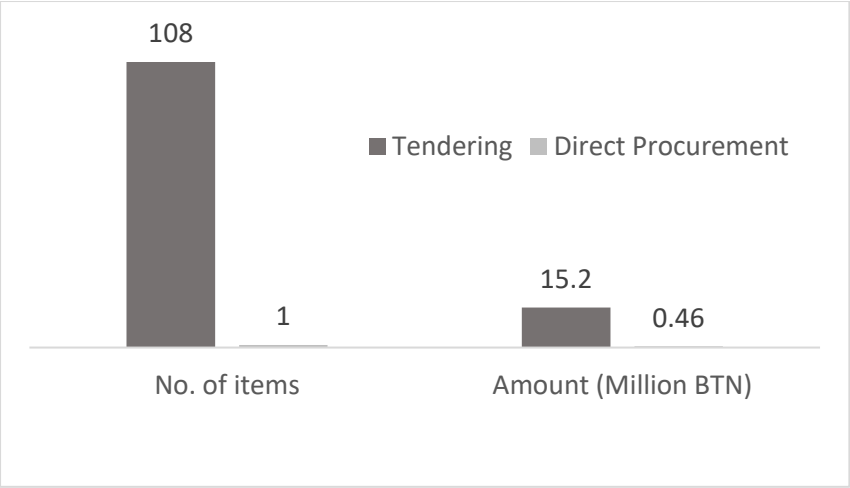


Figure 14: Graph representing the number of equipment procured through various methods.

Table 24: Details of items procured.

Total number of items	Total no of items supply order placed	No. of items with full qty. delivered	No. of items without full qty. delivered	No. of items failed to supply	Amount in BTN (M)
166	113	107	2	4	15.66

5.3. Verification and inspection of veterinary drugs and equipment

The verification team conducted a total of 12 verifications of new consignments during the FY 2020 – 2021 to inspect the newly arrived consignments of veterinary medicines, equipment and non-drug items.

Table 25: Details of verifications visits for veterinary medicine consignments.

Sl. No.	Date of Verification	Team Members	Number of items	
			Accepted	Rejected
1	27th – 28th October2020	4	34	2
2	12th – 13th November 2020	3	23	
3	19th November 2020	2	2	
4	20th – 24th November 2020	3	34	
5	25th – 27th February 2021	3	15	
6	11th April 2021	3	16	
7	8th April 2021	4	9	

Table 26: Details of verification visits for veterinary equipment and non-drug items consignments.

Sl. No.	Date of Verification	Team Members	Number of items	
			Accepted	Rejected
1	25th – 27th February 2021	3	10	
2	22nd – 23rd March 2021	3	4	
3	9th April 2021	3	7	
4	11th April 2021	3	13	
5	15th April 2021	4	37	
6	23rd April 2021	3	4	
7	10th – 11th May 2021	3	34	

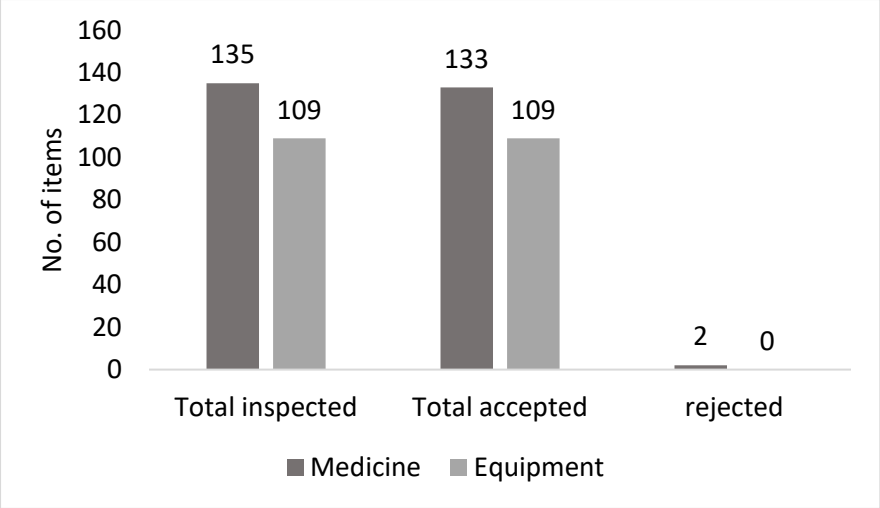


Figure 15: Graph showing a total no. of items inspected, accepted and rejected during the consignment verification.

5.4. Distribution of Veterinary Medicines

As per the EVDP management cycle, the mass distribution of veterinary medicines was done two times in a year i.e., the 1st mass distribution was done in November 2020 and the second mass distribution was done in May 2021 along with the distribution of equipment and non-drug items. First lot mass distribution was done in November 2020 as per the EVDP cycle from the NCAH. This was possible after translocation of the store to the NCAH after Phuentsogling was identified as a red zone area. The mass distribution was done up to the DVH point for Dzongkhags and till the respective Central Farms and Agencies' premises. The ad-hoc and emergency distribution of medicines was done throughout the year as and when the requisitions were submitted to DVEU by the respective units. A total medicines worth of BTN. 15.49M were distributed to Dzongkhags, Central Farms/ Agencies and other non-departmental agencies and Projects during the FY 2020 – 2021. The summary of the total amount (in Million) of veterinary medicines distributed to various Dzongkhags, Farms, Central Agencies and Non-departmental Agencies/projects are tabulated below.

Table 27: Worth (M BTN) of medicine distributed.

Sl. No.	User	1st Mass Distribution Amount	2nd Mass Distribution Amount	Emergency requisition Amount	Total distributed
1	Dzongkhags	6.96	4.78	0.67	12.4
2	Central Farms/ Agencies	1.57	0.83	0.2092	2.6
3	Other Agencies*	0.26	0.18	0.05	0.49
Total		8.79	5.79	0.92	15.49

**Non-departmental agencies and projects: BLDC, CNR Lobesa and NCD, Taba*

The Dzongkhag-wise budget ceiling for medicines, medicine indented and distribution of medicines done for individual Dzongkhag is as tabulated below.

Table 28: Worth (M BTN) of medicines indented vs. distributed to Dzongkhags.

Sl. No.	Dzongkhag	Percentage of items with Qty distributed ≥ Qty indented	Budget Ceiling (M)	Medicines Indented (M)*	Medicines Distributed (M)
1	Bumthang	52.0	0.499	0.390	0.26
2	Chhukha	46.3	1.086	0.850	0.72
3	Dagana	42.0	1.004	0.650	0.57
4	Gasa	50.4	0.340	0.250	0.23
5	Haa	52.0	0.567	0.450	0.38
6	Lhuntse	54.5	0.732	0.540	0.48
7	Mongar	34.3	2.267	2.850	1.22
8	Paro	52.9	1.460	1.170	0.88
9	Punakha	33.9	1.068	0.900	0.61
10	Pema Gatshel	52.6	0.748	0.570	0.44
11	Sarpang	32.8	1.227	1.180	0.78
12	Samtse	32.8	1.339	0.900	0.74
13	Samdrup Jongkhar	45.3	1.194	0.600	0.47
14	Thimphu	37.1	1.110	0.860	0.54
15	Tsirang	42.7	1.455	1.230	0.86
16	Tashigang	12.3	1.749	1.450	0.92
17	Tashi Yangtse	38.9	0.571	0.470	0.34
18	Trongsa	37.8	1.102	0.880	0.51
19	Wangdue	33.6	1.684	1.440	0.83
20	Zhemgang	42.7	1.035	0.710	0.57
	Total		22.237	18.340	12.4

** The amount of the medicines indent is lower than the budget ceiling as the selected rate of the medicines is comparatively lower than the previous year's rate (indent was workout based on the previous year's rate.*

The Central Farm/Agency-wise budget ceiling for Medicines, medicines indented and actual distribution of medicines done for individual Central Farm/Agencies during FY 2020-2021 is tabulated below.

Table 29: Worth (M BTN) of medicines indented vs. distributed to CF/ CA.

Sl. No.	Central Farms/ Central Agencies	Percentage of items with Qty distributed ≥ Qty indented	Budget Ceiling (M)	Medicines Indented (M)*	Medicines Distributed (M)
1	NCAH, Serbithang	48.4	0.113	0.06	0.03
2	RLDC, Tsimasham	39.8	0.113	0.17	0.07

3	RLDC, Wangdue	21.4	0.113	0.08	0.031
4	RLDC, Zhemgang	28.0	0.113	0.16	0.04
5	RLDC Kanglung		0.113		0.03
6	NDRDC, Yusipang	54.1	0.113	0.14	0.08
7	NHRDC, Jakar*	54.1	0.51	0.08	0.05
8	NVH, Motithang	87.5	0.185	0.59	0.92
9	NPRDC, Sarpang	60.0	0.488	0.26	0.269
10	NJBC, Samtse	47.2	0.261	0.08	0.04
11	NPBC, Yusipang	26.0	0.261	0.14	0.144
12	NHBF, Bumthang	66.7	0.113	0.07	0.06
13	RCBC, Bumthang	42.4	0.113	0.112	0.117
14	NSBC, Bumthang	63.0	0.113	0.02	0.02
15	CRC, Wangkha	44.6	0.113	0.08	0.06
16	RPBC, Paro	71.4	0.113	0.08	0.08
17	NPiRDC, Gelephu	30.8	0.113	0.14	0.13
18	NNBF,Tashiyangphu	56.1	0.113	0.05	0.04
19	RMBF, Zhemgang	59.4	0.113	0.02	0.019
20	RMBF, Arong	55.6	0.113	0.05	0.044
21	RPPBC, Lingmethang	52.1	0.17	0.12	0.13
22	NRCWWF, Gelegphu	21.4	0.053	0.007	0.0066
23	TVH Phuentshogling	63.2	0.113	0.113	0.133
24	TVH Gelegphu	50.0	0.088	0.13	0.109
25	TVH, Nganglam	61.8	0.088	0.066	0.054
26	TVH, Dewathang	61.8	0.088	0.066	0.054
27	NP&HBC,Lhuentse	74.6	0.022	0.017	0.015
28	NRCR&LF, Haa	33.3	0.053	0.009	0.0049
	Total		3.987	2.91	2.6

The unit received a total of 29 emergency medicines requisition from 20 centres during the FY 2019 – 2020. Out of 29 requisitions, 2 were for CABC medicines worth 1.25 M. The details of the emergency medicines requisition received and distributed during the FY 2020 – 2021 are tabulated below.

Table 30: Details of emergency requisition of medicines distributed.

Sl. No.	Users	Total no. of times	Amount (In Million BTN)	Remarks
1	Dzongkhags	11	1.59	Highest no. of times from Haa and Paro and Dagana: 2 times each
2	Central Farms/Agencies	15	0.66	Highest No. of times from NVH, 5 times
4	Non-departmental Agencies/Project	3	0.55	Highest no of times from BLDC Samrang.

Total	29	2.8

The worth of medicines distributed to Dzongkhags, Central Farms/Agencies and other non-departmental agencies during the FY 2020-2021 was compared with the budgetary ceiling allocated during indent collection. All the centres except NVH, Motithang had received the actual distribution less than their budget ceiling. The reason is that the budget ceiling was allocated based on the proposed annual budget (27 M), whereas the approved budget was BTN 18.5 M for FY 2019 – 2020. Further, we had to supply medicines to other non-departmental agencies. The details of medicines supplied to non-departmental agencies are shown in the following table.

Table 31: Details of medicine support to non-departmental agencies.

Sl. No.	User	No. of times	Total Items	Amount in BTN (M)
1	BLDC, Samrang	4	80	0.289
2	BLDC, Sarpang	2	11	0.168
3	CNR, Lobesa	1	32	0.015
4	NCD, Taba	1	28	0.018
Total		8	151	0.49

The table below shows the quantity of antimicrobials (in Kgs) as per the antimicrobial class distributed in the FY 2020 – 2021. The active ingredient of antimicrobials was calculated according to the OIE method and tabulated as per the OIE Antimicrobial usage reporting option 1.

Table 32: Quantity of antimicrobials distributed.

Antimicrobial Class	Amount of Active ingredient (Kg)
Aminoglycosides	8.52
Amphenicols	1.05
1-2 gen. cephalosporins	5.29
3-4 gen cephalosporins	8.19
Fluoroquinolones	5.27
Nitrofurans	0.62
Penicillins	23.97
Sulfonamides (including trimethoprim)	153.7
Tetracyclines	35.43
Others*	102.77

**Povidone iodine and Metronidazole*

5.5. Distribution of Veterinary equipment and non-drug items

While the equipment and non-drug items were also distributed during mass medicine distribution in December 2020, the scheduled mass distribution was done in May 2021. Although we have scheduled to distribute in April 2021, we could not do since Phuentshogling went into lockdown. However, we were able to complete the mass distribution in May after getting special approval from COVID-19STF. Equipment and non-drug items total worth of BTN 13.03 M was distributed to Dzongkhags and central agencies/farms in the FY 2020-21.

Table 33: The detail of the items distributed to Dzongkhags (in amounts).

Sl. No.	Dzongkhag	Routine distribution Amount (M BTN)	Emergency distribution Amount (M BTN)	Total Amount (M BTN)
1	Bumthang	0.51	0.000	0.51
2	Chhukha	0.585	0.000	0.58
3	Dagana	0.562	0.000	0.562
4	Gasa	0.274	0.000	0.274
5	Haa	0.459	0.0013	0.460
6	Lhuentse	0.405	0.000	0.405
7	Monggar	0.558	0.000	0.558
8	Paro	0.701	0.000	0.701
9	Punakha	0.595	0.000	0.595
10	Pema Gatshel	0.511	0.000	0.511
11	Sarpang	0.579	0.000	0.579
12	Samtse	0.682	0.0013	0.683
13	Samdrup Jongkhar	0.473	0.000	0.473
14	Thimphu	0.435	0.000	0.435
15	Tsirang	0.562	0.000	0.562
16	Tashigang	0.497	0.0052	0.502
17	Tashi Yangtse	0.416	0.000	0.416
18	Trongsa	0.383	0.000	0.383
19	Wangdue Phodrang	0.549	0.000	0.549
20	Zhemgang	0.37	0.0118	0.3818
TOTAL		10.106	0.0196	10.126

Table 34: The detail of the items distributed to CF/CA (in amounts).

Sl. No.	Central Farms/Agencies	Routine Distribution Amount (M BTN)	Emergency Distribution Amount (M BTN)	Total Distribution Amount (M BTN)
1	NVH, Motithang	0.85	0.0496	0.8996
2	NCAH, Serbithang	0.0729	0.000	0.0729

3	NPBC, Yusipang	0.0086	0.003	0.0116
4	NDR&DC, Yusipang	0.0185	0.000	0.0185
5	TVH, Phuentshogling	0.715	0.0075	0.7225
6	RCRF, Wangkha	0.0465	0.000	0.0465
7	NJBC, Samtse	0.0535	0.000	0.0535
8	RLDC, Tsimasham	0.0158	0.0146	0.0304
9	NSBC, Bumthang	0.0154	0.000	0.0154
10	BSF, Bumthang	0.0078	0.000	0.0078
11	RPBC Paro	0.12	0.000	0.12
12	TVH & SVL Gelegphu	0.18	0.000	0.18
13	RLDC, Wangdue	0.0068	0.000	0.0068
14	RPPBC, Lingmethang	0.0488	0.000	0.0488
15	NNBF, Tashiyangphu	0.0105	0.000	0.0105
16	RMBF, Arong	0.0556	0.000	0.0556
17	NRCR&LF, Haa	0.00077	0.000	0.00077
18	NHRDC, Bumthang	0.013059	0.000	0.013
19	NPHBC, Sertsham	0.0578	0.000	0.0578
20	RLDC, Kanglung	0.330	0.000	0.33
21	NRCR&LF, Haa	0.00077	0.000	0.00077
22	Fishery, Gelegphu	0.0056	0.069	0.0746
23	Horse Farm, Bumthang	0.0093	0.000	0.0093
24	NPiRDC, Gelegphu	0.0063	0.000	0.0063
25	NPRDC, Sarpang	0.11	0.000	0.11
	TOTAL	2.76	0.144	2.904

5.6. Tendering of medicines and vaccines for FY 2021-2022

The fast-track tendering for medicines and vaccines for FY 2021-2022 was carried out and completed during FY 2020-2021 in June 2021 as per the EVDP management cycle. The tendering was done through the e-GP system. The summary of tendering is tabulated below.

Table 35: Summary of tendered, selected and re-tender items for 2021-2022.

Category	Total Tendered	Total Selected		Total for Re-tender	
	Number	Number	%	Number	%
Veterinary Medicines	165	140	84.85	25	15.15
Vaccines	10	10	10	0	0
Total	175	150	85.71	25	14.29

Table 36: Summary of tendered amount against budget proposed (reworked based on selected quote).

Category	Budget Proposed for 2020-21 (BTN)	Tender Amount Selected (BTN)	Balance (BTN)

Veterinary Medicines	28.06 M	26.942 M	+1.118 M
Vaccines	4.76 M	6.41 M	-1.6 5M

5.7. Support on the cold chain facilities for Dzongkhags, Central Farms and Central Agencies under the Department of Livestock

During the National Animal Health Coordination Workshop held in Gelegphu, Sarpang from 9th to 12th January 2019, the issue of breakdown of the cold chain equipment distributed in 2003 through KR-II Grant was deliberated. It is important to have a proper cold chain to stock the vaccines and some of the essential medicines. The break in the cold chain will lead to a reduction in the potency of vaccines thereby leading to vaccination failure and outbreak of diseases in the field. The successful prevention of diseases in production animals and companion animals will lead to increased production and prevent the spread of diseases from animals to humans, respectively. Understanding the importance of having sound cold chain facilities, the floor agreed to support the procurement of cold chain equipment through EU-RDCCRP. Accordingly, the NCAH in collaboration with AHD, DoL proposed a budget and total budget of BTN. 21.54 M for procurement of Veterinary Equipment including cold chain and as a subsidiary budget for Veterinary medicines and vaccines was approved for the FY 2020-21.

The DVEU, NCAH procured 7 types of cold chain equipment worth BTN 7.4 M and distributed them. The procurement and distribution were done in consultation with the field offices after getting realistic requirements in the field. All the equipment procured and distributed were of good quality and specifically designed for veterinary/medical use. The details of the equipment procured and distributed are shown in the table below.

Table 18. Details of cold chain equipment procured.

Sl. No.	Particulars	Model No	Quantity	Rate	Amount	Remarks
1	Pharmacy Refrigerator (300L)	ElanPro ECG-305	70	38900	2723000	For Gewog Centres and Farms
2	Pharmacy Refrigerator (360L	Labfreez MR-PR-360	28	106722	2988216	For DVH, NVH and TVH
3	Pharmacy Refrigerator (1360L)	Labfreez MR-PR-1360	1	202125	202125	For LCS
4	Medium Vaccine Carrier (22.5L)	Apex (AICB-503L WHO PQS no: E004/030)	30	9406	282180	For DVH & Farms
5	Cool box (5L)	Apex (AICB-46L WHO PQS no: E004/047)	4000	1150	460000	Direct Procurement

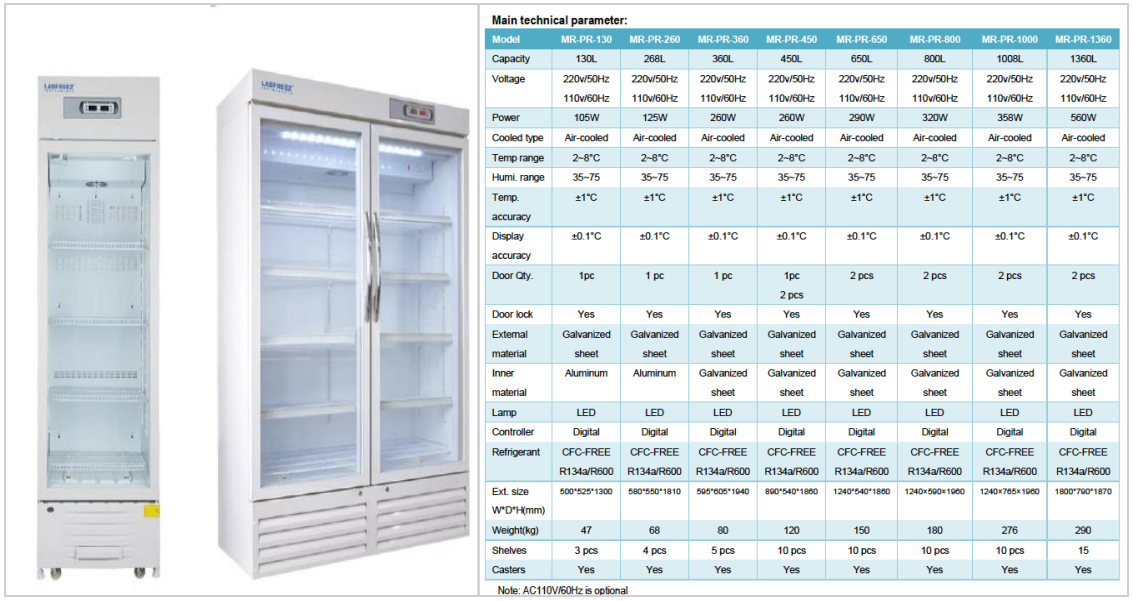
6	Data Logger	Care process instrument (ETS-PDL-K03)	25	7080	177000
7	Refrigerator Thermometer	Acutex Model DC-9	300	1815	544500
Total					73,77,021

Table 37: Details of cold chain equipment distributed to Dzongkhags.

Sl. No.	Dzongkhag	Pharmacy Refrigerator			Coolbox AIVC-46L	Medium Vaccine carrier-AICB-503L	Data Logger	Refrigerator Thermometer
		ElanPro ECG-305	Labfreez MR-PR-360	Labfreez MR-PR-1360				
1	Lhuentse	3	1	0	13	1	1	12
2	Monggar	4	1	0	21	1	1	21
3	S/Jongkhar	4	1	0	14	1	1	13
4	T/Yangtse	3	1	0	11	1	1	10
5	T/Gang	3	1	0	23	1	1	22
6	Pema Gatshel	4	1	0	14	1	1	13
7	Chhukha	3	1	0	14	1	1	13
8	Samtse	5	1	0	18	1	1	17
9	Haa	2	1	0	9	1	1	8
10	Paro	3	1	0	13	1	1	12
11	Thimphu	1	1	0	12	1	1	11
12	Dagana	4	1	0	17	1	1	16
13	Gasa	1	1	0	7	1	1	6
14	Punakha	4	1	0	14	1	1	13
15	Tsirang	3	1	0	15	1	1	14
16	Wangdue Phodrang	4	1	0	19	1	1	18
17	Bumthang	3	1	0	7	1	1	6
18	Sarpang	4	1	0	15	1	1	14
19	Trongsa	3	1	0	8	1	1	7
20	Zhemgang	2	1	0	13	1	1	12
Total		63	20	0	277	20	20	257

Table 38: Details of cold chain equipment distributed to Central Agencies and Farms.

Sl. No.	Dzongkhag	Pharmacy Refrigerator			Cool box AIVC-46L	Medium Vaccine carrier-AICB-503L	Data Logger	Refrigerator Thermometer
		ElanPro ECG-305	Labfreez MR-PR-360	Labfreez MR-PR-1360				
1	RLDC, Wangdue	0	0	0	2	0	0	1
2	RLDC, Tsimasham	0	0	0	2	0	0	1
3	RLDC, Zhemgang	0	0	0	2	0	0	1
4	RLDC, Kanglung	0	0	0	2	1	0	1
5	RPBC, Paro	0	1	0	1	1	0	1
6	RPPBC, Lingmethang	1	0	0	1	0	0	1
7	NPRDC, G/phu	0	1	0	1	0	0	1
8	NVH, M/thang	0	2	0	3	0	1	3
9	LCS, P/ling	1	0	1	3	2	0	2
10	TVH, P/ling	0	1	0	2	1	1	2
11	TVH, P/ling	0	1	0	2	1	1	2
12	TVH, D/thang	0	1	0	2	0	1	2
13	TVH, Nganglam	0	1	0	2	0	1	2
14	RMBF, Aorong	1	0	0	1	0	0	1
15	NJBC, Samtse	1	0	0	1	0	0	1
16	NNBF, T/Yangphu	0	0	0	1	0	0	1
17	NPHPC, Sertsham	1	0	0	1	1	0	1
18	RBPC, Yusipang	0	0	0	1	0	0	1
19	NDRC, Yusipang	0	0	0	1	0	0	1
20	NHRDC, B/thang	0	0	0	2	0	0	1
21	NHF, B/thang	0	0	0	1	0	0	1
22	Brown Swiss Farm, Bumthang	0	0	0	1	0	0	1
23	RMBF, Z/gang	0	0	0	1	0	0	1
24	CRC, WangKha	1	0	0	1	0	0	1
25	NCAH, Serbithang	0	0	0	3	2	0	1
26	NPiRDC, Gelegphu	1	0	0	1	1	0	1
27	NSBC, B/thang	0	0	0	1	0	0	1
28	NRDCA, G/phu	0	0	0	2	0	0	1
Total		7	8	1	46	10	0	35



Main technical parameter:

Model	MR-PR-130	MR-PR-260	MR-PR-360	MR-PR-450	MR-PR-650	MR-PR-800	MR-PR-1000	MR-PR-1360
Capacity	130L	268L	360L	450L	650L	800L	1008L	1360L
Voltage	220v/50Hz 110v/60Hz	220v/50Hz 110v/60Hz	220v/50Hz 110v/60Hz	220v/50Hz 110v/60Hz	220v/50Hz 110v/60Hz	220v/50Hz 110v/60Hz	220v/50Hz 110v/60Hz	220v/50Hz 110v/60Hz
Power	105W	125W	260W	260W	290W	320W	358W	560W
Cooled type	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled
Temp range	2~8°C	2~8°C	2~8°C	2~8°C	2~8°C	2~8°C	2~8°C	2~8°C
Humi. range	35~75	35~75	35~75	35~75	35~75	35~75	35~75	35~75
Temp. accuracy	±1°C	±1°C	±1°C	±1°C	±1°C	±1°C	±1°C	±1°C
Display accuracy	±0.1°C	±0.1°C	±0.1°C	±0.1°C	±0.1°C	±0.1°C	±0.1°C	±0.1°C
Door Qty.	1pc	1 pc	1 pc	1pc 2 pcs	2 pcs	2 pcs	2 pcs	2 pcs
Door lock	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
External material	Galvanized sheet	Galvanized sheet	Galvanized sheet	Galvanized sheet	Galvanized sheet	Galvanized sheet	Galvanized sheet	Galvanized sheet
Inner material	Aluminum	Aluminum	Galvanized sheet	Galvanized sheet	Galvanized sheet	Galvanized sheet	Galvanized sheet	Galvanized sheet
Lamp	LED	LED	LED	LED	LED	LED	LED	LED
Controller	Digital	Digital	Digital	Digital	Digital	Digital	Digital	Digital
Refrigerant	CFC-FREE R134a/R600	CFC-FREE R134a/R600	CFC-FREE R134a/R600	CFC-FREE R134a/R600	CFC-FREE R134a/R600	CFC-FREE R134a/R600	CFC-FREE R134a/R600	CFC-FREE R134a/R600
Ext. size W*D*H(mm)	500*525*1300	580*550*1810	595*605*1940	890*540*1860	1240*540*1860	1240×590×1960	1240×765×1960	1800*790*1870
Weight(kg)	47	68	80	120	150	180	276	290
Shelves	3 pcs	4 pcs	5 pcs	10 pcs	10 pcs	10 pcs	10 pcs	15
Casters	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: AC110V/60Hz is optional

Figure 16: Figure 12: Pharmacy Refrigerators LabFreez MR-PRA-360 (360L) and Pharmacy Refrigerator Labfreez MR-PR-1360 (1360L).

- Perfect product visibility with double vacuum glass door
- Adjustable Shelves
- Lock & Castors for easy mobility
- Eco Friendly Refrigerant

Specifications for this item

Brand Name	Elanpro
Item Volume	300.00 liters
Number of Items	1
Part Number	ECG305
Temperature Range	1°C ~ 10°C degrees_celsius
Wattage	160.00

Apex International

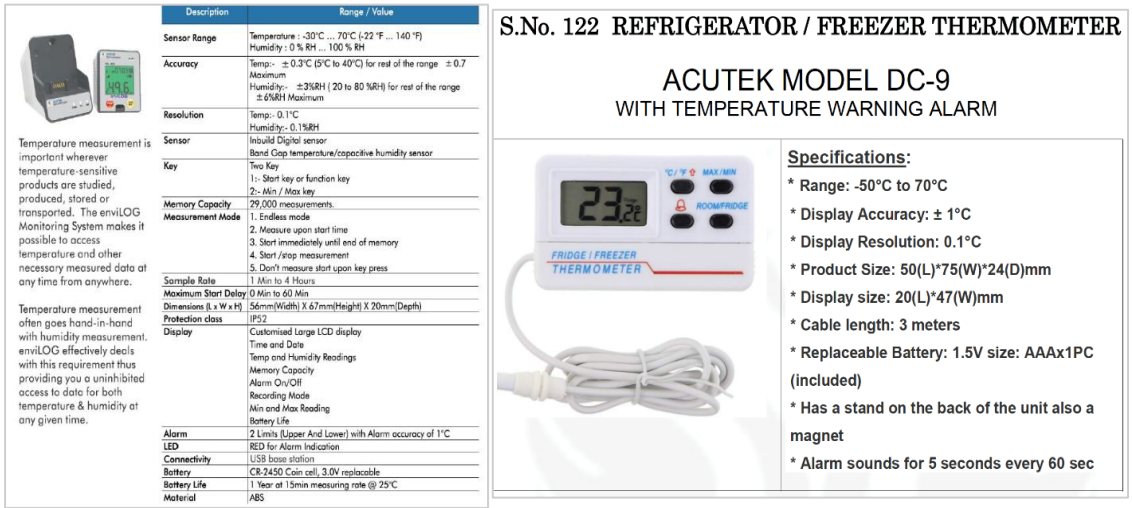
COLD BOX

MODEL AICB-503L
LONG RANGE
WHO PQS NO.: E004/030

SPECIFICATIONS

Range	Long
Vaccine Storage Capacity	22.5 Litres
Weight Fully Loaded	48.2 Kgs
Weight Empty (with empty ice pack)	23.55 Kgs
External dimensions(WxDxH)`	76.5 X 61.2 X 51.5 cms
Internal dimensions(WxDxH)`	51.8x37.0x27.7 cms
Vaccine Storage dimensions (WxDxH)	45.5x31.0x16.0 cms
Lid type & fixing	Hinged
External material	LLDPE
Internal lining material	LLDPE
Insulation material	CFC-free Polyurethane
Insulation thickness	100 mm
Number of Ice Packs	50 x 0.3 Litre
Cold life without opening at 43 C	128.16hours

Figure 17: Pharmacy refrigerator (ElanPro ECG-305) and Medium Vaccine carrier (AICB-503L).



Temperature measurement is important wherever temperature-sensitive products are studied, produced, stored or transported. The enviLOG Monitoring System makes it possible to access temperature and other necessary measured data at any time from anywhere.

Temperature measurement often goes hand-in-hand with humidity measurement. enviLOG effectively deals with this requirement thus providing you a uninhibited access to data for both temperature & humidity at any given time.

Description	Range / Value
Sensor Range	Temperature : -30°C ... 70°C (-22 °F ... 140 °F) Humidity : 0 % RH ... 100 % RH
Accuracy	Temp:- ±0.3°C (5°C to 40°C) for rest of the range ±0.7 Maximum Humidity:- ±3%RH (20 to 80 %RH) for rest of the range ±6%RH Maximum
Resolution	Temp:- 0.1°C Humidity:- 0.1%RH
Sensor	Inbuild Digital sensor Band Gap temperature/capacitive humidity sensor
Key	Two Key 1:- Start key or function key 2:- Min / Max key
Memory Capacity	29,000 measurements.
Measurement Mode	1. Endless mode 2. Measure upon start time 3. Start immediately until end of memory 4. Start /stop measurement 5. Don't measure start upon key press
Sample Rate	1 Min to 4 Hours
Maximum Start Delay	0 Min to 60 Min
Dimensions (L x W x H)	56mm(Width) X 67mm(Height) X 20mm(Depth)
Protection class	IP52
Display	Customised Large LCD display Time and Date Temp and Humidity Readings Memory Capacity Alarm On/Off Recording Mode Min and Max Reading Battery Life
Alarm	2 Limits (Upper And Lower) with Alarm accuracy of 1°C
LED	RED for Alarm Indication
Connectivity	USB base station
Battery	CR-2450 Coin cell, 3.0V replacable
Battery Life	1 Year at 15min measuring rate @ 25°C
Material	ABS

S.No. 122 REFRIGERATOR / FREEZER THERMOMETER

ACUTEK MODEL DC-9
WITH TEMPERATURE WARNING ALARM

FRIDGE / FREEZER THERMOMETER

Specifications:

* Range: -50°C to 70°C
* Display Accuracy: ± 1°C
* Display Resolution: 0.1°C
* Product Size: 50(L)*75(W)*24(D)mm
* Display size: 20(L)*47(W)mm
* Cable length: 3 meters
* Replaceable Battery: 1.5V size: AAAx1PC (included)
* Has a stand on the back of the unit also a magnet
* Alarm sounds for 5 seconds every 60 sec

Figure 18: Data Logger (ETS-PDL-K03) and Refrigerator thermometer (Acutex DC-9).

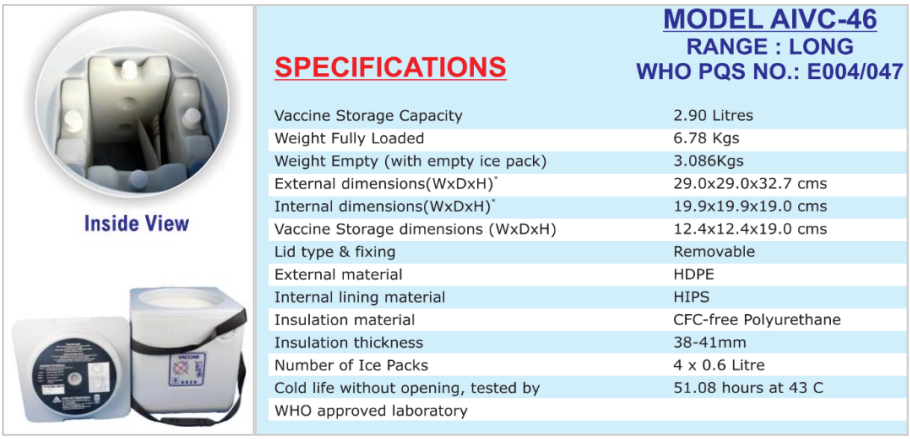


Figure 19: Coolbox (5L), AIVC-46, WHO PQS No. E004/047.

5.8. Support and Monitoring of Livestock Centre Store, Phuentshogling on Store Management

5.8.1. Procurement of Work Safety Equipment

Livestock Centre Store (LCS), Phuentshogling is responsible for storing and managing all kinds of Veterinary Medicines, Equipment and non-drug items meant for distribution to all the animal health centres across the country. The worth and volume of the consignments that are managed and stored at the store are substantially high. The staff must deal with both hazardous and heavy consignment daily. Recognizing the importance of practising work safety measures at the store to protect the workers as well as the material they are dealing with, the DVEU, NCAH felt the need to immediately implement the safety measures at LCS. To implement the basic safety measures at the workplace, the unit secured a budget and procured Personal Protective Equipment (PPE) and spill kits worth BTN 0.14 M for LCS.

Table 39: Details of PPEs procured.

Sl. No.	Items	Rate	Nos.	Amount
1	Ladder	9850	2	19700
2	Hydraulic trolley	25000	2	50000
3	Safety boots	2150	15	32250
4	Safety helmets	350	20	7000
5	Safety Goggles	95	20	1900
6	Face Shield	85	20	1700
7	Working gloves (Leather)	110	20	2200
8	Scoop with detachable for collecting glass fragment	450	2	900
9	Mop stick with bucket	300	2	600
10	Colour-coded waste bins	2500	3	7500
11	Vacuum Cleaner	10500	1	10500
Total Amount				134250

Figure 20: PPEs procured from LCS.

5.8.2. Development of Work safety SOP

The implementation of work safety measures at Livestock Centre Store requires Standard Operating Procedure (SOP) and PPE. Apart from the procurement of PPE, the unit had also developed a draft SOP to guide the staff of the LCS in handling the medicines in compliance with standard protocols to ensure the safety of the staff and optimize drug management. Although the unit has a plan to train the staff at LCS on work safety measures SOP for immediate implementation, this could not be materialized in this FY as the Phuentshogling falls in the COVID-19 red zone area. However, the unit is planning to conduct training on the SOP and implement it as the situation improves in Phuentshogling.

5.8.3. Temporary Management of Store from the NCAH

In September 2020, the Livestock Central Store (LCS), Phuentsholing had been cordoned as it falls under the COVID-19 hot spot area and access to LCS was strictly restricted. As a result, the functioning of LCS had been put on halt. Further, since Phuentsholing was already identified as a red zone, the functioning of LCS is going to be affected. To continue with the uninterrupted functioning of LCS, we had translocated LCS to NCAH, Serbithang w.e.f. 8th September 2020. This arrangement is basically to avert the spread of infection from the hot zone and to provide uninterrupted service of LCS. Accordingly, the unit had also developed a Standard Operating Procedure (SOP) for the delivery of Veterinary Medicines and equipment

from the NCAH, Serbithang, Thimphu. Until the translocation of the store back to LCS, Phuentshogling at the end of March 2021, the unit had been managing the store at the NCAH and carrying out the following activities:

- Overall management of store at the NCAH
- Reception and verification of new consignments of veterinary medicines and equipment for FY 2020-21
- 1st lot mass distribution of Veterinary medicines in November 2020
- Ad hoc distribution of emergency requisition of veterinary medicines and vaccines.

With the translocation of LCS to the NCAH, Serbithang, we could provide uninterrupted delivery of veterinary medicines and equipment to the animal health centres across the country as per the Essential Veterinary Drug Programme cycle.

5.9. Enhancement of Veterinary medicine information management system

5.9.1. G2C database feature enhancement and TOT training

The G2C database for the management of Veterinary medicines and vaccines was developed as a part of a public service delivery initiative by the RGOB. The database could not be implemented due to a lack of budget to train field users on the use of the database. After securing a sum of BTN. 2.98M through Country Grant Fleming Fund Project for the training of field staff, the unit in collaboration with the ICTD, MoAF developed training module. The first batch of TOT for the East and East-central region was conducted in Mongar at Hotel Druk Zongar from 18-19th December 2020. A total of 24 officials including Veterinary Officers and Livestock Production Officers attended the training. During the training, the participants felt the need to have report generation features in the database. Accordingly, the unit worked in consultation with the database developer and created the features to generate different reports for the different users. ToTs for other regions and subsequent cascading training to the field users by the ToT had to be kept on hold due to the restriction of organizing meetings. However, the unit will be implementing the remaining training in July 2021.

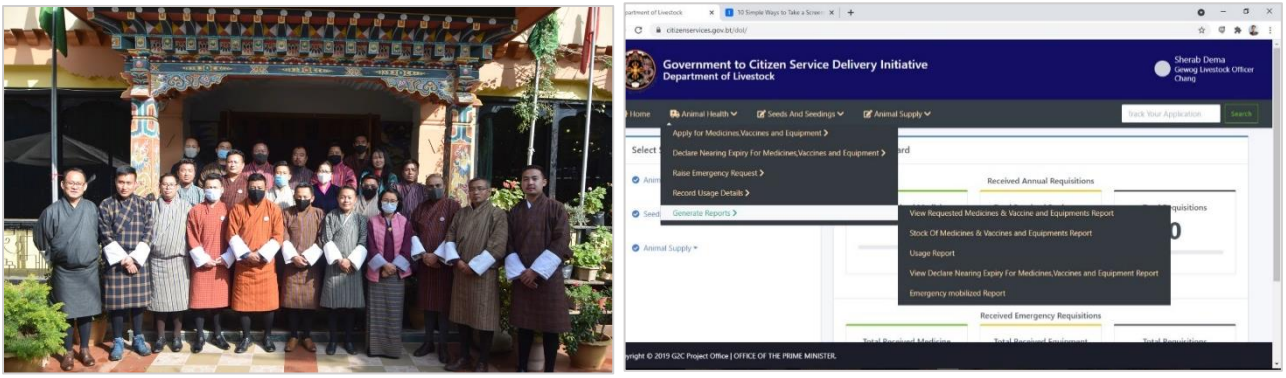


Figure 21: Figure 17: Left - ToT participants of the East and East-central region. Right - G2C database with additional "report generation" features.

5.9.2. Submission of antibiotic data to OIE

The annual routine antimicrobial consumption report to OIE for the period 1st July 2020 to 30th June 2021 was submitted successfully through using reporting option 1.

5.9.3. Development of DRUKMED Mobile Application

The National Centre for Animal Health (NCAH), Serbithang under the Department of Livestock has guideline documents such as the National Veterinary Drug Formulary (NVDF), the Standard Treatment Guideline for animals (STG) and the Antibiotic Use Guidelines, which are dynamic and used on daily basis.

These documents are handy references for all competent professionals under the Department of Livestock and academics under the domain of the veterinary profession. However, these documents are available in printed and soft copies to all the users. As such it is not very user friendly particularly for the animal health workers in remote places where they must walk hours to attend the cases. To make these documents more dynamic, versatile and also harnessing the power of technology, we have developed DRUK MED mobile application in collaboration with Drug Regulatory Authority (DRA) and MOH. The Apps contains three sections: Human Health, Animal Health and Sowa Rigpa. The application will work on both Android and IOS platforms also in both online and offline modes. Animal Health Section contains the following features:

- National Veterinary Drug Formulary (NVDF)
- Standard Treatment Guideline for animals (STG)
- Antibiotic Usage Guidelines
- Dosage calculator

Figure 22: Launching of DRUK MED mobile application at DRA.

The mobile application was launched on 14th June 2021 coinciding with the foundation day of DRA, and it was developed through fund support from the Fleming Fund Country Grant Project.

5.9.4. Enhancement of Veterinary Information System (VIS) database

The Veterinary Information System (VIS) is an online database system developed to manage the monthly animal health data of all animal health extension centres in the country. The database system was launched on 9 November 2016. The system is nested (as a sub-domain) on the National Centre for Animal Health's website. Currently, the Disease Prevention and Control Unit (DPCU) under NCAH looks after the management of the database system and functions as the administrator.

After a thorough review of the existing system and identification of the system's limitations and corresponding scopes, the VIS enhancement project was initiated with the fund support from the Fleming Fund country grant.

The rationale behind the enhancement of VIS is as follows:

- The Fleming Fund country grant of Bhutan has agreed to support and facilitate the use of the Government-to-Citizen (G2C) system, a web portal developed with the primary objective to simplify and enhance the delivery of public services, to monitor and evaluate antimicrobial usage in the country. However, through this system, information regarding overall procurement, distribution, and stock management can be recorded or updated. Therefore, in addition, the enhancement of VIS was viewed to be a huge opportunity concerning "monitoring and evaluation of antimicrobial usage in food-producing animals in Bhutan" because one of the most important features to be built during the enhancement of the database is the treatment section or the activities involving antimicrobial and other medicines' usage: this includes modification of clinical, deworming, vaccination, and sterilization, and incorporation of treatment part of notifiable animal disease outbreaks.
- To monitor the type, quantities and usage pattern of antimicrobial agents used in food-producing animals, evaluate the quality and authenticity of antimicrobial products in use, and ultimately to contain antimicrobial resistance (AMR), the OIE, supported by FAO and WHO within the tripartite collaboration, has taken the lead to build a global database on antimicrobial agents intended for use in animals. To contribute to this global effort against AMR, being a member nation to the OIE, Bhutan also reports the antimicrobial usage details as required.
- Due to the lack of a robust and dynamic electronic information recording system to record the use of antimicrobial agents in different animal health clinical activities, detailed information could not be collected and reported, therefore, Bhutan currently reports using "Reporting Option 1" of the database, the base option, where the overall amount procured and distributed for use in animals by antimicrobial class is reported. The VIS, after enhancement, will have the feature to capture all the clinical details where the use of antimicrobials is involved, therefore, Bhutan can jump to "Reporting Option 3" where

detailed information can be recorded and reported regarding the overall amount used in animals by antimicrobial class, with the possibility to separate by type of use, species group and route of administration.

- The current database system in place has already identified and trained data input sources: functional offices and users (data managers/ guest users), and it is quite popular among field professionals. Owing to the system's well-established data sources/users, it is a big opportunity to modify and enhance the current system by working on the limitations and incorporating the changes accordingly.

A core team was formed comprising officials from the NCAH, National Veterinary Hospital and the Information, Communication and Technology Division of the Ministry of Agriculture and Forests. The detailed user requirement analysis was conducted, developed request for proposal document, tender evaluated, and the project was awarded to a competent private firm. The prototype of the system was presented, and the system is expected to be built by the end of August 2021.

6. BIOLOGICAL PRODUCTION UNIT (BPU)

Mandates

- Production of viral and bacterial vaccines and biologicals.
- Import/procurement of vaccines that are not produced within the country.
- Provision of technical support and monitor the cold chain facilities in the field to ensure the effective storage of vaccine and veterinary biologicals.

Human resources

- Mr Harka Bahadur Tamang, Senior Livestock Health Supervisor (superannuated)
- Mr Migma, Senior Laboratory Technician
- Ms Karma Choki, Assistant Laboratory Technician
- Mr Sangay Nidup, Laboratory Attendant

6.1. Vaccine production and procurement

During FY 2020 – 2021, the unit produced a total of 7,200 doses of Classical swine fever vaccine and 2,876 doses of Anthrax vaccine.

The unit procured a total of 8 types of vaccines: five were for poultry, one for small animals (dogs and cats) and two for other livestock species. The procurement was done through routine annual tendering for veterinary medicines and vaccines by the Drug, Vaccine and Equipment Unit (DVEU). Vaccines worth BTN 6.5 M was procured against the approved budget of BTN 1.5 M, which is 333.3% above the approved budget. The additional amount of BTN 5 M was met from the DVEU budget for the procurement of equipment (BTN 4.32 M) through EU-RDCCRP and DPM Flagship Programme (Nu. 0.68 M for 30,000 doses of rabies vaccine). The details of vaccines procured are shown in the table below.

Table 40: Details of the vaccines procured during the FY 2020 – 2021.

Sl. No.	Vaccine	Company	Doses	Amount Nu (M)
1	Gumboro (IBD)	Venkateshwara Hatcheries	28,00,000	0.91
2	ND B_1	Venkateshwara Hatcheries	16,00,000	0.28
3	ND R_2B	Venkateshwara Hatcheries	10,00,000	0.32
4	Fowl Pox	Venkateshwara Hatcheries	15,00,000	0.237
5	Mareks	Venkateshwara Hatcheries	14,00,000	0.588
6	FMD	Futvac, Briliant Bio Phama	1,80,000	2.506
7	HS&BQ	Indian Immunologicals	84,000	0.32
8	Anti-Rabies	Raksharab Indian Immunologicals	60,000	1.35
Total				6.5

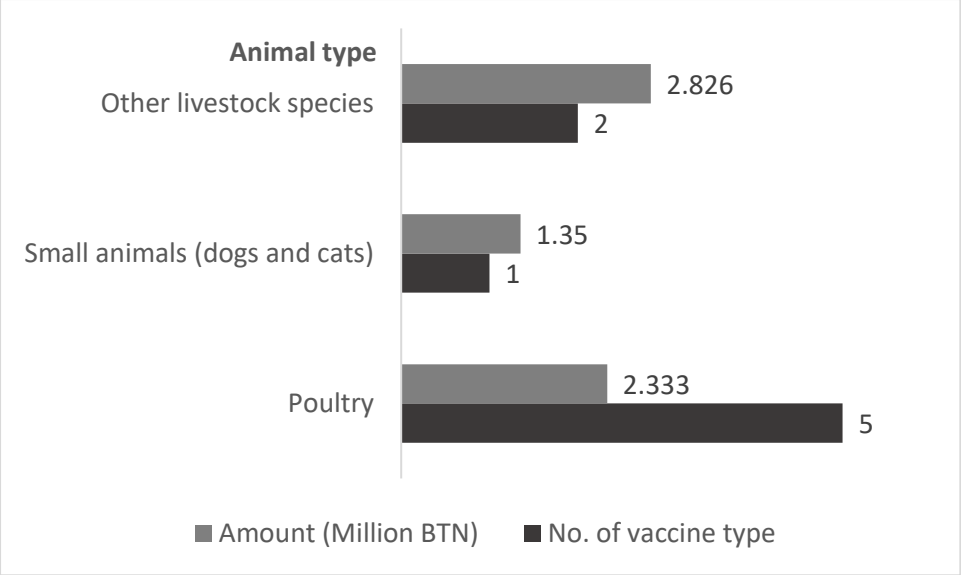


Figure 23: Species-specific vaccines procured, and cost incurred.

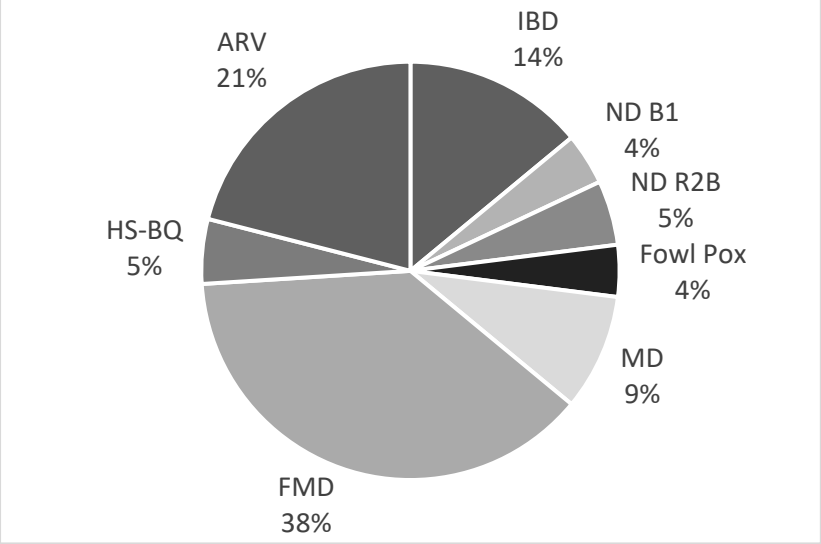


Figure 24: Vaccine-wise budget consumption.

6.2. Vaccines Distribution

The BPU distributed vaccines, both imported and locally produced, through both routine mass distribution and as per ad-hoc/emergency requisitions. The routine mass vaccine distribution was done as per the schedule, which started, from the (mention the date, align with the APA rating scale). The unit delivered the vaccines to animal health centres during the mass distribution. Although the unit could not deliver the vaccines to the eastern region during mass distribution due to COVID-19 movement restriction, the Regional Livestock Development Centre, Kanglung lifted the vaccines from the NCAH and distributed them. Apart from the routine distribution, ad-hoc and emergency distributions were done as and when there was a requirement from Dzongkhag Veterinary Hospitals, Central Units including private poultry farms. During the FY 2020-21, a total of 5,273,875 doses of vaccines were distributed, of which 5,000,150 doses of poultry vaccines, 221,525 of other livestock vaccines and 52,550

of canine vaccine (Anti-rabies). Apart from those vaccines procured and locally produced vaccines in the FY 2020-21, 3850 doses of PPR vaccines received through the support from FAO in the FY 2019-2020 were also distributed.

Figure 26 shows the comparison of quantities (doses) of vaccines forecast from the field during annual indent collection by the BPU, procured or produced by the unit and distributed in the FY 2020-21. The quantity of the vaccines forecast from the field during annual indent collection is much higher than the quantity distributed based on the actual requirement from the field at the time of distribution for all kinds of vaccines. This indicates that the field offices are over forecasting the quantity required. To facilitate the unit to make use of the approved budget efficiently for the procurement of vaccines, the field offices should work on coming up with a realistic forecast of the quantity of vaccines required.

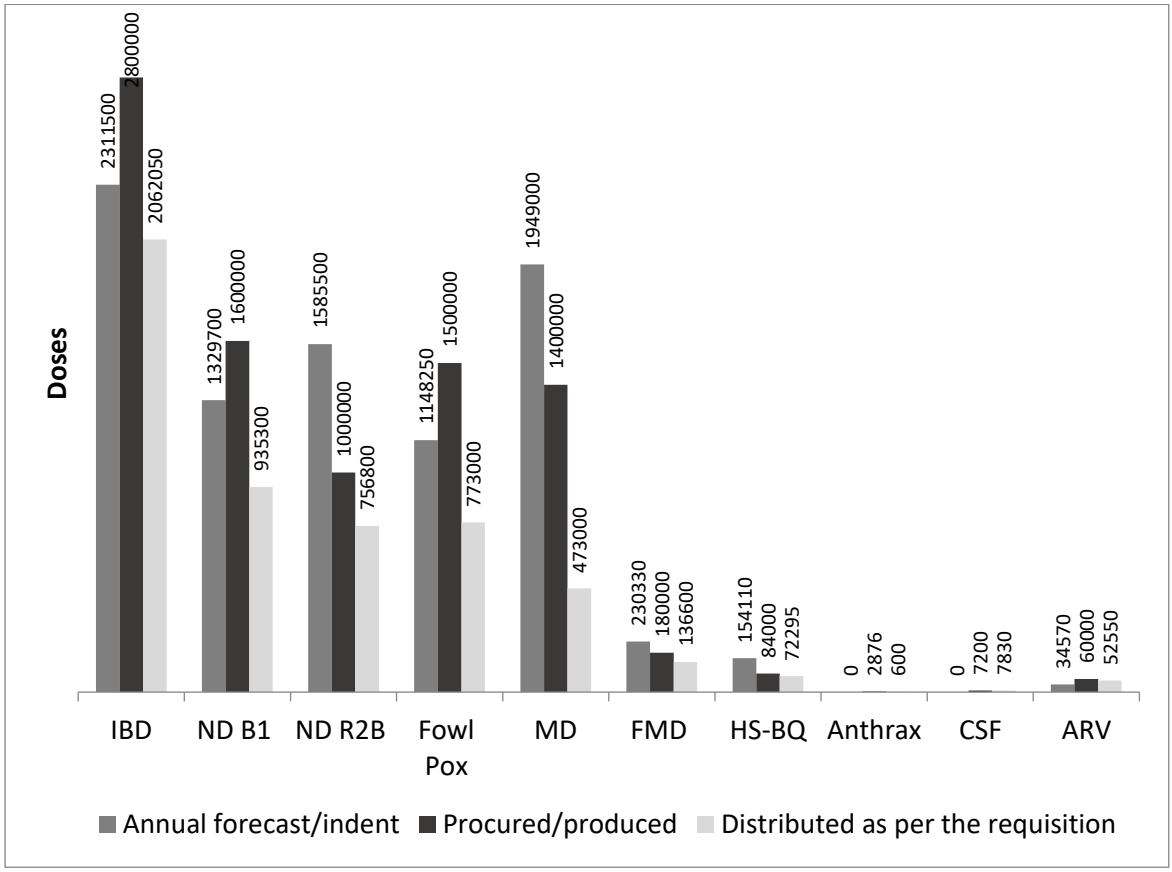


Figure 25: Comparison of quantities of vaccines forecast by the field offices during annual indent, Procured/produced and distributed.

Figure 27 shows the quantity (doses) of different kinds of vaccines distributed to Dzongkhags and central farms in FY 2020-21. Compared to Central farms, Dzongkhags received higher quantities (doses) of all the vaccines except the Marek's vaccine.

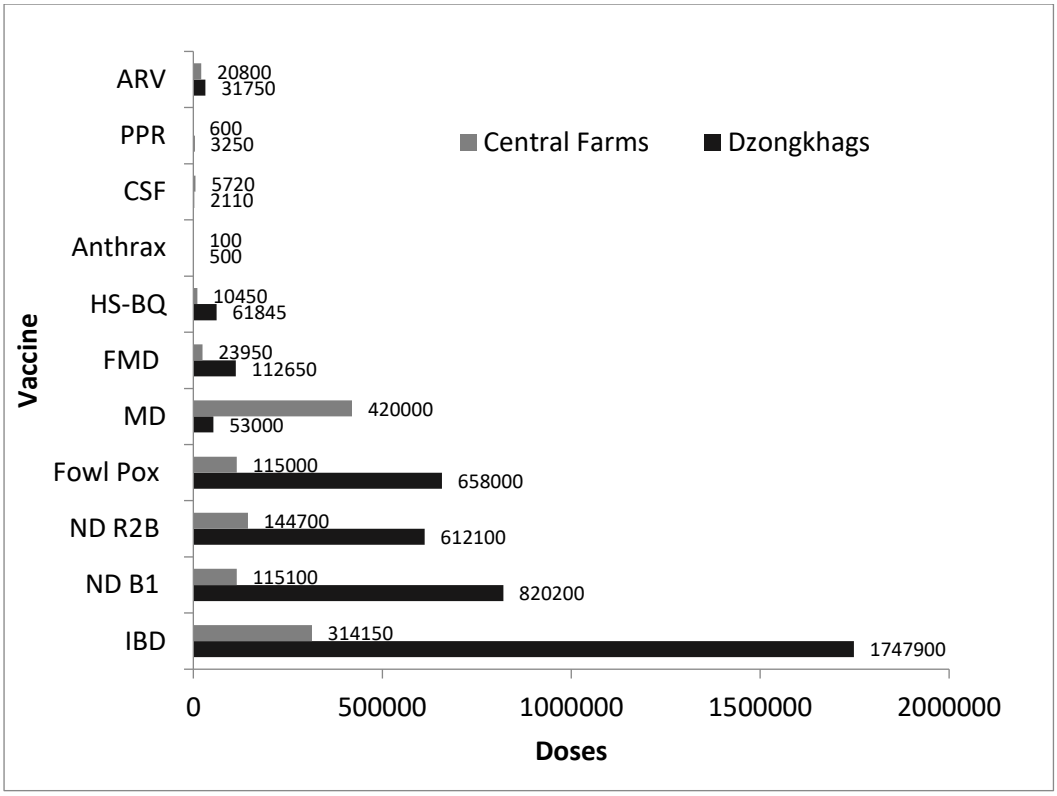


Figure 26: Quantity (doses) of different vaccines distributed to Dzongkhags and Central farms.

During the distribution, it was ensured that:

- The vaccines are delivered to the destination.
- The temperature of the refrigerated van is well maintained throughout the travel time using a data logger.
- Monitoring of the cold chain equipment (Refrigerators) in all the DVHs (as per standard format) was done.
- Monitoring of the vaccine stock, usages, expiry, etc. (as per standard format) were done.
- Issues if any were discussed with the In-Charge, DVH related to vaccines.

6.3. Temperature recording using the data logger

Figure 28 indicates the temperature recordings of the vaccine storage room between July and October 2020. It is evident from the graph that the cold chain of vaccines is always maintained within the recommended temperature of 2°C to 8°C. All the vaccines that are produced in-house as well as procured from outside are stored in the cool room on arrival until the final distribution.

Figure 27: The temperature recordings of the vaccine storage room, July to October 2020.

6.4. Other activities

Besides attending to the regular activities, the BPU is mandated to perform, the staff of the unit participated in the following events during the FY 2020-2021:

- Training on LIMS conducted by the NCAH at Punakha River Valley.
- An ethnoveterinary survey in Bumthang along with the DPCU team.
- KAP Survey along with DPM team in Bumthang.
- Rapid dog survey under Thimphu dzongkhag along with DPM team.
- Virtual Training on GMP for Quality Management System conducted by DRA.
- Evaluation of Tender for veterinary medicines and vaccines for the FY 2021-2022.

7. DOG POPULATION MANAGEMENT UNIT (DPMU)

Dog population management is a national concern that needs to be addressed concertedly by involving all the relevant partners. Poor waste management, irresponsible pet dog ownership and lack of policy enforcement are identified as the source of an increasing number of free-roaming dogs in the country. In the past, the Department of Livestock adopted various strategies to manage the free-roaming dog population. However, none of the solutions appeared effective, acceptable and sustainable. The Catch-Neuter-Vaccinate-Release (CNVR) is a new strategy introduced by the Department in collaboration with Humane Society International (HSI) since 2009, following which the number of free-roaming dogs is stabilized in the country. The CNVR concept is being further disseminated and conceptualized at the community level as Community Animal Birth Control (CABC) programme. Despite continuous efforts from the Department and relevant stakeholders, the issues of free-roaming dogs and associated risks remain constant and additionally, the emergence of feral dogs in some of the Dzongkhags has become a national issue.

To combat the issue of free-roaming dogs, the Royal Government of Bhutan through the Parliament has entrusted the task to the Department of Livestock to carry out nationwide dog population management through National Waste Management & Stray Dog Population Control (NWM&SDPC) Flagship Programme.

The flagship programme is for the duration of three years (2020-2023) and has an estimated budget outlay of Nu. 115 million.

Projects under DPM flagship:

- Strengthening Dog Population Management through effective waste management, community engagement and mass animal birth control funded by BTFEC- July 2020 to June 2023. The goal of this project is to reduce the free-roaming dog population to an acceptable and manageable level thereby having a healthy and happy society with a clean and peaceful environment with focus intervention in Thimphu and other dzongkhags of importance with a budget outlay of BTN 14.97 million.
- Project on Community Engagement and Human Behaviour change for the sustainable management of dog population in Paro and Thimphu, Bhutan funded by Humane Society International (HSI) with a budget outlay of USD 92000 for the period of July 2021 to June 2023. The goal of the project is to ensure a sustainable long-term solution to the dog population management through Community Engagement and Human Behavior Change covering the four main areas of Legislation, Empowerment, Guardianship and Sterilization (LEGS) to facilitate and encourage responsible dog ownership and dog-friendly neighbourhoods.

Main mandates

The main mandate of the National Dog Population Management Programme is to reduce the free-roaming dog population to a manageable level in the public places with 95% sterilization coverage and reverse owned and un-owned dogs' ratio from existing 30:70 to 70:30.

The DPM programme will strive to achieve the following objectives:

- Improve health and welfare of owned and un-owned dog population
- Reduce numbers of free-roaming dogs through enhanced animal birth control
- Promote responsible dog ownership, dog adoption and community animal birth control through community engagement
- Contribute towards the elimination of dog mediated human rabies
- Reduce the risk of dog bites and transmission of zoonotic diseases from dogs to humans
- Prevent harm to the environment and threat to endangered wildlife species

Human resources

- Dr Hiruka Mahat, Principal Livestock Health Officer, Head
- Dr Sonam Peldon, Senior Veterinary Officer
- Mr Prem Kumar Gurung, Team Leader, Animal Welfare Attendant
- Mr Karma Tenzin, Animal Welfare Attendant
- Mr Nima, Animal Welfare Attendant
- Mr Pema Tashi, Animal Welfare Attendant
- Mr Lhap Dorji, Animal Welfare Attendant
- Mr Chimi Dorji, Animal Welfare Attendant
- Mr Pasang Wangdi, Animal Welfare Attendant
- Mr Sangay Wangchuk, Animal Welfare Attendant
- Mr Jamyang Chador, Animal Welfare Attendant
- Ms Namgay Peday, Animal Welfare Attendant

7.1. Dog Population Management

For the successful implementation of the dog population management programme in the dzongkhags, the following activities are conducted during each campaign:

i. Pre-campaign Dog population survey: the Pre-campaign dog population survey is conducted in the selected dzongkhag under the respective RLDC. The pre-campaign dog survey is conducted by using the Epicollect-5 mobile App. Before the dog population survey, hands-on training on the use of epi-collect 5 is conducted. The Pre-campaign survey will help the PMU and implementing agency to make an informed decision and plan the campaign in the dzongkhag and also help to evaluate the past sterilization coverage of the dzongkhag. The pre-campaign survey will also help during the overall evaluation of the programme.

ii. Consultative stakeholder meeting: After the pre-campaign dog population survey, a stakeholder consultative meeting is conducted with the relevant stakeholders to inform on the DPM flagship programme and pre-campaign dog population survey findings. The consultative meeting will also garner supports and commitments from the local leaders and the stakeholders towards the dog population management programme in the dzongkhag.

iii. Strategic planning and technical meeting: After the data analysis, the findings of the pre-campaign survey are presented to the livestock officials to understand the past sterilization coverage and to plan the campaign. The meeting finalizes the clinic locations, team assignment and assignment of roles and responsibilities to the individual team members considering the commitments and targets set by the local leaders and stakeholders.

iv. DPM campaign: The activity in the campaign encompasses awareness and advocacy on responsible pet ownership, livestock rules and regulations, adoption; catch-neuter-vaccinate-release protocol and pet registration.

v. Mid-rapid dog population survey: During the campaign, an external team surveys the areas where the CNVR is covered. The survey team monitors the progress of the campaign and informs the campaign team where-ever the un-notched dogs are and identifies the areas that need to be addressed.

vi. Final survey: The final survey is conducted to evaluate the DPM programme in the dzongkhag and to help the decision-makers to make an informed decision and plan for the way forward for the management of the dog population in the dzongkhag.

vii. Handing-taking of the DPM roadmap to the dzongkhag: The way-forward and road map is finalized after discussing with the local leaders and dzongkhag livestock sector. The road map is then signed between the Dzongda and the Director, Department of Livestock for the sustainability of the programme and the DPM programme is handed over to the dzongkhag for the management of the dog population in the future.

7.1.1. Paro Dzongkhag

A. Pre-campaign survey

The pre-campaign dog survey was conducted from 24th to 28th June 2020 involving de-suup and livestock officials from Paro and Regional Livestock Development Centre, Tsimasham.

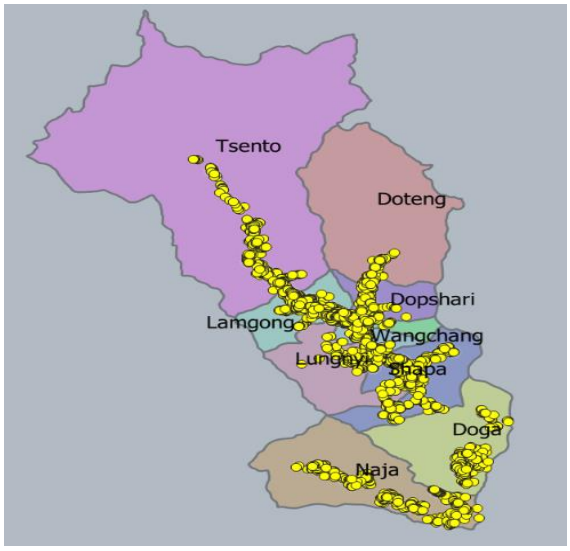


Figure 28: Dogs Sighted during the Pre-campaign dog survey, Paro.

As per the Dog Population pre-campaign survey in Paro Dzongkhag, 8218 dogs were sighted in ten gewogs, out of which 51% were unowned (4191 strays) dogs and 49% owned (4027 pet) dogs. The past CNVR coverage was 61% in stray (2515 dogs) and 39% in owned dogs. Only 30% (1208) of total pets were registered with livestock centres.

B. Stakeholder consultative meeting

Series of consultative meetings were conducted in Paro. A final stakeholder consultative meeting was held on 6th August 2020 where the Dzongkhag committed to 100% sterilization coverage and 60% adoption of free-roaming unowned dogs through collaboration and community engagement where the local government will lead the programme in their respective gewogs.

C. Campaign: sterilization, vaccination, registration and adoption

During the campaign in 10 gewogs, a total of 2578 dogs were sterilised of which 26% (682) were owned and 73% (1881) were unowned dogs.

During the campaign, 1155 dogs were registered at the field clinic. Of the 1155 dogs, 900 dogs were adopted, and 255 owned dogs were registered during the campaign.

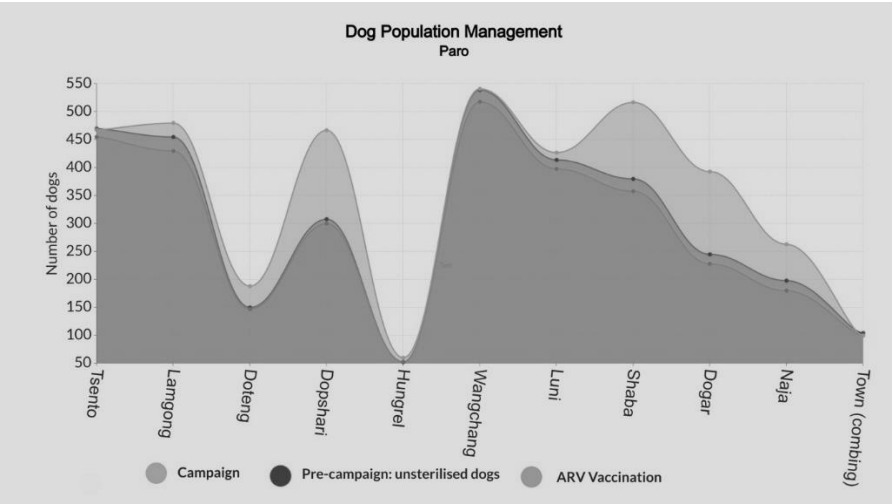


Figure 29: Dog population Management Progress, Paro.

D. Final survey

The final rapid survey was conducted after completing the campaign and combing sterilisation. This final survey was to give an account of the real situation in the field and to earmark the areas with un-sterilised dogs and puppies for future planning and intervention. The survey sighted 2180 dogs in ten gewogs of which 180 dogs were puppies, 467 dogs owned and 1533 unowned dogs. According to the final survey, the Dzongkhag achieved 94% (1450) sterilisation coverage in the unowned population and 86% (406) sterilisation coverage in the owned dog population.

E. The way forward: road map/ debriefing meeting

A debriefing meeting was held on 2nd December 2020 to inform the stakeholders of the achievements and progress made during the DPM campaign in Paro. The meeting endorsed following for the implementation plans for the sustainable dog population management programme:

- Increase community engagement
- Enhance the community animal birth control programme
- The increased adoption rate of puppies and
- Promote responsible pet ownership and
- Increase pet registration with the livestock centres
- Education and awareness on DPM
- Feral dog management in Pombesa and other areas through socially and scientifically accepted interventions

F. Combing operation in Paro

The combing operation was led by Paro Livestock Sector supported by RLDC, Tshimasham and DPM Flagship Programme in 2021. The team covered all the gewogs and targeted the puppies and dogs earmarked during the final DPM dog survey.

The programme was funded mostly by Paro Dzongkhag and partially by the DPM flagship Programme. The expenditure incurred from the DPM flagship programme was BTN 0.1 million only.

7.1.2. Bumthang Dzongkhag

A. Pre-campaign survey

The dog population and household KAP (Knowledge, Attitude and Practices) surveys were conducted between 13 – 16 July 2020 using the Epicollect5 mobile app.

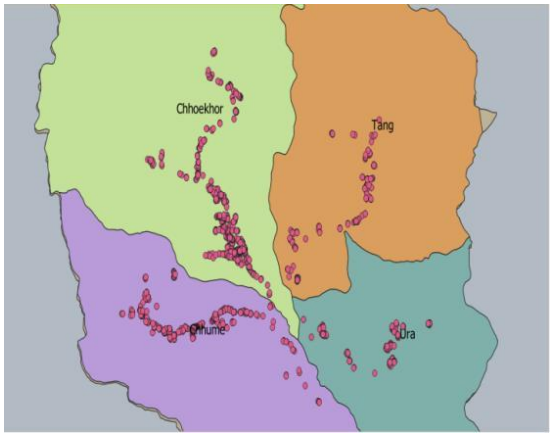


Figure 30: Spatial distribution of dogs in Bumthang.

The pre-campaign survey in Bumthang trained the regional DPM coordinators in the country. The survey was conducted by the DPM regional co-ordinators, livestock

In the household KAP survey, 354 households in Bumthang Throm and four Gewogs were randomly selected and included for the household KAP survey using Epicollect5 mobile apps. 43.8% of 354 households surveyed owned dogs i.e., 155 households. Out of these 155 households, 57% were roaming owned dogs and 43% confined owned dogs.

During the dog population survey, a total of 2278 free-roaming dogs were sighted in the town and four gewogs. Out of 2278 free-roaming dogs sighted, 60.4% (1376) were un-owned dogs and 39.6% (902) were owned dogs. Out of 2278 dogs sighted during the survey, 32.2% (734) were neutered and 56.5% (1288) of the dogs sighted were not notched indicating non-neuter status whereas 11.2% (256) of the dogs could not be identified for their neuter status.

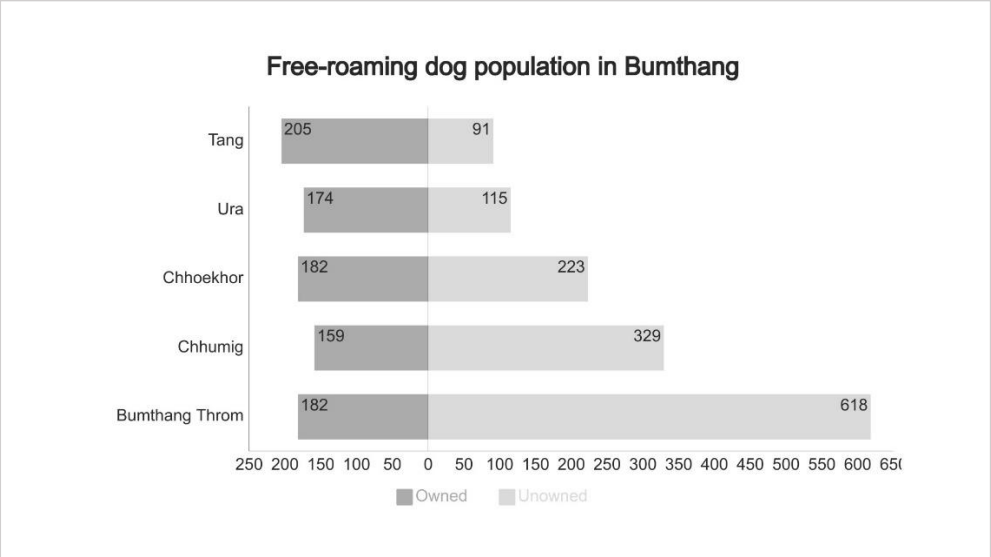


Figure 31: Free-roaming dog sighted during pre-campaign dog survey, Bumthang.

B. Stakeholder consultative meeting

Three rounds of consultation meetings were organized by RLDC, Zhemgang in collaboration with the DoL and NCAH, Serbithang for Bumthang Dzongkhag with the main aim to advocate on DPM programme, draw up a strategic plan for the programme and garner commitments and supports from the key stakeholders involved.

C. Campaign: sterilization, vaccination, registration and adoption

A total of 2155 dogs (1473 free-roaming and 682 pets) were registered in the Epicollect5 mobile apps during the registration process. Out of 2155 registered dogs, 958 dogs were registered and issued pet registration cards during the programme. These 958 dogs include 682 pets and 276 adopted dogs.

2155 dogs were vaccinated against rabies and 1709 were sterilised during the campaign. The overall sterilization coverage during the DPM programme in Bumthang Dzongkhag was 91.5 %.

D. Community supports for DPM programme

The communities were encouraged to catch free-roaming dogs in their respective communities and bring them to the field clinics. The pet owners were also advised to present their pets to the clinic during the programme. A total of 422 free-roaming dogs were caught by the communities and 682 pets were presented directly to the clinic by the pet owners. The overall community support was 51.2% for the programme.

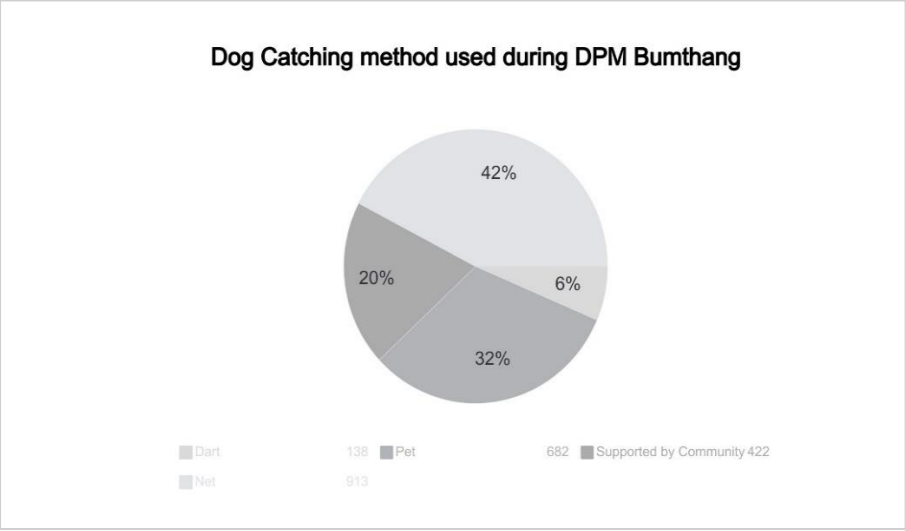


Figure 32: Methods of dog catching, Bumthang.

E. Final survey

The final rapid survey was carried out using the Epicollect5 mobile app. The dogs which could not be covered due to feral or aggressive nature and those that were left out as they were too young to undergo surgery were recorded.

During the final survey of the DPM programme, 75 stray dogs were recorded to have been left unsterilized by the DPM team because of logistical issues to reach the area, not being able to capture due to over-aggressiveness, feral and being too young to undertake surgery. Out of these 75 dogs, 19 were in Chhoekhor-toed, 24 in Throm, 4 in Tang, 6 in Ura and 22 in Chhumig.

F. Combing Operation

The combing operations were carried out between 23 – 30 April 2021. A total of 215 dogs were covered during the combing operations out of which, 180 were free-roaming dogs and 35 were pet dogs.

G. Handing taking of DPM Bumthang to the Dzongkhag

After the successful completion of the DPM programme in Bumthang, the handing-taking of the DPM programme and DPM roadmap for the Dzongkhag was conducted on 20th May 2021. The DPM roadmap was jointly signed between the Dzongkhag Administration, Bumthang and the Department of Livestock, MoAF.

With the signing of the roadmap, the ownership of the DPM activities was formally handed over to Bumthang Dzongkhag Administration with technical backstopping by the Department of Livestock to ensure and sustain the DPM achievements through continuous Community Animal Birth Control (CABC) and Mass Dog Vaccination (MDV) programme in the Dzongkhag.

7.1.3. Thimphu Dzongkhag

Dog Population Management in Thimphu is given the utmost importance from the Department and DPM flagship Unit owing to the highest number of free-roaming dogs in the country and also being the capital city. During the survey in May 2020, the estimated dog population in Thimphu Thromde and peri-urban areas was 13000. The 6000 dogs sighted were unowned dogs with sterilization coverage of 50%.

The campaign from May to July 2020, sterilized 1266 dogs. Thimphu being the largest city and having the highest population, DPM in Thimphu needs a multi-sectoral approach involving all stakeholders for the success of the programme.

A. Stakeholder consultative meeting

A stakeholder consultative meeting was held on 16th March with the participation from following organisations: Zeus for Homeless and Stray Dogs, Royal Society for the Protection and Care of Animals, Bhutan Animal Rescue and Care, Jangsa Animal Saving Trust, Clean Bhutan, Thimphu Thromde, Thimphu Dzongkhag Administration, National Veterinary Hospital and Department of Livestock. The stakeholder meeting was held to garner support and commitments from the stakeholders for the successful implementation of the DPM campaign.

B. Strategic planning and rapid survey

The strategic planning for the programme was held on 18th March 2021 to plan the Human Resources mobilisation, clinic locations, logistic arrangements and launch of the programme. During the meeting, the precampaign rapid survey areas were identified to get an estimate of the unsterilised free-roaming dog population in the Thromde and peri-urban areas.

On 19th and 20th March, a pre-campaign rapid survey was conducted. During the rapid survey, the sterilisation coverage in Thimphu was 46 % for free-roaming dogs. Based on the findings catching schedule and further interventions were planned.

C. Launch of DPM campaign

The DPM campaign was formally launched on the 25th of March 2021 by The Chair, HE Minister, MoAF in presence of all the stakeholders. The launch was a high-profile event with

a rationale to inform the public of the programme and to get their support during the programme.

D. Campaign: sterilization, vaccination, and adoption

A total of 1700 dogs and 114 cats were sterilized and vaccinated against rabies in 44 days. 82.6% (1405) of the total dogs sterilized were unowned dogs,17.4% (295) were owned dogs. 71 dogs were adopted during the campaign.

The field clinics were located in strategic locations: NVH old premises Chubachu, Thromde Engineering Office, Dashing Lam and DVH, Ramtokto for convenience of the public.

The campaign was supported by Thimphu Thromde (manpower, field clinic, dog catching van), National Veterinary Hospital (Veterinarians, Veterinary paraprofessional, vehicle and equipment), Dzongkhag Livestock Sector (field clinic, Veterinarians, Veterinary paraprofessional and equipment), Regional Livestock Development Centre, Tshimasham (Veterinarians and Veterinary paraprofessional) and JAST (manpower and rehabilitation of sick dogs).

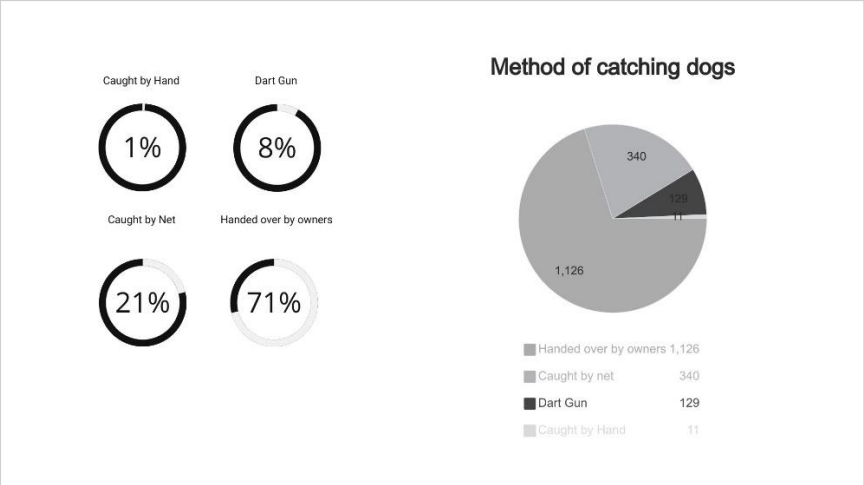


Figure 33: Methods of dog catching, Thimphu.

E. Final survey

The final rapid survey was conducted from 14th to 16th May to inform the campaign team on the remaining unsterilized free-roaming dogs and also to assess and monitor the success of the programme. The sterilization coverage during the DPM campaign was 82%.

F. Way-forward

The final meeting for DPM was held on the 19th of May 2021 chaired by the Director, Department of Livestock. The following were the recommendations of the meeting:

- Due to the lack of public support in Thimphu, the DPM campaign in Thimphu will have a tailor-made strategy addressing all the issues in the thromde.

- Small scale DPM campaign in Thimphu to be continued throughout the year at DVH Ramtokto.
- To identify areas for a field location in Thimphu with permanent structures with access to electricity, water and parking facilities.
- Among the AWOs, only JAST participated during the DPM campaign. It was recommended that other AWOs can participate according to their capacity in future campaigns.

7.1.4. Trashigang Dzongkhag

A. Epicollect5 training, pre-campaign dog survey and KAP DPM survey

Epicollect5 training was held at RLDC Kanglung from 8th March to 10th March 2021 for all Livestock Extension agents, Tshogpas and volunteers. The training was done batch-wise following COVID 19 health protocols. The pre-survey planning exercise was carried out in consultation with the concerned geog in-charges and volunteers.

The precampaign dog population survey was conducted from 9th March to 19th March led by the respective gewog livestock in-charges using the Epicollect5 mobile app in the areas like towns, schools, Lhakhang, government/private institutions.

A total of 4611 dogs were sighted during the survey in 15 gewogs. Out of 4611 dogs, 39% (1830) were owned and 61% (2811) were unowned dogs. The sterilisation coverage in Trashigang was 34% (626 of 1830) in owned dogs and 33% (923 of 2811) in unowned dogs.

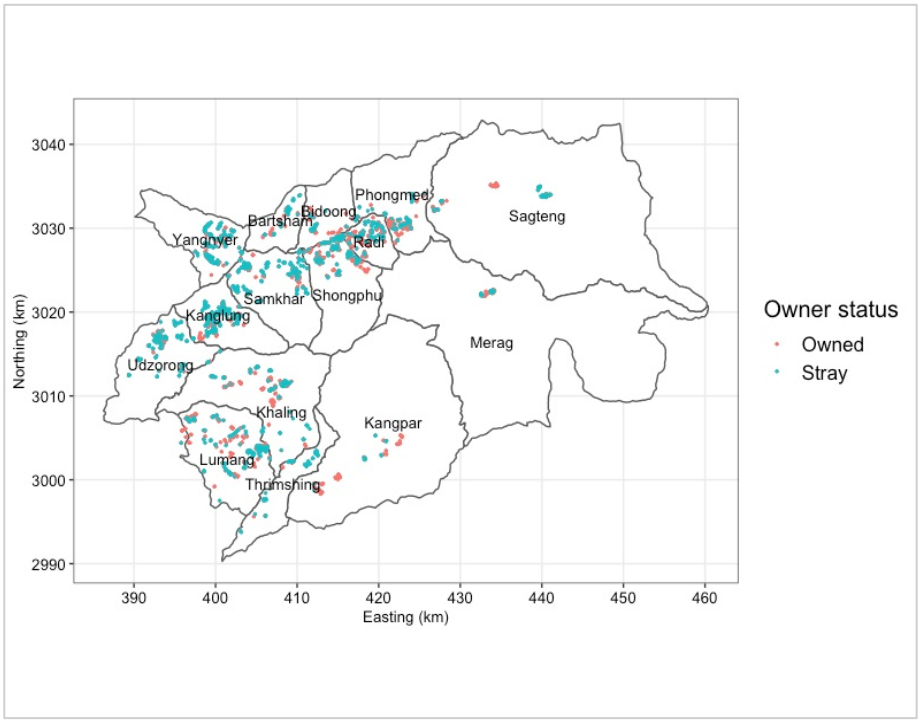


Figure 34: Map 4. Pre-campaign Dog population survey, Tashigang.

A KAP survey was conducted in 433 households. The main findings were:

- 34% (157) of the respondents expressed their interest to own a dog and
- 90 % (392) of the respondent said there is a need for control measures to manage the dog population in the district.

B. Stakeholder consultative meeting

A stakeholder consultation meeting with the relevant stakeholders was held on the 15th April, 2021. The meeting was to inform the stakeholders on the National Waste Management and Stray Dog Population Control Flagship Programme, draw upon common consensus to manage the free-roaming dog population in the Dzongkhag through consultation, collaboration, and commitment. The dzongkhag committed to fully support the mandate of the DPM Flagship programme.

C. Campaign: sterilization, vaccination, registration and adoption

The DPM campaign was formally launched on 4th May 2021 from Kangpara Geog but had to be closed a day after launch due to lockdown in the Dzongkhag. The DPM team sterilised 64 dogs and vaccinated 71 dogs against rabies. The campaign will resume as soon as the COVID-19 restrictions are lifted in the dzongkhag.

7.1.5. Tsirang Dzongkhag

A. Pre-campaign survey

The precampaign dog population survey in Tsirang was conducted from 2nd to 5th December 2020 using the Epicollect5 mobile app in the areas like towns, schools, Lhakhang, government/private institutions. The remaining dog population for the respective gewogs was gathered by the livestock extension in-charges through the respective Tshogpa. The survey revealed that Tsirang Dzongkhag had 3143 dogs including both the owned and unowned dogs. Out of 3143 dogs, 78.7% (2475) were owned and the remaining 21.3% (668) were un-owned dogs. The sterilisation coverage was 56% (1381) in owned dogs and 48% (316) of un-owned dogs.

B. Stakeholder consultative meeting

A stakeholder consultation meeting with the relevant stakeholders was held on the 5th of March 2021. The meeting was to inform the stakeholders on the National Waste Management and Stray Dog Population Control Flagship Programme, draw upon common consensus to manage the free-roaming dog population in the Dzongkhag through consultation, collaboration, and commitment. The dzongkhag aimed to sterilize 100% of the unsterilized dogs and vaccinate at least 90% of the total dog population during the DPM campaign.

C. Campaign: sterilization, vaccination, registration and adoption

The DPM campaign Tsirang was formally launched on 31st May 2021. The campaign was conducted through three strategically located clinics in the dzongkhag: DVH Tsirang, Mendrelgang LEC and Sergithang LEC. A total of 1713 animals were bought to the clinics for sterilization and vaccination. 73% (1254) of the animals bought were owned and the remaining 27% (459) were un-owned dogs.

Out of 1713 animals, 1694 animals were neutered during a 22-day campaign period.

A separate mass dog vaccination campaign was also carried out by the dog catching team. A total of 2623 dogs were vaccinated, 1702 (64.89%) dogs were vaccinated at the DPM clinics when the dogs were brought for sterilization; the remaining 921 (35.11%) dogs were vaccinated by the dog catching team at strategic points.

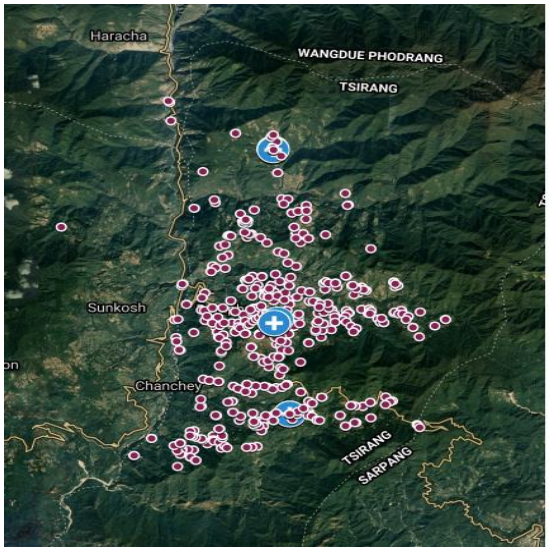


Figure 35: Map showing the vaccination points and clinic location in Tsirang.

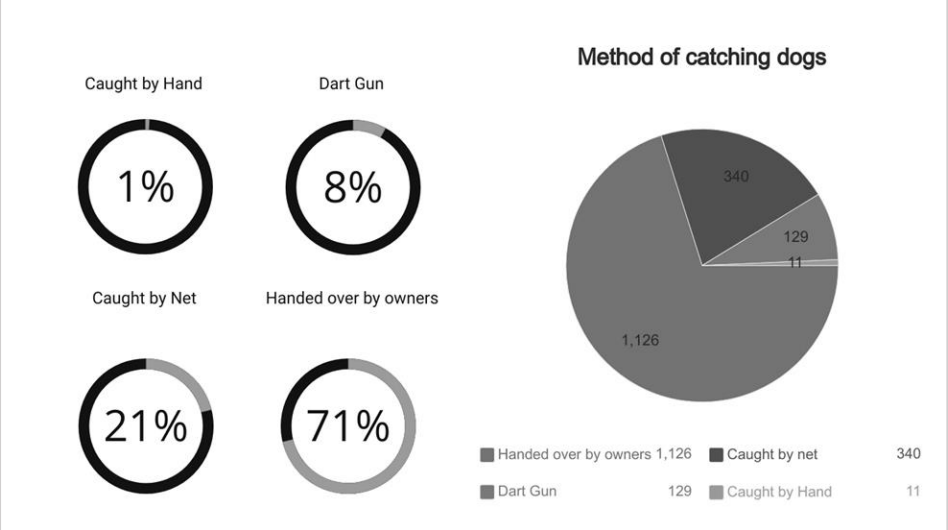


Figure 36: Methods of dog catching, Tsirang.

D. Mid-rapid survey

A team led by the NCAH and NVH conducted a mid- rapid survey to monitor the success of the programme and to earmark the unneutered free-roaming dogs in the dzongkhag. The sterilization coverage in free-roaming dogs was 80% and the DPM team was informed of the location of the un-neutered free-roaming dogs.

E. Combing Operation

The combing operation was conducted from 18th June till 25th June 2021. During the combing operation, 98 dogs were sterilized; 48% (47) was owned dogs and 52% (52) were unowned. Most of the dogs were caught using dart guns and nets during the operation.

F. Handing taking of DPM Tsirang to the Dzongkhag

After the successful completion of the DPM programme in Tsirang, the handing-taking of the DPM programme and DPM roadmap for the Dzongkhag was held on 21st June 2021. The DPM roadmap was jointly signed between the Dzongkhag Administration, Tsirang and the Department of Livestock, MoAF.

With the signing of the roadmap, the ownership of the DPM activities was formally handed over to Dzongkhag Administration, Tsirang with technical backstopping by the Department of Livestock to ensure and sustain the DPM achievements through continuous Community Animal Birth Control (CABC) and Mass Dog Vaccination (MDV) programme in the Dzongkhag.

7.2. Mass Dog Vaccination

The annual mass dog vaccination (MDV) programme is being carried out in the rabies endemic areas of Bhutan along the Indo-Bhutan border and has been an annual event since 2013. Before the vaccination programme being undertaken, an awareness campaign on rabies and the vaccination programme is made to the residents along the border area through village headman and livestock extension staff.

However, this fiscal year, due to the COVID-19 restrictions, the team from the NCAH could not move towards the rabies endemic areas for the mass dog vaccination programme. Considering the epidemiology of rabies disease in Bhutan and recent outbreaks in the country, priority for the implementation of MDV campaigns was given to Samtse, Chhukha and Pema Gatshel dzongkhags. The DPM flagship programme funded the Mass Rabies vaccination campaign based on the proposal submitted by the regions. The allocation of the funds and schedule was finalized through a virtual meeting with the Regional Directors, Regional DPM Focal person in collaboration with DPCU, DVEU and DPM flagship Unit. During the meeting, it was finalized that the data for MDV will be collected using Epicollect5. A budget outlay of BTN 1.43 million was earmarked from DPM Flagship for the campaign with an assurance that Rabies TCP programme will top up in case of budget shortage.

Details of the mass dog vaccination campaigns coordinated by the Centre during the FY 2020 – 2021 are as tabulated below.

Table 41: Figure 38: Details of mass dog vaccination campaigns in rabies high-risk areas.

Sl. No.	Dzongkhag	Gewog	Total stray Population in the high-risk areas*	Campaign Period	Total stray dogs vaccinated	Coverage (%)
1	Samtse	Norboogang, Ugyentse, Yoeseltse, Sangagchhoeling, Tashichhoeling, Namgyalchhoeling, Pemaling, Tendruk, Norgaygang, Phuentshogpelri, Dophuchen, Duenchukha	2500	5 - 27 Feb	2229	89.16
2	Chhukha	Phuentshogling, Sampheling, Loggchina	873	1 - 10 March	819	93.81
3	Pema Gatshel	Norboogang, Dechhenling, Chhoekhorling	214	3 - 14 April	184	85.90
			Average MDV coverage (%)			89.62

**Stray population submitted by the campaign team*

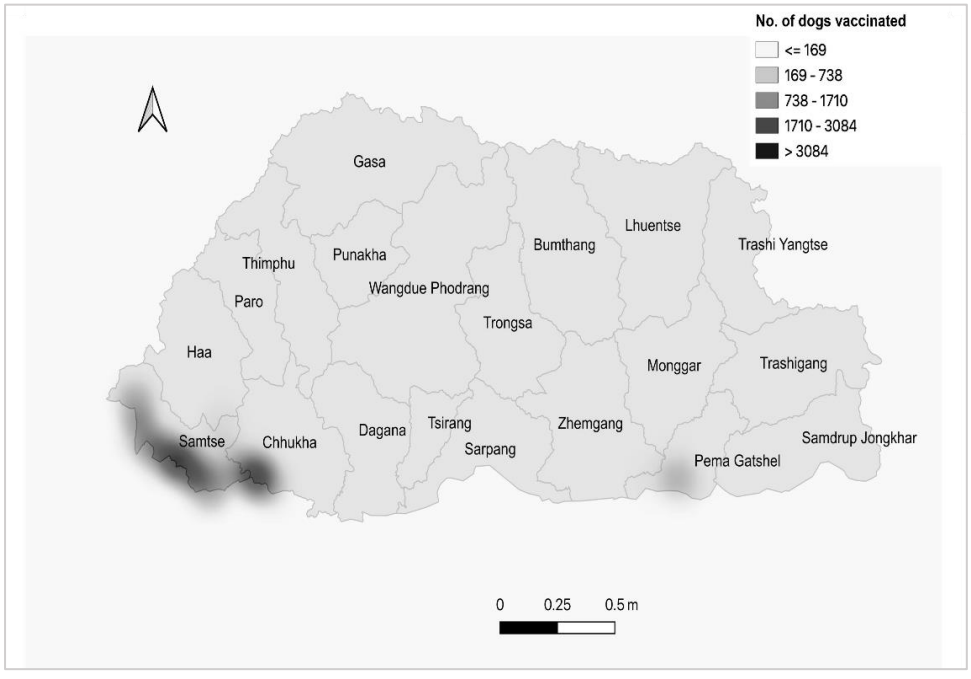


Figure 37: No. of dogs vaccinated during MDV campaigns.

Besides the stray dogs, predominantly rabies-affected dog population, during the MDV campaigns, pet dogs and cats were also vaccinated with the anti-rabies vaccine. During the above MDV campaigns in the country, a total of 2005 dogs and 1139 cats were vaccinated.

7.3. Feral dog management: Paro and Thimphu – inventory

Feral dogs are those dogs that have either been abandoned or was born on the streets/ wild and has never been socialized. Feral dogs are not accustomed to humans and fear them.

The most visible distinguishing feature of feral from domestic dogs (owned and stray) is the degree of reliance or dependence on humans, and by timidity in their behaviour towards humans. Human intervention or assistance is not needed for them to survive and to reproduce. Their feeding nature consists of scavenging for garbage, or they start hunting for animals as a source of food. Over the years, there is a report of increasing stray/ feral dogs at the human-wildlife-interface leading to several issues which pose a serious threat to wildlife conservation as well as the livelihood of marginal farmers especially the highlanders. There are reports of stray/ feral dogs attacking the wild animals in the urban periphery such as Thimphu. Though there have been sporadic reports of emerging feral dogs in the country there is no real data of where the problems are. Therefore, to get a sense of the feral dog situation in the country, a reporting form was developed in consultation with the Regional Livestock Development Centres. The form was circulated to the dzongkhags to report any cases of feral or feral dog emergence. For the reporting purpose, feral dogs are defined as those dogs that have either been abandoned or was born on the streets/ wild and has never been socialized where the dogs are not accustomed to humans and fear them.

Dzongkhags to have reported about feral dogs are, Gasa, Haa, Paro, Samdrup Jongkhar, Trashi Yangtse, Thimphu, Trongsa, Wangdi Phodrang and Zhemgang.

Chhukha and Dagana reported that there are no feral dogs in the dzongkhags. However, other dzongkhags did not report at all.

According to the report, there are approximately 1254 feral dogs and most of the dzongkhags reported translocation of dogs and stray dogs turning feral as the presumed source of feral dogs. The report of feral dogs, some of the areas or dzongkhags doesn't need any intervention as there is no damage caused to the environment or humans. However, the centre will develop an intervention plan specific to the dzongkhag addressing the issues.

The DPM unit intervenes whenever the unit receives a request or command for feral dog management. The DPM unit carried out the following operations upon the Royal Command and request from the DLS Thimphu.

Table 42: Feral dog management operation carried out, FY 2020-2021.

SL No.	Area	Campaign Period	Total no. of dogs eliminated	Collaborators
1	Kuenselphodrang to Hindu temple	16/12/2020 to 17/12/2020	9 dogs were eliminated from the area.	Upon the Royal Command RBG, DoFPS, and DoL
2	Motithang Palace area	7/2/2021 to 12/2/21	114 dogs were eliminated from the area.	Royal Command RBG and DoL
3	Tango-Cheri	8/5/2021 to 10/5/2021	17 dogs were eliminated from the area.	DLS Thimphu
4	Motithang area	20/5/2021	13 dogs were eliminated from the area.	RBP and DPM team upon the Royal Command

7.4. Supports for CABC

With the launch of the flagship programme, the Centre has supported dzongkhags through medicines or minimal financial support to help them conduct regular community animal birth control (CABC) programmes.

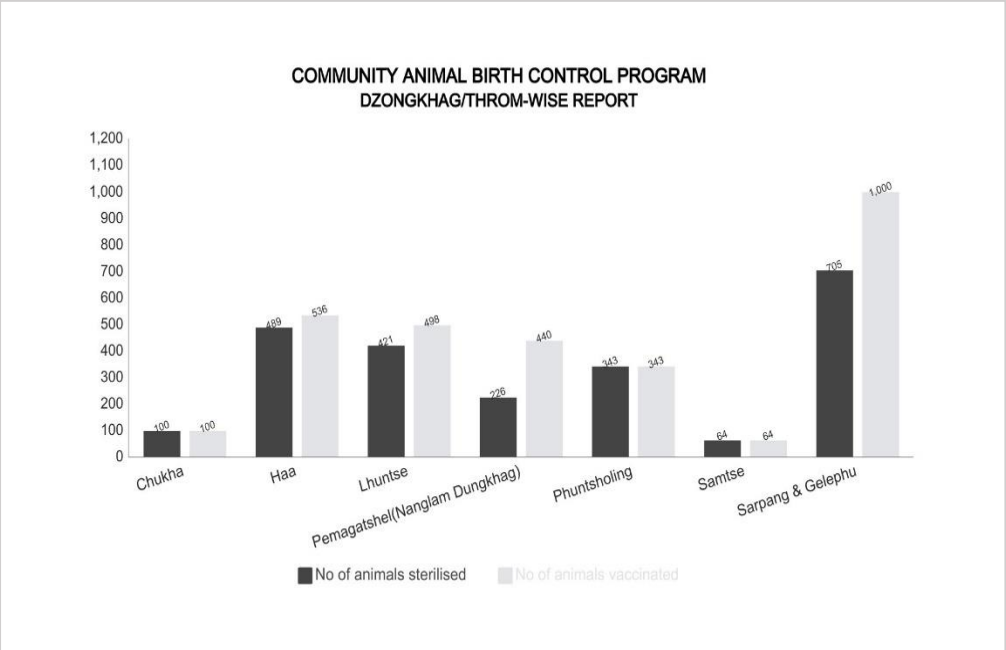


Figure 38: No. of dogs sterilized/vaccinated through CABC programmes.

8. DISEASE SURVEILLANCE AND ANIMAL HEALTH RESEARCH

8.1. Animal health research activities endorsed, FY 2020 – 2021.

During the FY 2020 – 2021, 14 research activities were endorsed by the Livestock Technical Advisory Committee of the Department of the Livestock; they are:

1. Occurrence of *Echinococcus granulosus sensu lato* and Other Taeniids in Bhutan.
2. Assessment of KAP on Gid in yaks and laboratory surveillance in the highland communities of Bhutan.
3. Analysis of pigs' mortality at National Nucleus Pig Breeding Centre, Yusipang
4. Cerebral cysticercosis in a wild Bengal tiger (*Panthera tigris tigris*) in Bhutan: The first report in non-domestic felids.
5. Descriptive epidemiology of the first outbreak of Lumpy skin disease in Bhutan.
6. Further development of a reverse-transcription loop-mediated isothermal amplification (RT-LAMP) assay for the detection of foot and mouth disease virus and validation in the field with the use of internal positive control.
7. Survey of ethnoveterinary practices in selected areas in Bhutan.
8. Descriptive epidemiology of the first outbreak of *Capripox* in domestic and wild ruminants in Bhutan.
9. Determination of rabies antibody titre in pets and free-roaming dogs in selected rabies endemic and non-endemic areas in Bhutan.
10. Modelling the environmental suitability and genotype analysis of *B. anthracis* strains circulating in Bhutan.
11. CCHF seroprevalence study in goats in southern parts of Bhutan.
12. AMR surveillance in *E. coli, Salmonella, Enterococci and Campylobacter* isolated from commercial broiler and layer chicken population in Bhutan.
13. Study on bat-mediated transboundary zoonoses in Bhutan.
14. Prevalence of parasites and vector-borne diseases of canines in southern Bhutan.

8.2. Animal disease surveillance and related activities conducted, FY 2020 – 2021.

8.2.1. Genotype analysis of *Bacillus anthracis* strains circulating in Bhutan

Puspa Maya Sharma, Tenzinla , Nirmal Kumar Thapa

Introduction

Anthrax caused by *Bacillus anthracis* is primarily a disease of herbivores. The bacteria *Bacillus anthracis is* spore-forming, Gram-positive, rod-shaped and the spores are highly resistant to extremes of heat, cold, pH, desiccation, chemicals (and thus to disinfection), irradiation and other such adverse conditions. Therefore, the spore forms are the predominant phase in the environment, and it is very largely through the uptake of spores that the animals contact anthrax.

The disease is one of the most important causes of mortality in cattle, sheep, goats, horses and pigs worldwide. The disease is enzootic in most countries of Africa and Asia, several

European countries and countries/areas of the American continent and certain areas of Australia. In Bhutan, the disease is reported sporadically every year from some parts of the country.

Through the genetic study, *B. anthracis* isolates from the 2010 outbreak in cattle in Zhemgang, central Bhutan was found to be part of the multilocus variable-number tandem repeat (MLVA) analysis B1 lineage (genotype 83) and canonical single-nucleotide polymorphism subgroup B.Br.001/002. The B lineage is less widespread and primarily associated with South Africa, but it has been reported in parts of the United States, Europe, and Asia, including the Caucasus region. Although anthrax has been reported sporadically from different parts of the country, no detailed studies have been conducted to understand the circulation and identification of anthrax strain and environmental and other associated risk factors for the occurrence of anthrax in Bhutan. Therefore, the main objectives of this study are to:

- Identify anthrax strain circulating in different agroecological zones in Bhutan.
- Identify risk factors and map the risk of anthrax outbreaks at the human-animal-environmental interface.

Brief Methodology

The anthrax outbreak location in animals between 2010 and 2017 identified from the DPCU database was validated and burial sites located. Three soil samples were collected from burial sites and control sites respectively.

If the cases are encountered in animals during the study period, the samples (blood smear and tissue samples) from the clinical cases or the carcasses will be collected for culture and isolation of the organism.

A total of 96 soil samples were collected from both burial and control sites. Out of 96 samples, 60 samples were processed and cultured for *Bacillus anthracis*. Sheep blood agar and BACARA plates were used for culture and identification of *Bacillus anthracis* typical colonies. Suspected colonies were observed under a microscope and PCR was performed.

Results

No *Bacillus anthracis* resembling colonies were identified from sheep blood agar. Only haemolytic colonies resembling *Bacillus cereus* were identified.

Conclusion

The possibility of culturing *Bacillus anthracis* from the soil is very low due to multiple factors like low or unavailability of spores in samples, wrong identification of burial site, etc. Hence, the study will focus more on clinical samples like blood, blood-stained soils, tissue or swabs from anthrax suspected cases.

8.2.2. Case report on the mortality of wild boar due to *E. fergusonii*

N.K Thapa, Puspa M Sharma, Tenzinla, Dr. RB Gurung

Anamnesis

Following a call from the Royal Palace, Samtenling and the command to perform post-mortem of a dead pig (wild boar), the team of officials from National Centre for Animal Health (NCAH), Serbithang and National Veterinary Hospital (NVH), Motithang immediately visited the site to conduct post-mortem and sample collection.

It was informed that the animal was found dead with bleeding from nostrils and salivation on the evening of 29/5/2021. There were about 17 numbers of wild pigs excluding one dead (11 piglets, 5 females, 1 male) as reported.

Post-mortem findings

Externally, bleeding from the nostrils and frothy salivary discharge from the mouth were noted however, no external injuries were observed. In the digestive tract, no signs of irritation were observed in the internal lining of the digestive tract which usually occurs during oral consumption of poisons. The stomach contained partially digested grass material and grains and no unusual odour was noted from the stomach contents (usually in rat poisoning case with zinc phosphate, the stomach contents emit the smell of garlic).

Laboratory analysis

To establish the cause of the mortality, various advanced diagnostic laboratory tests were performed on the samples collected (Table 43).

Table 43: Details of laboratory tests conducted on samples from wild boars of Samtenling, Thimphu.

Sl. No.	Agent examined	Test method	Result
A.	Molecular analysis		
1	African Swine Fever (ASF)	RT-PCR	Negative
2	Classical Swine Fever (CSF)	RT-PCR	Negative
3	Porcine Reproductive and Respiratory Syndrome (PRRS)	RT-PCR	Negative
B.	Bacterial culture		
4	*Escherichia coli*	API-20	Positive
5	*Escherichia fergusonii*	API-20	Positive
C.	Parasitology		
6	Trichinella	Pepsin digestion	Negative
7	Other gut worms	Sedimentation	Negative
D.	Toxicology		
8	Maize aflatoxin	Rapid and ELISA	Negative
E.	Forensic poison analysis		

9	Organophosphates (Diazinon, Chlorpyrifos, Parathion)	GC-MS	Negative
F.	Metal		
10	Zinc	ICP-OES	Insignificant

8.2.3. Investigation of Porcine circovirus-associated disease (PCVAD) at the National Nucleus Pig Breeding Centre (NNPBC) Yusipang

NK Thapa, PB Rai, Ugyen Pema, RB Gurung

The National Nucleus Pig Breeding Centre is located at Yusipang, Thimphu. The farm was started in 2016 for maintaining the great grandparents (GGP), grandparents (GP) and parent stock (PS) to supply the genetically improved piglets and PS. The farm supplies piglets to the farmers for breeding and fattening purposes. Following the report of various health issues from the farm, the causes of ailments were investigated from the LSU. The farm was inspected in the previous years too for various reports of disease conditions and was diagnosed as Erysipelas, Salmonellosis and also other bacterial infection. Recommendations were made and improvement was observed.

However, despite several remedies like hygiene improvement in farm biosecurity, the cases were again observed. The common problems observed were abortion, stillbirth, foetal mummification and bluish ear tip in the females and adults, weakness and skin lesions in the piglets.

Hence, the investigation was made in April 2021. The common bacteria isolated from the vaginal swabs of abortion history were *Actinomyces, Streptococcous spp.* and *E. coli*. From the skin scrapings of the dermatitis cases, mostly the weaners, Rhizopus fungi were isolated indicating Dermatophytosis. Two animals from the replacement shed were detected with antibodies against Porcine Circovirus type 2 (PCV2) which indicates exposure to the virus.

The signs and symptoms recorded in the farm is consistent with PCAVD. Further, the presence of antibody in the animals indicates the exposure of animals to the virus. Currently symptomatic treatment should be carried out with improve in hygiene and management. Further, screening of animals will be carried out subject to availability of the kits. The farm should enhance the biosecurity of the farm and improve hygiene management. Avoid overcrowding in the shed (keep one empty cage in between), if possible and routine disinfection of the sheds.

8.2.4. Detection of Multi-drug resistant and Extended-spectrum beta-lactamase-producing Enterobacteriaceae in Thimphu, Bhutan.

Puspa Maya Sharma, Tenzinla, Nirmal Kumar Thapa, Meena Devi Samal

Three MDR and ESBL producing Enterobacteriaceae were detected from clinical samples from companion animals (cat and dog) and aquatic duck referred from National Veterinary Hospital, Thimphu. The isolates were identified as *Serratia rubidaea* (cat), *Proteus mirabilis*

(dog) and *E. coli* (duck). The detailed description of the specimen and antibiotic profile of different ESBL organisms are mentioned in table 44 and 45.

Table 44: Details of specimen received and MDR- and ESBL-producing bacteria isolated.

Bacteria	Host species	Specimen	Location
E. coli	Duck	Intestine	Samtenlng, Thimphu
Serratia rubidaea	Cat	Blood	Babesa, Thimphu
Proteus mirabilis	Dog	Urine	In-patient at National Veterinary Hospital, Thimphu

Table 45: The antibiotic profile of MDR bacteria.

Bacteria	AMP	TCY	SXT	GEN	CTR
E. coli	R	R	R	S	R
Serratia rubidaea	R	R	R	R	R
Proteus mirabilis	R	R	S	I	R

All the isolates were found to be MDR with susceptibility to only Gentamicin for *E. coli* and Sulfamethoxazole Trimethoprim for *Proteus mirabilis*. However, *Serratia rubidae* was found resistant to all the antibiotics tested. The isolates will be referred to the University of Melbourne for the characterization of resistant genes.

The detection of the above MDR/ESBLs producing organisms in the various animals in the country is significant from the public health point. It is also important from the animal health perspective since they were isolated from the clinical case and post-mortem case of a duck. The investigation of such MDR /ESBL producing organisms shall be continued for understanding the antibiotic profile and the clinical significance in the animals. It could also be undertaken as one health study in future with other agencies.

8.2.5. Detection of Classical swine fever (CSF) in wild piglets

NK Thapa, Tenzinla, Kelzang Lhamo, Puspa M Sharma

In June 2021, three piglets of wild pigs were found dead in the Samtenling palace forest area. The carcass was submitted to LSU for post-mortem examination. Since the carcass was fully decomposed and infested with maggots, post-mortem examination could not be conducted. However, the bone marrow samples were collected and tested for African swine fever (ASF), Classical Swine Fever (CSF) and Porcine Respiratory and Reproductive Syndrome (PRRS) by real-time PCR. The samples tested positive for CSF indicating the cause of death as Classical swine fever. Control measures were advised. However, vaccination of the wild pig population may not be possible at this stage. If required, we may have to explore the possibilities in future in collaboration with the Nature Conservation Division, Department of Forests and Park Services.

8.2.6. Prevalence and characterization of *Staphylococcus aureus* cultured from raw milk from government farms in Bhutan.

Puspa M Sharma, Tenzinla, Bindu Parajuli, Nirmal Kumar Thapa

Introduction

In Bhutan, milk and milk products are consumed daily by individual families. Further, the method of milk and milk products consumed in the country possesses a high risk of transmitting pathogenic bacteria from animals to humans. Currently, there is no study to characterize *S.aureus* in the country. This study aims to estimate the prevalence of *S. aureus* from raw milk from dairy cows from three government dairy farms and to describe the characteristics of the isolates, to provide the groundwork for further studies on the control and prevention of contamination of *S. aureus* in raw milk of dairy cows with mastitis.

Results

Highest prevalence of *S. aureus* of 43.75% was detected at Regional Calf rearing center (7/16) followed by Brown Swiss cattle farm, Bumthang with 31.1% (14/45) however, no isolate was detected at National Jersey Breeding Centre (0/15), Samtse. The high prevalence of *S. aureus* at RCRC Wangkha could be due to low sample size compared to Brown swiss cattle farm

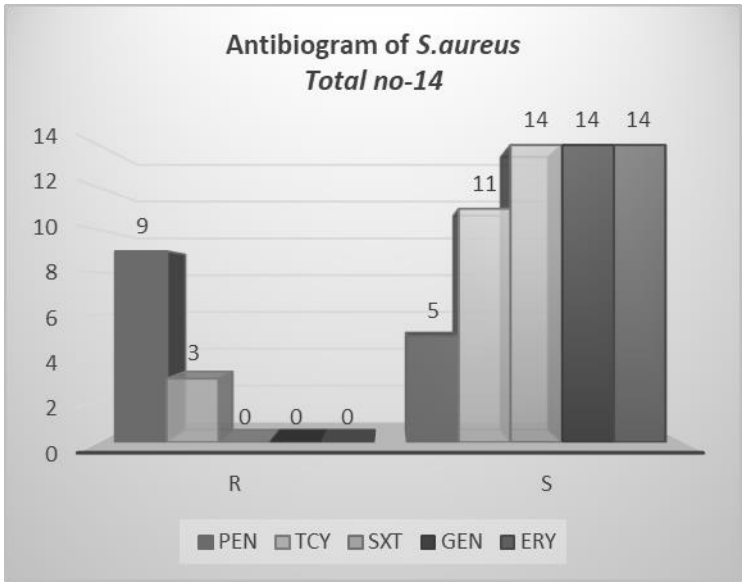


Figure 39: Antibiogram of Staphylococcus aureus against Penicillin, Tetracycline, Trimethoprim/ Sulfamethoxazole, Gentamycin and Erythromycin.

All positive isolates were shipped to Australia for whole genome sequencing and identification of virulence factors.

Highest resistance was observed against Penicillin 64% followed by Tetracycline 21%, this could be due to the frequent use of these drugs in the farm as they are readily available in the centers.

Detection of *S. aureus* at high level in 2 farms indicate the significance of the bacteria associated with the mastitis cases in the animals. However, only after the genetic characterization the strain will be known. However, alarming levels of resistance is observed to Penicillin and Tetracyclines. The absence of the organism at NJBC could eb due to following of proper hygiene and management practiced at the farms.

8.2.7. Detection of African swine fever (ASF) in stray pigs at Phuentshogling

In early May 2021, many stray scavenging pigs were found dead at the Phuentshogling sewerage area. At some places, the remains of the carcass were spotted. The carcasses spotted were in a decomposed state, hence the bone marrow sample was submitted to LSU for diagnosis. Molecular tests were carried out for African swine fever, Classical swine fever and Porcine respiratory and reproductive syndrome (PRRS) by real-time PCR. The samples tested positive for African swine fever.

Following confirmation of the disease, the RRT team was activated to implement a disease outbreak investigation. Many other stray pigs were identified, and samples collected tested positive for the ASF virus. About 34 stray pigs have died of the infection.

In response, a 3-D (Depopulation, Disposal and Decontamination) operation was conducted and culled 21 stray pigs. The outbreak could be contained efficiently at the source.

8.2.8. Detection of Lumpy Skin Disease (LSD)

The first suspected case of LSD was reported from Langchenphu gewog under Samdrup Jongkhar on the 21st August 2020 in six cattle. Confirmation of the outbreak could not be done as the country was under lockdown. In addition, there was no diagnostic capacity at the NCAH then. A second suspected case of LSD was reported from Tashichhoeling, Samtse on 22nd September 2020. The National Centre for Animal Health received four samples from Samtse on 4th October and confirmed the outbreak on the next day as LSD. The disease was confirmed by PCR.

The disease has affected cattle in 10 gewogs of Samtse dzongkhag and a gewog under Sarpang dzongkhag.

8.3. Research articles published during FY 2020 – 2021.

8.3.1. Occurrence of *Echinococcus granulosus sensu lato* and Other Taeniids in Bhutan.

Puspa M. Sharma [1], *, Nirmal K. Thapa [1], *Pema Tshomo [1],* ***Tshewang Dema [1],*** *Cristian A. Alvarez Rojas [2], Tenzin Tenzin [1],* ***Ratna B. Gurung [1]****, Tshering Norbu [3], Lhatru Lhatru [4], Phurpa Namgyel [5], Chimi Jamtsho [6], Kinzang Dukpa [1], Yoenten Phuentshok [7], Krishna P. Sharma [8], Sonam Pelden [9] and Peter Deplazes [2], **

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Abstract: The present research shows the results of a national study documenting the occurrence and genetic diversity of Echinococcus and Taenia species across Bhutan. Environmental dog faecal samples (n = 953) were collected from 2016 to 2018 in all 20 Bhutanese districts, mainly in urbanised areas. Cystic echinococcosis cysts were isolated from 13 humans and one mithun (*Bos frontalis*). Isolation of taeniid eggs from faeces was performed by sieving/flotation technique, followed by DNA isolation, PCR and sequence analyses for species identification (gene target: small subunit of ribosomal RNA). Genetic diversity of *E. granulosus s.s.* was based on the sequence (1609 bp) of the cox1 gene. A total of 67 out of 953 (7%) dog faecal samples were positive for at least one taeniid species. From the 670 free-roaming dog faecal samples, 40 (5.9%) were positive for taeniid DNA, 22 (3.2%) of them were identified as *E. granulosus s.s.* and four (0.5%) as *E. ortleppi* (G5). From the 283 faecal samples originating from yak-grazing areas, 27 (9.5%) were taeniid positive, including eight (2.8%) infected with *E. granulosus s.s.* and four (1.4%) with *E. ortleppi. E. granulosus s.s.* was identified in all isolates from human and the cyst from mithun. A haplotype network (cox1 gene) from *E. granulosus s.s,* including isolates from 12 dogs, two human and one mithun, revealed eight different haplotypes. The most common cox1 haplotype was the globally distributed Eg01, followed by Eg40 and Eg37 (previously described in China). Five new cox1 haplotypes (EgBhu1–5) originated from human, dogs, and a mithun were identified. The study indicated the contamination of urban areas and pastures with Echinococcus eggs in seven districts in Bhutan. The molecular characterisation of *E. granulosus* self-revealed different *E. granulosus s.s.* haplotypes as well as *E. ortleppi.* The transmission of *T. multiceps* was documented only in the western part of the country. Considering the zoonotic feature of E. *granulosus s.s.* and *E. ortleppi* and the economic impact of coenurosis caused by *T. multiceps* (also known as gid) in Bhutan, the findings of this study represent a significant contribution towards an epidemiological baseline for the establishment of a national control programme. Pathogens 2021,10,330 https://doi.org/10.3390/pathogens 10030330

8.3.2. Effectiveness of different treatment protocols against cutaneous bovine papillomatosis (wart): a clinical trial study

Ugyen Namgyel[1]*, *Karma Wangdi[2], Rinzin Pem[2],* ***Sangay Rinchen[1], Pelden Wangchuk[1], Sonam Peldon[1], Rb Gurung[1]*** *and Bir Doj Rai[3].*

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Abstract: Cutaneous papillomatosis in bovine is a persistent problem in Bhutan imposing heavy economic losses to the farmers and compromising animal welfare. Although there are numerous therapies with varying protocols, it is not known which therapy is the most effective. A research trial was conducted to identify the most effective treatment protocol for cutaneous papillomatosis in Bhutan. A total of 20 cases identified based on clinical manifestation were stratified into different groups based on location and morphology of papilloma. A total of 5 cases were randomly selected from the different stratified groups and assigned to each treatment arm. Four treatment options - Autovaccines, Autohaemotherapy, Ivermectin injection, and Lithium antimony were used for the study. The response to treatment was measured every 15 days for 3 months and considered successful treatment upon complete disappearance of all papillomas. Proportion of animals recovered in each treatment was calculated and compared between other groups using Chi-Square test. The overall recovery rate of 40% (95% CI 19.1-63.9%) within 90 days post-treatment was recorded in the current study. A statistically significant difference (p=0.040) in recovery rate among the different treatment groups was observed. Lithium group had the highest recovery rate of 80% (95%CI 28.4-99.5%) while autovaccine group had none recovered. The remission rate in the Autohaemotherapy and Ivermectin group was 60% (95%CI 14.7-94.7%) and 20% (95%CI 0.5-71.6%), respectively. All the animals with warts in udder and teat region in Lithium group (4 out of 5 animals) recovered. Comparatively, the Lithium group also had the fastest recovery rate. This study further validated the effectives of lithium against the treatment of wart in udder/treat region. Therefore, the lithium treatment protocol can be adopted for treating udder/teat warts in the country. Further studies with larger sample sizes are recommended to establish effectiveness of other treatment protocols.

8.3.3. Analysis of pigs' mortality at National Nucleus Pig Breeding Centre, Yusipang

Nk Thapa[1], Puspa Maya Sharma[1], *Menuka Rai[2] and* ***Rb Gurung[1]***

1. *National Centre for Animal Health, Serbithang, Thimphu*
2. *National Nucleus Pig Breeding Centre, Yusipang, Thimphu, Bhutan*

Abstract: A retrospective study was conducted to understand the extent and causes of mortality in pigs at the National Nucleus Pig Breeding Centre, Yusipang. This study used

secondary data on pig deaths, observed clinical signs recorded and molecular laboratory reports to assess the extent and causes of mortality. The data were analysed descriptively using Microsoft excel. The farm average mortality rate was recorded at 6.78 in 2018-19. Highest mortality rate was recorded in adult pigs (13.3%), followed by sucklers (5.9%), weaners (5%) and growers (2.9%). Seasonally, the highest mortality was recorded between October to January and December to February in the sucklers and weaners, respectively. Majority of the mortality in sucklers (97.6%) and weaners (67.7%) are recorded as sudden death. Similarly, a large number of growers (31%) are also recorded to have died suddenly, followed by lameness (24.1%), Blue ear (20.7%). In the adult group, highest case reported was associated with Chronic illness and weakness (27.3%) followed by digestive related illness (21.2%), high respiration (15.2%) and reproductive problems (12.1%). As per the necropsy findings, cause of highest death was due to hepatic disorder (28.9%) followed by cardiopathy (15.6%), and respiratory infection and septicaemia (12.5%). The main isolates in the bacterial infection and septicaemia were *Escherichia coli, Erysipelothrix rhusiopathiae, Klebsiella, Streptococcus* and *Staphylococcus*. *Salmonella* was isolated from diarrhoeal cases in piglets in the month of May 2019. Similarly, *Staphylococcus hyicus, Streptococcus, Corynebacterium, Actinomyces, Actinobacillus* and *Escherichia coli* were also isolated from animals with reproductive disorder. Molecular analysis confirmed negative against ASF, CSF, PRRS and Brucellosis. The three main steps in biosecurity measures – segregation, cleaning and disinfection needs to be strictly instituted. NNPBC should have adequate space for isolation of the sick animals, proper water supply for cleaning and adequate stock of disinfectants for routine disinfection. Additionally, proper health monitoring of the animals also needs attention.

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8.3.4. One Health in Policy Development: Options to prevent rabies in cattle in Bhutan.

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Introduction: Bhutan is a small, landlocked Himalayan kingdom located in South Asia, between China to the north and India to the south, west, and east. About 60% of its population (estimated at 750,000) live in rural areas and depend on agriculture and livestock farming for their livelihoods. As a result, livestock remains critical to enhancing and sustaining rural livelihoods. With the country's aim to attain self-sufficiency in livestock products, the Royal Government of Bhutan prioritised improvement of livestock productivity, including dairy cattle. Besides ensuring accessibility to breed improvement programmes by establishing artificial insemination centres and supplying breeding bulls across the country, the Government also provides subsidies to import exotic breeds of cattle, mostly from India, to

supplement the supply of improved cattle breeds within Bhutan. Because of this, the number of farmers rearing exotic breeds of dairy cattle, mainly European breeds such as Jersey, have been increasing. For instance, the percentage of imported cattle breeds increased from 24.1% in 2012 to 27.4% in 2014 while the indigenous cattle (Bos indicus) decreased from 75.9% in 2012 to 72.6% in 2014 (MoAF, 2015). As rural communities are dependent on cattle and other livestock species for their livelihoods, infectious diseases such as rabies, brucellosis, anthrax, and leptospirosis not only reduce productivity and result in death of animals, but also pose a significant public health risk. Whereas all livestock diseases have a potential impact on rural communities, some have more immediate impacts. Rabies, due to the high case fatality rate in exposed individuals and the potential public health risk, remains a disease of great concern. Although dog-mediated rabies has been successfully eliminated from most regions of Bhutan, it remains endemic in the southern parts of the country (Tenzin, 2012). Sporadic incursions are also reported in the east (Tenzin et al, 2017). Elimination of rabies from the southern part of Bhutan is complicated by the porous border with the neighbouring Indian states of West Bengal and Assam. Dogs are the main reservoir for rabies in Bhutan and it is thought that wildlife transmitted rabies is currently not a significant consideration in the region. Further work may be needed to fully assess this in the future. Around seventeen outbreaks of rabies are reported annually in dogs with spill over infection to other domestic animals, resulting in continuous public health risks and economic losses (NCAH, 2017). There has not been a human case of rabies reported in the country since 2016.

8.3.5. A qualitative risk assessment of rabies reintroduction into the rabies low-risk zone of Bhutan

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Abstract: In Bhutan, dog-mediated rabies has been successfully eliminated from most regions of the country but remains endemic in the Southern region and sporadic incursions are also reported in the East. Elimination of rabies from the southern part of Bhutan is challenged by the porous border with the neighbouring states of India which facilitates free and unregulated movement of animals. Around 17 outbreaks of rabies are reported annually in dogs and other domestic animals, posing continuous public health risks and economic losses. Furthermore, due to anthropogenic factors, such as increasing human settlements along highways, increased animal transportation, and the complex and changing human-pet relationship, there is potential to reintroduce rabies from rabies high-risk zone to rabies low-risk zone. This study was undertaken to estimate the risk of rabies re-introduction to the rabies low-risk zone by performing a qualitative risk assessment. The assessment was conducted for three risk pathways (stray dog-pathway, pet dog-pathway and cattle-pathway) under two scenarios: (1)

no risk mitigation measures in place and (2) current risk mitigation measures in place. The current control measures include Government led programmes, such as mass dog vaccination and dog population management, regulation of the movment of animals through pre-travel check-up and health certification, regular awareness education and rabies surveillance in the rabies endemic areas. The probability of an event occurring was assigned using the data from the available literature. Where gaps in knowledge existed, expert opinion, elicited through modified Delphi method, was used. Under the scenario in which no risk mitigation measures were in place, the risk of rabies re-introduction was estimated to be medium for the stray-dog pathway with a low level of uncertainty, low for pet-dog pathway with a low level of uncertainty, and very low for the cattle-pathway with a medium level of uncertainty. When current risk-mitigation measures were included, the risk of rabies reintroduction was estimated to be very low for the stray-dog pathway with a medium level of uncertainty, low for the pet dog-pathway with a low level of uncertainty, and extremely low for the cattle-pathway with a medium level of uncertainty. The risk of rabies re-introduction through all the pathways was greater than negligible. These findings highlight the importance of maintaining and enhancing current risk mitigation measures to prevent re-introduction of rabies into rabies low-risk zone.

8.3.6. The role of laboratories in animal-related disasters and emergencies

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Summary: This paper outlines the role of laboratories in animal-health-related disasters and emergencies, with a particular focus on biological threats – intentional, accidental and natural. Whilst multisectoral coordination is increasingly recognised as necessary for effective preparedness and response to all kinds of disasters, the role of the laboratory is often overlooked. The laboratories' involvement, not just in the response, but across all phases of disaster management – mitigation, planning, response and recovery – is essential, not only for improved animal health but for preservation of livelihoods and for food security, social cohesion and economic stability.

8.3.7. The potential of diagnostic point-of-care tests (POCTs) for infectious and zoonotic animal diseases in developing countries: Technical, regulatory and sociocultural considerations.

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Abstract: Remote and rural communities in low- and middle-income countries (LMICs) are disproportionately affected by infectious animal diseases due to their close contact with livestock and limited access to animal health personnel). However, animal disease surveillance and diagnosis in LMICs is often challenging, and turnaround times between sample submission and diagnosis can take days to weeks. This diagnostic gap and subsequent disease under-reporting can allow emerging and transboundary animal pathogens to spread, with potentially serious and far-reaching consequences. Point-of-care tests (POCTs), which allow for rapid diagnosis of infectious diseases in non-laboratory settings, have the potential to significantly disrupt traditional animal health surveillance paradigms in LMICs. This literature review sought to identify POCTs currently available for diagnosing infectious animal diseases and to determine facilitators and barriers to their use and uptake in LMICs. Results indicated that some veterinary POCTs have been used for field-based animal disease diagnosis in LMICs with good results. However, many POCTs target a small number of key agricultural and zoonotic animal diseases, while few exist for other important animal diseases. POCT evaluation is rarely taken beyond the laboratory and into the field where they are predicted to have the greatest impact, and where conditions can greatly affect test performance. A lack of mandated test validation regulations for veterinary POCTs has allowed tests of varying quality to enter the market, presenting challenges for potential customers. The use of substandard, improperly validated or unsuitable POCTs in LMICs can greatly undermine their true potential and can have far-reaching negative impacts on disease control. To successfully implement novel rapid diagnostic pathways for animal disease in LMICs, technical, regulatory, sociopolitical and economic challenges must be overcome, and further research is urgently needed before the potential of animal disease POCTs can be fully realized.

8.3.8. A knowledge, attitudes, and practices study on ticks and tick-borne diseases in cattle among farmers in a selected area of eastern Bhutan

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Abstract: Livestock farming plays an important role in supporting the livelihood of resource-poor subsistence farmers in Bhutan. However, ticks and tick-borne diseases (TBDs) are one of the major constraints to livestock farming due to their negative effect on health and production. To date, no study has been conducted in Bhutan to assess farmers' knowledge,

attitude, and practices (KAP) about ticks and TBDs in cattle, although such information is essential in ensuring the development and adoption of effective prevention and control measures. Therefore, a KAP survey was conducted among 246 cattle owners in the Samkhar sub-district of eastern Bhutan in June 2019, using a structured questionnaire. Based on our scoring criteria, 52% [95%CI: 45.5–58.4] had adequate knowledge about ticks as potential vectors of diseases. Logistic regression analysis showed that the individuals who practiced a stallfeeding system of cattle rearing were 2.8 times [OR = 2.8 (95%CI: 1.66–4.78)] more likely to have adequate knowledge than others. Sixty-eight percent [95%CI: 62.5–74.4] had a favorable attitude toward tick prevention and control programmes. Men were 1.95 times [OR = 1.95 (95%CI: 1.09–3.55)] more likely to have a favorable attitude than women, and the individuals who practiced a stall-feeding system were 2.59 times [OR = 2.59 95%CI: 1.45–4.78)] more likely to have a favorable attitude than others, after adjusting for the effect of other variables in the model. Overall, only 38% [95%CI 32.5–45] of the respondents reported tick infestation as one of the most important animal health problems, but 100% reported using acaricides to control ticks in cattle. Despite a high level of acaricide usage, the level of knowledge was low among the farmers interviewed. Findings from this study underline the importance of considering identified knowledge gaps and initiating education efforts to improve the adoption of effective tick prevention and control measures among farmers.

8.3.9. Identification, Distribution, and Habitat Suitability Models of Ixodid Tick Species in Cattle in Eastern Bhutan

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Abstract: Tick infestation is the most reported parasitological problem in cattle in Bhutan. In May and June 2019, we collected ticks from 240 cattle in two districts of Eastern Bhutan. Tick presence, diversity, and infestation prevalence were examined by morphological identification of 3600 live adult ticks. The relationships between cattle, geographic factors, and infestation prevalence were assessed using logistic regression analyses. Habitat suitability for the tick species identified was determined using MaxEnt. Four genera and six species of ticks were found. These were *Rhipicephalus microplus* (Canestrini) (70.2% (95% confidence interval (CI): 68.7–71.7)), *Rhipicephalus haemaphysaloides Supino* (18.8% (95% CI: 17.5–20.1)), Haemaphysalis bispinosa Neumann (8.2% (95% CI: 7.3–9.1)), *Haemaphysalis spinigera*

Neumann (2.5% (95% CI: 2–3)), *Amblyomma testudinarium* Koch (0.19% (95% CI: 0.07–0.4)), and a single unidentified Ixodes sp. Logistic regression indicated that the variables associated with infestation were: longitude and cattle age for *R. microplus*; latitude for *R. haemaphysaloides;* and altitude and cattle breed for *H. bispinosa* and *H. spinigera.* MaxEnt models showed land cover to be an important predictor for the occurrence of all tick species examined. These findings provide information that can be used to initiate and plan enhanced tick surveillance and subsequent prevention and control programmes for ticks and tick-borne diseases in cattle in Bhutan.

8.3.10. Antibiotic Prescription in Veterinary Consultations in Bhutan: A Retrospective Cross-Sectional Study

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Abstract: The veterinary prescription of antibiotics in low- and middle-income countries (LMIC) remains largely undocumented. In Bhutan, however, the national veterinary service keeps records of their activities and prescriptions, which offer an opportunity to establish a benchmark to assess the use of these agents in this and other LMIC. A cross-sectional retrospective study was designed and 2,266 handwritten veterinary records from 2017 were sampled from 23 animal health premises (AHPs) to estimate individual and an overall proportion of consultations that resulted in an antibiotic prescription. The frequency of antibiotic prescription per species, type of AHP, and according to WHO's AWaRe index and OIE list of priority antimicrobials were also explored. It was estimated that 31% (95% confidence interval: 29–33%; intracluster correlation: 0.03) of the veterinary consultations resulted in an antibiotic prescription. The incidence of antibiotic prescription was highest in consultations of poultry across AHP. Across species, diarrhea and wounds were frequently treated with broad-spectrum antibiotics including sulfonamides, tetracyclines, trimethoprim + sulfa, and penicillin. Between 45% and 70% antibiotics prescribed correspond to AWaRe's access group and up to 25% to AWaRe's watch group. Over 70% of antibiotics dispensed in veterinary consultations for any species correspond to the OIE's veterinary critically important antimicrobial agents. Overall, the study demonstrated positive features of veterinary antimicrobial stewardship in Bhutan, given the conservative proportion of consultation that results in this type of prescription and the type of antibiotic prescribed.

Although the veterinary service closely follows the Bhutanese Standard Treatment Guidelines, the prescription of antibiotics to key species should be closely monitored. Our study suggests that further improvements of antibiotic stewardship can be achieved through standardisation of antibiotic prescription to some species, a revision of the guidelines toward reducing the prescription of antibiotics of high relevance for human medicine, and by including details of clinical investigation, use of tests, and treatment outcomes in veterinary consultation records.

8.3.11. Cerebral cysticercosis in a wild Bengal tiger (Panthera tigris tigris) in Bhutan: A first report in non-domestic felids

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Abstract: The endangered Bengal tiger (*Panthera tigris tigris*) is a keystone species playing an essential role in ecology as well as in the social and spiritual lives of the Himalayan people. The latest estimate of the Bengal tiger population in Bhutan accounts for 103 individuals. Infectious organisms, including zoonotic parasites causing high burden in human health, have received little attention as a cause of mortality in tigers. Taeniosis/cysticercosis, caused by the cestode *Taenia solium*, is considered one of the major neglected tropical diseases in Southeast Asia. We present here a case of neurocysticercosis in a Bengal tiger showing advanced neurological disease outside Thimphu, the capital city of Bhutan. After palliative care, the animal died, and necropsy revealed multiple small cysts in the brain. Here we show the presence of two genetic variants of *T. solium* in the parasite material collected based on PCR and sequencing of the complete cox1 and cytB genes. The sequences form a discrete branch within the Asia plus Madagascar cluster of the parasite. On other hand, tests for feline morbillivirus, feline calicivirus, canine distemper virus, Nipah, rabies, Japanese encephalitis,

feline leukaemia and feline immunodeficiency virus were negative. In contrast, PCR for feline herpesvirus was positive and a latex agglutination test revealed an elevated antibody titer against Toxoplasma gondii (titer 1:256). The molecular examination of taeniid eggs isolated from the tiger faeces produced sequences for which the highest homology in GenBank is between 92% and 94% with *T. regis* and *T. hydatigena*. This fatal case of *T. solium* neurocysticercosis, a disease previously unrecorded in tigers or other non-domestic felids, demonstrates an anthropogenically driven transmission of a deadly pathogen which could become a serious threat to the tiger population.

9. HUMAN RESOURCE AND CAPACITY BUILDING

9.1. Hands-on training for laboratory technicians on the diagnosis of Rabies by FAT

5-day hands-on training for laboratory technicians on rabies diagnosis using fluorescent antibody test (FAT) was conducted from 12th to 16th April 2021 at the National Centre for Animal Health (NCAH), Serbithang, Thimphu. About 17 participants attended the training, representing the National Veterinary Laboratory (NVL), Serbithang; National Veterinary Hospital (NVH), Motithang; Regional Livestock Development Centre (RLDC), Tshimasham, Wangdue, Zhemgang and Kanglung; and Dzongkhag Veterinary Laboratory (DVL), Dagana, Tsirang, Thimphu, Lhuentse, Chhukha and Wangdue Phodrang.

The training was conducted with the main objective to enhance the laboratory diagnostic capacity for rabies disease diagnosis in animals, and to achieve the vision of elimination of dog-mediated human rabies in Bhutan by 2030.

Technical resources were provided by the National Centre for Animal Health (NCAH), Department of Livestock (DoL) and the Ministry of Health (MoH).

The training programme was organized by the DoL and NCAH, with the fund support from the Food and Agriculture Organization of the United Nations Technical Cooperation Programme (FAO TCP).

Figure 40: Training on rabies diagnosis by FAT, in pictures.

9.2. Training workshop on laboratory standard operating procedures (SOP) at NVH

The laboratory standard operating procedure (SOP) is a set of written instructions that describes, in detail, how to perform a laboratory process or experiment safely and effectively. The laboratory must have written SOPs when work involves the use of hazardous materials (biological or chemical) or physical hazards. It is equally important to have standardized and harmonized SOPs amongst the various veterinary laboratories to produce uniform results amongst the various laboratories. The national veterinary laboratory (NVL) at the National Centre for Animal Health (NCAH), is mandated to develop and standardizes the tests including SOPs for various veterinary laboratories in the country. The national veterinary hospital has recently developed laboratory diagnostic capacity for parasitology, biochemistry and

haematology for clinical samples. However, NVH required familiarization/orientation on the laboratory techniques and standard operating procedures. Hence, a two-day training workshop on various SOPs on sample collection, packaging, transportation, parasitology, haematology and biochemistry testing procedures was conducted at NVH. The main objectives of the workshop were:

- To train and familiarize laboratory standard operating procedures on sample collection, packaging, storage and transportation;
- Standardize and harmonize laboratory SOPs on Parasitology, Haematology and Biochemistry;
- Asses the microbiology facility at NVH for future development of capacities.

The participants were trained and familiarized with the following SOPs:

- Sample collection for:
  - Faecal sample collection for parasitological tests;
  - Blood protozoa parasites collection and preparation;
  - Skin scrapping collection for parasitological tests;
  - Tissue aspirates collection;
  - Meat sample muscle biopsies collection;
  - Blood sample collection for haematological tests;
  - Serum sample collection for biochemical tests and serological tests;
  - Urine sample collection for Biochemical tests and bacteriological tests.
- Faecal examination by Direct Method
- Faecal examination by Direct Method – Mucosal Impression smear
- Flotation technique
- Sedimentation technique
- Quantitative Techniques – Stoll's Dilution Method
- Blood Smear Preparation for Haematology
- Blood smear staining techniques
- Differential leucocytes count (DLC)
- Sample Referral to National Veterinary Laboratory
- Sample packaging, storage and packaging.

9.3. Training of Animal Health Laboratory diagnosticians on use of Laboratory Information Management System (LIMS)

The training on Laboratory Information Management System (LIMS) for the laboratory diagnosticians for all the animal health laboratories of the country was organized. Three-days training each was conducted in three regions v.i.z. at Monger on 5 to 7 of November 2020 for the eastern region, Punakha for the Western Region on 18 to 20 of November 2020 and Bumthang for the central region on 26 to 28 of November 2020. A total of 52 participants were involved in the training and the resource persons were involved from National Centre for Animal Health and Namchoey consultancy. The participants represented National Veterinary Laboratory, National Veterinary Hospital, Regional Livestock Development Centres

and Dzongkhag Veterinary Laboratories. However, in compliance with COVID protocol, the participants from the red zone were not included in this training.

Data management on laboratory service operations is very challenging without proper record keeping. Further, due to the lack of electronic records (online system), it is tedious to compile the reports and perform analysis from hard copies. This affects the delivery of laboratory services in the country. The animal health services did not have such an electronic recording system of the laboratory activities. The same was recommended by the Technical Backstopping Mission of FAO conducted in 2017, and accordingly the National Centre for Animal Health, Serbithang has developed an online LIMS for storage of information on laboratory activities, report generation, report dissemination to clients and enhance animal health service delivery. The Database was tested several rounds in-house and was formally launched during July 2019.

It has the features for online entry of sample details, test results, diagnosis and recommendation. The system helps the veterinary laboratories track samples from submission to testing and reporting. This database enables real-time tracking of sample testing status through a paperless system. Besides data storage and test result dissemination, customized analysis can also be performed to provide decisions required in policy interventions. This database will immensely reduce turn-around time for diagnostic service delivery. This system is intended for all the laboratory facilities under the Department of Livestock (DoL) viz. National Centre for Animal Health (NCAH), Regional Livestock Development Centres (RLDCs), Satellite Veterinary Laboratories (SVLs) and Dzongkhag Veterinary Laboratories (DVLs).

The main objectives of the training were to support animal health laboratories in the use of electronic recording system of all the laboratory activities and use a paperless system of result dissemination, generation of accurate AST data for guiding the veterinary clinicians for prescribing right antibiotics and thereby promoting their prudent use. In addition, the training of relevant officials will greatly support data generation and analysis for the forthcoming laboratory surveillance in chickens under the Fleming Fund Country grant.

The training was conducted by the National Veterinary Laboratory, Serbithang and is being funded by Fleming Fund Country Grant.

9.4. Animal Health Technical Working Group (TWG) Meeting on Fleming Fund Project Activities

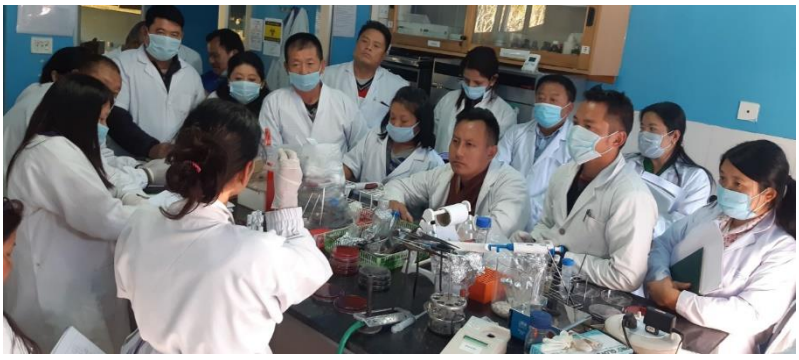
Under the Ministry of Agriculture & Forests, various organizations involved in AMR activities under Fleming Fund Project include the National Veterinary Laboratory, two Regional Livestock Development Centres under the Department of Livestock (DoL) and National Food Testing Laboratory, Bhutan Agriculture and Food Regulatory Authority (BAFRA). Since two different organizations are involved, it is necessary to improve the coordination of Fleming Fund activities. Hence, a two-day Animal Health TWG meeting was held w.e.f. 4th to 5th of May 2021 at Tashi Namgay Resort, Paro.

The main objectives of the meeting were to review the activities carried out, discuss the status and plan the way forward the activities. A total of 15 participants representing from

Department of Livestock (Animal Health Division, National Centre for Animal Health, National Veterinary Hospital & Regional Livestock Development Centres); Bhutan Agriculture & Food Regulatory Authority (BAFRA), HQ, National Food Testing Laboratory, Yusipang and Fleming Fund Project Unit attended the meeting. During the meeting, the activities carried out by different agencies were reviewed and the issues were resolved. In addition, the way forward was discussed including the prioritization of the activities for the Country grant 2. The meeting was funded by the Fleming Fund country grant.

9.5. Hands-on-training on microbiology techniques for culture, identification and antibiotic susceptibility testing of *Campylobacter, Enterococci, Salmonella* and *E. coli* from poultry

One of the main aims of the Fleming Fund Project is to strengthen microbiology laboratory capacity for AMR diagnostics at the surveillance laboratories. The capacity of these laboratories needs to be enhanced and facilitated to identify, isolate and perform Antibiotic Sensitivity Test (AST) on WHO identified GLASS (Global AMR surveillance system) pathogens such as Campylobacter spp., Enterococci spp., Salmonella spp. and E. coli. However, the surveillance laboratories identified do not have adequate capacity to carry out culture, identification and AST for the target pathogens. Therefore, it is important to train the laboratory technologist and technicians from all the surveillance sites on the sample processing, culture, identification and AST on the target pathogens.



Hence, five days long hands-on training on microbiology techniques for culture, identification and antibiotic susceptibility testing of Campylobacter, Enterococci, Salmonella and E. coli from poultry was conducted at (NCAH), Serbithang from 28th October – 1st November 2020. The participants were laboratory technologists/technicians from the Department of Livestock (National Veterinary Laboratory, Regional Laboratories of Regional Livestock Development Centre, National Veterinary Hospital) and BAFRA (National Food Testing Laboratory). The training was conducted by a microbiologist/ Senior Laboratory Officer from the NCAH and a microbiologist from Royal Centre for Disease Control (RCDC).

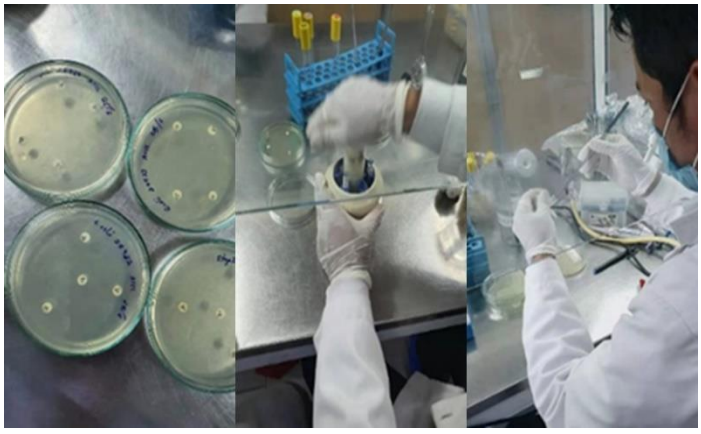
The workshop was conducted with the following expected outcomes:

- Skilled microbiology laboratory technologist/technicians on handling and culture, identification of Campylobacter, Enterococci, Salmonella and E. coli.
- Skilled microbiology laboratory technologist/technicians on performing antimicrobial susceptibility testing (AST) for *Campylobacter, Enterococci, Salmonella* and *E. coli*
- Laboratory technologist/technicians well versed with SOPS.

- Laboratory technologist/technicians well versed with surveillance plans and processing of samples.
- Laboratory technologist/technicians trained on the report of the results.

9.6. Hands-on-training on Internal quality control and maintenance of ATCC reference cultures

One of the main objectives of the Fleming Fund Project is to strengthen microbiology laboratory capacity for AMR diagnostics at the surveillance laboratories. The capacity of these laboratories needs to be enhanced and facilitated to identify, isolate and perform Antibiotic Sensitivity Test (AST) on WHO identified GLASS (Global AMR surveillance system) pathogens such as *Campylobacter spp*., *Enterococci spp., Salmonella spp.* and *E. coli.* In performing the diagnostic tests, the control strains must be used and ran parallel to the tests. The American Type Cell Culture control strains are used as controls for identification and antibiotic susceptibility testing by most of the international reference laboratories. These ATCC control strains are available for purchase and can be cultured and maintained for use over the years. Hence, training on the culture and maintenance of ATCC organisms is extremely important and focused on the culture, usage, maintenance and storage of ATCC organisms. In addition, the performance of antibiotic susceptibility testing, interpretation and recording of the Quality control ranges. Hence, a three-day hands-on training on culture and maintenance of ATCC reference strains was conducted at NFTL, Yusipang from 24th to 26th June 2021. The training focused on culture, usage, maintenance and storage of ATCC organisms. In addition, the performance of antibiotic susceptibility testing, interpretation and recording of the Quality control ranges. The participants were laboratory technologists and technicians from BAFRA (National Food Testing Laboratory). The training was conducted by Ms Puspa Maya Sharma, microbiologist/ Sr. Laboratory Officer from the NCAH.



The main objectives of the workshop were:

- To review and finalize the standard operating procedure for internal quality control and maintenance of ATCC reference cultures.
- Skilled microbiology laboratory technologist/technicians on culture and maintenance of ATCC control strains.
- Laboratory technologist/technicians well versed with SOP and record maintenance.

9.7. Hands-on training to laboratory and field staff on sample collection, packaging and transportation" of caeca samples from poultry for AMR surveillance.

Hands-on training on sample collection, packaging and transportation of caeca samples for AMR surveillance was conducted on18-22nd October 2020 for the laboratory staff at Paro.

Collecting whole caeca is preferred: Representative of on-farm antimicrobial use as there is less opportunity for environmental contamination of samples. Collecting whole caeca is preferable to taking a swab of the caecal content as the higher volume of material in the whole caecum is likely to increase the chance of detecting the bacteria of interest if they are present.

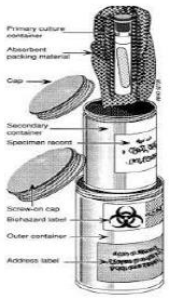
Procedure

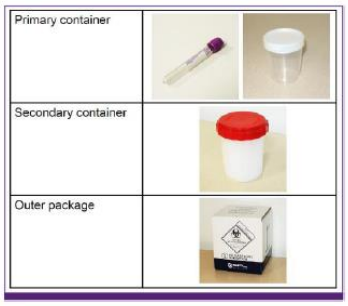
- Collect whole intact-full caeca from healthy animals within 10 min of slaughter.
- Identify the caecum

Figure 41: Procedure for caeca sample collection.

- Tight the intestinal area at two points above the caecum. Cut the intestinal area with scissors in between the tighten points to prevent the spread of faecal contents.

- Hold the caecum with forceps and pour the whole caecum into a sterile plastic bag by cutting the tip of the caecum.
- Put the caecum into a sterile plastic bag and place the sample at 4°C immediately.
- Both the caeca are put in a primary container (zip-lock plastic bag) and placed in a well-labelled secondary container (zip-lock plastic bag)/ any other leakproof container.





- The secondary packaging is placed in an outer container; this will be cool boxes (foam boxes) / UN boxes with ice gel packs.
- Ensure that there is no direct **contact between the ice and the sample.**
- The samples should be sent safely to the laboratory as soon as possible by the fastest available means.

9.8. Hands-on training on the use of Epicollect5 application

Epicollect5 is a mobile & web application for free and easy data collection hosted by Imperial College London at https://five.epicollect.net. It provides both the web and mobile application for the generation of forms (questionnaires) and freely hosted project websites for data collection.

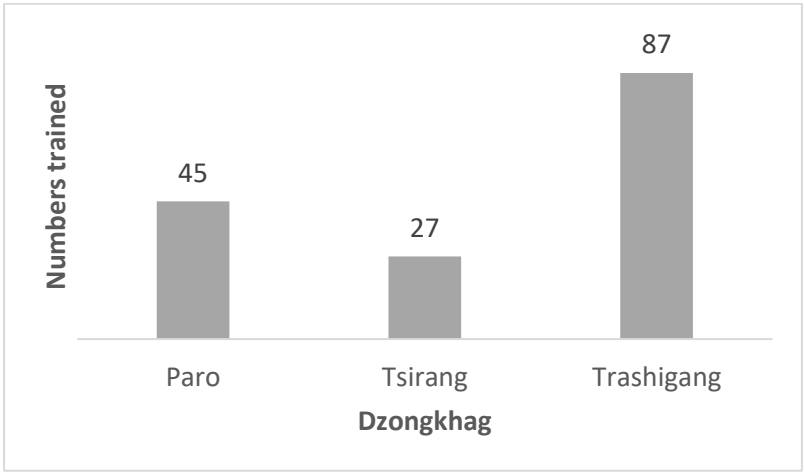


Figure 42: No. of persons trained to use Epicollect5

The application was used to capture necessary data during dog population surveys during dog population management campaigns. Before the conduct of surveys, a project was created by

DPMU, and the livestock officials and others involved in the survey were provided hands-on training on the use of the app.

A total of 159 Livestock officials and Desuups were trained in Paro, Tsirang and Trashigang (Figure 42).

9.9. Fresher Training on Cleaning and Maintenance of Laboratory Glassware

One-day Fresher training on Cleaning Laboratory Glassware and Safety Handling was conducted at National Veterinary Laboratory, Serbithang for the Lab Attendant of Laboratory Services Unit and Biological Production Unit on 1st April 2021. The main objectives of the training were to ensure proper cleaning of lab glassware to avoid interference during analysis which is also one of Good Laboratory Practices (GLP) and Quality Control in the laboratory and to train on proper safe handling practices during cleaning and maintenance.

The training programme was conducted through video shows on HOW TO WASH LAB GLASSWARE? and HOW TO OPERATE AUTOCLAVE? Followed by a presentation on types of glassware in the Laboratory, usage of PPE, safely handling Glasswares. And the participants were sensitized on the newly developed maintenance log sheet and SOP on Cleaning Glasswares and Maintenance. Finally, the training Programme ended with discussions related to issues faced by lab attendants and distribution of lab consumables both needed for cleaning the lab glassware and safety gear.

10. MAJOR ONE HEALTH ACTIVITIES

10.1. World Rabies Day 2020

World Rabies Day is an international awareness campaign coordinated by the Global Alliance for Rabies Control, a non-profit organization with headquarters in the United States. It is a United Nations Observance and has been endorsed by international human and veterinary health organizations such as the World Health Organization, the Pan American Health Organization, the World Organisation for Animal Health and the US Centres for Disease Control and Prevention. World Rabies Day takes place each year on September 28, the anniversary of the death of Louis Pasteur who, with the collaboration of his colleagues, developed the first efficacious rabies vaccine.

The first World Rabies Day campaign took place on 8 September 2007 as a partnership between the Alliance for Rabies Control and the Centres for Disease Control and Prevention, Atlanta, USA, with the co-sponsorship of the World Health Organization, the World Organisation for Animal Health and the Pan American Health Organization. In 2009, after three World Rabies Days, the Global Alliance for Rabies Control estimated that rabies prevention and awareness events had taken place in over 100 countries, that nearly 100 million people worldwide had been educated about rabies and that nearly 3 million dogs had been vaccinated during events linked to the campaign.

A 2011 review by a network of international government agencies, academics, NGOs and vaccine manufacturers identified World Rabies Day as a useful tool to assist with rabies prevention, targeting at-risk communities, animal health workers, public health practitioners, governments, key opinion leaders and experts.

In the years following the review, World Rabies Day has also been used by governments and international agencies as a day on which to announce policies, plans and progress on rabies elimination. For example, in 2013, the Food and Agricultural Organization of the UN, the World Health Organization and the World Organisation for Animal Health first called for the global elimination of canine-mediated rabies in a joint statement released on World Rabies Day. At the first Pan-African Rabies Control Network meeting in 2015, the 33 African countries represented their recommended consideration of World Rabies Day as an opportunity for rabies advocacy. It has been included in the Association of Southeast Asian Nations Rabies Elimination Strategy.

WRD 2020 – "End Rabies: Collaborate, Vaccinate"

28 September 2020 was the 14th World Rabies Day, and this year's theme was "End Rabies: Collaborate, Vaccinate".

End rabies: a reminder that we have 10 years to end human deaths from dog rabies and that we can raise awareness at the global level through the End Rabies Now campaign.

Collaborate: The United Against Rabies coalition was formed and subsequently launched the Global Strategic Plan. We need to continue collaboration at the international, national, and local levels to eliminate rabies – especially keeping in mind that it's a disease that knows no borders.

Vaccinate: A massive breakthrough was recently made in the rabies world – GAVI, the vaccine alliance, has included rabies into its portfolio of vaccines. This means that with their support, 181,000 more human deaths from rabies can be prevented. We also need to remember to vaccinate dogs to prevent rabies at its source so that we can reach elimination.

WRD 2020 in Bhutan

National

To observe the WRD 2020, activities implemented at the national level are as follows:

- Reiterating Bhutan's commitment to eliminate canine-mediated human rabies by 2030, a joint statement was released by the honourable ministers of the Ministry of Agriculture and Forests (MoAF) and the Ministry of Health (MoH).
- Representatives from the Department of Livestock (DoL), MoAF and the Department of Public Health (DoPH), MoH participated in a panel discussion – which was broadcasted on the national television, BBS – to highlight the importance of the day, and create awareness on rabies and its preventive measures.
- Bulk SMS sharing through Bhutan Telecom to inform the public about the day and the advice to vaccinate their dogs against rabies.
- For wider coverage, infographics, important links, and messages about the day and rabies disease were shared through relevant websites, social media handles, and newspapers.

Regions and Districts

Various activities were implemented in the field to observe the event:

- Free anti-rabies vaccination for dogs and cats
- Registration of pets
- Sterilization of dogs and cats
- Displaying and distribution of educational posters and leaflets
- Deworming of dogs and cats
- Awareness to animal owners visiting animal health extension centres for pet vaccination or seeking other animal health services.

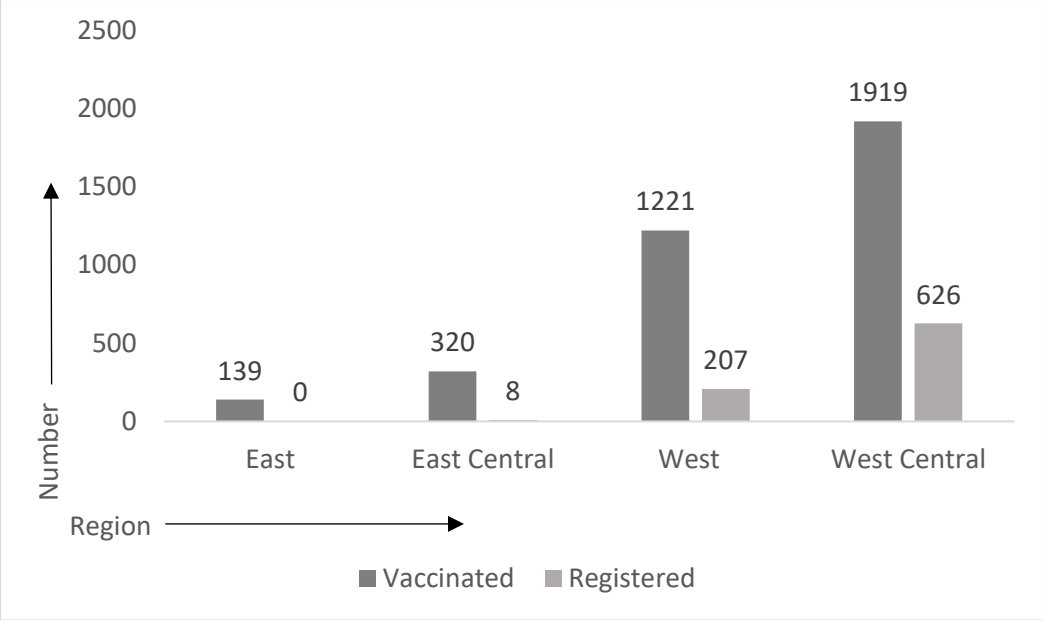


Figure 43: No. of dogs and cats vaccinated and/or registered during the WRD 2020.

10.2. World Antimicrobial Awareness Week 2020

November 18th – 24th is observed as *World Antimicrobial Awareness Week* (WAAW) globally. The WAAW was observed to raise awareness on antimicrobial resistance (AMR) to the public, health workers and policymakers and to promote good practice in this area of concern, to limit the emergence and spread of resistant bacteria throughout the world. The slogan 2020 WAAW was "Antimicrobials: handle with care".

Figure 44: One-health advocacy meeting, in pictures.

Antimicrobials are the essential medicines used to treat infection with microorganisms like bacteria, viruses, fungi and parasites in humans and animals. These agents have substantially reduced the burden of diseases in humans and animals and contributed to food security and safety**.** However, the emergence and spread of AMR in several microorganisms are complicating the management of many infectious diseases. AMR occurs when these

microorganisms change naturally and are triggered by inappropriate use, misuse or overuse in humans, animals and plants whereby they don't respond to treatment with the antimicrobials which they used to be before. AMR endangers animal health and welfare, as well as food production, and adversely affects the functioning of human, animal and plant health systems and economies. It is also considered one of the biggest global threats by the WHO. Hence, it requires inter-sector collaboration to reduce the emergence and spread of resistant micro-organisms.

To mark the occasion and join the global movement, **One Health Advocacy meeting on Antimicrobial Resistance** was conducted at Kuenphen Rabten Resort, Chang Jalu, Thimphu. The main objectives of the workshop were to create awareness to various one-health stakeholders, on the AMR and to encourage the prudent usage of antimicrobials in respective areas. The meeting was organized by the Department of Livestock and funded by the Ministry of Health.

The meeting was chaired by the Director, Department of Livestock and was attended by the representative from the World Health Organization (WHO) to Bhutan and the World Organisation for Animal Health (OIE). About 25 participants attended the advocacy programme representing various agencies such as the Department of Livestock (DoL) HQ, National Centre for Animal Health (NCAH); AMR programme, Department of Medical Services and JDW National Referral Hospital from the Ministry of Health (MoH); Drug Regulatory Authority (DRA); Khesar Gyalpo University of Medical Sciences of Bhutan (KGUMB); One Health Secretariat; National Plant Protection Centre (NPPC) from Department of Agriculture (DoA); Nature Conservation Division (NCD) from Department of Forests & Park Services (DoFPs); media representatives from Information & Communication Division (ICTD), Ministry of Agriculture & Forests (MoAF), Bhutan Broad Casting Services(BBS) and Kuensel.

10.3. A multi-sectoral approach to responding to Covid-19 pandemic in Bhutan

As the COVID-19 pandemic unfolded around the world, the importance of a multi-sectoral approach to address the sanitary crisis had become more evident. In Bhutan, the sharing of expertise is at the centre of the response strategy. The Ministry of Health has involved experts from different domains in the National Technical Advisory Group. Among them, veterinarians and veterinary paraprofessionals play

a key role by sharing their expertise in epidemiology, laboratory testing, regulations, and policies.

Veterinary epidemiologists have had notably contributed to the development of the National COVID-19 Preparedness and Response Plan and the establishment of the standard operating procedures. They also worked on adapting and deploying the national plan to the different districts.

The laboratory personnel from the NCAH were involved in Sample reception/distribution, sorting /pooling, extraction and master mix & Data management, analysis and reporting.

The Veterinary Services shared their expertise on contact tracing and quarantine measures to support the control of people movement in-and-out of the country. In the field, laboratory officers from the Veterinary laboratories have been trained on diagnostic protocols for COVID-19 and have been deployed with all the necessary material to establish a new testing facility.

The country recognises the risks and is prepared to deploy the necessary resources if the situation aggravates. The experience of Bhutan demonstrates that a truly operational One Health approach can effectively reduce the impact of the sanitary challenges, such as COVID-19.

11. ADMINISTRATIVE SECTION

Main mandates

- Implement HR initiatives in the areas of organizational and professional development, and change management in alignment with organizational strategy;
- Data management concerning Human Resource requirement, leave records, encashment, transfer details of employees, etc.;
- Assist in organizing workshops/seminars/conferences;
- Drafting letter/correspondence related to HR activities.

Human resources

- Dr Ratna Bahadur Gurung, Programme Director
- Ms Karma Dekar, Sr Adm. Assistant
- Ms Phuentsho Choden, Adm. Assistant
- Mr Rinzin Dorji, Storekeeper
- Ms Pemo, Sr Telephone Operator
- Mr Tashi Gelay, Driver
- Mr Pema Wangdi, Driver
- Mr Sangay Tshering, Driver
- Mr Tshewang Rinzin, Driver II
- Mr Tandin Wangchuk, Driver II
- Ms Tshering Dekar, ESP
- Mr Karna Kumar Tamang, ESP
- Ms Sangay Nidup, ESP
- Mr Phub Namgay, ESP
- Ms Kencho Dema, ESP

11.1. Construction & Renovation work carried out

Details of construction work carried out during the FY 2020 – 2021 are shown in the following table.

Table 46: Construction and renovation activities FY 2020 - 2021.

Sl. No.	Name of work	Funding	Cost (Million BTN)
1	Construction of Sheep shed	Fleming fund	1.5
2	Renovation for earthing	Fleming fund	0.031

11.2. Other activities

- During the FY 2020 – 2021, office stationaries worth BTN 50,000 and furniture and other office equipment worth BTN 113,000 were procured.
- Completed auditing for FY 2018 – 2019 and FY 2019 – 2020.

12. ACCOUNTS SECTION

Main mandates

- Exercise accounting procedures and internal control systems are always exercised;
- Manage funds utilization according to the budget appropriations;
- Uphold the financial integrity of the organisation;
- Coordinate and facilitate auditing through the production of all records and evidence;
- Ensure that funds are spent and managed according to our government plans and policies;
- Ascertain and evaluate the financial projection and financial progress reports for the agency.

Human resources

- Ms Pari Chhetri, Accounts Assistant II
- Ms Pema Choden, Accounts Assistant II

12.1. Financial achievements

During the FY 2020 – 2021, the Centre was allocated a total budget of BTN 66.622 million, of which the Centre utilized BTN 66.507 million, translating to the total budget utilization of 99.827 per cent. The detailed budget expenditure statement is as shown in the following table.

Table 47: Budget expenditure statement, FY 2020 – 2021.

ADMINISTRATIVE UNIT:				204.01	MINISTRY OF AGRICULTURE & FORESTS					
DEPARTMENT:				03	DEPARTMENT OF LIVESTOCK					
FIELD OFFICE:				20	NATIONAL CENTRE FOR ANIMAL HEALTH, SERBITHANG					
PRG	**SPRG**	**ACT**	**SACT**	**FIC**	**OBC**	**TITLE**	**BUDGET**	**EXPENDITURE**	**BALANCE**	**%**
045						LIVESTOCK SERVICES				
	027					LIVESTOCK HEALTH SERVICES				
		001				DIRECTION SERVICES NCAH				
			01			PERSONNEL EMOLUMENTS				
				0001		RGOB Financing				
					01.01	Pay and Allowances	13.479	13.386	0.093	0.69
					02.01	Other Personnel Emoluments	0.836	0.825	0.011	1.35
					11.03	Travel - (LTC/Leave Travel Concession)	0.575	0.575		
					24.03	Contributions - Provident Fund	1.677	1.668	0.009	0.55
					25.01	Retirement Benefits	3.400	3.398	0.002	0.05
						TOTAL OF FIC 0001	19.967	19.852	0.115	
						TOTAL OF SAct 01	19.967	19.852	0.115	
			02			OPERATION & MANAGEMENT SERVICES				
				0001		RGOB Financing				
					12.01	Utilities -Telephones, Telex, Fax, E-mail, Internet	0.272	0.272	0.000	0.00
					12.03	Utilities - Electricity, Water, Sewerage	0.378	0.378	0.000	0.02
					12.05	Utilities - Fuelwood	0.005	0.005		

					14.01	S & M - Office Supplies, Printing, Publications	0.050	0.050		
					15.01	Maintenance of Property - Buildings	0.042	0.042		
					15.02	Maintenance of Property - Vehicles	0.428	0.428		
					15.07	Maintenance of Property - Computers	0.010	0.010		
					17.02	Op. Exp. - Taxes, Duties, Royalties, Fees, Handling Charges, Bank Charges	0.170	0.170		
					17.08	Op. Exp. - In country Meetings and Celebrations	0.095	0.095		
						TOTAL OF FIC 0001	1.450	1.450	0.000	
						TOTAL OF SAct 02	1.450	1.450	0.000	
			03			PROVIDE ADMINISTRATION SERVICES AND STAFF MOBILITY				
				0001		RGOB Financing				
					11.01	Travel - In country	0.705	0.705		
						TOTAL OF FIC 0001	0.705	0.705		
						TOTAL OF SAct 03	0.705	0.705		
						TOTAL OF Act 001	22.122	22.007	0.115	
		002				DRUGS VACCINES AND EQUIPMENT UNIT DVEU				
			01			PROCUREMENT, DISTRIBUTION AND MANAGEMENT OF VETERINARY MEDICINES, VACCINES & EQUIPMENT				
				0001		RGOB Financing				
					14.02	S & M - Medicines & Laboratory Consumables	18.500	18.500	0.000	0.00
						TOTAL OF FIC 0001	18.500	18.500	0.000	
				4599		Rural Development and Climate Change Response Programme				
					52.07	Plant & Equipt. - Hospital/Lab. Equipment	23.600	23.600		
						TOTAL OF FIC 4599	23.600	23.600		
						TOTAL OF SAct 01	42.100	42.100	0.000	
						TOTAL OF Act 002	42.100	42.100	0.000	
		003				LABORATORY SERVICE UNIT				
			01			TEST KITS VALIDATION AND TEST STANDARDIZATION FOR SEROLOGY AND MOLECULAR				
				0001		RGOB Financing				
					14.02	S & M - Medicines & Laboratory Consumables	0.025	0.025		
						TOTAL OF FIC 0001	0.025	0.025		
						TOTAL OF SAct 01	0.025	0.025		
			08			MONITORING AND REPORTING AND CERTIFICATION OF BIOSAFETY CABINETS, FUME HOODS AND ISOLATORS.				
				0001		RGOB Financing				
					17.02	Op. Exp. - Taxes, Duties, Royalties, Fees, Handling Charges, Bank Charges	0.005	0.005		
						TOTAL OF FIC 0001	0.005	0.005		

						TOTAL OF SAct 08	0.005	0.005		
			10			COLLABORATIVE STUDIES ON RISK ANALYSIS OF TRANS BOUNDARY AND ENVIRONMENTAL ZOONOSES				
				4694		"Collaborative studies on risk analysis of trans-boundary and environmental zoonoses"				
					11.01	Travel - In country				
					17.08	Op. Exp. - In country Meetings and Celebrations				
					45.02	Training - Others	0.241	0.241		
						TOTAL OF FIC 4694	0.241	0.241		
						TOTAL OF SAct 10	0.241	0.241		
						TOTAL OF Act 003	0.271	0.271		
		004				DISEASE PREVENTION AND CONTROL UNIT				
			01			COLLABORATIVE STUDIES ON RISK ANALYSIS OF TRANSBOUNDARY AND ENVIRONMENTAL ZOONOSES				
				4694		"Collaborative studies on risk analysis of trans-boundary and environmental zoonoses"				
					11.01	Travel - In country				
					17.09	Op. Exp. - Survey/Census				
					45.02	Training - Others	0.380	0.380		
						TOTAL OF FIC 4694	0.380	0.380		
						TOTAL OF SAct 01	0.380	0.380		
						TOTAL OF Act 004	0.380	0.380		
		005				BIOLOGICAL PRODUCTION UNIT				
			01			PRODUCTION OF ANIMAL VACCINES				
				0001		RGOB Financing				
					14.02	S & M - Medicines & Laboratory Consumables	0.209	0.209	0.000	0.00
					14.05	S & M - Animal Feeds	0.040	0.040		
						TOTAL OF FIC 0001	0.249	0.249	0.000	
						TOTAL OF SAct 01	0.249	0.249	0.000	
			02			PROCUREMENT AND DISTRIBUTION OF ANIMAL/POULTRY VACCINES				
				0001		RGOB Financing				
					14.02	S & M - Medicines & Laboratory Consumables	1.500	1.500		
						TOTAL OF FIC 0001	1.500	1.500		
						TOTAL OF SAct 02	1.500	1.500		
						TOTAL OF Act 005	1.749	1.749	0.000	
						TOTAL OF SPrg 027	66.622	66.507	0.115	
						TOTAL OF Prg 045	66.622	66.507	0.115	
						TOTAL OF FO 20	66.622	66.507	0.115	
						TOTAL OF Dept 03	66.622	66.507	0.115	
						TOTAL OF AU 204.01	66.622	66.507	0.115	
						GRAND TOTAL	66.622	66.507	0.115	

13. ANNEXURE

13.1. List of staff at the National Centre for Animal Health

Sl. No.	Name	Position Title	EID No.	Position Level
1	Dr R B Gurung	Specialist III (Animal Health)	9603028	ES II
2	Dr N.K. Thapa	Specialist II (Animal Health)	9302007	ES III
3	Dr Hiruka Mahat	Dy. Chief Veterinary Officer	200501113	P2 A
4	Dr Sangay Rinchen	Sr. Veterinary Officer	201201011	P3A
5	Dr Pelden Wangchuk	Sr. Veterinary Officer	20140103307	P4 A
6	Dr Ugyen Namgyal	Dy. Chief Veterinary Officer	201201012	P2A
7	Dr Sonam Peldon	Dy. Chief Veterinary Officer	201201016	P2A
8	Ms Puspa Maya Sharma	Sr. Laboratory Officer	20140103185	P3A
9	Ms Dechen Wangmo	Sr. Laboratory Officer	20150105019	P4A
10	Mr Purna Bdr. Rai	Sr. Laboratory Technician II	8806138	SS3A
11	Ms Karma Pelden Zangmo	Pharmacist	20200116341	P4A
12	Mr Kinzang Namgay	Sr. Livestock Health Supervisor	8604131	SS4 A
13	Mr Namgay Dorji	Sr. Livestock Health Supervisor II	200208011	SS3 A
14	Ms Sonam Deki	Livestock Production Supervisor I	20150905895	S1A
15	Mr Migma	Sr. Laboratory Technician II	9801103	SS3A
16	Mr Tenzinla	Sr. Laboratory Technician II	9901013	SS3A
17	Mr Dawa Tshering	Sr. Laboratory Technician II	9901014	SS3A
18	Ms Ugyen Pema	Asstt. Laboratory Technician I	2109009	S1 A
19	MS Kelzang Lhamo	Asstt. Laboratory Technician I	200310013	S1A
20	Ms Tshewang Dema	Asstt. Laboratory Technician I	200407360	S1 A
21	Ms Karma Choki	Asstt. Laboratory Technician I	2108008	S1 A
22	Ms Pasang Bida	Asstt. Laboratory Technician I	2109008	S1 A
23	Ms Pema Choden	Accounts Assistant II	8712024	SS4 A
24	Ms Pari Chhetri	Accounts Assistant II	9709069	SS3 A
25	Ms Karma Dekar	Sr. Administrative Assistant	9507009	SS4A
26	Mr Rinzin Dorji	Storekeeper	9910107	S4A
27	Ms Phuntsho Choden	Administrative Asst II	200712003	S4A
28	Ms Pemo	Sr. Telephone Operator II	9904051	O1A
29	Mr Penjor	Driver	9906003	O1 A
30	Mr Tashi Gayleg	Driver	2006039	O1 A
31	Mr Pema Wangdi	Driver	2106032	O1 A
32	Ms Sangay Tshering	Driver	9902017	O1 A
33	Mr Tshewang Rinzin	Driver II	201108012	O2 A
34	Mr Tandin Wangchuk	Driver II	20120300163	O2 A

35	Mr Karna Kumar Tamang	Sweeper	ESP
36	Mr Sangay Nidup	Helper (Lab Utility)	ESP
37	Mr Phub Namgay	Laboratory Attendant	ESP
38	Ms Tshering Dolkar	Night Guard	ESP
39	Ms Kencho Dema	Helper (Lab Utility)	ESP

13.2. Staff transferred (to and from NCAH), resigned, or superannuated.

- Dr Tenzin, PLHO (Resigned)
- Mr Harka Bdr Tamang, SrAHS (Superannuated)
- Dr Sonam Peldon, Sr. Veterinary Officer (transferred in)

13.3. Staff promotion

- Dr Ugyen Namgyal, Dy CVO, P2A
- Dr Sonam Peldon, Dy CVO, P2A
- Ms Pema Choden, Sr. Account Asst. IV
- Kinzang Namgay, Sr. LHS
- Tandin Wangchuk, Driver

13.4. Detail of infrastructure

Sl. No	Class of Building	No. of Unit
1	Office building (Administrative Block)	1
2	Laboratory	2 (Old and BSL 2)
3	Vaccine Production building	1
4	Old Laboratory building (Store)	1
5	Generator House	1
6	Refrigerator Workshop	1
7	Small animal shed	1
8	Sheep shed	1
9	Garage	1
	Poultry Shed	1
10	Animal potency test	1
11	Guard house	1
12	Res. Quarter, Class II	3
13	Res. Quarter, Class III	1
14	Res. quarter, Class IV	4
15	Drivers quarter	2
16	Res. quarter, old hostel	5

13.5. Detail of office vehicles

Sl. No.	Type of vehicle/ Machinery	Make/Model	Date of Purchase	Registration No.	Stationed at	Present condition
1	Eicher Bus	Indian/2010	2009	BG-1-A0612	NCAH	Running
2	Scorpio Pick up (Double cabin)	Indian/2008	2008	BG-1-A1601	NCAH	Off Road
3	Bolero Pick up (Single cabin)	Indian/2008	2008	BG-1-A1602	NCAH	Off Road
4	Isuzu Pick up	Isuzu	2019	BG-1-A3344	DPM	Running
5	Bike (Bajaj pulsar)	Bajaj Co.2008	2008	BG-2-A0217	NCAH	Off road
6	Toyota Hilux (Refrigerator Van)	Japan/2010	2010	BG-1-A1887	NCAH	Running
7	Toyota Hilux (Vigo)	Bangkok	2013	BG-1-A2290	DPM	Running
8	Toyota Hilux (Vigo)	Bangkok	2013	BG-1-A2291	DPM	Running
9	Bolero	Mahindra, India	2011	BG-1-A1952	DPM	Off road
10	Bolero	Mahindra	2018	BG-1-A3076	DPM	Running

13.6. Expenditure for maintenance and spare parts

Sl. No	Vehicle No.	Funding	Cost (BTN)
1	BG-1-A1601	RGoB	
2	BG-1-A1602	RGoB	
3	BG-1-A1887	RGoB	
4	BG-1-A0612	RGoB	
5	BG-1-A2291	HSI Project	
6	BG-1-A2290	HSI Project	
7	BG-1-A3076	HSI Project	
8	BG-1-A1952	HSI Project	
Total Amount:			**840,000**

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NCAH